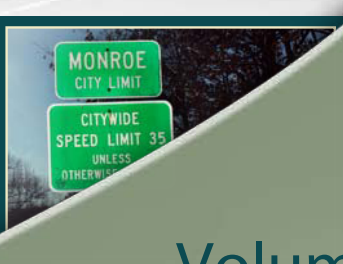
NORTH CAROLINA
Turnpike Authority

A Division of NCDOT



Volume 3
Appendix C

Monroe Connector/Bypass

Administrative Action Draft Supplemental Final Environmental Impact Statement

November 2013

Lead Agencies: US Department of Transportation
Federal Highway Administration
North Carolina Department of Transportation

Cooperating Agency: US Army Corps of Engineers

Submitted Pursuant to the National Environmental Policy Act
23 CFR 771.119 and 42 USC 4332(2)(c)

Monroe Connector/Bypass
Mecklenburg and Union Counties
STIP Projects R-2559 and R-3329

ABSTRACT

This report is a Supplement to the May 25, 2010 Final Environmental Impact Statement for the Monroe Connector/Bypass. The proposed action is the construction of a controlled-access toll facility extending from US 74 near I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, a distance of approximately 20 miles.

On May 3, 2012 the United State Court of Appeals for the Fourth Circuit in North Carolina Wildlife Federation, Clean Air Carolina; Yadkin Riverkeeper v. North Carolina Department of Transportation and Federal Highway Administration, No. 11-2210, held that the Federal Highway Administration (FHWA) and the North Carolina Department of Transportation (NCDOT) had not complied with the provisions of the National Environmental Policy Act (NEPA) by failing to disclose critical assumptions underlying their decision to build the proposed project and by providing the public with incorrect information. Specifically, in addressing public comments on the project as to whether the data set used as the project's no-build scenario for the indirect and cumulative analysis contained the project, the agencies responded "TAZ socioeconomic forecasts for the No Build Scenario did not include the Monroe Connector. [The Mecklenburg Union County Metropolitan Planning Organization (MUMPO) confirmed our assumption regarding the reasonableness of the 2030 TAZ forecasts for use as a No Build basis." The second sentence accurately reflects the agencies' final conclusion, but the first sentence is not correct. Travel time to employment, one of eight land development factors for Union County used to project no-build growth estimates for the year 2030, presumed the presence of the proposed Monroe Connector/Bypass. As a result, the data relied upon to reflect the no build scenario included a build assumption. In response to the court's decision FHWA rescinded the Record of Decision (ROD) for this project on July 3, 2012. NCDOT and FHWA then re-initiated the National Environmental Policy Act (NEPA) process which has led to the development of this Draft Supplemental Final Environmental Impact Statement (EIS).

This Draft Supplemental Final EIS (DSEIS) addresses current environmental conditions and focuses on any changes that have occurred with regards to the project (note: there have been no changes in the proposed action), the alternatives analysis, the affected environment and impacts, and any new issues or information identified since the Final EIS was published. This DSEIS also documents the assumptions and methods underlying the modeling for the quantitative indirect and cumulative effects analysis at issue in the prior litigation, documents the actions taken to test the propriety of using the data set provided by MUMPO, and explains how and why the agencies determined the no-build and build models for the indirect and cumulative effects analysis are reasonable and enable a meaningful comparison of the environmental impacts associate with the build and no-build scenarios.

Requests for project documentation may be directed to the NCDOT at the contact below.

North Carolina Department of Transportation (NCDOT)
Ms. Jennifer Harris, PE
1548 Mail Service Center
Raleigh, NC 27699-1548
Email: monroe@ncdot.org
Phone: 919-707-6025

FHWA-NC-EIS-09-01-DS

Monroe Connector /Bypass
From Near I-485 at US 74 to
US 74 Between the Towns of Wingate and Marshville
Mecklenburg and Union Counties

Federal Aid Project No. STP-NHF-74(90)
WBS No. 34533.1.1TA1
STIP Project No. R-3329/R-2559

ADMINISTRATIVE ACTION
Draft Supplemental Final Environmental Impact Statement

November 2013
Submitted Pursuant to 42 USC 4332(2)(c)
UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
&
NC DEPARTMENT OF TRANSPORTATION

Cooperating Agency: US Army Corps of Engineers

Approved

11/8/13
Date

Richard W. Hancock, PE, Manager
Project Development and Environmental Analysis Unit
North Carolina Department of Transportation

11/8/13
Date

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

The FHWA will issue a single Final Environmental Impact Statement and Record of Decision document pursuant to Pub. L. 112-141, 126 Stat. 405, Section 1319(b) unless FHWA determines statutory criteria or practicability considerations preclude issuance of the combined document pursuant to Section 1319.

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FHWA-NC-EIS-09-01-DS

Monroe Connector /Bypass
From Near I-485 at US 74 to
US 74 Between the Towns of Wingate and Marshville
Mecklenburg and Union Counties

Federal Aid Project No. STP-NHF-74(90)
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Cooperating Agency: US Army Corps of Engineers

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11/8/13
Date

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Project Manager, Atkins

NORTH CAROLINA PROFESSIONAL SEAL 023639 ENGINEER CARMELO GIBILARO
11/8/13

For the North Carolina Department of Transportation

11.8.2013
Date

Jennifer Harris, PE, Project Development Section Head – Western Region/Turnpike
NCDOT – Project Development and Environmental Analysis Unit

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TABLE OF CONTENTS

***Note**: This Draft Supplemental Final EIS has been published in three volumes:*

VOLUME 1 – Table of Contents, Text and Figures
VOLUME 2 – Table of Contents and Appendices A, B, D thru G
VOLUME 3 – Table of Contents and Appendix C

PAGE

TABLE OF CONTENTS i

LIST OF TABLES iv
LIST OF FIGURES v
LIST OF EXHIBITS vi
APPENDICES vi

P PREFACE P-1

P.1 LEAD AGENCIES, COOPERATING AGENCIES, AND PARTICPATING AGENCIES P-1
P.2 HOW THIS DOCUMENT WILL BE USED P-2
P.3 ORGANIZATION OF THIS DOCUMENT P-4
P.4 HISTORY OF PROJECT P-5
P.4.1 PREVIOUS STUDIES OF MONROE BYPASS P-5
P.4.2 PREVIOUS STUDIES OF MONROE CONNECTOR P-6
P.4.3 MONROE BYPASS AND MONROE CONNECTOR COMBINED P-6
P.4.4 ACTIVITIES BETWEEN THE DRAFT EIS AND FINAL EIS P-7
P.4.5 ACTIVITIES SINCE THE FINAL EIS P-9

PC SPECIAL PROJECT COMMITMENTS PC-1

1 PURPOSE AND NEED FOR ACTION 1-1

1.1 PROPOSED ACTION 1-1
1.1.1 EVALUATION OF NEED FOR PROPOSED ACTION 1-1
1.1.2 PURPOSE OF PROPOSED ACTION 1-3
1.2 PROJECT SETTING AND HISTORY 1-3
1.2.1 TRANSPORTATION SYSTEMS 1-4
1.2.2 SOCIAL AND ECONOMIC CONDITIONS 1-4
1.2.3 TRANSPORTATION AND LAND USE PLANS 1-5
1.2.4 ROADWAY CONDITIONS AND OPERATIONS 1-5

2 ALTERNATIVES CONSIDERED 2-1
2.1 ALTERNATIVES DEVELOPMENT AND SCREENING 2-1
2.2 ALTERNATIVES SCREENING FOR THE DRAFT EIS 2-2
2.2.1 PROCESS OVERVIEW AND SCREENING RESULTS 2-2
2.2.2 DETAILED STUDY ALTERNATIVES IN THE DRAFT EIS 2-6
2.3 ADDITIONAL CONSIDERATION OF ALTERNATIVES IN THE FINAL EIS 2-7
2.4 ADDITIONAL CONSIDERATION OF ALTERNATIVES AFTER THE FINAL EIS 2-10
2.5 TRAFFIC FORESCASTS AND OPERATIONS ANALYSES 2-12
2.5.1 BACKGROUND INFORMATION 2-12
2.5.2 TRAFFIC FORECASTS 2-13
2.5.3 TRAFFIC OPERATIONS ANALYSES 2-24
2.6 CONCLUSION REGARDING THE ALTERNATIVES ANALYSIS PROCESS 2-26

3 PREFERRED ALTERNATIVE 3-1
3.1 DESCRIPTION OF THE PREFERRED ALTERNATIVE 3-1
3.1.1 GENERAL DESCRIPTION 3-1
3.1.2 DESIGN CRITERIA 3-1
3.1.3 TOLLING INFORMATION 3-2
3.2 REASONS FOR SELECTING DSA D AS THE PREFERRED ALTERNATIVE 3-3
3.3 DESIGN REFINEMENTS TO THE PREFERRED ALTERNATIVE 3-7
3.3.1 DESIGN REFINEMENTS SUMMARY 3-7
3.3.2 SERVICE ROADS SUMMARY 3-8
3.3.3 AVOIDANCE AND MINIMIZATION OF IMPACTS TO WATERS OF THE US 3-8
3.3.4 COST ESTIMATES FOR THE PREFERRED ALTERNATIVE 3-10
3.3.5 UPDATED TRAFFIC FORECASTS AND OPERATIONS ANALYSIS IN THE FINAL EIS 3-12
3.4 SUMMARY OF IMPACTS FROM THE PREFERRED ALTERNATIVE 3-13

4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 4-1
4.1 HUMAN ENVIRONMENT 4-1
4.1.1 SOCIO-ECONOMIC CHARACTERISTICS 4-1
4.1.2 COMMUNITY RESOURCES 4-2
4.1.3 LAND USE AND TRANSPORTATION PLANNING 4-4
4.1.4 RIGHT-OF-WAY ACQUISITION AND RELOCATIONS 4-5
4.1.5 ENVIRONMENTAL JUSTICE 4-5
4.1.6 LIMITED ENGLISH PROFICIENCY 4-6
4.2 PHYSICAL ENVIRONMENT 4-7
4.2.1 NOISE 4-7
4.2.2 AIR QUALITY 4-10
4.2.3 FARMLAND 4-14
4.2.4 UTILITIES AND INFRASTRUCTURE 4-15
4.2.5 VISUAL RESOURCES 4-15
4.2.6 HAZARDOUS MATERIALS 4-15
4.2.7 FLOODPLAINS AND FLOODWAYS 4-15

4.3 CULTURAL RESOURCES 4-16
4.3.1 HISTORIC ARCHITECTURAL RESOURCES 4-16
4.3.2 ARCHAEOLOGICAL RESOURCES 4-16
4.3.3 SECTION 4(F) AND SECTION 6(F) RESOURCES 4-17
4.4 NATURAL RESOURCES 4-17
4.4.1 SOILS, GEOLOGY, AND MINERAL RESOURCES 4-17
4.4.2 WATER RESOURCES 4-18
4.4.3 NATURAL COMMUNITIES AND WILDLIFE 4-18
4.4.4 WATER RESOURCES IN FEDERAL JURISDICTION 4-20
4.4.5 PROTECTED SPECIES 4-21
4.5 INDIRECT AND CUMULATIVE EFFECTS 4-23
4.5.1 METHODOLOGY 4-23
4.5.2 HOW WERE THE MPO SOCIOECONOMIC PROJECTIONS DEVELOPED? 4-25
4.5.3 HOW WAS INDUCED GROWTH ESTIMATED? 4-29
4.5.4 WHAT ARE THE RESULTS OF THE UPDATED ICE ANALYSIS? 4-30
4.5.5 WHAT ARE THE IMPACTS ASSOCIATED WITH THE RESULTS OF THE ANALYSIS? 4-31
4.5.6 HOW CAN INDIRECT AND CUMULATIVE IMPACTS BE MINIMIZED OR AVOIDED? 4-33
4.6 OTHER IMPACTS 4-34
4.6.1 IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES 4-34
4.6.2 RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM IMPACTS 4-34

5 COMMENTS AND COORDINATION 5-1
5.1 COMMENTS ON THE FINAL EIS 5-1
5.2 PUBLIC INVOLVEMENT AND AGENCY COORDINATION AFTER THE FINAL EIS 5-1
5.2.1 CITIZENS UPDATE WORKSHOPS 5-2
5.2.2 COMMENTS RECEIVED AFTER FINAL EIS 5-2
5.2.3 SMALL GROUP MEETINGS 5-2
5.3 AGENCY COORDINATION 5-3
5.3.1 COORDINATION WITH MUMPO 5-3
5.3.2 AGENCY MEETINGS 5-3

6 LIST OF PREPARERS 6-1
6.1 FEDERAL HIGHWAY ADMINISTRATION 6-1
6.2 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION 6-1
6.3 PRIVATE CONSULTING FIRMS 6-2

7 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT 7-1
7.1 FEDERAL AGENCIES 7-1
7.2 REGIONAL OFFICES OF FEDERAL AGENCIES 7-1
7.3 STATE AGENCIES 7-1
7.4 LOCAL GOVERNMENTS AND AGENCIES 7-2

7.5 PUBLIC REVIEW LOCATIONS 7-2

8 REFERENCES 8-1

8.1 REFERENCES 8-1
8.2 SUPPORTING PROJECT DOCUMENTATION 8-7
8.2.1 SUPPORTING PROJECT DOCUMENTATION PRIOR TO PUBLICATION OF THE DRAFT EIS 8-7
8.2.2 SUPPORTING PROJECT DOCUMENTATION AFTER PUBLICATION OF THE DRAFT EIS 8-8
8.2.3 REFERENCES AND SUPPORTING PROJECT DOCUMENTATION AFTER THE FINAL EIS 8-9
8.3 LIST OF ACRONYMS 8-10

LIST OF TABLES

Preface
P-1 Summary of Evaluation of Changes Since the Final EIS P-11

Special Project Commitments
PC-1 Special Project Commitments PC-1

Section 1
1-1 Speed Limits on Existing US 74 1-2
1-2 Peak Hour Speeds Along US 74 Eastbound (2011, 2012, August 2013) 1-7
1-3 Peak Hour Speeds Along US 74 Westbound (2011, 2012, August 2013 1-8
1-4 Impact of Signal Spacing on Travel Time 1-13

Section 2
2-1 Detailed Study Alternatives 2-6
2-2 US 74 Improvements Implemented Since July 2007 2-11
2-3 Summary of Monroe Connector/Bypass Project Traffic Forecasts 2-14
2-4 Effects of Socioeconomic Data Sets on Travel Demand Model Output 2-17
2-5 Effects of the Indirect and Cumulative Effects Analysis Socioeconomic Data on Travel Demand Model Output 2-18
2-6 Comparisons of No-Build Scenario MRM Model Output 2-20
2-7 Comparisons of Build Scenario MRM Model Output 2-22
2-8 Effects of the Monroe Connector/Bypass on US 74 Traffic 2-24
2-9 Summary of Monroe Connector/Bypass Project Traffic Operations Analyses 2-24

Section 3
3-1 Changes in Jurisdictional Resource Impacts Due to Design Refinements 3-9
3-2 Changes in Jurisdictional Resource Impacts Since the Draft EIS 3-10
3-3 Cost Estimates for Preferred Alternative 3-11

Section 4
4-1 Noise Abatement Criteria 4-8

4-2 Monroe Connector/Bypass Preferred Alternative Preliminary Recommended Noise Barriers..... 4-10
4-3 National Ambient Air Quality Standards..... 4-11
4-4 Potential Impacts to Terrestrial Communities by Detailed Study Alternative..... 4-19
4-5 MRM Socioeconomic Projections Versions 4-26
4-6 Updated Land Use Scenario Results 4-30
4-7 Percent Impervious Cover Results from 2010 Report Compared to 2013 Report .. 4-31

Section 5
5-1 MUMPO Meeting Summaries 5-3
5-2 Agency Meeting Summaries.....5-3

Section 8
8-1 List of Acronyms 8-10

LIST OF FIGURES (Figures located at the end of each chapter)

Preface
P-1 Monroe Bypass Detailed Study Alternatives and Preferred Alternative
P-2 Monroe Connector Preliminary Corridors and Detailed Study Alternatives

Section 1
1-1 Project Study Area

Section 2
2-1 Alternative Concepts and Decision Points

Section 3
3-1 Detailed Study Alternatives
3-2 Preferred Alternative DSA D
3-3 Typical Section
3-4 Preferred Alternative Functional Designs

Section 4
4-1 Population Change (2000/2010)
4-2 Community Resources
4-3 African American Population in the Demographic Area
4-4 Hispanic Population in the Demographic Area
4-5 Percentage Below Poverty Level in the Demographic Area
4-6 Updated Noise Impact Assessment Information
4-7 Updated 2010 Baseline Land Use Scenario
4-8 Updated 2030 No-Build Land Use Scenario
4-9 Updated 2030 Build Land Use Scenario

LIST OF EXHIBITS

Section 1

1-1 Average Operating Speeds for US 74 Eastbound (August 2013 Lunch Peak) 1-9
1-2 Average Operating Speeds for US 74 Eastbound (August 2013 PM Peak)..... 1-10
1-3 Average Operating Speeds for US 74 Westbound (August 2013 AM Peak) 1-11
1-4 Average Operating Speeds for US 74 Westbound (August 2013 PM Peak)..... 1-12

Section 2

2-1 Alternatives Evaluation Process for the Monroe Connector/Bypass.....2-2
2-2 Components of the Metrolina Regional Travel Demand Model 2-15

APPENDICES
(VOLUME 2 OF THE DRAFT SUPPLEMENTAL FINAL EIS)

A. Comments
B. Additional Information on Alternatives Analysis
D. Updated Census Tables
E. Updated ICE Technical Report
F. Errata
G. Traffic Forecast Memo

(VOLUME 3 OF THE DRAFT SUPPLEMENTAL FINAL EIS)

C. Correspondence and Coordination

NOTE: A CD of the approved Draft EIS and Final EIS is included inside the back cover of Volume #2 of this Draft Supplemental Final EIS. These documents can also be view at www.ncdot.gov/projects/monroeconnector.

APPENDIX C
CORRESPONDENCE AND COORDINATION

ORGANIZATION OF APPENDIX C

C-1. Agency Coordination

C-2. USFWS Coordination

C-3. Other Correspondence

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APPENDIX C-1
AGENCY COORDINATION

Document	Date	Page
Ecosystem Enhancement Program Acceptance - USACE	06/24/10	C1-1
Ecosystem Enhancement Program Acceptance - NCTA	06/24/10	C1-2
Meeting Minutes from 7/18/12 Agency Meeting	07/18/12	C1-3
Meeting Minutes from 9/12/12 Agency Meeting	09/12/12	C1-36
Meeting Minutes from 10/17/12 Agency Meeting	10/17/12	C1-55
Meeting Minutes from 11/8/12 Agency Meeting	11/08/12	C1-73
Memo from Alan Johnson (NCDWQ) to Jennifer Harris (NCDOT)	11/05/12	C1-95
Email from Alan Johnson (NCDWQ) to NCDOT	01/16/13	C1-96
NCDOT Responses to NCDWQ Questions	03/22/13	C1-98
Meeting Summary from 2/19/13 meeting with US Army Corps of Engineers	04/10/13	C1-137
USACE Permit Revocation Letter	04/17/13	C1-170

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Ecosystem Enhancement PROGRAM

June 24, 2010

Ms. Liz Hair
U. S. Army Corps of Engineers
Asheville Regulatory Field Office
151 Patton Avenue, Suite 208
Asheville, North Carolina 28801-5006

Dear Ms. Hair:

Subject: EEP Mitigation Acceptance Letter:

R-2559/R-3329, Monroe Bypass and Connector, Union and Mecklenburg Counties

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the compensatory stream and riparian wetland mitigation for the unavoidable impact associated with the above referenced projects. Based on the information supplied by the NCDOT on June 23, 2010, the impacts are located in CU 03040105 of the Yadkin River Basin in the Southern Piedmont (SP) Eco-Region, and the anticipated mitigation credits needed to offset the impacts are as follows:

Yadkin 03040105 SP	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	0	0	23,083	8.10	0	0	0	0
Mitigation Units (Credits-up to 2:1)	0	0	46,166	16.20	0	0	0	0

Mitigation associated with this project will be provided in accordance with Section X of Amendment No. 2 to the Memorandum of Agreement between the N. C. Department of Environment and Natural Resources, the N. C. Department of Transportation, and the U. S. Army Corps of Engineers fully executed on March 8, 2007 (Tri-Party MOA). EEP commits to implement sufficient compensatory stream and riparian wetland mitigation in the appropriate cataloging unit in the amount listed in the above table to offset the impacts associated with this project by the end of the MOA year in which this project is permitted. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from EEP.

If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-715-1929.

Sincerely,

James B. Stanfill for

William D. Gilmore, P.E.
EEP Director

cc: Mr. Gregory J. Thorpe, Ph.D., NCDOT-PDEA
Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit
File: R-2559 / R-3329

Ecosystem Enhancement PROGRAM

June 24, 2010

Mr. Steve DeWitt, P.E.
Chief Engineer
North Carolina Turnpike Authority
5400 Glenwood Avenue, Suite 200
Raleigh, North Carolina 27612

Dear Mr. DeWitt:

Subject: EEP Mitigation Acceptance Letter:

R-2559/R-3329, Monroe Bypass and Connector, Union and Mecklenburg Counties

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the compensatory stream and riparian wetland mitigation for the subject project. Based on the information supplied by you on June 23, 2010, the impacts are located in CU 03040105 of the Yadkin River Basin in the Southern Piedmont (SP) Eco-Region, and are as follows:

Yadkin 03040105 SP	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	0	0	23,083	8.10	0	0	0	0
Mitigation Units (Credits-up to 2:1)	0	0	46,166	16.20	0	0	0	0

EEP commits to implementing sufficient compensatory stream and riparian wetland mitigation credits to offset the impacts associated with this project by the end of the MOA Year in which this project is permitted, in accordance with Section X of the Amendment No. 2 to the Memorandum of Agreement between the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U. S. Army Corps of Engineers, fully executed on March 8, 2007. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from EEP.

If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-715-1929.

Sincerely,

James B. Stanfill for

William D. Gilmore, P.E.
EEP Director

cc: Ms. Liz Hair, USACE – Asheville Regulatory Field Office
Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit
Ms. Linda Fitzpatrick, NCDOT – PDEA
File: R-2559 / R-3329

Monroe Bypass Agency Meeting

MEETING MINUTES

Date: July 18, 2012
10:00 AM to 12:15 PM
NCDOT Century Center – Structures Conference Room

Project: STIP R-3329/R-2559 Monroe Connector/Bypass – STP-NHF-74(90)

Attendees:

George Hoops, FHWA
Scott McLendon, USACE
Liz Hair, USACE (phone)
Marella Buncick, USFWS
Marla Chambers, NCWRC
David Wainwright, NCDWQ
Cindy Karoly, NCDWQ
Alan Johnson, NCDWQ (phone)
Amy Simes, NCDENR
Scott Slusser, NCDOJ
Ebony Pittman, NCDOJ
Ed Lewis, NCDOT – HES
Greg Thorpe, NCDOT – PDEA
Steve Gurganus, NCDOT – HES
Colin Mellor, NCDOT - NES
Carla Dagnino, NCDOT - NES
Elizabeth Lusk, NCDOT - NES
Jesse Gilstrap, NCDOT-WZTC
Lawrence Gettier, NCDOT – WZTC
Barney Blackburn, NCDOT – REU
Mark Staley, NCDOT - REU
Kevin Fischer, NCDOT – Structures Mgmt
Larry Thompson, NCDOT - Div 10
Jamal Alavi, NCDOT – TPB
Ron Wilkins, NCDOT - Utilities
Tim McFadden, NCDOT – DB
Malcolm Watson, NCDOT – DB
Jennifer Harris, NCTA
Zak Hamidi, NCTA
Rick Baucom, NCTA
Christy Shumate, NCTA-GEC
Carl Gibilaro, Atkins
Ken Gilland, Michael Baker Eng.
Lorna Parkins, Michael Baker Eng.
Scudder Wagg, Michael Baker Eng.
Tommy Peacock, RKK
Tina Swiezy, RKK
Jim Triplett, UIG (phone)
Sam Stutt, UIG (phone)
Lindy Hallman, UIG (phone)
Greg Miller (phone)

Presentation Materials:

- Agenda
- PowerPoint presentation: Land Use Forecast Background and Union County Growth Analysis

Purpose:

Provide an update on the Monroe Bypass project status, review issues raised in the recent legal proceedings and discuss the next steps.

The following items were discussed at the meeting:

Summary of Legal Proceedings

On May 3, 2012, the US Court of Appeals (4th Circuit) stated that the North Carolina Department of Transportation (NCDOT) had failed to disclose critical assumptions underlying their decision to build the Monroe Connector/Bypass: *In sum, although we need not and do not decide whether the NEPA permits the Agencies to use MUMPO's data in this case, we do hold that by doing so without disclosing the data's underlying assumptions and falsely responding to public concerns, the Agencies failed to take the "hard look" at environmental consequences.* The Court further stated that the MUMPO data from which the

quantitative ICE Build and No-Build projections were developed contained the project in the travel time to employment, one of the factors used to develop the socioeconomic data. They further stated that this inclusion was not shared with the agencies and cast doubt on the findings of the analysis. NCDOT did request a rehearing due to facts and law the Court overlooked or misunderstood but that request was denied on June 29, 2012.

Update on Construction, Right of Way Process and Permits

In light of the recent court decision, FHWA rescinded the Record of Decision (August 2010). In addition, all design work for the design-build project has been suspended. Right of way acquisition activities have also been suspended, although property owners may apply for consideration for hardship acquisition. At NCTA's request, the Section 401 permit issued by NC Division of Water Quality (DWQ) has been withdrawn and the US Army Corps of Engineers (USACE) Section 404 permit has been suspended.

Indirect and Cumulative Effects Analysis

Baker Engineering gave a presentation on the process used to complete the quantitative indirect and cumulative effects study for the project. The presentation included details on the data and methodology used, as well as how and why decisions and conclusions were reached. The intent of the presentation was to provide agencies some background and explanation of the issues involved in the litigation. In addition, the presentation provided an overview of growth trends in Union County and the Metrolina region. A copy of the PowerPoint presentation is attached to these minutes.

Next Steps

NCTA and NCDOT have reviewed the court's decision and identified topics where additional documentation and explanation are warranted. These topics include:

- Indirect and cumulative effects analysis data and methodologies
- Growth trends in Union County
- Evaluation of the *US 74 Corridor Study* prepared by Stantec in 2007 for NCDOT-Division 10
- Alternatives analysis and build corridors considered
- 2035 No-Build Traffic forecasts (see FEIS Appendix A)

NCTA will compile information on these topics and share that with agencies and the public. NCTA will also review other components of the NEPA study to determine if additional analysis is necessary. NCTA will also ask for agency input on other topics to be addressed and methodologies to be used. The type of NEPA document that will ultimately be prepared has not yet been determined.

Update on Public Involvement Activities

On June 18 and 19, community meetings were held in Stallings and Monroe to provide updates similar to what was presented at this agency meeting. Those meetings included additional focus on the right of way acquisition process. The presentation to the public provided a broader level of technical detail regarding the modeling than was presented today. A total of approximately 200 people attended the meetings.

Q&A / COMMENTS:

1. *USFWS noted that it is, or should be, inherent that the MPO's model would include the project. An explanation that was previously provided regarding the inclusion of the project in the model was that the land use model included the transportation network and that homes and businesses around the interchanges were then removed to create the No-Build scenario. So, did the NCTA delete projected growth included in the MPO's model around the future interchanges to get to a No-Build scenario, and if so, how was sprawl away from the interchanges accounted for?*
   The assumption that the MPO's model would inherently include the project and therefore represent a future Build scenario is the basis of the confusion regarding the ICE analysis. In the modeling process used to develop future socioeconomic data, two separate models were used: a land use forecast model and a transportation network model. The analysis of the socioeconomic forecasts

provided by MUMPO indicated that project-related growth concentrated at future interchanges for the Bypass were not incorporated in those forecasts because at the time the forecasts were created, the planning experts did not contemplate the Project in their land use plans. Therefore, households and employment in the socioeconomic forecasts were not removed at the interchange areas. Instead, in development of the Build Land Use scenario, additional development or more intense development was added around the interchange areas to reflect induced development from the project.

2. *Were the items in the Hammer Report (top-down socioeconomic projections) weighted? (USFWS)*
   Yes. The Hammer Report looked at 227 representative counties to determine the influence of each factor.

3. *When you reevaluate the study, will you reuse the 2003/2004 socioeconomic data or consider updated data? (USFWS)*
   The 2003/2004 socioeconomic forecasts are forecasts of future population and employment (year 2030) developed by MUMPO for use in their long range planning and travel demand modeling. These are the forecasts that were used in the indirect and cumulative effects analysis to represent the future No-Build condition. MUMPO is currently updating their long range transportation plan and associated socioeconomic projects; however, these will not be available for at least nine months and likely a year. Therefore, the 2003/2004 projections are still the best available forecast data that has been reviewed and approved by regional leaders. NCTA is still investigating options for other socioeconomic forecasts that may inform any update to the ICE.

4. *How do you determine what land is defined as "available land"? (USFWS)*
   Land available for development that would be considered for possible development in the No Build and Build Land Use Scenarios was any parcel considered "undeveloped" in the existing land use. This included farms, forests and other vacant lands. Land protected by stream buffer ordinances, however, was not considered available for development.

5. *Agencies asked for clarification on the roles of NCTA, FHWA, and agencies and the status of the legal proceedings.*
   NCTA and FHWA's roles will be the same as they have been, with FHWA as the lead federal agency and decision-maker. The type of NEPA documentation that will be prepared has not been determined yet. The agencies will be asked to provide input on all documentation, data, and methodologies used in responding to the court's concerns. The legal proceedings related to the lawsuit filed in November 2010 are now closed.

6. *What is the projected schedule moving forward? (USACE)*
   NCTA anticipates a new ROD in early 2013. After that, NCTA will resubmit a permit application for a new 401 permit and request the 404 permit be taken off suspended status. NCTA is hopeful that the design-build process can be reinitiated by April 2013.

7. *NCWRC noted that studies show high levels of development occurring in Union County with and without the project. What are NCDOT and the localities doing to protect resources and water quality? A partnership between NCDOT, NCDWQ, and local governments could be considered, as well as local land use restrictions.*
   NCTA will review current land use and trends and update the cumulative effects section of the report, if required; as well as consider NCWRC's Green Growth Toolbox Handbook.

8. *USFWS asked if a merger type process to review the new data and provide comments had been considered.*
   NCTA and FHWA will discuss this and determine some key points for agency involvement and input in this process. Agencies will be asked to provide input and comments on all documents.

9. *USFWS noted that depending on the outcome of NCTA's current studies, they may need to revisit consultations under Section 7 of the Endangered Species Act.*
   At this time, no modifications appear to be needed. NCTA and FHWA will continue to coordinate with USFWS to determine an appropriate course of action.

Previous Action Items:

- None.

New Action Items:

- Identify the process that will be used for future meetings and the sharing of data. There was agreement among the participants that the project does not need to return to the Purpose and Need or Alternatives phases (concurrence points 1, 2 and 2a) nor does it need to enter into the formal Merger process.

Resolutions:

- None.

Next Steps:

- NCDOT will continue to be committed to full disclosure and transparency. In future meetings NCDOT will provide any materials requested by the agencies in a detailed yet understandable manner to expedite the decision making process.
- Next Meeting – August 22, 2012

Shumate, Christy

From: Chris Militscher <Militscher.Chris@epamail.epa.gov>
Sent: Wednesday, August 08, 2012 8:15 AM
To: Alavi, J S
Cc: Johnson, Alan; Simes, Amy; Blackburn, Barney R; Moose, Barry S; Carl Gibilaro; Dagnino, Carla S; Mellor, Colin; Shumate, Christy; Karoly, Cyndi; Wainwright, David; Lewis, Ed F; Lusk, Elizabeth L; epittman@ncdoj.gov; 'george.hoops@dot.gov'; Thorpe, Gregory J; Nelson, Jane C; Gilstrap, Jesse W; Harris, Jennifer; 'kgilland@mbakercorp.com'; Hamidi, K. Zak; Gettier, Lawrence; Parkins, Lorna; Thompson, Larry B; 'marella_buncick@fws.gov'; Chambers, Marla J; Clawson, Marshall W; Watson, Malcolm C; Staley, Mark K; Wilkins, Ronald B; Gledhill-earley, Renee; Baucom, Richard W; 'sarah.e.hair@usace.army.mil'; 'scott.c.mclendon@usace.army.mil'; Gurganus, Stephen J (Steve) - HEU; Slusser, Scott (SSLUSSER@ncdoj.gov); Franklin, Spencer T; swagg@mbakercorp.com; Mcfadden, Timothy T; tpeacock@rkk.com; Tina Swiezy (tswiezy@rkk.com); Fischer, Kevin
Subject: RE: Monroe Connector/Bypass (R-3329/R-2559) -- Agency Meeting - July 18 DRAFT MINUTES

Jamal: Thanks for the answer to my question. I do not see a need to review Dr. Appold's methodology or the proposal and contract, but I appreciate the offer. Hope you are doing well and thanks again.

"Alavi, J S" ---08/07/2012 01:38:34 PM---Hi Chris, I'll answer question #1.

From: "Alavi, J S" <jalavi@ncdot.gov>
To: "Mellor, Colin" <cmellor@ncdot.gov>, Chris Militscher/R4/USEPA/US@EPA, "Shumate, Christy" <cmshumate@ncdot.gov>
Cc: "Johnson, Alan" <alan.johnson@ncdenr.gov>, "Simes, Amy" <amy.simes@ncdenr.gov>, "Blackburn, Barney R" <bblackburn@ncdot.gov>, "Moose, Barry S" <bmoose@ncdot.gov>, Carl Gibilaro <carl.gibilaro@atkinsglobal.com>, "Dagnino, Carla S" <cdagnino@ncdot.gov>, "Karoly, Cyndi" <cyndi.karoly@ncdenr.gov>, "Wainwright, David" <david.wainwright@ncdenr.gov>, "Lewis, Ed F" <elewis@ncdot.gov>, "Lusk, Elizabeth L" <ellusk@ncdot.gov>, "epittman@ncdoj.gov" <epittman@ncdoj.gov>, "'george.hoops@dot.gov'" <george.hoops@dot.gov>, "Thorpe, Gregory J" <gthorpe@ncdot.gov>, "Nelson, Jane C" <jcnelson@ncdot.gov>, "Gilstrap, Jesse W" <jgilstrap@ncdot.gov>, "Harris, Jennifer" <jhharris1@ncdot.gov>, "'kgilland@mbakercorp.com'" <kgilland@mbakercorp.com>, "Hamidi, K. Zak" <khamidi@ncdot.gov>, "Gettier, Lawrence" <lgettier@ncdot.gov>, "Parkins, Lorna" <LPARKINS@mbakercorp.com>, "Thompson, Larry B" <lthompson@ncdot.gov>, "'marella_buncick@fws.gov'" <marella_buncick@fws.gov>, "Chambers, Marla J" <marla.chambers@ncwildlife.org>, "Clawson, Marshall W" <mclawson@ncdot.gov>, "Watson, Malcolm C" <mcwatson@ncdot.gov>, "Staley, Mark K" <mstaley@ncdot.gov>, "Wilkins, Ronald B" <rbwilkins@ncdot.gov>, "Gledhill-earley, Renee" <renee.gledhill-earley@ncdcr.gov>, "Baucom, Richard W" <rwbaucom@ncdot.gov>, "'sarah.e.hair@usace.army.mil'" <sarah.e.hair@usace.army.mil>, "'scott.c.mclendon@usace.army.mil'" <scott.c.mclendon@usace.army.mil>, "Gurganus, Stephen J (Steve) - HEU" <sjgurganus@ncdot.gov>, "Slusser, Scott (SSLUSSER@ncdoj.gov)" <SSLUSSER@ncdoj.gov>, "Franklin, Spencer T" <stfranklin@ncdot.gov>, "swagg@mbakercorp.com" <swagg@mbakercorp.com>, "Mcfadden, Timothy T" <tmcfadden@ncdot.gov>, "tpeacock@rkk.com" <tpeacock@rkk.com>, "Tina Swiezy (tswiezy@rkk.com)" <tswiezy@rkk.com>, "Fischer, Kevin" <wkfischer@ncdot.gov>
Date: 08/07/2012 01:38 PM
Subject: RE: Monroe Connector/Bypass (R-3329/R-2559) -- Agency Meeting - July 18 DRAFT MINUTES

Hi Chris,

I'll answer question #1.

The future projections will be done in 5-year increments. However, to develop those projections, the consultant (Stephen Appold with UNC's Kenan-Flagler Business School) will spend much effort analyzing the effects of the recession, which followed the very high growth period beforehand. Land use data for any off year (2011, 2012, 2016, etc.) will be interpolated using the latest approved land use data set and Steve's 5 year projections.

Dr. Appold's methodology is very solid. It has been reviewed by the Metrolina Regional Model team members and approved by the executive committee. If you would like to review the methodology, we will be happy to provide you with the contract and the proposal for this task.

Thanks, Jamal

Jamal S. Alavi, PE, CPM
Transportation Engineering Manager
Metrolina Planning Group
Transportation Planning Branch, NCDOT
1554 Mail Service Center, Raleigh, NC 27699
Tel: 919-707-0970
http://www.ncdot.org/doh/preconstruct/tpb/

From: Mellor, Colin
Sent: Monday, August 06, 2012 8:48 AM
To: Chris Militscher; Shumate, Christy
Cc: Johnson, Alan; Simes, Amy; Blackburn, Barney R; Moose, Barry S; Carl Gibilaro; Dagnino, Carla S; Karoly, Cyndi; Wainwright, David; Lewis, Ed F; Lusk, Elizabeth L; epittman@ncdoj.gov; 'george.hoops@dot.gov'; Thorpe, Gregory J; Alavi, J S; Nelson, Jane C; Gilstrap, Jesse W; Harris, Jennifer; 'kgilland@mbakercorp.com'; Hamidi, K. Zak; Gettier, Lawrence; Parkins, Lorna; Thompson, Larry B; 'marella_buncick@fws.gov'; Chambers, Marla J; Clawson, Marshall W; Watson, Malcolm C; Staley, Mark K; Wilkins, Ronald B; Gledhill-earley, Renee; Baucom, Richard W; 'sarah.e.hair@usace.army.mil'; 'scott.c.mclendon@usace.army.mil'; Gurganus, Stephen J (Steve) - HEU; Slusser, Scott (SSLUSSER@ncdoj.gov); Franklin, Spencer T; swagg@mbakercorp.com; Mcfadden, Timothy T; tpeacock@rkk.com; Tina Swiezy (tswiezy@rkk.com); Fischer, Kevin
Subject: RE: Monroe Connector/Bypass (R-3329/R-2559) -- Agency Meeting - July 18 DRAFT MINUTES

Chris,

I can answer question #2 and the answer is yes. Yes - updates to the ICE have the POTENTIAL to affect future land use projections and therefore may affect the ICI analysis. When we have re-scrutinized all the ICE input we will definitely re-evaluate the water quality model.

Colin

Colin Mellor
NCDOT - PDEA, Natural Environment Section
(919) 707-6139

From: Chris Militscher [mailto:Militscher.Chris@epamail.epa.gov]
Sent: Friday, August 03, 2012 11:56 AM
To: Shumate, Christy
Cc: Johnson, Alan; Simes, Amy; Blackburn, Barney R; Moose, Barry S; Carl Gibilaro; Dagnino, Carla S; Mellor, Colin; Karoly, Cyndi; Wainwright, David; Lewis, Ed F; Lusk, Elizabeth L; epittman@ncdoj.gov; 'george.hoops@dot.gov'; Thorpe, Gregory J; Alavi, J S; Nelson, Jane C; Gilstrap, Jesse W; Harris, Jennifer; 'kgilland@mbakercorp.com'; Hamidi, K. Zak; Gettier, Lawrence; Parkins, Lorna; Thompson, Larry B; 'marella_buncick@fws.gov'; Chambers, Marla J; Clawson, Marshall W; Watson, Malcolm C; Staley, Mark K; Wilkins, Ronald B; Gledhill-earley, Renee; Baucom, Richard W; 'sarah.e.hair@usace.army.mil'; 'scott.c.mclendon@usace.army.mil'; Gurganus, Stephen J (Steve) - HEU; Slusser, Scott (SSLUSSER@ncdoj.gov); Franklin, Spencer T; swagg@mbakercorp.com; Mcfadden, Timothy T; tpeacock@rkk.com; Tina Swiezy (tswiezy@rkk.com); Fischer, Kevin
Subject: RE: Monroe Connector/Bypass (R-3329/R-2559) -- Agency Meeting - July 18 DRAFT MINUTES

Christie: Thanks for the additional information. I do not have any specific comments on the Baker presentation but I did have two potentially related questions:

1. Do you know if MUMPO is planning to look at population and traffic growth projections in their future

updated LRTP in smaller (less than 5 year) time increments (e.g., "pre-2009 recession and post-recession)?

2. Are you planning to internally re-evalaute the findings from the ICI Water Quality Analysis that was provided to some of the agencies? My reason for asking is that I thought that the ICE findings can potentially shape the transportation agencies' assumptions used in an ICI study. It may not, but I cannot recall if there is a connection between the two types of analyses.

From Baker presentation:

Removal of Bypass results in minor changes to travel times and composite scores ϒ *21 (of 256) TAZs increase travel time by more than 1 minute* ϒ *14 TAZs see 1% or more change in composite score* / *Average Composite Score change is 0.21%* / *Maximum Composite Score change is 3.9%* *Still assessing the overall implications to ICE Report*

Thanks again.

-----"Shumate, Christy" <cmshumate@ncdot.gov> wrote: -----
To: Chris Militscher/R4/USEPA/US@EPA
From: "Shumate, Christy" <cmshumate@ncdot.gov>
Date: 08/03/2012 10:47AM
Cc: "Johnson, Alan" <alan.johnson@ncdenr.gov>, "Simes, Amy" <amy.simes@ncdenr.gov>, "Blackburn, Barney R" <bblackburn@ncdot.gov>, "Moose, Barry S" <bmoose@ncdot.gov>, Carl Gibilaro <carl.gibilaro@atkinsglobal.com>, "Dagnino, Carla S" <cdagnino@ncdot.gov>, "Mellor, Colin" <cmellor@ncdot.gov>, "Karoly, Cyndi" <cyndi.karoly@ncdenr.gov>, "Wainwright, David" <david.wainwright@ncdenr.gov>, "Lewis, Ed F" <elewis@ncdot.gov>, "Lusk, Elizabeth L" <ellusk@ncdot.gov>, "epittman@ncdoj.gov" <epittman@ncdoj.gov>, "'george.hoops@dot.gov'" <george.hoops@dot.gov>, "Thorpe, Gregory J" <gthorpe@ncdot.gov>, "Alavi, J S" <jalavi@ncdot.gov>, "Nelson, Jane C" <jcnelson@ncdot.gov>, "Gilstrap, Jesse W" <jgilstrap@ncdot.gov>, "Harris, Jennifer" <jhharris1@ncdot.gov>, "'kgilland@mbakercorp.com'" <kgilland@mbakercorp.com>, "Hamidi, K. Zak" <khamidi@ncdot.gov>, "Gettier, Lawrence" <lgettier@ncdot.gov>, "Parkins, Lorna" <LPARKINS@mbakercorp.com>, "Thompson, Larry B" <lthompson@ncdot.gov>, "'marella_buncick@fws.gov'" <marella_buncick@fws.gov>, "Chambers, Marla J" <marla.chambers@ncwildlife.org>, "Clawson, Marshall W" <mclawson@ncdot.gov>, "Watson, Malcolm C" <mcwatson@ncdot.gov>, "Staley, Mark K" <mstaley@ncdot.gov>, "Wilkins, Ronald B" <rbwilkins@ncdot.gov>, "Gledhill-earley, Renee" <renee.gledhill-earley@ncdcr.gov>, "Baucom, Richard W" <rwbaucom@ncdot.gov>, "'sarah.e.hair@usace.army.mil'" <sarah.e.hair@usace.army.mil>, "'scott.c.mclendon@usace.army.mil'" <scott.c.mclendon@usace.army.mil>, "Gurganus, Stephen J (Steve) - HEU" <sjgurganus@ncdot.gov>, "Slusser, Scott (SSLUSSER@ncdoj.gov)" <SSLUSSER@ncdoj.gov>, "Franklin, Spencer T" <stfranklin@ncdot.gov>, "swagg@mbakercorp.com" <swagg@mbakercorp.com>, "Mcfadden, Timothy T" <tmcfadden@ncdot.gov>, "tpeacock@rkk.com" <tpeacock@rkk.com>, "Tina Swiezy (tswiezy@rkk.com)" <tswiezy@rkk.com>, "Fischer, Kevin" <wkfischer@ncdot.gov>
Subject: RE: Monroe Connector/Bypass (R-3329/R-2559) -- Agency Meeting - July 18 DRAFT MINUTES
Chris,

We will clarify this in the minutes. The 2003/2004 socioeconomic forecasts are forecasts of future population and employment (year 2030) developed by MUMPO for use in their long range planning and travel demand modeling. These are the forecasts that we used in the indirect and cumulative effects analysis to represent the future No-Build condition. MUMPO is currently updating their long range transportation plan and associated socioeconomic projects; however, these will not be available for at least nine months and likely a year. Therefore, the 2003/2004 projections are still the best available forecast data that has been reviewed and approved by regional leaders. We are still investigating options for other socioeconomic forecasts that may inform any update to the ICE and if you have any recommendations we will gladly look into those.

Attached is a pdf of the presentation made at the agency meeting that explains the data and methodology used in the ICE study. We would be happy to review the presentation with you via conference call or answer any questions you have.

Thanks,

Christy

From: Chris Militscher [mailto:Militscher.Chris@epamail.epa.gov]
Sent: Wednesday, August 01, 2012 1:16 PM
To: Shumate, Christy
Cc: Johnson, Alan; Simes, Amy; Blackburn, Barney R; Moose, Barry S; Carl Gibilaro; Dagnino, Carla S; Mellor, Colin; Karoly, Cyndi; Wainwright, David; Lewis, Ed F; Lusk, Elizabeth L; epittman@ncdoj.gov; 'george.hoops@dot.gov'; Thorpe, Gregory J; Alavi, J S; Nelson, Jane C; Gilstrap, Jesse W; Harris, Jennifer; 'kgilland@mbakercorp.com'; Hamidi, K. Zak; Gettier, Lawrence; Parkins, Lorna; Thompson, Larry B; 'marella_buncick@fws.gov'; Chambers, Marla J; Clawson, Marshall W; Watson, Malcolm C; Staley, Mark K; Wilkins, Ronald B; Gledhill-earley, Renee; Baucom, Richard W; 'sarah.e.hair@usace.army.mil'; 'scott.c.mclendon@usace.army.mil'; Gurganus, Stephen J (Steve) - HEU; Slusser, Scott (SSLUSSER@ncdoj.gov); Franklin, Spencer T; swagg@mbakercorp.com; Mcfadden, Timothy T; tpeacock@rkk.com; Tina Swiezy (tswiezy@rkk.com); Fischer, Kevin
Subject: Re: Monroe Connector/Bypass (R-3329/R-2559) -- Agency Meeting - July 18 DRAFT MINUTES

Christie: I read in the meeting minutes that only 2003-2004 socioeconomic data is available. Maybe I have confused myself on this issue because the 2010 U.S. Census is completed.

http://quickfacts.census.gov/qfd/states/37000.html

Thanks.

Email correspondence to and from this sender is subject to the N.C. Public Records Law and may be disclosed to third parties.

[attachment "Baker Presentation for Agency Meeting_7_18_12.pdf" removed by Chris Militscher/R4/USEPA/US]

Monroe Connector/Bypass Agency Update

LAND USE FORECAST BACKGROUND AND UNION COUNTY GROWTH ANALYSIS

THIS PRESENTATION INCLUDES INFORMATION AND FINDINGS THAT ARE UNDER DEVELOPMENT AND MAY BE SUBJECT TO CHANGE

July 18, 2012

Outline of Today's Discussion

- Discuss the recent appeals court decision
- NCDOT responses
- Provide detailed information on MUMPO's planning process as it related to the Monroe Connector/Bypass
- Discuss how this information was used in the ICE analysis
- Appropriateness of the ICE analysis
- The growth of Union County during the "No Build" condition
- Factors affecting growth trends in Union County
- Next steps

July 18, 2012

Appeals Court Decision

- On May 3, 2012, the US Court of Appeals (4th Circuit) stated that NCDOT had failed to disclose critical assumptions underlying their decision to build the Monroe Connector/Bypass:
- *In sum, although we need not and do not decide whether NEPA permits the Agencies to use MUMPO's data in this case, we do hold that by doing so without disclosing the data's underlying assumptions and by falsely responding to public concerns, the Agencies failed to take the required "'hard look' at environmental consequences."*

Appeals Court Decision

- They also stated that the MUMPO data from which the quantitative ICE Build and No-Build projections were developed contained the Connector in the travel time to employment. They further stated that this inclusion was not shared with the agencies and cast doubt on the findings of the analysis.

Build vs Build

- Statement in ROD (pg C-11)
  - *TAZ socioeconomic forecasts for the No Build Scenario did not include the Monroe Connector. MUMPO confirmed our assumption regarding the reasonableness of the 2030 TAZ forecasts for use as a No Build basis.*
- Statement is technically incorrect

Right of Way & Construction

- Right of way acquisition had begun on select parcels but has been stopped
- All design and construction activities suspended
- NCTA requested that permits be suspended

Community Meetings

- June 18 & 19, 2012
- 200+ attendees
- Presentation on legal issues, right of way and construction status

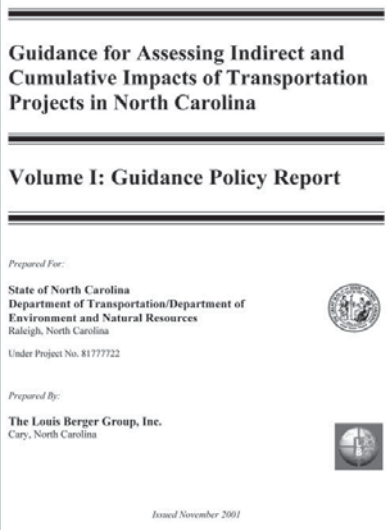
Moving Forward

- NCDOT is committed to full disclosure and transparency and has already conducted two public meetings to address concerns over the previous process
- NCDOT also wishes to share with the agencies all relevant details on how the model was developed, the appropriateness of the model, and how this information shaped the analysis.

What are the rules for ICE Analysis?

NCDOT developed a set of approaches for ICE analysis

- Developed in cooperation with
  - FHWA
  - NCDENR
  - North Carolina State Attorney General's Office
  - County and Municipal Officials
- Guidance went into effect in 2001.



Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina

Volume I: Guidance Policy Report

Prepared For:

State of North Carolina
Department of Transportation/Department of Environment and Natural Resources
Raleigh, North Carolina

Under Project No. 81777722

Prepared By:

The Louis Berger Group, Inc.
Cary, North Carolina

Issued November 2001

Guidance Recommendations on Data Use

Official projections generated by state, regional or MPO agencies should also be utilized whenever possible as a source of information on future conditions. **Page III-16**

Whenever possible, forecasts developed for other purposes by regional planning and transportation agencies should be utilized. **Page IV-4**

- Reasoning is that Metropolitan Planning Organizations (MPOs):
  - were created by the federal government to develop projections
  - are familiar with job and population trends and community goals
  - have years of experience in developing these projections

Guidance Recommendations on Data Use

Trend extrapolation techniques are limited in the application to indirect/cumulative effects analysis, because the techniques are only useful in creating base case or no-action forecasts - extrapolation is not helpful in evaluating project alternatives that will by definition change conditions on which historical trends are based. Also, this type of forecasting technique is unnecessary when accepted forecasts have been developed already by local or regional agencies for the study area. **Page IV-9**

Example 2 – Detailed Analysis Techniques: . . . Develop a general No Action Scenario for the study area based on 20-year growth projections furnished by the local Metropolitan Planning Organization (MPO). **Page IV-31**

- The guidance says the MPO forecasts should be used in the analysis. How are they used?
  - Provide a control total for future population and employment at the small area level.
  - Provide guidance on how much growth will occur and where it will occur.

MPO Forecasts can be used two ways:

Choice A

- MPO Forecasts Represent **No Build Alternative**
- Guidance from planners and analysis create a (higher) **Build Forecast**

Choice B

- MPO Forecasts Represent **Build Alternative**
- Guidance from planners and analysis create a (lesser) **No Build Forecast**

MPO Forecasts can be used two ways:

Choice A

MPO Forecasts Represent No Build Alternative

Appropriate when research indicates the **regional land use impacts of the project** are **not** represented by the forecasts

Choice B

MPO Forecasts Represent Build Alternative

Appropriate when research indicates the **regional land use impacts of the project are** represented in the forecasts

Basis for Choice A vs Choice B

- Discuss with local planners what will future development look like with and without the project
- Identify constraints to development that would affect growth patterns regardless of the project
- Identify related actions (such as development of water and sewer lines) that would affect development densities with and without the project

→ Based on the above process, we determine if the estimated development is a better match for the build, or the no build option.

Use of the MUMPO Data in the ICE

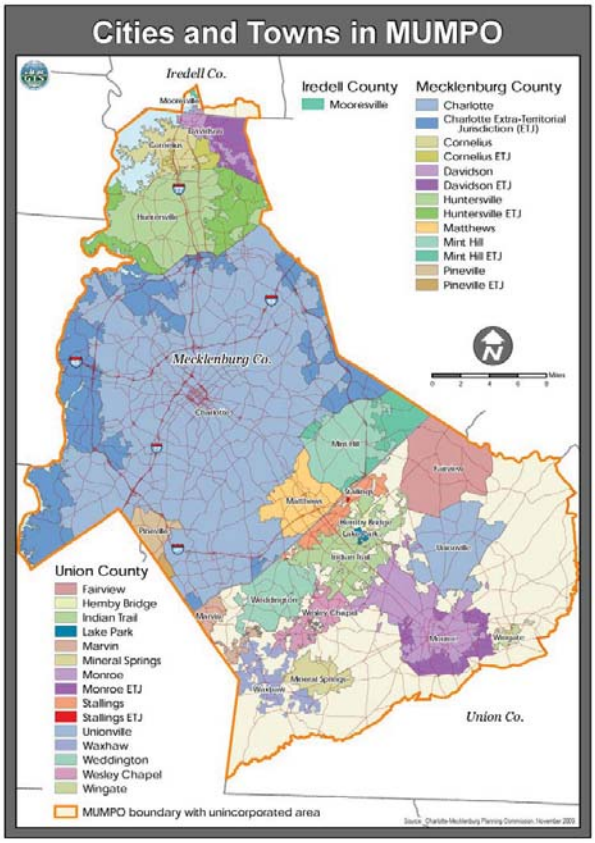
- TAZ level socioeconomic data from MUMPO served as control totals for developing the ICE No Build land use scenario.
- Based on consultations with local planners and use of the Hartgen method, additional development was added to create a Build land use scenario.

Steps taken for the Monroe Connector/Bypass ICE

Mecklenburg – Union Metropolitan Planning Organization (MUMPO)

MUMPO, in cooperation with the State, developed its current transportation plan from 2001 to 2005. The purpose of the plan was to: 1) Assist governing bodies and official agencies in determining courses of action and in formulating attainable capital improvement programs in anticipation of community needs; and, 2) Guide private individuals and groups in planning their decisions which can be important factors in the pattern of future development and redevelopment of the area.

July 18, 2012



LAND USE FORECASTS: Population and Employment Data by Traffic Analysis Zone

TRANSPORTATION NETWORK: Locations and Capacities of Roads and Transit

1. Trip Generation

- How many trips and for what purpose?
- Defines origins and destinations

2. Trip Distribution

- Which origins and destinations will be linked together?

Travel Demand Model

3. Mode Split

- Given trip origins and destinations, how will travelers get around via the available travel modes?

4. Trip Assignment

- How will the trips be made across the transportation network?

July 18, 2012

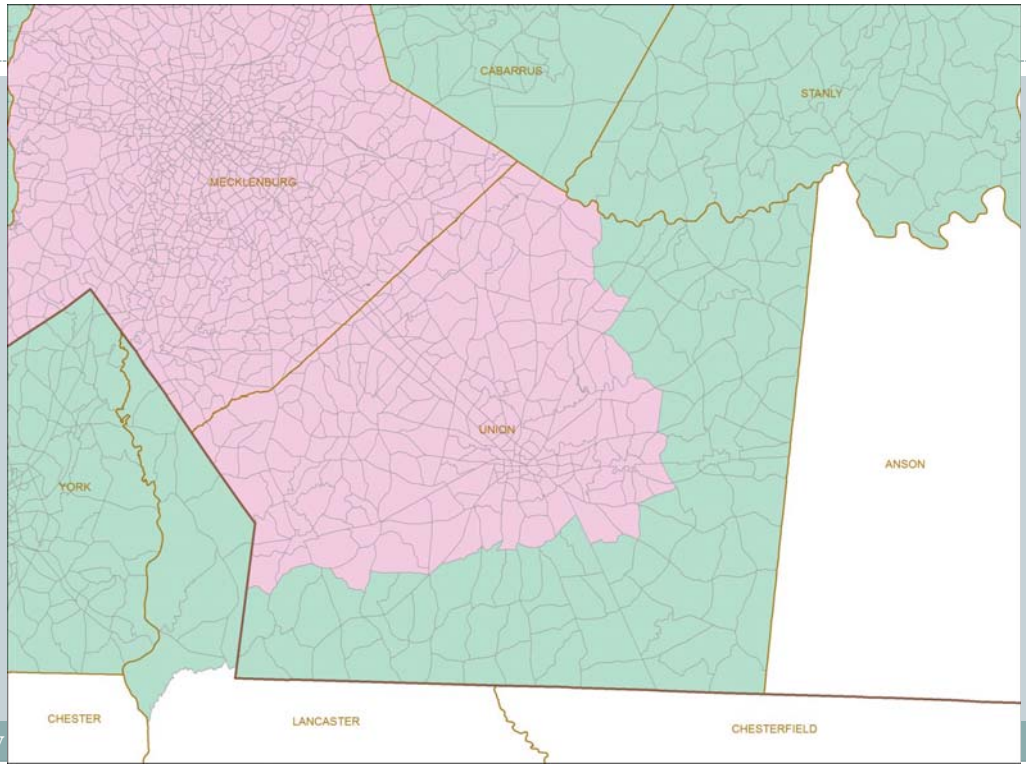
LAND USE FORECASTS: Population and Employment Data by Traffic Analysis Zone

TRANSPORTATION NETWORK: Locations and Capacities of Roads and Transit

Note that the land use forecasts and transportation network are completely separate inputs to the model. The methods the MPO uses to develop each input determines whether there is any connection between the two.

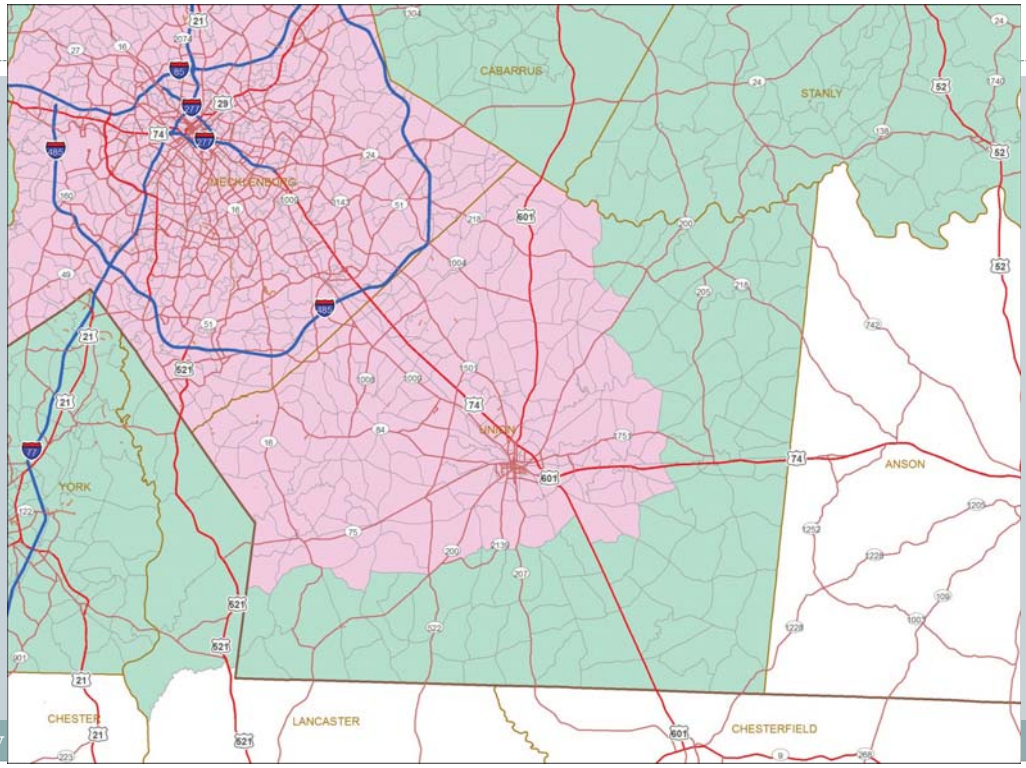
July 18, 2012

Traffic Analysis Zones

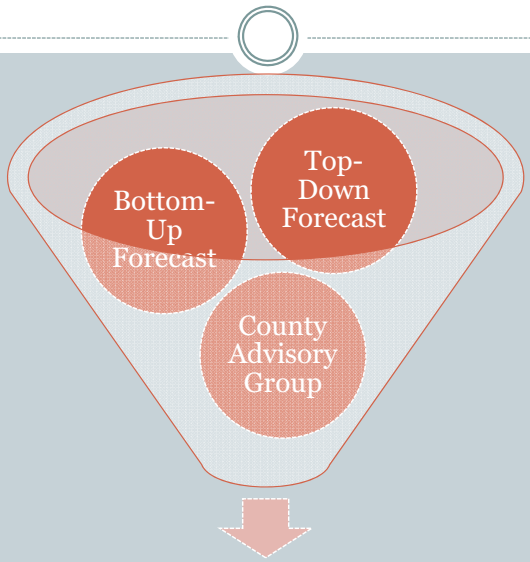


July

Traffic Analysis Zones and Major Roads (2008)



How were the MUMPO land use forecasts developed?



2030 TAZ forecasts

Forecasting Roles

Top-Down

- Projects Regional Population & Employment totals
- Sets county totals

Bottom-Up

- Distributes growth developed in the top-down model at the county-level based on Traffic Area Zones (TAZs)
- DOES NOT include adjustments to regional growth patterns other than within counties
- MUMPO process only applied to central and western Union County

Expert Panel

- Local planners refine the in-county land use allocation based on adopted plans and local land use expertise, basically this serves as a reality check on the anticipated growth

Forecasting Factors

Top-Down

- Regional Forecast
- County Level Forecast (Allocated using variables statistically tested against 228 metropolitan counties in 27 regions)
  - Past economic and demographic trends
  - Economic and demographic conditions (as of 2003)
  - Influence of income on growth patterns
  - Proximity
  - Land availability
  - Past land use and infrastructure policies

Bottom-Up*

- Developable Residential Land
- Redevelopable Residential Land
- Recent Population Change
- Travel Time to Employment Centers (note: this is the only factor that includes the Monroe Connector)
- Water Availability
- Sewer Availability
- Expert Panel (High Growth Areas)*
- Growth Policy Factor*

* Union County Factors

Accessibility Considerations

Top-Down

- Large scale transportation projects was a factor omitted from the top down analysis (From Hammer Report, p. 14)

Bottom-Up

- Does include the regional "build" network including the Monroe Connector, but only in travel time to employment calculations for future year(s).
- Considers travel time from each TAZ to the NEAREST employment center, NOT regional employment centers

Expert Panel

- Reflects local advisors' expectations (in 2003-2004) of whether new roads would be built
- Reflects the assumptions in adopted land use plans regarding the anticipated road network

July 18, 2012

How does this affect the ICE Study

Top-Down

- This component, which includes the estimation of total job and population growth for each county, DID NOT include the Monroe Connector

Bottom-Up

- Includes the regional "build" network (with Monroe Connector) for the travel time component only, and only for central and western Union County
- The way travel time to employment was calculated does not capture regional travel time impacts, it only captures impacts within Union County to the nearest employment center also within Union County

Expert Panel

- Adopted land use plans at the time this analysis was done did not reflect impacts of the Monroe Connector
- Members of the Expert Panel stated during the interview process for the ICE study that the Monroe Connector WAS NOT included in their expectations

July 18, 2012

What do the Forecasts Represent?

- Based on extensive interviews, adopted land use plans in 2003-4 did not assume the MC
- The MUMPO forecast development process did not consider MC impact on regional land use distribution (across counties)
- The impact of the MC in Union County is only considered in terms of travel time to nearest Union County employment centers.
  - Therefore travel time benefits of the MC in the forecasts are limited and may actually be zero or close thereto (based on discussions with MUMPO staff) AND were not considered in eastern Union County.

Conclusion

- Based on this evaluation it was concluded that the MUMPO forecasts most closely represented a No-Build Condition

Does MUMPO agree with our conclusion?

- NCTA and NCDOT met with MUMPO on June 19th.
- They agreed with the conclusion that use of their data for the No-Build Option was appropriate.
  - Because the regional control totals on county populations and employment from the top-down process
  - Because inclusion of the project in the travel time to employment factor had minimal impact on that factor.
  - Because the planners and the Expert Panel members involved in the bottom up process did not anticipate the MC in the long term forecasts.
- Minutes for the meeting will be included in administrative record.

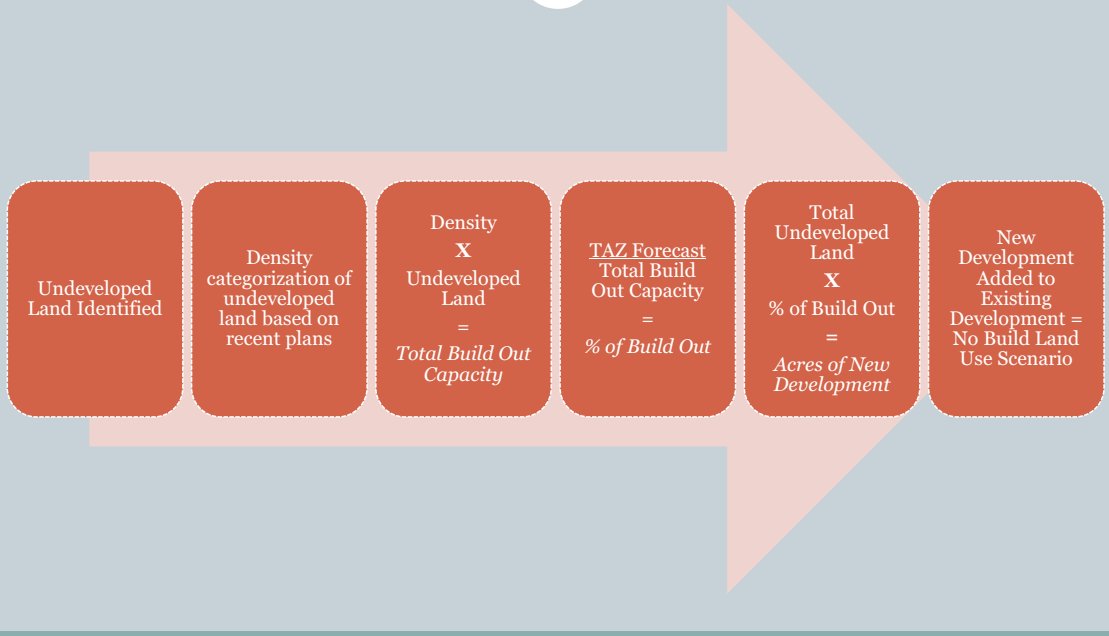
July 18, 2012

Preliminary Results of Travel Time to Employment Factor Reexamination

- MUMPO, NCDOT and other modelers worked together to reexamine the Travel Time to Employment Factor
  - Assess the differences with and without the Monroe Connector in the roadway network
- Removal of Bypass results in minor changes to travel times and composite scores
  - 21 (of 256) TAZs increase travel time by more than 1 minute
  - 14 TAZs see 1% or more change in composite score
    - Average Composite Score change is 0.21%
    - Maximum Composite Score change is 3.9%
- Still assessing the overall implications to ICE Report

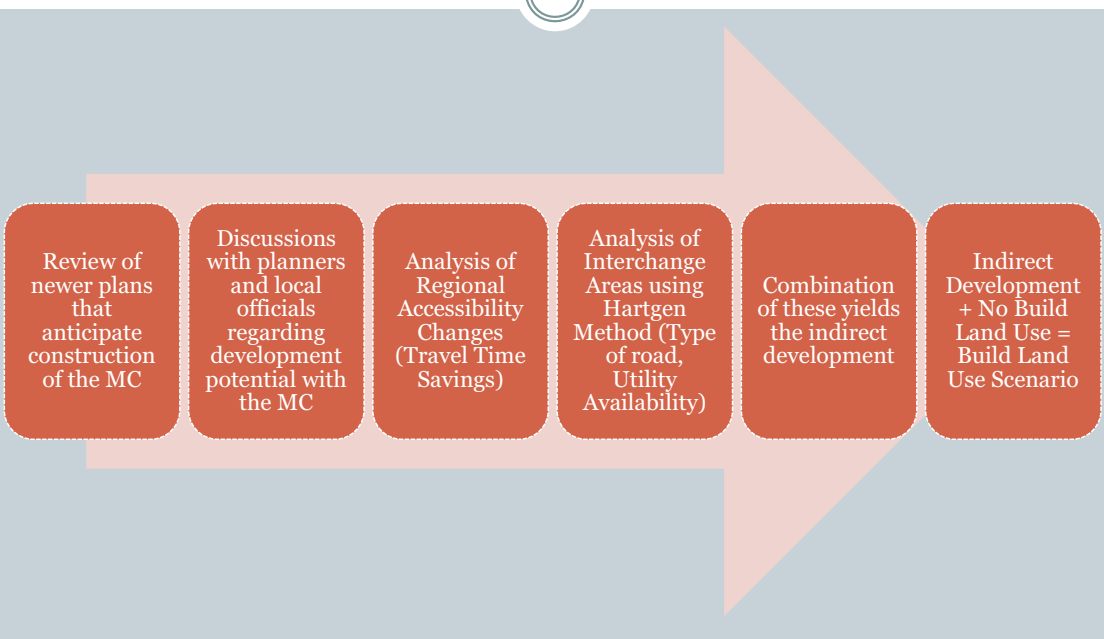
July 18, 2012

Use of MUMPO Data in No Build Scenario



July 18, 2012

Build Scenario Diagram



July 18, 2012

What do these outcomes mean?

- Union County has been, is, and will continue to grow rapidly without the Monroe Connector
- Future growth levels are not highly dependent on the Monroe Connector
- The timing and distribution of future growth IS affected by the Monroe Connector, as shown in our Build Alternative results

Union County Growth Factors

What ARE the forecasts?

Union County:

Year	Population	Avg Annual Growth Rate	Time Period
2000*	123,677	4.7%	1990 to 2000
2005*	162,929	6.4%	2000 to 2005
2010*	201,292	4.7%	2005 to 2010
2030**	337,317	See below	

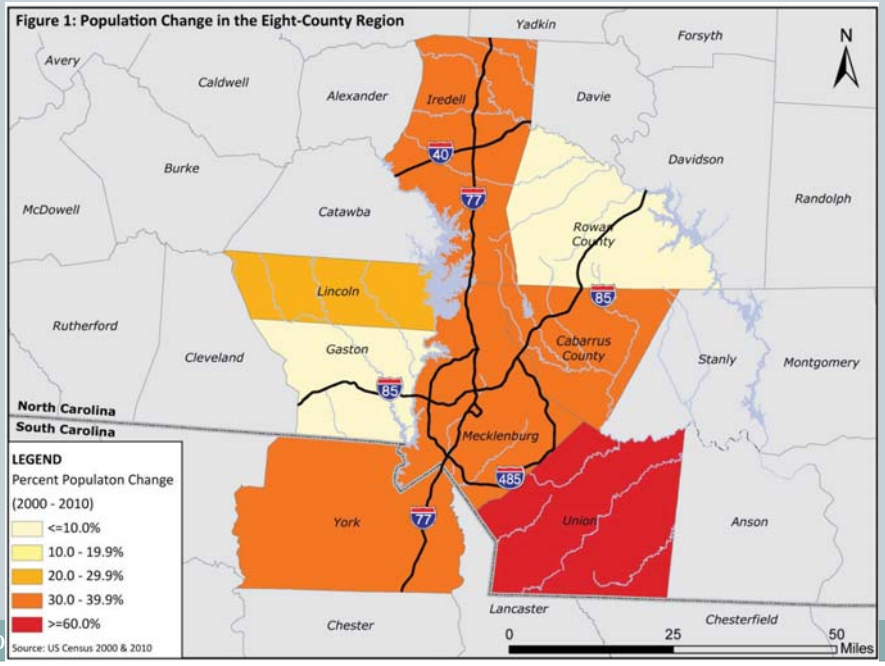
* US Census Bureau
** MUMPO Forecast

Difference between 2010 population and 2030 forecast has a 3.4% average annual growth rate

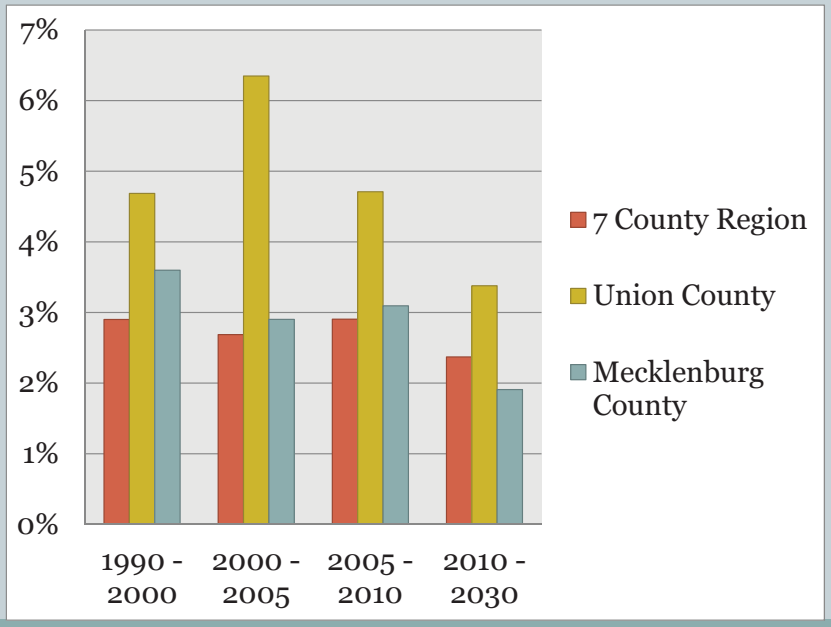
Union County and Growth

- Analyzed regional growth trends and underlying reasons for growth
  - Compared 8-county region
    - Mecklenburg, Union, Cabarrus, Rowan, Iredell, Lincoln, Gaston and York
  - Growth trends and factors analyzed
    - Historical growth trends
    - Trends relative to MUMPO forecasts
    - Population density
    - Median household income
    - Housing differences (size, cost)
    - School quality
    - Commuting time

Regional Population Growth



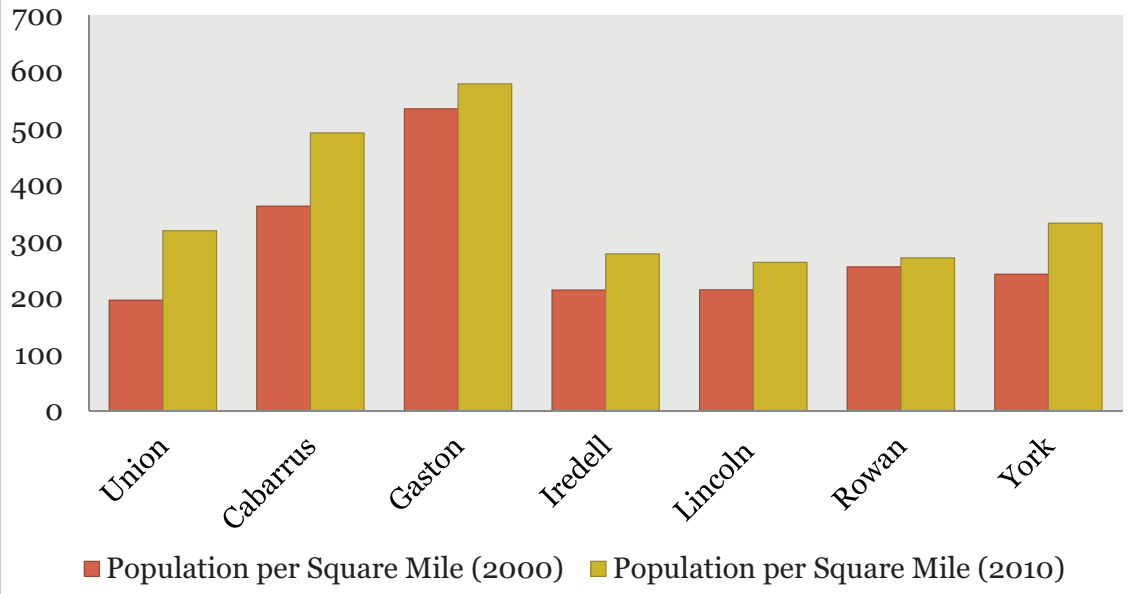
Regional Growth Rates (Average Annual)



Union County Population Data

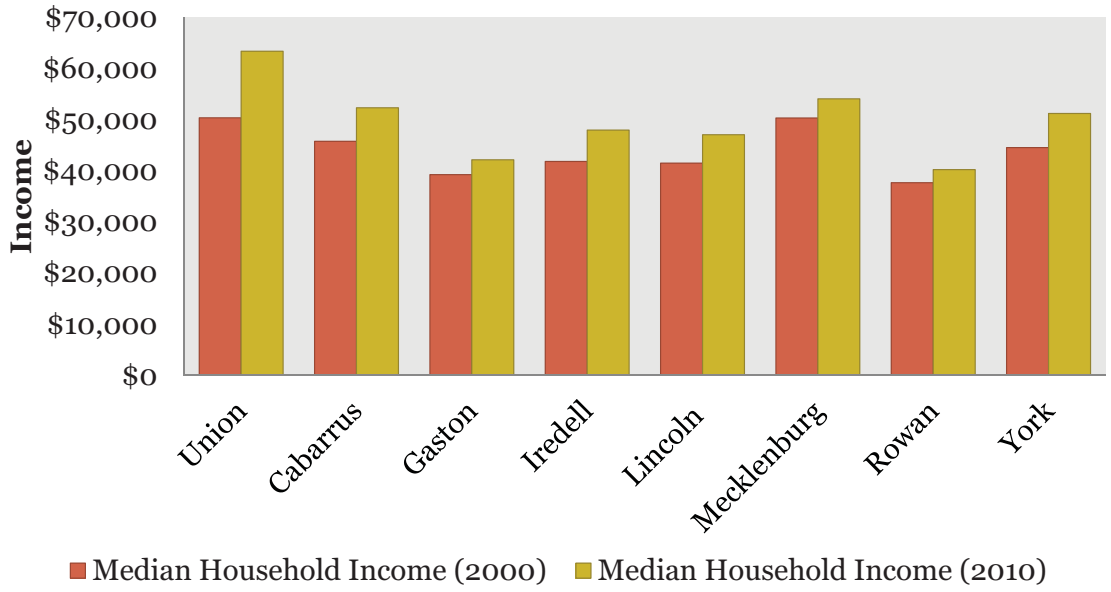
- By 2008, annual Union County growth rates far exceeded those estimated by MUMPO in their population forecasts with the MC neither built nor under construction
- According to US Census Data, Union County had the greatest percentage population increase in North Carolina from 2000 to 2010.
  - Why is there rapid growth in Union County in the absence of the Monroe Connector?

Population Density (per Sq Mi)



Mecklenburg: 1,327.6 (2000); 1,755.6 (2010)

Median Household Income



July 18, 2012

Housing Characteristics

	Union County	Cabarrus County	Gaston County	Iredell County	Lincoln County	Mecklenburg County	Rowan County	York County
% Owner-occupied	83.3%	74.1%	68.1%	74.1%	74.9%	61.9%	69.7%	72.1%
% Renter-occupied	16.7%	25.9%	31.9%	25.9%	25.1%	38.1%	30.3%	27.9%
Median Home Value ($)	$203,200	$172,200	$124,500	$168,200	$156,700	$190,900	$128,700	$164,700
% Single Family Detached Housing	84.9%	76.6%	75.0%	73.0%	67.9%	60.3%	67.5%	68.1%
Median Number of Rooms per Unit	6.4	5.7	5.3	5.7	5.6	5.6	5.4	5.7

Source: American Community Survey 2008-2010, 3-Year Estimates, Table DP04 (Selected Housing Characteristics)

July 18, 2012

School Quality (SAT Scores)

School System	% Tested	Math (M) Score	Critical Reading (CR) Score	Writing (W) Score	M+CR	M+CR+W
Cabarrus County Schools	65.3	522	497	483	1019	1502
Gaston County Schools	58.3	495	480	455	975	1430
Iredell-Statesville Schools	60.4	524	502	480	1026	1506
Lincoln County Schools	58.7	513	478	456	991	1447
Charlotte-Mecklenburg Schools	68.5	507	495	480	1002	1482
Union County Public Schools	68.7	524	503	491	1027	1518
Rowan-Salisbury Schools	51.9	495	474	453	969	1422
York 1	42.0	478	457	432	935	1367
York 2 - Clover	59.0	493	486	460	979	1439
York 3 - Rock Hill	54.0	482	470	455	952	1407
York 4 - Fort Mill	72.0	535	529	505	1064	1569

Sources: North Carolina State Board of Education, Accountability Services, Division SAT Report 2011;
South Carolina Department of Education, Public School District Distribution Mean SAT Scores for 2011

School Quality (Graduation Rates)

School System	Graduation Rate (%)
Cabarrus County Schools	84.1
Gaston County Schools	75.4
Iredell-Statesville Schools	85.1
Lincoln County Schools	81.6
Charlotte-Mecklenburg Schools	73.5
Union County Public Schools	89.1
Rowan-Salisbury Schools	76.9
York 1	78.3
York 2 - Clover	77.3
York 3 - Rock Hill	73.5
York 4 - Fort Mill	91.2

Sources: North Carolina State Board of Education,
Accountability Services Division, 4-Year Cohort Graduation Rates;
South Carolina Department of Education,
Annual School District Report Cards

Commute Times

	2010		2000	
	Mean Travel Time to Work	Difference from Regional Average	Mean Travel Time to Work	Difference from Regional Average
Cabarrus County	26.0	3.6%	27.0	3.4%
Gaston County	25.0	-0.4%	24.6	-5.7%
Iredell County	24.2	-3.6%	24.5	-6.1%
Lincoln County	-	-	27.1	3.8%
Mecklenburg County	24.7	-1.6%	26.0	-0.4%
Rowan County	23.2	-7.6%	23.3	-10.7%
Union County	27.8	10.8%	29.0	11.1%
York County	24.0	-4.4%	27.2	4.2%
Charlotte MSA	25.1		26.1	

Notes: 2010 Travel Time data not available for Lincoln County.
Sources: 2000 Census Summary File 3, American Community Survey 2008-2010 3-Year Estimates Table S0802

Conclusions

- In the absence of the Monroe Connector, growth in Union County has exceeded that of other counties in the area
- Factors driving growth in Union County appear to be available land, high median income, and the area school system
- Commuting time is higher for residents of Union County than for other counties in the area
  - But this has not deterred the fast pace of growth for over a decade
- The practical "No Build" since 2001 demonstrates that rapid growth in Union County will likely continue, regardless of whether the Monroe Connector is built.

Conclusions

- For this project, the regional forecasts best represent the No Build scenario
  - MUMPO control totals were used and local input helped determine actual locations within TAZs where development would occur without the project.
- Build Alternative forecasts were developed showing the additional growth and land use distribution impacts of the project
  - Based in some areas on more recent land use or economic development plans that do anticipate the road
  - Based on areas affected by combination of available water and sewer to support higher densities AND improved **regional** accessibility from the Monroe Connector

Next Steps

- Working with local modelers to calculate exact affect of Travel Time to Employment with and without the MC.
  - Results will determine level of adjustment, if any, needed to the No Build land use for the ICE.
- Review other possible new information to determine if it affects current assumptions.
  - New information may require adjustments to ICE or other supporting documents.

Next Steps

- Continued agency participation and feedback
  - Discuss today's presentation and questions
  - Future meetings and process
  - Continue to meet CEQ obligations under 40 CFR 1503.3
- Additional public outreach and communication will also be part of the steps to address the court's concerns
- Determine appropriate course of action to update EIS (SEIS, EA, other) and reach a new ROD.

July 18, 2012

Monroe Bypass Agency Meeting

MEETING MINUTES

Date: September 12, 2012
12:30 PM to 2:30 PM
NCDOT Century Center – Structures Conference Room

Project: STIP R-3329/R-2559 Monroe Connector/Bypass – STP-NHF-74(90)

Attendees:

George Hoops, FHWA
Scott Jones, FHWA (phone)
Chris Militscher, USEPA (phone)
Liz Hair, USACE
Marella Buncick, USFWS
David Wainwright, NCDWQ
Alan Johnson, NCDWQ
Amy Simes, NCDENR
Scott Slusser, NCDOJ
Phil Harris, NCDOT - NES
Tris Ford, NCDOT – HES - PICS
Colin Mellor, NCDOT - NES
Carla Dagnino, NCDOT - NES
Elizabeth Lusk, NCDOT - NES
Barney Blackburn, NCDOT – REU
Tim McFadden, NCDOT – DB
Marshall Clawson, NCDOT – Hydraulics
Jamal Alavi, NCDOT – TPB
Greg Thorpe, NCDOT -- PDEA
Jennifer Harris, NCDOT - PDEA
Rick Baucom, NCDOT – Div 10
Christy Shumate, NCTA-GEC
Carl Gibilaro, Atkins
Ken Gilland, Michael Baker Eng.
Lorna Parkins, Michael Baker Eng.
Scudder Wagg, Michael Baker Eng. (phone)
Tommy Peacock, RKK
Tina Swiezy, RKK
Stephen Roberts. RKK
Sam Stutt, UIG (phone)
Greg Miller UIG (phone)

Presentation Materials:

- Agenda
- Powerpoint presentation
- Draft Union County Growth Factors Memo

Purpose:

Provide an update on the Monroe Bypass project status, including current activities and future activities.

The project status was presented in a PowerPoint presentation given by Carl Gibilaro, Ken Gilland and Lorna Parkins.

Summary of PowerPoint Presentation

Current Activities - Analysis activities completed to date where no changes were identified: Geoenvironmental, Floodplains and Floodways, Historic Architecture, Archaeology, Air Quality and Community Impact Assessment. The community impact assessment analysis revealed that there have not been any notable changes in the area. Between 2000 and 2010 there was a 49% population increase in the Demographic Study Area (DSA). This growth is consistent with the 49% growth which occurred between 1990 and 2000. African American populations did drop slightly; there was a slight increase in Hispanic populations; but the general locations of these populations remained the same. No new subdivisions or commercial developments have been constructed within the project corridor since the Final Environmental Impact Statement (FEIS) was published.

Activities currently underway are as follows:

- Indirect and Cumulative Effects – working with MUMPO and those involved in the development of the socio-economic projections to remove any influence the project may have had in the socio-economic projections and to quantify the impact, if any, that the project may have had in the No-Build representation. The result of this analysis will be used to analyze other components of the EIS to determine the significance of the new information.
- Future Land Use Plans - meeting once again with local planners to discuss their plans and determine if anything has changed since the last analyses.
- Traffic Modeling and Forecasting - determining if there will be any changes in regard to the traffic forecasts.
- Threatened and Endangered (Section 7) - new surveys are being scheduled. Atkins will be completing the plant surveys and the Catena Group will be updating the mussel surveys. No significant changes are anticipated at this time.
- Noise Impact Analyses - Noise impact analysis procedures have been updated since the original analyses. The Traffic Noise Analysis will be updated to conform to the new policies and procedures.
- Alternatives Review - Additional documentation is being prepared clarifying the analyses completed as part of the improve existing US 74 alternatives and TSM/TDM options.

Ongoing Outreach Activities – Interviews with local officials and staff are being scheduled to identify any changes in local municipalities' long range plans or visions for growth within their jurisdiction. Questions to be asked include any proposed developments, long term growth expectations, land use plan updates, and any changes since previous interviews. A list of questions to be asked of the local officials is included in the handout attached to these minutes. It was noted that the question regarding the use of the "Green Growth Toolbox" question is a direct result of a suggestion made at the July 18th agency meeting. These interviews will be used to verify and or supplement data used in the updated Indirect and Cumulative Effects (ICE) analysis.

Union County Growth Factors Memo – an analysis of the historic and future growth of the Charlotte region was performed by Baker and a draft of this Technical Memorandum was distributed for review following this agency meeting. Details of the analysis are included in the attached PowerPoint presentation and the actual Technical Memorandum. The Technical Memorandum concludes that the historic growth within Union County will continue based on the characteristics of Union County that are shown in research on regional growth to cause some counties to grow faster than others. Factors that appear to be driving the local growth include available land, household income, housing affordability, and quality of schools. Commute times, however, do not appear to be a critical factor.

NCDOT is working closely with the people who prepared the original Union County "bottom up" land use distribution model to remove any influence of the Monroe Connector/Bypass to the Travel Time to Employment factor, which was one of the 8 factors considered for future growth in Union County. This information will then be reviewed to determine if there is any effect on current assumptions. Based on any new information, the ICE document will be revised and updated accordingly.

Purpose and Need – Purpose and Need has been discussed at length in the past and can be broken down into four parts: 1) Improve mobility and capacity within the corridor, 2) Allow for high speed regional travel, 3) Consistent with NC Intrastate System, Strategic Highway Corridor program, and 4) Allows access to properties along US 74. The need for the project is an existing problem. The roadway is currently overcapacity with low travel speeds during the peak hours and 1/3 of the existing interchanges functioning at a level of service of E or F. These problems will continue to worsen in the future and must be addressed for the facility to be consistent with local and state plans. NCDOT has not identified any changes that would result in changing the project's purpose and need. Agencies were asked to provide any new information that should be considered.

Next Steps – Future near term activities include updating the previous natural resources investigations, completing the meetings with local planners / officials and reassess the alternative analyses and impacts. Anticipated topics of discussion at the next agency meeting include: indirect and cumulative effects, upgrade existing US 74 alternatives, traffic forecasts, alternatives development and analysis, natural and

jurisdictional resources, and noise. Agencies should provide information on any updated information or new developments in the study area that they are aware of.

Q&A / COMMENTS:

1. *NCDWQ questioned in determining the growth in Union County, how was the model influenced by the growth boom that was occurring in 2004.*
   It is notable that of the forecasts available in 2009 (after the boom period ended), the MUMPO forecasts from 2004 did a better job of predicting the 2010 population level in Union County than other forecasts prepared by other sources (see powerpoint presentation scatter diagram). The models take into account the cyclical economic effects of a region and look at what the region has to offer to attract future growth. Also, Union County growth has continued through the recession and is still robust.

2. *USACE asked what the next steps would be once the new ROD is complete.*
   An environmental document will be prepared to document everything that has been reanalyzed and any new information that is available since the Final EIS was approved. The type of document to be prepared is currently being reviewed and a final determination of the document type will not be made until any required changes and/or updates are identified. One scenario discussed includes this document being made available for agency and public review and comment and a public hearing being held. Following the comment period, comments would be considered and addressed prior to issuance of a new ROD. Once published, this new ROD would have a 150 day litigation window in which it may be challenged. The 404 permit with USACE is currently suspended and the 401 permit was withdrawn. At this time we anticipate design, permit application/modification, and right-of-way acquisition to resume following approval of the new ROD.

3. *USFWS inquired if a new Water Quality Analysis will be completed.*
   Until the updated data is received, we do not know if there will be any significant changes to land use in the area. Unless there are significant changes to the existing land uses, a new Water Quality Analysis will not be completed. It is recognized that if land use does change, the Biological Assessment will need to be revisited. USFWS assumes there will be some changes based on the amount of time that has passed since the original analyses were completed.

4. *USFWS also asked if a Supplemental EIS was required to issue a ROD. They were not familiar with the process of preparing an EA at this point in the process.*
   This issue is under review by FHWA and a decision is dependent on the significance of the changes identified as part of the reevaluation and new analyses.

5. *USEPA expressed concern that since the original project required an EIS, and new studies and analyses are being undertaken, it may not be appropriate to prepare an EA.*
   FHWA requested that further discussion on this topic be tabled until additional information can be received. FHWA continues to review and evaluate new information in order to help guide how to proceed. It was requested if the agencies have additional information to share on this matter to please do so. USEPA stated that CEQ rules dictate the type of document that is required. If there is an existing DEIS and FEIS, then this process requires the last document be supplemented.

6. *USFWS commented that there are still many unanswered questions regarding the project. There were comments on the previous ICE which they felt were not addressed. Socioeconomic data and water quality information will be very important to them as part of any decision-making process. It was requested that any new documentation clearly explain how the 1 factor (travel time to employment) fits in within the 8 total factors considered in the model. They have also heard statistics of this project being just 20 miles of a 2400 mile road network amongst other items included as part of court documents and many items appear to be mixed and matched and/or have different scales or geographic coverage. They would request that all information presented, including what the project baseline is as well as the impacts associated with the project, are made very clear and understandable. Consistency when developing comparisons and drawing conclusions would make the document easier for the agencies and the public to understand.*

NCTA is very interested in understanding what unanswered questions remain. NCTA acknowledged that they understood that the burden to make sure everything is clear is on them and the purpose of these meetings is to try to explain this very technical and detailed information as clearly as possible.

7. *USFWS was also concerned with the aggressive project schedule and requested frequent updates in order that the agencies understand what is going on and can offer appropriate input.*

8. *USFWS questioned whether the Project Legacy in eastern Union County is included in the ICE analyses.*
   NCTA did have some information on the project. It was discussed in the qualitative ICE analysis report. Additional information regarding this proposed project may be available and it will be included in future land use scenarios, if it is determined that the project is reasonably foreseeable. The Town of Marshville had previously requested that NCDOT-Transportation Planning Branch do an analysis of the Legacy proposal but there was not a common vision among local officials regarding Project Legacy. Because of the lack of a common vision, Project Legacy is not included in Mecklenburg Union Metropolitan Planning Organization's socioeconomic projections or Metrolina Regional Travel Demand Model.

Previous Action Items:

- None.

New Action Items:

- Agencies review Union County Growth Factors Memo and provide comments to the project team.
- Agencies to provide project team with any new project specific information or regulatory guidance relevant to this process that an agency deems relevant.
- Agencies to provide NCDOT with information of potential development that could impact future growth estimates.
- USACE to provide any permit information to NCDOT regarding Project Legacy and other projects in Union County.
- NCTA will email Union County Growth Memo to USEPA.
- NCTA would request the agencies to specify any questions or comments they feel have remained unanswered since the previous EIS. It is anticipated that the responses to any unanswered questions will depend on the result of current study; however, it is very possible that NCTA can clarify or respond to some of these questions with current existing information. As the schedule to move forward is aggressive, it is prudent to address all unanswered questions as expeditiously as possible.
- Agencies were asked to provide any new information that should be considered with respect to the project's purpose and need.

Resolutions:

- None.

Next Steps:

- NCDOT will continue analyses to identify any changes that may have occurred since approval of the FEIS.
- Present project coordination plan and discuss steps for moving ahead.
- Next Meeting – October 17 or 18, 2012

Monroe Connector/Bypass
STIP R-3329/R-2559
Fed Aid # STP-NHF-74(90)

Agency Update
September 12, 2012

Agenda

- Provide overview of current activities
- Discuss ongoing outreach activities
- Review findings of *Union County Growth Tech Memo*
- Review Purpose and Need
- Future Activities

Overview of Current Activities

- Cultural Resources
- Geoenvironmental
- Floodplains and Floodways
- Historic Architecture
- Archaeology
- Air Quality

Activities Completed – No changes identified

Overview of Current Activities

- Cultural Resources
- Geoenvironmental
- Floodplains and Floodways
- Historic Architecture
- Archaeology
- Air Quality
- **Community Impact Assessment**

Activities Completed – No changes identified

Overview of Current Activities

- Indirect and Cumulative
- Future Land Use Plans
- Traffic Modeling and Forecasts
- Purpose and Need
- T&E / Section 7 consultation
- Noise Impact Analysis
- Alternatives Review

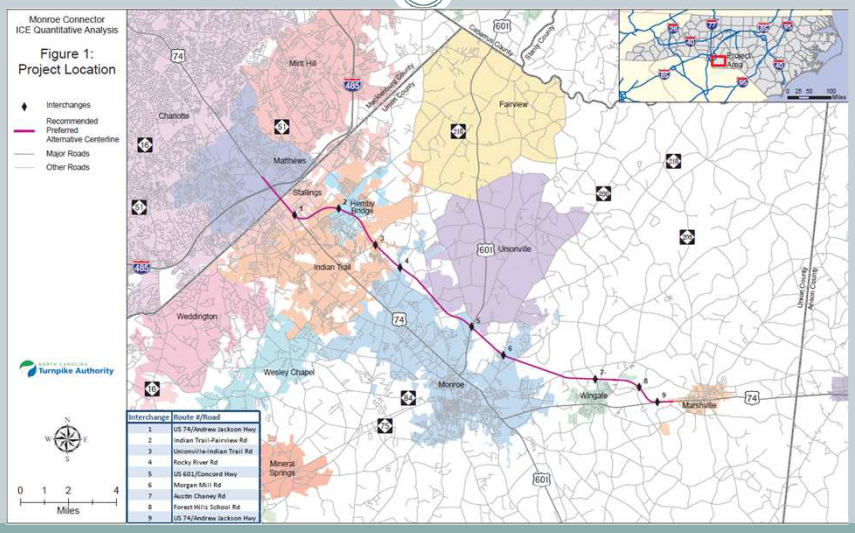
Activities Underway

Local Officials' Outreach

- On August 27-28, NCTA began the process of setting up interviews with area planners and local officials.

9/28/2012

Local Officials' Outreach



9/28/2012

Updated Questions

- The August 2009 interview covered land use and economic development trends, growth management and natural resource protection – in general, have any of these dynamics affecting future land use changed since the previous interview?
- Have any changes to future land use plans, transportation plans or other plans, policies or projections been made that incorporate information from the 2010 Census?
- Have new or amended land use regulations been developed since August of 2009? Please see the list we have provided of documents we collected and reviewed during the previous environmental documentation effort. Are there any updates to those plans or regulations? If there have been any changes, please provide specific web link or a copy of the document.
- Has the local regulation of natural resources (including stream buffers) changed since August 2009? If so, how?

9/28/2012

Updated Questions (cont.)

- What can you tell us about any proposed or approved developments that have come to light since the August 2009 interviews? What information is available about any of these planned or approved developments that are not built yet? Can you provide any details and locations for these projects?
- Have long-term growth expectations changed since the previous interview and if so how?
- Has the city/town/county updated its Comprehensive Plan or Land Use plan since August 2009?
  - If so, does this updated plan reflect conditions in the future with or without the Monroe Connector?
- We are reviewing and considering the predictions of future growth (2030 forecast year) included in the previous EIS. Are there any other factors that have changed since August 2009 that might affect the level of future growth and the location of that growth in your community?
  - Do these changes reflect the future with the Monroe Connector/Bypass, without the Monroe Connector/Bypass, or is there no difference on that basis?

9/28/2012

Updated Questions (cont.)

- Have there been any changes in capacity of utility infrastructure or expectations about the future capacity since the last round of interviews? Do any of those changes affect growth expectations?
- Are you or other planners or development review staff familiar with the North Carolina Wildlife Resources Commission's "Green Growth Toolbox"? (http://216.27.39.101/greengrowth/)
  - Have you attempted to implement any of the practices, ordinances or other policies recommended by the toolbox?
  - Have you attempted to incorporate any other low-impact design type policies into zoning, subdivision or other land development ordinances?
  - How would you rate the likelihood of incorporating any low-impact design principles in future regulations or plans?

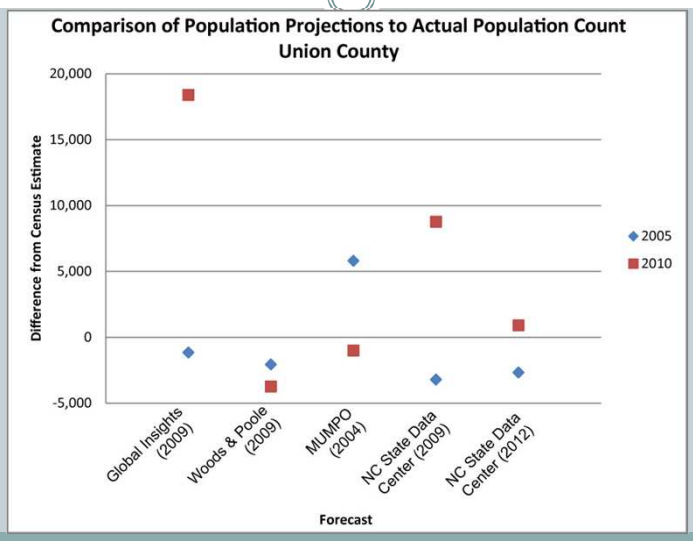
9/28/2012

Union County and Growth

- Since our last meeting, we have finalized the Union County Growth Memo, which is intended to supplement the revised Quantitative ICE
  - Growth in the Charlotte-Gastonia-Rock Hill Metropolitan Statistical Area (MSA)
    - Mecklenburg, Union, Gaston, Cabarrus, and Anson Counties in North Carolina and York County in South Carolina
  - Growth in the Charlotte-Gastonia-Salisbury Combined Metropolitan Statistical Area (CMSA)
    - includes the above counties plus Iredell, Lincoln, Rowan, Stanly, and Alexander Counties in North Carolina and Chester and Lancaster Counties in South Carolina

9/28/2012

Union County Growth Forecasts



9/28/2012

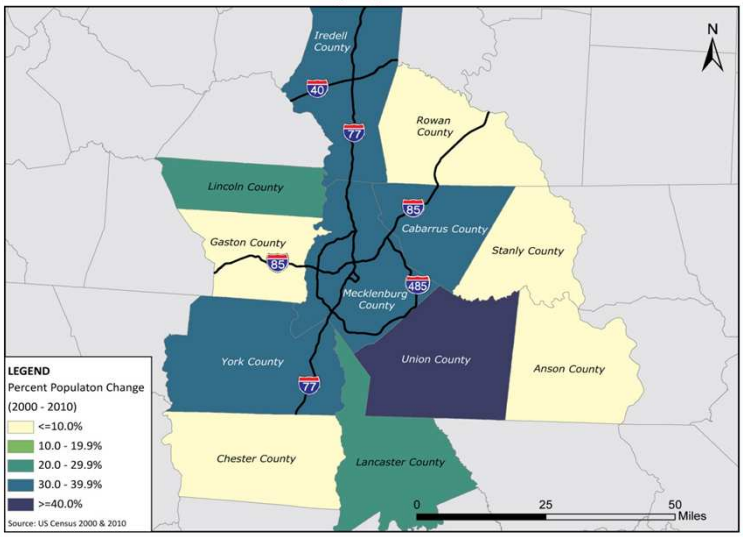
Table 1: Population and MUMPO Forecast Status for CMSA Counties

County	State	MUMPO Forecasts Coverage	Population					
			1990	2000	2010	1990 to 2010 Growth	% Growth 1990-2010	% of CMSA Population Growth 1990-2010
MSA Counties								
Mecklenburg	NC	Whole	511,433	695,454	919,628	408,195	79.5%	45.3%
Union	NC	Whole	84,211	123,677	201,292	117,081	139.0%	13.0%
Gaston	NC	Whole	174,769	190,365	206,086	31,317	17.7%	3.5%
Cabarrus	NC	Whole	98,935	131,063	178,011	79,076	79.9%	8.8%
York	SC	Whole	131,497	164,614	226,073	94,576	71.9%	10.5%
Anson	NC	None	23,474	25,275	26,948	3,474	12.9%	0.4%
CMSA Counties								
Iredell	NC	Partial	93,205	122,660	159,437	66,232	71.6%	7.4%
Lincoln	NC	Whole	50,319	63,780	78,265	27,946	55.5%	3.1%
Rowan	NC	Whole	110,605	130,340	138,423	27,818	25.2%	3.1%
Stanly	NC	Whole	51,765	58,100	60,585	8,820	17.0%	1.0%
Chester	SC	None	32,170	34,068	33,140	970	3.0%	0.1%
Lancaster	SC	Partial	54,516	61,351	76,652	22,136	40.6%	2.5%
Cleveland	NC	Partial	84,958	96,287	98,078	13,120	15.8%	1.5%
		Total	1,501,857	1,897,034	2,402,618	900,761	60.0%	

Source: US Census 1990, 2000 and 2010, MUMPO Socioeconomic Forecasts

9/28/2012

Regional Population Growth



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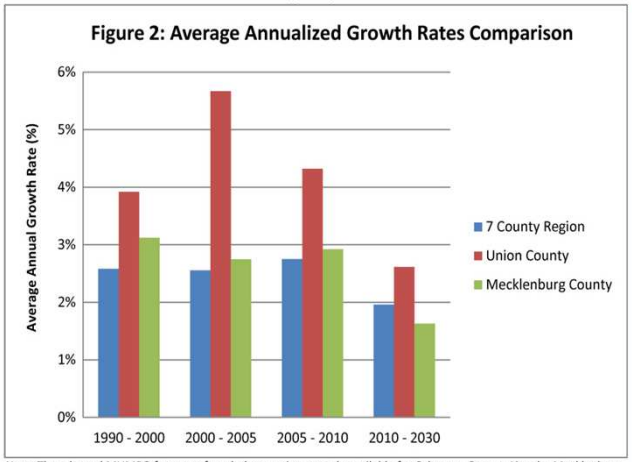
Average Annualized Growth Rates Comparison



Note: The adopted MUMPO forecasts for whole counties are only available for Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union and York Counties.
Sources: US Census 2000 and 2010, MUMPO 2030 Socioeconomic Forecasts

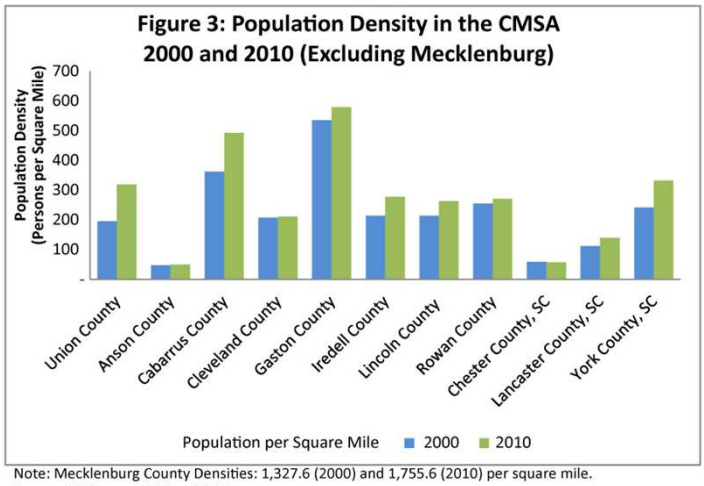
Union County Population Data

- By 2008, annual Union County growth rates far exceeded those estimated by MUMPO in their population forecasts with the MC neither built nor under construction
- According to US Census Data, Union County had the greatest percentage population increase in North Carolina from 2000 to 2010.
  - Why is there rapid growth in Union County in the absence of the Monroe Connector?

Union County Growth Factors

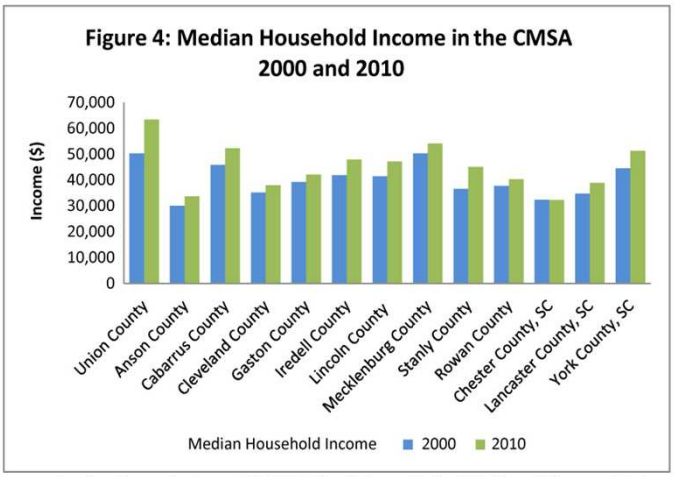
- Much of our analysis is based on Dr. Thomas Hammer's 2003 "Demographic and Economic Forecasts for the Charlotte Region."
  - While physical proximity (straight line distance) to metropolitan areas is one factor in predicting future growth, more significant factors are
    - Available land
    - Household income

Population Density (per Sq Mi)



Note: Mecklenburg County Densities: 1,327.6 (2000) and 1,755.6 (2010) per square mile.
Source: US Census 2000 and 2010

Median Household Income



Source: American Community Survey 2008-2010, 3-Year Estimates, Table S2503 (Financial Characteristics)

Housing Characteristics for the CMSA

	Union County	Anson County	Cabarrus County	Cleveland County	Gaston County	Iredell County	Lincoln County	Mecklenburg County	Stanly County	Rowan County	Chester County, SC	Lancaster County, SC	York County, SC
% Owner-occupied	83.3	65.3	74.1	66.2	68.1	74.1	74.9	61.9	69.7	69.7	76.4	73.1	72.1
% Renter-occupied	16.7	34.7	25.9	33.8	31.9	25.9	25.1	38.1	30.3	30.3	23.6	26.9	27.9
Median Home Value ($)	203,200	81,700	172,200	104,800	124,500	168,200	156,700	190,900	124,000	128,700	85,800	129,400	164,700
% Single Family Detached Housing	84.9	68.2	76.6	67.5	75.0	73.0	67.9	60.3	74.9	67.5	68.5	75.0	68.1
Median Number of Rooms per Unit	6.4	5.3	5.7	5.3	5.3	5.7	5.6	5.6	5.5	5.4	5.5	5.6	5.7
Percentage of Units by Number of Bedrooms													
No bedroom	0.7	0.5	0.8	0.8	1.3	0.6	0.6	1.2	0.9	1.5	0.1	1.2	0.7
1 bedroom	2.6	5.0	4.5	4.8	5.7	3.7	2.5	10.9	5.2	3.8	4.5	3.0	5.7
2 bedrooms	14.4	30.4	24.4	31.8	30.9	24.4	27.5	25.1	27.5	31.7	32.6	27.5	24.5
3 bedrooms	49.7	52.3	47.1	52.4	47.3	50.3	53.0	39.1	54.4	48.1	48.1	52.9	48.6
4 bedrooms	22.6	10.5	17.7	8.7	12.3	16.6	12.9	19.1	9.5	11.9	11.2	12.7	16.1
5 or more bedrooms	10.0	1.4	5.5	1.5	2.5	4.3	3.5	4.5	2.7	3.0	3.5	2.7	4.3

School Quality (SAT Scores)

Average SAT Scores for County-Wide School Districts in the CMSA

School System	# Tested	% Tested	Math (M) Score	Critical Reading (CR) Score	Writing (W) Score	M+CR	M+CR+W
Anson County Schools	159	53.7	436	427	407	863	1270
Cabarrus County Schools	1169	65.3	522	497	483	1019	1502
Cleveland County Schools	589	58.6	500	470	451	970	1421
Gaston County Schools	1136	58.3	495	480	455	975	1430
Iredell-Statesville Schools	847	60.4	524	502	480	1026	1506
Lincoln County Schools	449	58.7	513	478	456	991	1447
Charlotte-Mecklenburg Schools	5240	68.5	507	495	480	1002	1482
Rowan-Salisbury Schools	676	51.9	495	474	453	969	1422
Stanly County Schools	339	57	495	465	442	960	1402
Union County Public Schools	1635	68.7	524	503	491	1027	1518
Chester, SC	93	27	491	451	453	942	1395
Lancaster, SC	399	54	454	440	423	894	1317

9/28/2012

School Quality (Graduation Rates)

School System	Graduation Rate (%)
Anson County Schools	75.9
Cabarrus County Schools	84.1
Cleveland County Schools	73.2
Gaston County Schools	75.4
Iredell-Statesville Schools	85.1
Lincoln County Schools	81.6
Charlotte-Mecklenburg Schools	73.5
Rowan-Salisbury Schools	76.9
Stanly County Schools	77.9
Union County Public Schools	89.1
Chester, SC	73.1
Lancaster, SC	73.7
York 1	78.3
York 2 - Clover	77.3
York 3 - Rock Hill	73.5
York 4 - Fort Mill	91.2

9/28/2012

Commute Times

	2010		2000	
	Mean Travel Time to Work	Difference from Regional Average	Mean Travel Time to Work	Difference from Regional Average
Anson County	-	-	27.5	
Cabarrus County	26.0	3.6%	27.0	3.4%
Cleveland County	-	-	23.5	-
Gaston County	25.0	-0.4%	24.6	-5.7%
Iredell County	24.2	-3.6%	24.5	-6.1%
Lincoln County	-	-	27.1	3.8%
Mecklenburg County	24.7	-1.6%	26.0	-0.4%
Rowan County	23.2	-7.6%	23.3	-10.7%
Stanly County	-	-	25.3	
Union County	27.8	10.8%	29.0	11.1%
Chester County	28.1	11.9%	27.8	6.5%
Lancaster County	27.9	11.1%	27.0	3.4%
York County	24.0	-4.4%	27.2	4.2%
Charlotte MSA	25.1		26.1	

9/28/2012

Conclusions

- Prior work by Hammer and others suggest that income and land availability serve as the prominent growth factors that would tend to attract a greater share of regional growth within a metropolitan region.
- This memo, assessing regional characteristics in 2000 and 2010 of the Charlotte CMSA, confirms that Union County has advantages that would predict higher than average growth, based on median income, housing stock, school quality and population density.
- Data suggest that these factors have driven growth in Union County, and will continue to drive future growth.

9/28/2012

Conclusions

- Other factors, such as straight-line proximity to Charlotte may also tend to favor future growth in Union County.
- Commute time does not appear to be a driving factor in Union County growth. The role of the connector and its impacts on the intensity and location of future growth will be included in the revised Quantitative ICE.
- Models developed by MUMPO in 2004 have been relatively accurate in predicting future growth without the Connector.

9/28/2012

Next Steps for the Quantitative ICE

- Working with Paul Smith to calculate exact affect of Travel Time to Employment with and without the MC.
  - Results will determine level of adjustment, if any, needed to the No Build land use for the ICE.
- Review other possible new information to determine if it affects current assumptions.
  - New information may require adjustments to ICE or other supporting documents.

9/28/2012

Purpose and Need

"Improve mobility and capacity within the project study area by providing a facility for the US 74 corridor from near I-485 in Mecklenburg County to between the towns of Wingate and Marshville in Union County that allows for high-speed regional travel consistent with the designations of the North Carolina SHC program and the North Carolina Intrastate System, while maintaining access to properties along existing US 74."

Purpose and Need

- Need is an existing problem
- Roadway is currently over capacity and will continue to be overcapacity with no improvements

Purpose and Need

- Need is an existing problem
- Roadway is currently over capacity and will continue to be overcapacity with no improvements
- Roadway can not serve High-Speed Regional Travel Consistent with the Designations and Goals of State and Local Transportation Plans

Next Steps

- Update on Natural Resources
- Meet with local planners / officials
- Reassess Alternative analyses and impacts

Monroe Bypass Agency Meeting

MEETING MINUTES

Date: October 17, 2012
1:00 PM to 2:30 PM
NCDOT Century Center – Structures Conference Room

Project: STIP R-3329/R-2559 Monroe Connector/Bypass – STP-NHF-74(90)

Attendees:

George Hoops, FHWA
Chris Militscher, USEPA (Phone)
Liz Hair, USACE (Phone)
Marla Chambers, NCWRC (Phone)
David Wainwright, NCDWQ
Alan Johnson, NCDWQ
Scott Slusser, NCDOJ
Greg Thorpe, NCDOT - PDEA
Phil Harris, NCDOT - NES
Tris Ford, NCDOT – HES - PICS
Colin Mellor, NCDOT - NES
Elizabeth Lusk, NCDOT – NES
Michael Turchy, NCDOT - NES
Jamal Alavi, NCDOT – TPB
Jim Dunlop, NCDOT – Congestion Mgmt
BenJetta Johnson, NCDOT – Cong. Mgmt (Phone)
Lawrence Gettier, NCDOT – Traffic Control
Malcolm Watson, NCDOT – Design Build
Jennifer Harris, NCDOT - PDEA
Rick Baucom, NCDOT – Div 10
Christy Shumate, NCTA-GEC
Carl Gibilaro, Atkins
Ken Gilland, Michael Baker Eng.
Lorna Parkins, Michael Baker Eng.
Scudder Wagg, Michael Baker Eng.
Nancy Scott, The Catena Group
Tim Savidge, The Catena Group

Presentation Materials:

- Agenda
- Indirect and Cumulative Analysis Review PowerPoint Presentation

Purpose:
Provide an update on the Monroe Bypass project, including current activities and future activities.

The Indirect and Cumulative Analysis Review was presented in a PowerPoint presentation given by Scudder Wagg, and Carl Gibilaro provided additional updates of project analyses.

Indirect and Cumulative Effects Analyses Update

Prior to the update, Mr. Wagg mentioned that no comments were received on the Union County Growth Memo which was distributed at the September 12, 2012 Agency Meeting. Attendees were asked if there were any questions or comments on the Memo but none were offered. In that the Union County Growth Memo will be incorporated into the final Indirect and Cumulative Effects Assessment document, the agencies will have another opportunity to comment but the project team would like comments as soon as possible so that any changes could be incorporated into the final analysis documentation.

Mr. Wagg then began his presentation with an overview of how MUMPO developed their socioeconomic forecasts and explained once again the Top Down, Bottom Up and Expert Panel roles in developing the models. An overview of the recent work by Paul Smith was presented explaining how he re-ran the original bottom up allocation model removing all influences of the Monroe Connector/Bypass. Prior to his retirement, Mr. Smith was employed by the University of North Carolina Charlotte and originally

developed this model. Mr. Smith has removed the influence of the project to the Travel Time to Employment factor and Mr. Wagg shared the new results.

The removal of the project only resulted in minor changes to travel times and composite scores within the model. Of the 256 Traffic Analysis Zones (TAZ) within Union County: 59% had no travel time changes, 33% had a travel time change increase of less than 1 minute, 8% had a travel time increase of more than 1 minute. The maximum change was 5.7 minutes and the average change within Union County was 18 seconds. Similarly for the composite scores, again 59% had no change, 36% had a change of less than 1% and 5% had a greater than 1% change in their composite score. The maximum change in the composite score of an individual TAZ was 3.9% with the average change being 0.21%. Those that changed saw a decline in their composite score due to the increased travel time.

The effect of these changes on the land use forecasts are as follows:

1. In TAZs where the composite score had declined, the allocation model had consumed <u>all available land</u> in the original allocation. When the allocation analysis was redone with the new composite scores all available land in the affected TAZs was also consumed.
2. The allocation model output once the Monroe Connector/Bypass was removed from the Travel Time Analysis was **<u>EXACTLY</u>** the same as the original model output. So while there were very minor changes in the composite score for some TAZs, the composite score change did not change the final allocation model output for those TAZs.

With this analysis, it has been confirmed that the MUMPO forecasts do in fact most closely represent the No-Build condition. Any updates to the Indirect and Cumulative Effects document will focus on new information available since the completion of the original report.

Michael Baker Corporation has completed new interviews with local planners to identify any new information since 2009 (when original study was done) regarding future land use in the area. Based on these interviews, most changes are expected to occur in eastern Union County assuming the Monroe Connector/Bypass is constructed. This will induce new development but move anticipated development further from the Goose Creek and Duck Creek basins to the eastern portion of the county. These watersheds are of key interest because they contain critical habitat for the federally-protected Carolina heelsplitter.

MUMPO is currently developing new household and employment forecasts. While draft regional and county control totals may be available in late October, approval of these totals and the TAZ-level forecasts are not expected prior to late first quarter of 2013. ICE Guidance recommends that current adopted forecasts be used in analyses and that the use of preliminary data is not appropriate. A draft ICE document is anticipated to be complete in late October. As appropriate, any apparent changes in the regional or county-level forecasts will be addressed in the update of the qualitative ICE report.

Mr. Wagg asked the group if the approach described seemed reasonable or if there were any questions about it. There were no concerns or questions from USEPA, USACE or NCWRC.

<u>Updated T&E Plant Surveys</u>

Mr. Gibilaro provided an update of the recent field surveys completed by Atkins. Scientists visited the project site from September 17th thru 21st surveying for populations of Schweinitz's sunflower, Michaux's sumac and Georgia aster. A detailed memo regarding these surveys was prepared and is available for review if any agencies would like a copy. No new populations of any threatened or endangered plant species were found with the project corridor and a biological conclusion of No Effect was made. This determination considered only possible direct impacts. The Catena Group will be analyzing whether there are any indirect effects to these species as part of their work.

<u>Updated Noise Impacts</u>

Mr. Gibilaro also provided an update of the Noise Impact Analysis Addendum recently completed by Atkins. Recent changes by the Federal Highway Administration and NCDOT regarding noise analysis and abatement required the preparation of this noise report addendum. The policy changes in the

determination of reasonableness of the inclusion of barriers make it easier for areas to qualify for noise barriers than by the previous policies.

While there has not been any new major development in the area, the new analyses identified 190 receptors in the project vicinity versus only 153 receptors in the previous study. The new analyses identified abatement measures at eight locations as feasible and reasonable for the benefit of 140 impacted receptors. The previous noise analyses only identified three locations as feasible and reasonable. Following the re-initiation of the project design work, a Design Noise Impact Analysis will be prepared where final determinations of noise abatement will be made.

Q&A / COMMENTS:

During the presentation of the ICE update, the representative of NCDWQ had several questions to make sure he understood what was being presented.

1. *Slide 10 – Did the Expert Panel assume that the Monroe Connector was present?*
   No. The project team verified with MUMPO and local planners that the land use plans adopted at that time did not include the Monroe Connector/Bypass, and these plans served as the basis for their assumptions.

2. *Slide 12 – The Top Down approach did not include the project, the Expert Panel did not include the project, and the Bottom Up approach included it but only for local trips, correct?*
   Correct, it was included in the LRTP roadway network which was a component of the "travel time to employment" factor which was one of eight factors in the Bottom Up approach.

3. *Slide 13 – Are the travel times mentioned regional or local?*
   Those are for local trips within Union County only.

4. *Slide 19 – These changes would be the same regardless of population?*
   Yes, the TAZ composite scores that rose were already near their capacity and redoing this process does not create excess capacity. These areas were already assumed to be heavily developed.

5. *When you go back and redo your study, will you look at regional travel times as well as local?*
   The regional travel times were included in the original study.

6. *Do you have a graphic of the Land Use Plan prior to the Connector?*
   We do have one that was reviewed but do not have it with us today. It was reviewed and included in the previous analysis. The current Land Use Plan was completed in 2010.

7. *Slide 12 – Will you go back and add the project to the Top Down, Bottom Up and Expert Panel to develop the Build Scenario? This might be necessary from a standpoint of defending your numbers.*
   No. Now that we have determined that the MUMPO model best represents the No-Build scenario, there are various accepted techniques available to create the Build scenario. The Top Down, Bottom Up and Expert Panel analyses are only used for regional long range forecasting/planning.

Previous Action Items:

- Agencies review Union County Growth Factors Memo and provide comments to the project team. **No comments received as of 10/17/12.**
- Agencies to provide project team with any new project specific information or regulatory guidance relevant to this process that an agency feels is relevant. **No additional information provided as of 10/17/12.**
- Agencies to provide NCDOT with information of potential development that could impact future growth estimates. **No additional information provided as of 10/17/12.**
- NCDOT will forward to USACE a project schedule and upcoming steps.
- USACE to provide any permit information to NCDOT regarding Project Legacy and other projects in Union County. **No additional information provided as of 10/17/12.**
- NCTA will email Union County Growth Memo to USEPA. **Provided via email on 9/28/12.**

New Action Items:

- Provide Marla Chambers with a copy of the Threatened and Endangered Field Survey Memorandum.

Resolutions:

- None.

Next Steps:

- NCDOT will continue analyses to identify any changes that may have occurred since approval of the FEIS.
- Prior to the next meeting, working towards determining if an updated Water Quality Analysis will be required.
- Anticipate initiating discussions as to the type of document that will be prepared to satisfy NEPA.
- Next Meeting – November 8, 2012

Monroe Connector/Bypass Agency Update

INDIRECT AND CUMULATIVE ANALYSIS REVIEW

THIS PRESENTATION INCLUDES INFORMATION AND FINDINGS THAT ARE UNDER DEVELOPMENT AND MAY BE SUBJECT TO CHANGE

October 17, 2012

Outline of Today's Discussion

- Review questions regarding *Union County Growth Memo*
- Review results from the recent modeling work
  - Reallocation of Population, Households and Employment to address Travel Time to Employment Factor
- Review information from interviews with local staff
- Review potential changes to ICE reports
- Discuss next steps in completing ICE reports

Union County Growth Memo Purpose

- Provide background and additional documentation on growth trends in the region.
- Provide answer to the question: why is Union County growing so quickly?
- To help corroborate the high level of growth forecasted in the No Build Scenario.

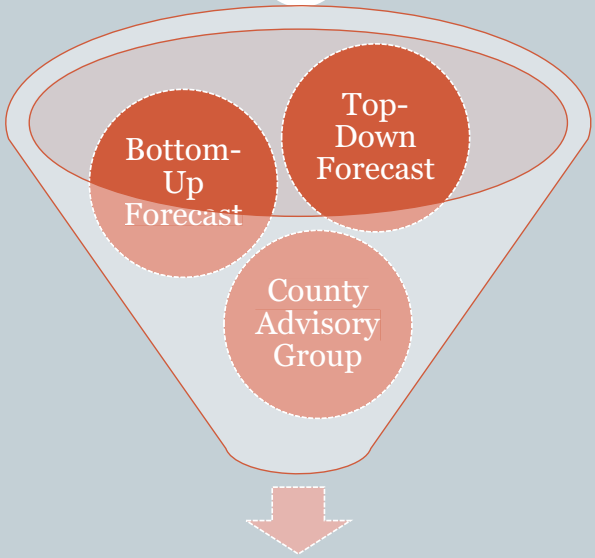
Union County Growth Memo Conclusions

- In the absence of the Monroe Connector, growth in Union County has exceeded that of other counties in the area
- Factors driving growth in Union County appear to be available land, high median income, and the area school system
- Commuting time is higher for residents of Union County than for other counties in the area
  - But this has not deterred the fast pace of growth for over a decade
- The practical "No Build" since 2001 demonstrates that rapid growth in Union County will likely continue, regardless of whether the Monroe Connector is built.

Union County Growth Memo Next Steps

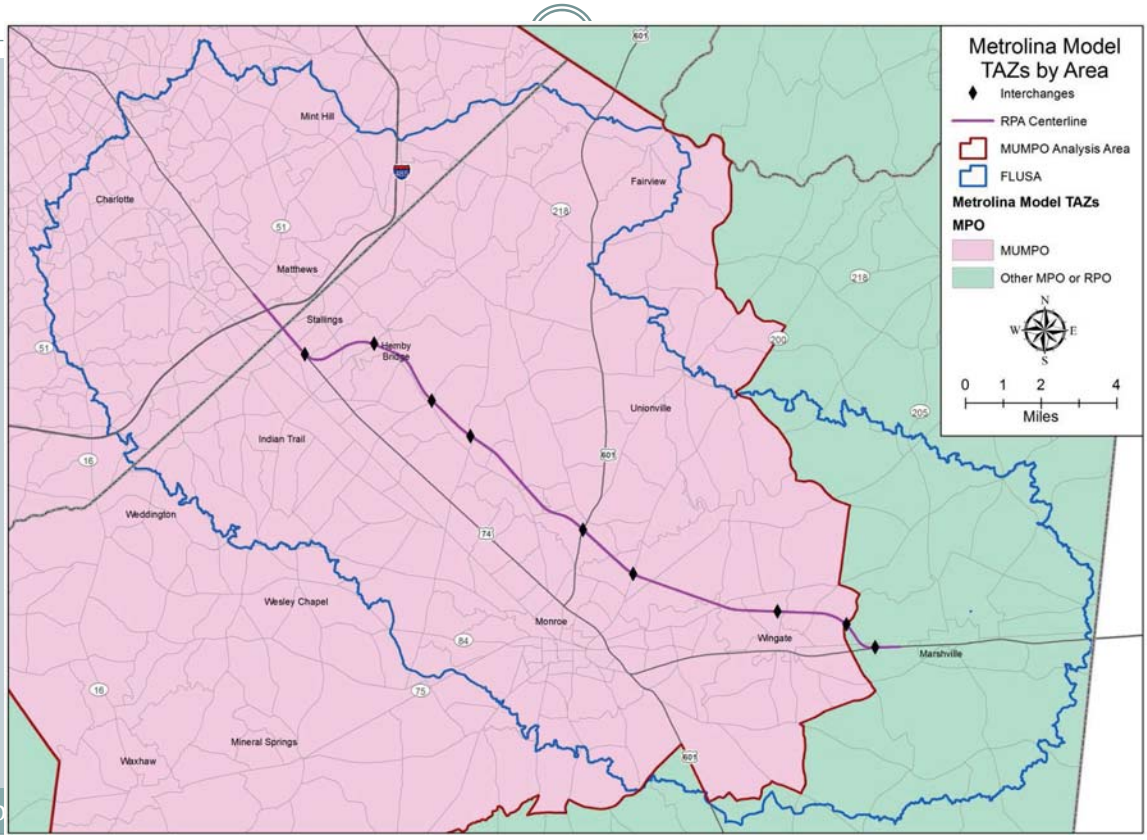
- Questions and comments from agencies will be addressed and memo will be updated.
- Documentation and analysis will be incorporated into updated ICE document.
- Discussion of questions?

How were the MUMPO land use forecasts developed?



2030 TAZ forecasts

Metrolina Model TAZs by Area



Forecasting Roles (MUMPO Area)

Top-Down

- Projects Regional Population & Employment totals
- Sets county totals

Bottom-Up

- Distributed growth developed in the top-down model at the county-level based on Traffic Area Zones (TAZs)
- DID NOT include adjustments to regional growth patterns other than within counties
- MUMPO process only applied to central and western Union County

Expert Panel

- Local planners refined the in-county land use allocation based on adopted plans and local land use expertise, basically this served as a reality check on the anticipated growth

Forecasting Roles (RPO Area)

Top-Down

- Projects Regional Population & Employment totals
- Sets county totals

Bottom-Up

- Used expert panel review and handsetting process to allocate control total growth to TAZ level

Forecasting Factors

Top-Down

- Regional Forecast
- County Level Forecast (Allocated using variables statistically tested against 228 metropolitan counties in 27 regions)
  - Past economic and demographic trends
  - Economic and demographic conditions (as of 2003)
  - Influence of income on growth patterns
  - Proximity (straight line distance from centroid of county)
  - Land availability
  - Past land use and infrastructure policies

Bottom-Up*

MUMPO Forecasting Area Only

- Developable Residential Land
- Redevelopable Residential Land
- Recent Population Change
- Travel Time to Employment Centers (note: this is the only factor that included the Monroe Connector)
- Water Availability
- Sewer Availability
- Expert Panel (High Growth Areas)*
- Growth Policy Factor*

* Union County Factors

Accessibility Considerations (MUMPO Area)

Top-Down

- Large scale transportation projects omitted from the top down analysis (From Hammer Report, p. 14)

Bottom-Up

- Included the regional "build" network including the Monroe Connector, but only in travel time to employment calculations for final allocation period (2020-2030).
- Considered travel time from each TAZ to the NEAREST employment center, NOT regional employment centers

Expert Panel

- Reflected local advisors' expectations (in 2003-2004) of whether new roads would be built
- Reflects the assumptions in adopted land use plans regarding the anticipated road network

Accessibility Considerations (RPO Area)

Top-Down

- Large scale transportation projects omitted from the top down analysis (From Hammer Report, p. 14)

Bottom-Up

- Reflected local advisors' expectations (in 2003-2004) of whether new roads would be built
- Reflects the assumptions in adopted land use plans regarding the anticipated road network

How does this affect the ICE Study

Top-Down

- This component, which includes the estimation of total job and population growth for each county, DID NOT include the Monroe Connector

Bottom-Up

- Included the regional "build" network (with Monroe Connector) for the travel time component only, and only for central and western Union County
- The way travel time to employment was calculated does not capture regional travel time impacts, it only captures impacts to the nearest employment center.

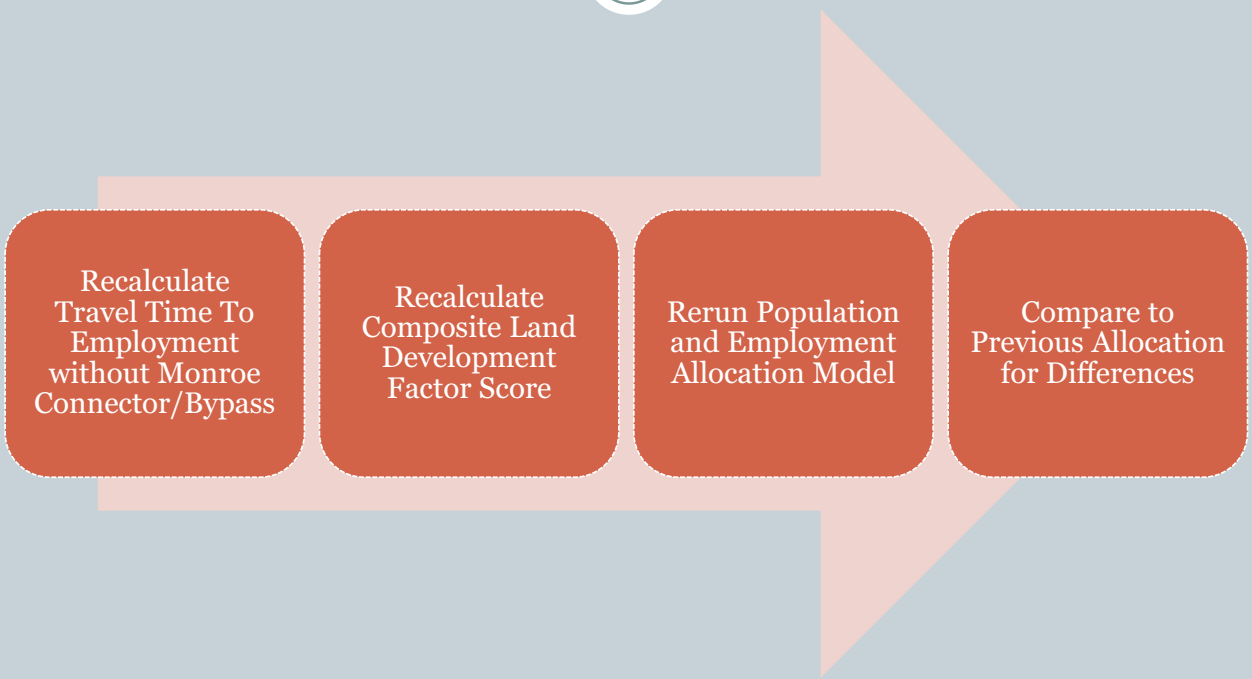
Expert Panel

- Adopted land use plans at the time this analysis was done did not reflect impacts of the Monroe Connector
- Members of the Expert Panel stated during the interview process for the ICE study that the Monroe Connector WAS NOT included in their expectations

Bottom Up Allocation Process Reassessment

- MUMPO, NCDOT and other modelers worked together to reexamine the Travel Time to Employment Factor
  - Assess the differences in travel times with and without the Monroe Connector in the roadway network
  - Assess the resulting changes to the Composite Score
  - Rerun the allocation process to assess any changes to population and employment allocations

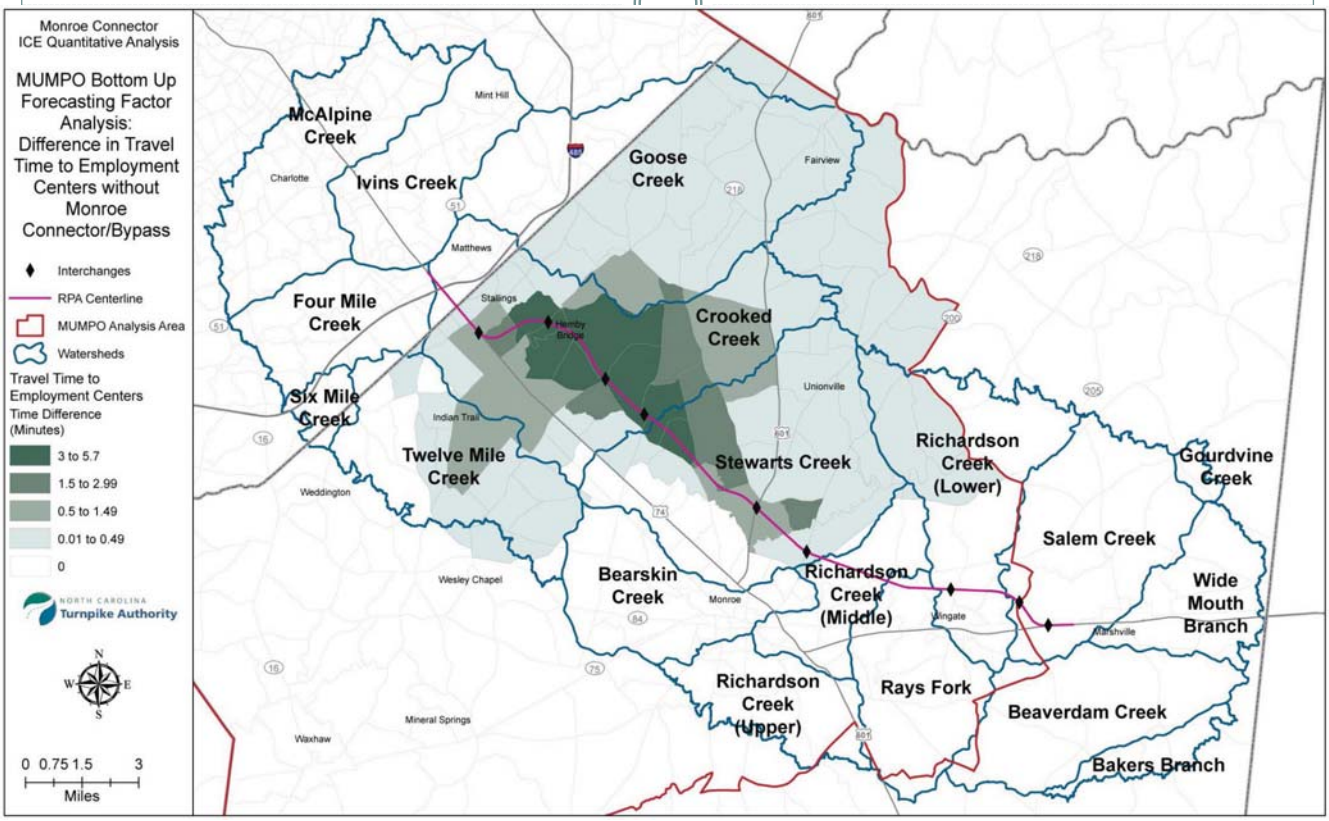
Bottom Up Allocation Process



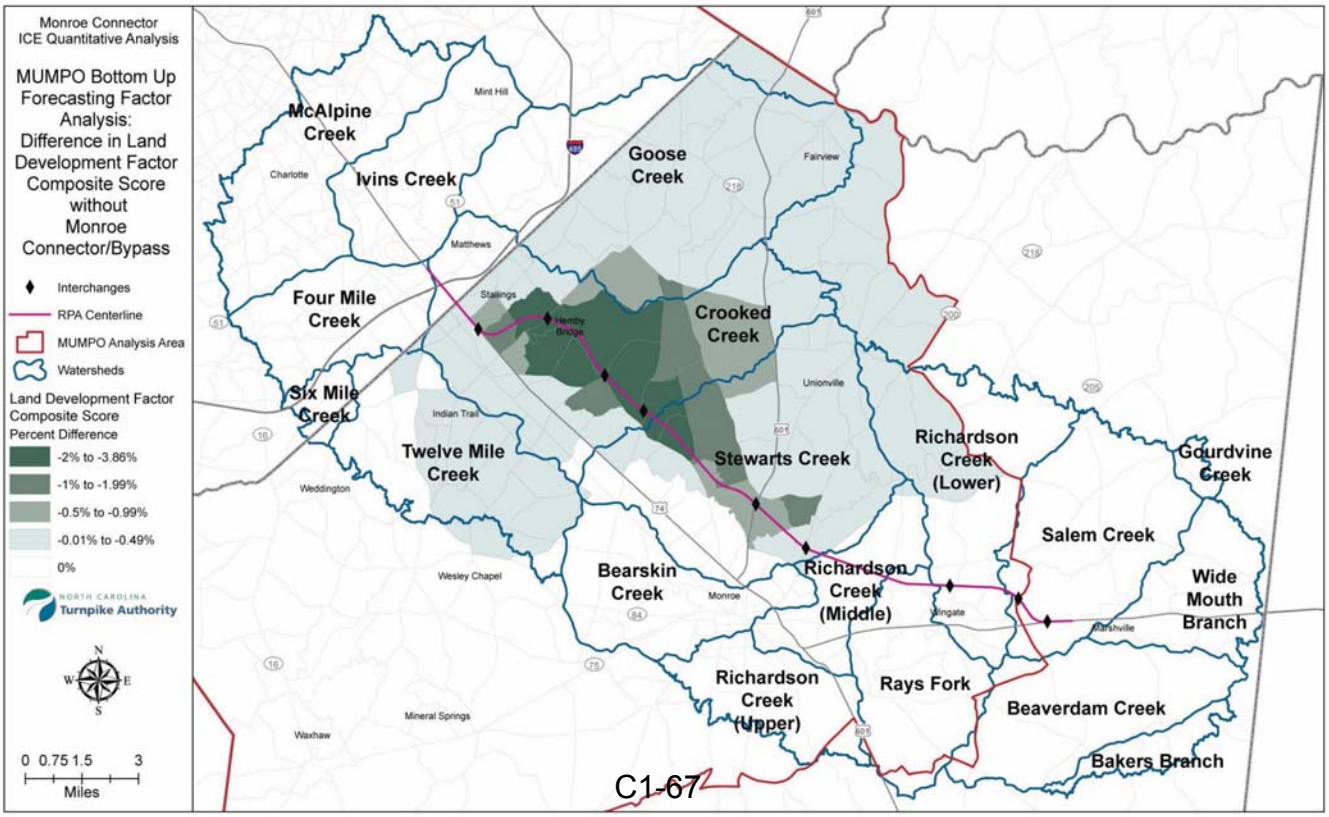
Travel Time and Composite Score Changes

- Removal of Bypass results in minor changes to travel times and composite scores
  - Travel Time Changes (out of 256 TAZs)
    - 150 TAZs (59%) have no change
    - 85 TAZs (33%) have increase of less than 1 minute
    - 21 TAZs (8%) increase by more than 1 minute
    - Maximum change is 5.7 minutes
    - Average change is 18 seconds
  - Composite Score Changes (out of 256 TAZs)
    - 150 TAZs (59%) have no change
    - 92 TAZs (36%) have change of less than 1%
    - 14 TAZs (5%) have 1% or more change in composite score
    - Average Composite Score change is 0.21%
    - Maximum Composite Score change is 3.9%

Change in Travel Time



Change in Composite Score



Allocation Model Process

Land available and zoning determines total capacity of each TAZ

Composite score determines percent of available land consumed by TAZ

TAZs with higher scores have higher percentage of available land requested by model

Composite Score Change Affect on Forecasts

- For those TAZs where the composite score declined, the allocation model had consumed all available land in the original allocation.
- The decrease in composite score did NOT result in the model requesting less land for development than was available in those TAZs.
- The allocation model output once the Monroe Connector/Bypass was removed from the Travel Time analysis was **EXACTLY** the same as the original model output

What do these outcomes mean?

- Based on this reallocation analysis and previous work the MUMPO forecasts most closely represent a No-Build Condition
  - Reallocation analysis shows that without the Monroe Connector/Bypass included in the Travel Time to Employment Factor the TAZ allocation is identical to the original TAZ allocation
- Updates to the ICE will focus on new information available since the completion of the last report.

Updates to ICE

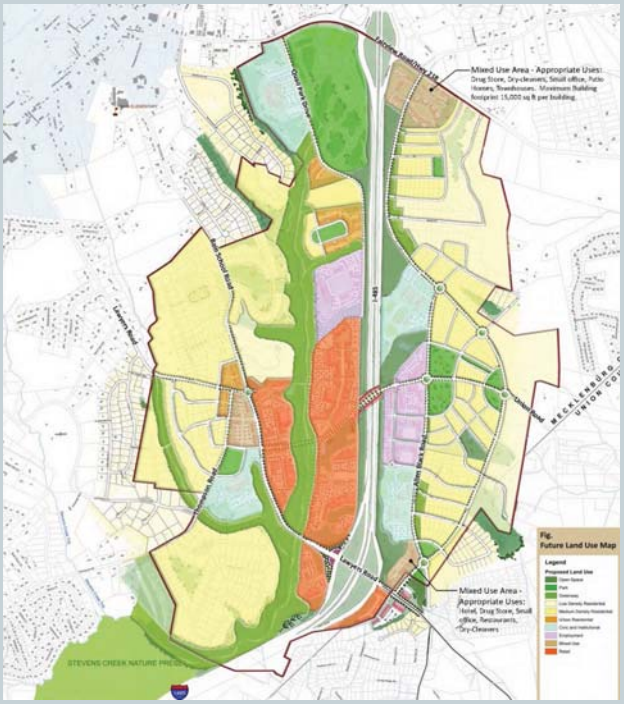
INTERVIEWS, NEW PLANS AND OTHER NEW INFORMATION

Interviews with Local Planners

- Completed interviews with 20 of 21 local jurisdictions or agencies
- Resulting information will be compiled into an update to the ICE report including updates to the future land use scenarios.
- Most changes to future land use scenarios will be minor.

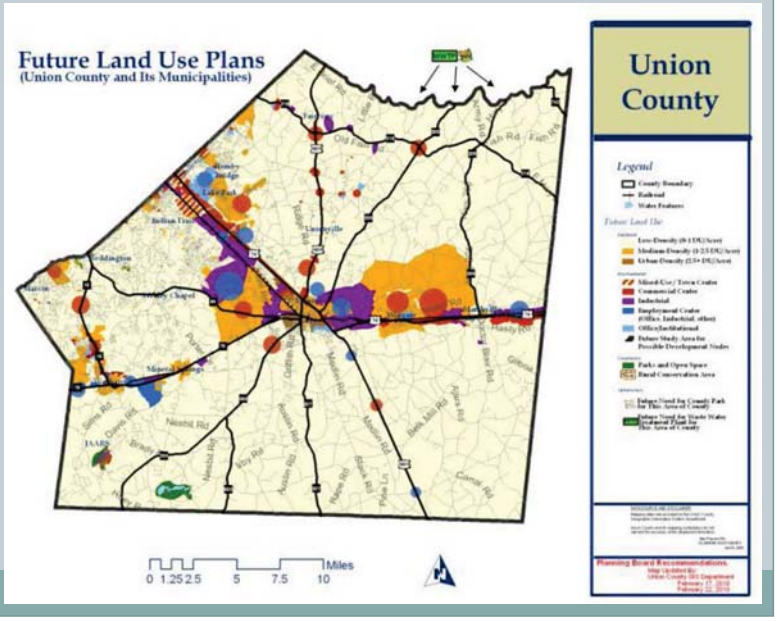
Example of Change: Lawyers Rd Development

- Changes to both No Build and Build
  - Small changes as most of the area was already forecasted to be developed.
  - Changing from one development category to another (i.e. from commercial to medium density residential)



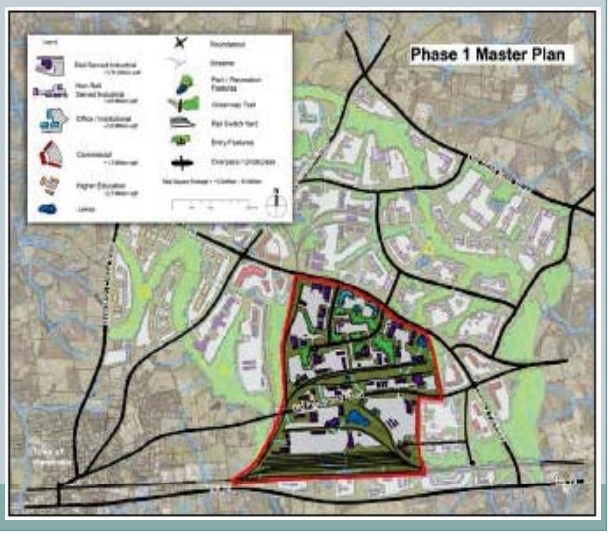
Example of Change: Eastern Union County

- New Union County Land Use Plan
- Explicitly assumes MC in projected land use
- Larger area of medium density housing
- Affects Build Scenario with higher levels of low and medium density residential development.



Example of No Change: Legacy Park

- Interviewed Union County Partnership for Progress
- Proposal is not incorporated into any local plans
  - Two localities have expressed official support for the project
- Vast majority of land is not zoned for use
- No financing plan for development
- No plan for providing utilities
- CSX has indicated the site is good and is interested in continuing coordination on possible development
  - Not interested in pursing environmental study of the site right now
- Development is considered highly speculative
- No changes to either scenario warranted based on current information



Example of Qualitative Update

- MUMPO is currently developing a new round of household and employment forecasts
- Forecasts expected to be complete in 1st Quarter of 2013
- Draft Regional and County control totals expected by end of October
- Discussions with MUMPO staff indicate that regional control total expected to be lower than currently adopted forecast
- ICE Guidance recommends using adopted forecasts, thus use of preliminary data in Quantitative ICE not appropriate.
- Qualitative ICE will be updated to discuss potential differences with lower MUMPO forecasts

Next Steps

- Finalize analysis of needed updates to ICE and develop new report
  - Expected draft by end of October
- Assess changes to Land Use Scenarios
  - Determine need for an updated water quality assessment and biological assessment

Monroe Bypass Agency Meeting

MEETING MINUTES

Date: November 8, 2012
2:15 PM to 4:30 PM
NCDOT Century Center – Structures Conference Room

Project: STIP R-3329/R-2559 Monroe Connector/Bypass – STP-NHF-74(90)

Attendees:

John Sullivan, FHWA
George Hoops, FHWA
Loretta Barren, FHWA
Chris Militscher, USEPA (Phone)
Marella Buncick USFWS
Liz Hair, USACE
Marla Chambers, NCWRC
David Wainwright, NCDWQ
Alan Johnson, NCDWQ (Phone)
Scott Slusser, NCDOJ
Greg Thorpe, NCDOT-PDEA
Phil Harris, NCDOT - NES
Michael Turchy, NCDOT - NES
Mark Staley, NCDOT – REU
Tim McFadden, NCDOT – D/B
Malcolm Watson, NCDOT – D/B
Kevin Fischer, NCDOT – Structures Mgmt
Jennifer Harris, NCTA
Rick Baucom, NCDOT – Div 10
Christy Shumate, NCTA-GEC
Carl Gibilaro, Atkins
Brad Allen, Atkins
Ken Gilland, Michael Baker Eng.
Scudder Wagg, Michael Baker Eng.
Michael Wood, The Catena Group
Nancy Scott, The Catena Group
Tim Savidge, The Catena Group

Presentation Materials:

- Agenda
- Indirect and Cumulative Analysis Review PowerPoint Presentation

Purpose:

Discuss ongoing activities and update agencies of findings to date of current analyses.

Indirect and Cumulative Analysis Review

Mr. Gilland and Mr. Wagg provided the group with an update of the Indirect and Cumulative Effects analysis via PowerPoint. A copy of their presentation is included with these minutes. Mr. Gilland began the presentation with a review of the MPO forecast development process. This information has been presented at previous meetings and was presented to determine if the group had any questions or concerns prior to NCTA going forward with this information.

Following Mr. Gilland, Mr. Wagg then provided the group with an update of the Travel Time Factor Reassessment work which has been completed. Mr. Paul Smith, who is the original developer of the model, removed all instances of the Monroe Connector/Bypass from the travel time to employment portion of the Mecklenburg-Union Metropolitan Planning Organization model. It was explained that changes discussed today were to the Land Use Model (LUM) and not the Travel Demand Model. Output of the LUM was compared to that of the previous analyses to determine what effect this change would have on the previous analyses. Mr. Smith reran the Travel Time to Employment Factor and TAZ travel times changed as follows: 59% of the Traffic Analysis Zones (TAZs) had no change, 33% of the TAZs increased by less than one minute and only 8% increased by greater than one minute. The maximum change across all 256 TAZs was 5.7 minutes with an average change of 18 seconds. Mr. Smith

recalculated the Composite Scores using the results of the Travel Time to Employment runs, and the scores changed as follows: 59% of the Traffic Analysis Zones (TAZs) had no change, 36% of the TAZs increased by less than one percent and only 5% increased by greater than one percent. The maximum change across all 256 TAZs was 3.9% with an average change of 0.21%.

Mr. Smith reran the entire LUM incorporating these new travel times, and it was determined that these resulting population and employment allocations are exactly the same as the original LUM runs and that no changes are necessary to our original No-Build land use scenario to address the Travel Time factor. An update of the ongoing Indirect and Cumulative Effects analysis was also provided by Mr. Wagg. The update is undergoing an internal review, and there is not an estimate as to when it will be completed.

Since no changes were needed to address the Travel Time factor, the only changes to incorporate into an update would be the result of new information that has come to light since the last report was completed in 2010. The travel time benefit analysis completed as part of the original Quantitative ICE report was presented graphically to the group as well to review the basis for the development of the previous Build Scenario. Unlike the Smith analysis that analyzed travel time to the nearest employment center, this analysis calculated travel times from TAZs to the I-485/US 74 interchange. The greatest travel time improvement was found in the eastern portion of the project showing a decrease in travel times of between eight and ten minutes in the areas northeast of Monroe and around Wingate and Marshville. An overview of the recent local officials' interviews was also shared along with identified changes in planned land use. The predominant change was in the Wingate and Marshville areas with a higher than previously anticipated area of medium density housing. It was clarified that while the results shared were presented numerically, these values are actually central points within a wider range of likely results. A twenty- to thirty-year county level forecast could exhibit a 10% to 20% range of error while for forecasts at a TAZ level the error could be much higher. The Hammer Report (county-level forecasts) documented a range of minus 25% to plus 15%. Overall the updates to the ICE Land Use Scenarios as a result of the new information gathered resulted in a 1% increase in total development for both the Build and No-Build Scenarios.

It was shared with the group that MUMPO is currently updating their household and employment forecasts but these will not be available until late first quarter of 2013. Current ICE guidance recommends the use of adopted forecasts thus the use of any preliminary data provided by MUMPO in a Quantitative ICE is not appropriate. Preliminary control totals for the region and county level are available and the differences between those control totals and those in the adopted forecasts will be evaluated in a qualitative assessment.

Q&A / COMMENTS:

1. *USEPA stated that the Water Quality Analyses will be their main focus. They do not completely understand the subtle changes that have been made to the ICE.* NCDOT attempted to provide clarity on the changes that had taken place in projected land use and the results of reassessing the travel time component of the existing MUMPO model. If USEPA has additional questions they wish to submit, NCDOT can address them.

2. *USFWS questioned how Mr. Smith removed the project from the transportation network of the LUM.* The LUM used a raster travel time model which used information about speed from the Travel Demand Model and merged that data with the local road speeds provided by GIS data. The Monroe Connector/Bypass was removed from the Travel Demand Model road network and the travel time to employment component of the LUM was re-run.

3. *Mr. Wood asked on a TAZ level, is the travel time measured to the closest employment center?* The times, as computed by Mr. Smith, were measured using a raster technique where for each cell (or 100x100 foot pixel) of the raster had a travel time calculated then for each TAZ, the travel time of all cells within that TAZ were averaged so that each TAZ would only have one travel time.

4. *USFWS asked if TAZ geographic boundaries change with each planning period.*

It is preferable to keep TAZs constant across planning periods to allow for past comparisons but they could be revised based on new census data. If the census identifies significant growth in an area, the TAZs could be split.

5. *DWQ asked for clarification that the travel times discussed today were mostly dealing with local travel. For instance if a driver used an interstate for 10 miles you wouldn't see much difference but utilizing local roads for 10 miles would result in changes to travel time.*
   FHWA clarified that the work to date was addressing the court's concerns that the LUM included the project as part of the No-Build analysis. The analysis completed thus far has shown that there is no-effect on the LUM and its use in the No-Build scenario. The particular travel time analysis MUMPO completed for its forecasting purposes is very different from the travel time analysis completed to assess indirect land use effects for the ICE report.

6. *FHWA asked for clarification that the allocated growth was based on your professional judgment and that adding all the additional growth in the TAZs would not equal the control totals.*
   Correct, no growth was shifted, but new growth was added to the study area. This was done to provide a conservative assessment of impacts for each watershed in the FLUSA. Reapportionment to keep overall growth level within the study area equal would have taken growth from other portions of Union County and added growth in eastern Union County. There are methodologies for doing this, but it was determined during the previous Quantitative ICE that growth would be added rather than reallocated, and this decision was carried forward for this analysis.

7. *NCWRC understood that changes were made and they were run through the model and nothing changed. What has changed with the Build scenario?*
   New land use plans provided by the locals were incorporated. Several towns had updated their land use plans which may have affected the No-Build and/or Build scenarios.

8. *USACE questioned what all these results mean.*
   The Travel Time to Employment change is a nonfactor in the analysis. FHWA noted that this information is being reviewed by the FHWA Resource Center. It is FHWA's opinion that a change of 1% due to updated future land use plans is insignificant when considering the error range in the LUM but they would like the perspective of the agencies. The project will still need to go back to the public with this information and explain all assumptions and variability of the model.

9. *DWQ was concerned that while it is determined that there is no difference with local growth(local travel time) per the result of the information just provided. What is the impact on regional growth/travel times?*
   The regional impact has been analyzed and additional development in eastern Union County was shown in both the previous Build Scenario and in the updated Build Scenario. Regional travel times are documented in the 2010 *Indirect and Cumulative Effects Quantitative Analysis*.

10. *NCWRC asked if the number of households and employees expected is available. This information was available in the previous report.*
    The increase in number of households is available but the number of employees is not as clear. It can be backed out of the analysis once it has undergone internal review. Note that, like the other portions of the land use forecast, this will be estimation.

11. *USFWS asked if the actual area of the road is included in the impervious area calculations.*
    Yes, it is included under the Transportation category and it assumes the entire right of way of the Monroe Connector/Bypass.

12. *NCWRC noted that several watersheds showed impacts in the previous report. Some of these watersheds are already of low quality. She suggested that more be done to protect the quality of these watersheds if the project results in additional impervious areas.* During development of the updated Quantitative ICE, local planners were asked if they were familiar with the NCWRC's Green Growth Toolbox, and if they planned on using those concepts to limit the effects of future development. This educational effort was conducted, at the request of NCWRC to increase the awareness of local planners of this online resource, which includes sample ordinances that could be

adopted to limit future effects of development whether indirectly caused by the Monroe Connector/Bypass or not. NCDOT is committed to performing the required mitigation for the effects of the connector as documented in the previous environmental document.

13. *USEPA expressed concerns with the Goose and Sixmile Creek watersheds. They are being impacted by other area projects. There is a lack of enforcement in the area and it is therefore a cumulative effect. He is concerned that controls are in place in the area but water quality continues to decline. This project may result in a small impact (less than 1%) but in Section 7, for impaired waters, that may be the difference.* It should be noted that cumulative effects were previously addressed in the original Quantitative ICE report and deemed appropriate by the resource agencies. There are no estimated changes in Goose and Sixmile Creeks between the Build and No-Build scenarios for the Monroe Connector, so there is no difference in cumulative impacts between project alternatives in those watersheds. FHWA asked the agencies to provide information or other methodologies that might result in different conclusions.

14. *USFWS requested verification that since there are no changes in the land use, the water quality impacts will not be remodeled?*
If the range of error is taken into account there is no change in the projected development. Ms. Harris explained in lieu of the meeting that took place between NCDOT and USFWS on 11/7, this issue needs further discussion in regards to if and where additional water quality modeling needs to be completed. FHWA feels that additional modeling is not necessary and once a thorough explanation of the differences found in the most recent study is provided to the agencies, stakeholders, and the public sufficient information will have been provided to show that no additional water quality analysis would be necessary.

15. *NCWRC questioned if there is a 15 – 20% error rate, why don't the results show a range?*
In early iterations of the original Quantitative ICE, a range was included in the results and discussions at that time it was concluded that using a range was confusing, so a decision was made to include a single value as a representative result. This decision was carried forward in the update. It was further explained that this was the best estimate available based on the tools available. FHWA pointed out that these analyses did not include the roadway as a toll facility, and stated that the tolling aspect could reduce the number of drivers using the facility. This could reduce the indirect development attributable to the facility. He also corrected that the 15 – 20% range is not truly an error range but rather the variability of the results.

16. *NCWRC questioned if the existing imperviousness was determined.*
Percent impervious cover in both the original report and the update was determined using standard values in the TR55 model. This is consistent with the ICE guidance. In the original ICE report GIS data from Mecklenburg County was used to analyze the actual impervious surface area by land use type and the actual imperviousness was lower for existing development than the assumptions from the TR55 model. This result was discussed with agencies at previous meetings and it was determined that the TR55 model values should be used to maintain consistency with ICE guidance.

17. *USFWS questioned the steps moving forward and agency roles and expectations.*
FHWA acknowledged that further discussions would need to take place between FHWA and USFWS on this subject prior to any determination on steps moving forward.

18. *NCWRC asked how the cumulative effects were identified.*
Cumulative effects were developed using information provided by local officials regarding new developments, recent or proposed zoning changes and new area plans. This is consistent with the determination of cumulative effects in the previous version of the Quantitative ICE, which was accepted by the agencies.

Previous Action Items:

- Provide Marla Chambers with a copy of the Threatened and Endangered Field Survey Memorandum. **A copy of the Threatened and Endangered Field Survey Memorandum was provided to Ms. Chambers and Ms. Buncick on 11/5/12**

New Action Items:

- Additional discussion to take place between USFWS and FHWA regarding the appropriateness and need to perform updated water quality impact modeling.
- FHWA asked the agencies to provide information or other methodologies that should be considered with respect to evaluating impacts.

Resolutions:

- None.

Next Steps:

- Next Meeting – TBD

Monroe Connector/Bypass Agency Update

INDIRECT AND CUMULATIVE ANALYSIS REVIEW

THIS PRESENTATION INCLUDES INFORMATION AND FINDINGS THAT ARE UNDER DEVELOPMENT AND MAY BE SUBJECT TO CHANGE

November 8, 2012

Outline of Today's Discussion

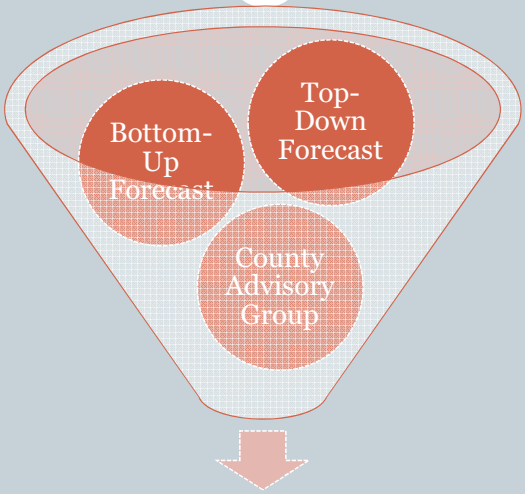
- RECAP OF MPO FORECAST DEVELOPMENT
- REVIEW RESULTS OF MUMPO MODEL REVISION
  - Reallocation of Population, Households and Employment to address Travel Time to Employment Factor
- REVIEW INFORMATION FROM INTERVIEWS WITH LOCAL STAFF
- REVIEW CHANGES TO ICE LAND USE MODEL
- REEVALUATION OF LAND USE DATA

November 8, 2012

Recap of MPO Forecasts Development Process

November 8, 2012

How were the MUMPO land use forecasts developed?



2030 TAZ forecasts

November 8, 2012

Forecasting Factors

Top-Down

- Regional Forecast
- County Level Forecast (Allocated using variables statistically tested against 228 metropolitan counties in 27 regions)
  - Past economic and demographic trends
  - Economic and demographic conditions (as of 2003)
  - Influence of income on growth patterns
  - Proximity (straight line distance from centroid of county)
  - Land availability
  - Past land use and infrastructure policies

MUMPO Forecasting Area Only

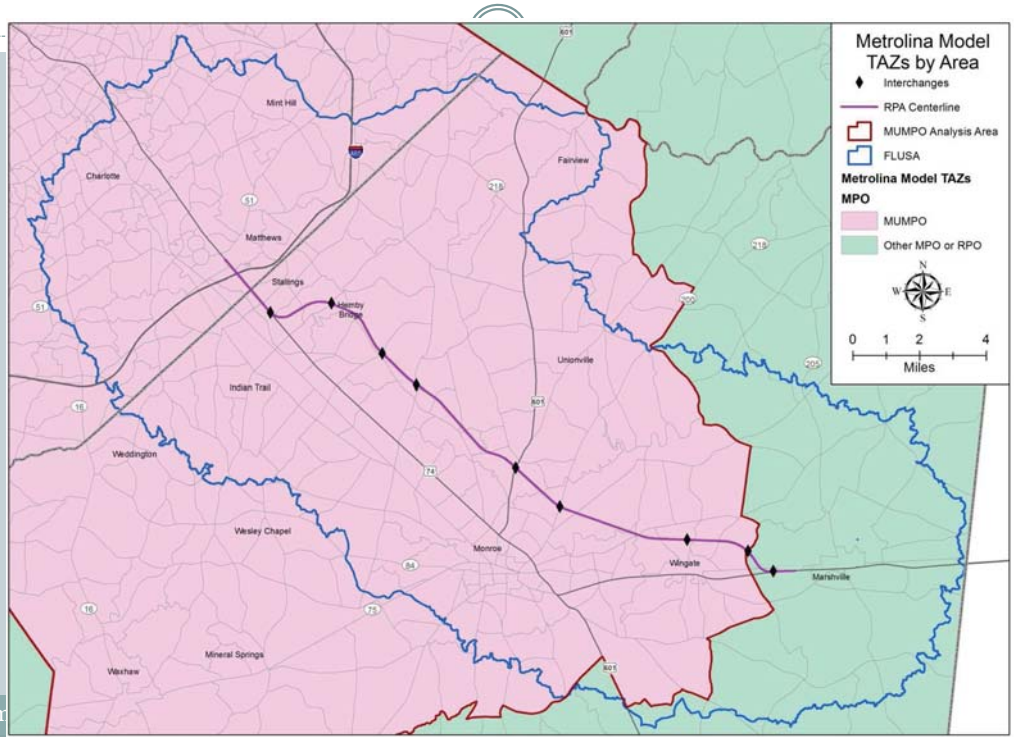
Bottom-Up*

- Developable Residential Land
- Redevelopable Residential Land
- Recent Population Change
- Travel Time to Employment Centers (note: this is the only factor that included the Monroe Connector)
- Water Availability
- Sewer Availability
- Expert Panel (High Growth Areas)*
- Growth Policy Factor*

November 8, 2012

* Union County Factors

Metrolina Model TAZs by Area



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Accessibility Considerations (MUMPO Area)

Top-Down

- Large scale transportation projects omitted from the top down analysis (From Hammer Report, p. 14)

Bottom-Up

- Included the regional "build" network including the Monroe Connector, but only in travel time to employment calculations for final allocation period (2020-2030).
- Considered travel time from each TAZ to the NEAREST employment center, NOT regional employment centers

Expert Panel

- Reflected local advisors' expectations (in 2003-2004) of whether new roads would be built
- Reflects the assumptions in adopted land use plans regarding the anticipated road network

November 8, 2012

Accessibility Considerations (RPO Area)

Top-Down

- Large scale transportation projects omitted from the top down analysis (From Hammer Report, p. 14)

Bottom-Up

- Reflected local advisors' expectations (in 2003-2004) of whether new roads would be built
- Reflects the assumptions in adopted land use plans regarding the anticipated road network

November 8, 2012

MPO Forecasts can be used two ways:

Choice A

- MPO Forecasts Represent **No Build Alternative**
- Guidance from planners and analysis create a (higher) **Build Forecast**

Choice B

- MPO Forecasts Represent **Build Alternative**
- Guidance from planners and analysis create a (lesser) **No Build Forecast**

November 8, 2012

MPO Forecasts can be used two ways:

Choice A

- MPO Forecasts Represent No Build Alternative
- Appropriate when research indicates the **regional land use impacts of the project** are **<u>not</u>** represented by the forecasts

Choice B

- MPO Forecasts Represent Build Alternative
- Appropriate when research indicates the **regional land use impacts of the project <u>are</u>** represented in the forecasts

November 8, 2012

Travel Time Factor Reassessment

MODEL RE-RUN BY PAUL SMITH

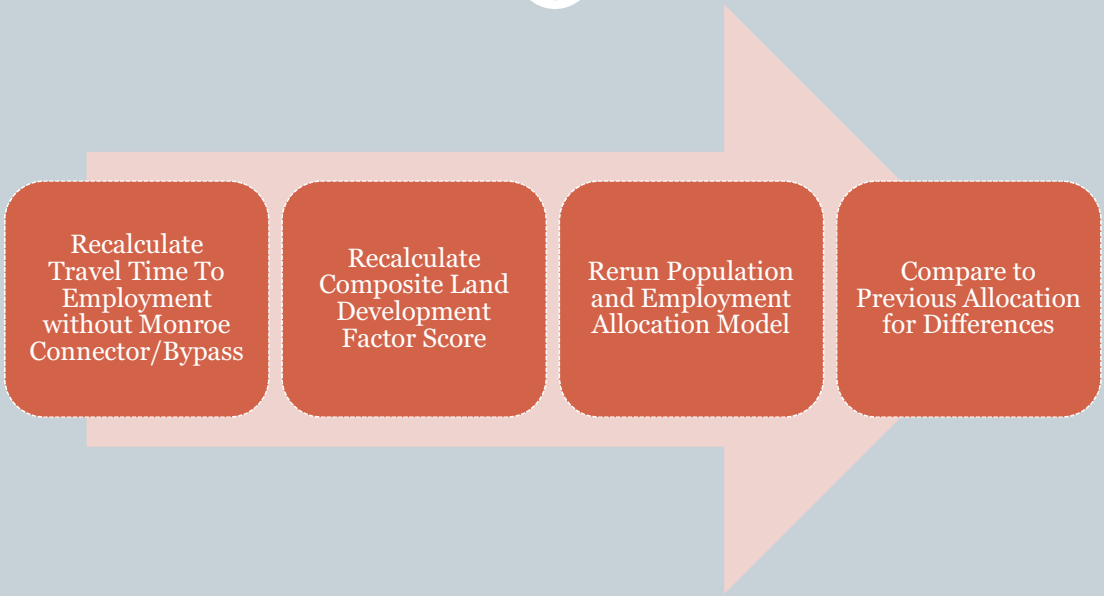
November 8, 2012

Bottom Up Allocation Process Reassessment

- MUMPO, NCDOT and other modelers worked together to reexamine the Travel Time to Employment Factor
  - Paul Smith, who ran the initial land allocation model, revised the model to remove any influence of the Monroe Connector on travel time to nearest employment center.
  - Assessed the differences in travel times with and without the Monroe Connector in the roadway network
  - Assessed the resulting changes to the Composite Score
  - Reran the allocation process to assess any changes to population and employment allocations

November 8, 2012

Bottom Up Allocation Process

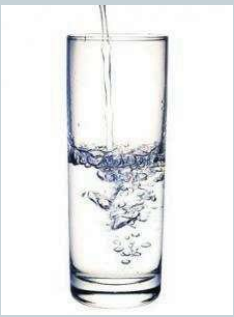


Travel Time and Composite Score Changes

- Removal of Bypass results in minor changes to travel times and composite scores
  - Travel Time Changes (out of 256 TAZs)
    - 150 TAZs (59%) have no change
    - 85 TAZs (33%) have increase of less than 1 minute
    - 21 TAZs (8%) increase by more than 1 minute
    - Maximum change is 5.7 minutes
    - Average change is 18 seconds
  - Composite Score Changes (out of 256 TAZs)
    - 150 TAZs (59%) have no change
    - 92 TAZs (36%) have change of less than 1%
    - 14 TAZs (5%) have 1% or more change in composite score
    - Average Composite Score change is 0.21%
    - Maximum Composite Score change is 3.9%

Composite Score Change Affect on Forecasts

- For those TAZs where the composite score declined, the allocation model had consumed all available land in the original allocation.
- The decrease in composite score did NOT result in the model requesting less land for development than was available in those TAZs.
- The allocation model output once the Monroe Connector/Bypass was removed from the Travel Time analysis was **EXACTLY** the same as the original model output



What do these outcomes mean?

- Based on this reallocation analysis and previous work the MUMPO forecasts most closely represent a No-Build Condition
  - Reallocation analysis shows that without the Monroe Connector/Bypass included in the Travel Time to Employment Factor the TAZ allocation is identical to the original TAZ allocation

Updates to ICE

INTERVIEWS, NEW PLANS AND OTHER NEW INFORMATION

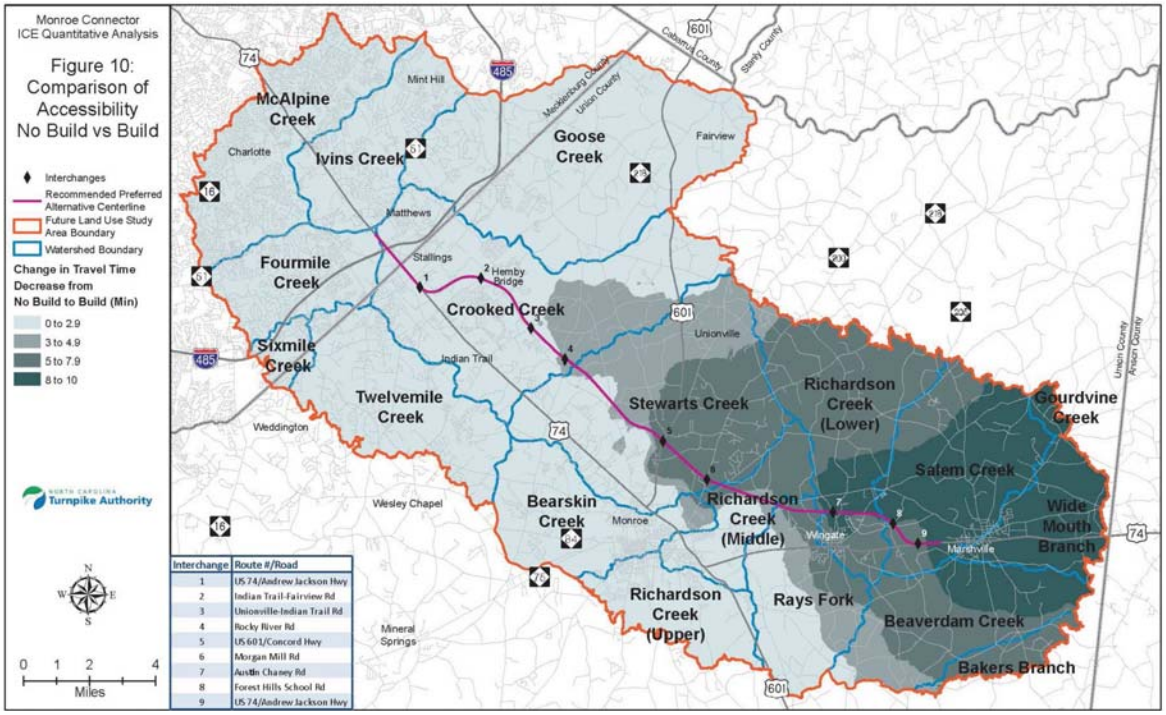
November 8, 2012

ICE Analysis Land Use Methodology

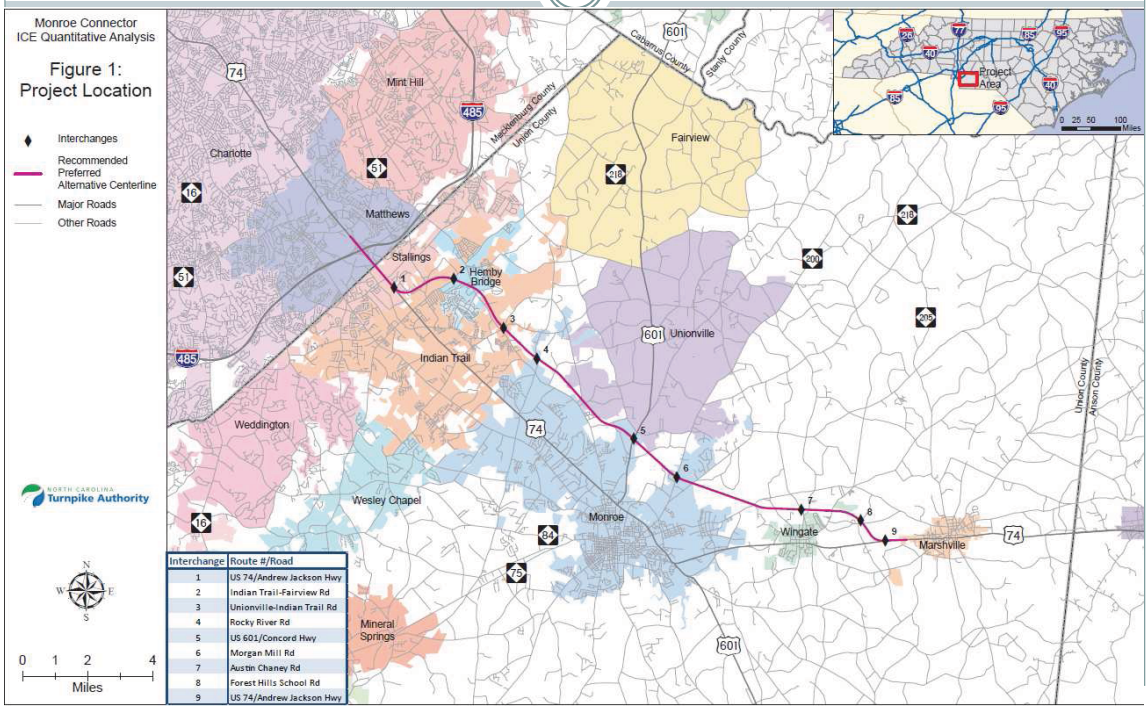
- Build Scenarios
  - Compared accessibility between Build and No Build Scenarios
    - Indicated greatest improvements in areas around and east of Monroe
  - Completed "Hartgen" analysis of Interchange areas
    - Indicated moderate commercial potential at all interchanges except Forest Hills School Road

November 8, 2012

Travel Time Analysis for ICE



Local Officials' Outreach



Interviews

Organization	Respondent	Date of Interview
Town of Wingate	Patrick Niland, Town Manager	September 6, 2012
Centralina COG	Diane Dil – Centralina Planner I	September 12, 2012
Town of Matthews	Kathi Ingrish - Planning Director	September 10, 2012
Town of Unionville	Sonya Gaddy, Land Use Administrator	September 11, 2012
Union County Planning	Amy Helms - Water and Land Resources Division Manager Scott Huneycutt - Engineering Division Manager Dick Black - Planning Director	September 12 & 19, 2012
Town of Marshville	Amanda Reid - Town Manager	September 12, 2012
Town of Indian Trail	Shelley DeHart, Director of Planning and Neighborhood Services Adam McLamb, Civil Engineer	September 14, 2012
Town of Mint Hill	John Hoard - Planner	September 14, 2012
Town of Weddington	Jordan Cook - Town Planner and Zoning Administrator	September 25, 2012
Town of Wesley Chapel	Josh Langen - Planning and Zoning Administrator	September 12, 2012
Charlotte – Mecklenburg Planning	Debra Campbell - Director, Charlotte-Mecklenburg Planning Department	September 14, 2012
City of Monroe	Doug Britt - Senior Planner	September 11, 2012
Town of Fairview	Ed Humphries, Land Use Administrator	September 11, 2012
Town of Stallings	Brian Matthews - Town Manager Lynne Hair - Town Planner	September 14, 2012
Union County Partnership for Progress*	Gretchen Carson, Planner Melanie O'Connell Underwood, Interim Director	September 27, 2012

Updated Questions

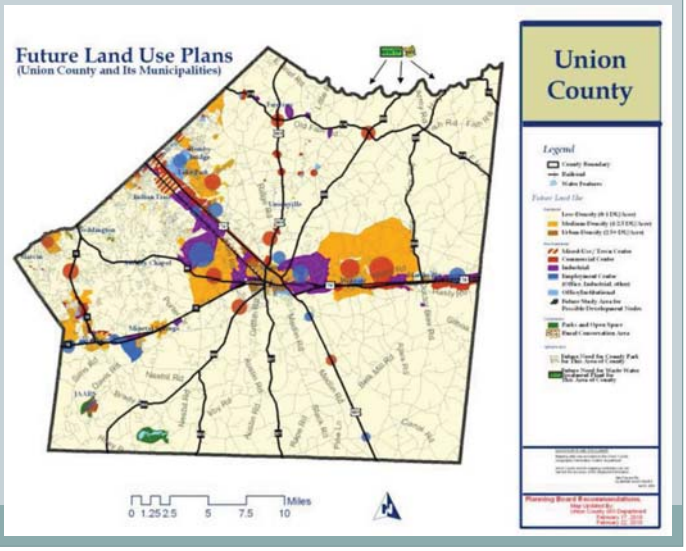
- Asked about
  - Changes in dynamics affecting future land use changed since the previous interview
  - changes to future land use plans, transportation plans or other plans, policies or projections that incorporate information from the 2010 Census
  - New or amended land use regulations since August of 2009
  - Changes in local regulation of natural resources (including stream buffers) since August 2009
  - Any proposed or approved developments since the August 2009
  - Changes in long-term growth expectations
  - Updates to Comprehensive Plan or Land Use
  - Changes in capacity of utility infrastructure or expectations about the future capacity
  - Familiarity and use of Low Impact Development Guidelines such as the "Green Growth Toolbox"

Interviews with Local Planners

- Completed interviews with 20 of 21 local jurisdictions or agencies (Hemby Bridge Mayor could not be reached to schedule an interview, information obtained from Union County)
- Obtained new GIS zoning data, information on new developments, and changes to water and sewer policies
- Resulting information was use to develop updates to the future land use scenarios (Build and No Build).

Example of Change: Eastern Union County

- New Union County Land Use Plan
- Explicitly assumes MC in projected land use
- Larger area of medium density housing
- Affects Build Scenario with higher levels of low and medium density residential development.



How to Interpret Results

- Results are reported numerically,
  - But 20-year forecasts should be considered to represent the central point within a range of likely results
  - Many unexpected factors can influence growth in the future
- The analysis was designed to be conservative
  - "new" growth was added beyond the control totals imposed by the MUMPO TAZ forecasts.
  - Re-apportionment within the FLUSA was not done.

Updated 2030 No-Build Land Use Compared to Original No-Build

Land Use	Total Area (acres) Original 2030 No Build	% of Total Area Original	Total Area (acres) Updated 2030 No Build	% of Total Area Updated	Difference in Percentage Between Original and Updated Results
Total Residential	97,900	48%	97,500	48%	<1%↓
Low Density Residential	81,300	40%	80,400	40%	<1%↓
Medium Density Residential	13,600	6%	14,000	7%	1%↑
High Density Residential	3,100	2%	3,100	2%	No Change
Commercial	4,800	2%	5,600	3%	1%↑
Industrial/Office/Institutional	8,500	4%	8,600	4%	<1%↑
Transportation	12,800	6%	12,800	6%	No Change
Total Developed	124,200	61%	124,500	62%	1%↑
Total Agricultural	37,800	19%	37,700	19%	<1%↓
Total Forested	38,200	19%	38,000	19%	<1%↓
Total Other	1,800	1%	1,800	1%	No Change
TOTAL	202,000	100%	202,000	100%	

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Changes in No-Build Impervious Cover in 2030 for the Original and Updated ICE Analysis

Watershed Name	Original 2030 Impervious Cover	Updated 2030 Impervious Cover	Difference in Percentages
Beaverdam Creek	7%	7%	No Change
Richardson Creek (Upper)	18%	18%	<1%↑
Rays Fork	16%	16%	<1%↑
Bearskin Creek	31%	31%	<1%↑
Richardson Creek (Middle)	27%	27%	<1%↑
Gourdvine Creek	8%	8%	No Change
Salem Creek	13%	13%	<1%↑
Six Mile Creek	30%	30%	<1%↑
Twelve Mile Creek	25%	25%	<1%↑
Richardson Creek (Lower)	15%	15%	<1%↑
Stewarts Creek	20%	21%	<1%↑
Four Mile Creek	34%	35%	1%↑
Crooked Creek	25%	26%	1%↑
Goose Creek	17%	18%	>1%↑
Ivins Creek	37%	37%	1%↑
McAlpine Creek	37%	37%	<1%↑
Bakers Branch	8%	8%	No Change
Wide Mouth Branch	12%	12%	<1%↑

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Changes in 2030 RPA Land Use, Original Report to Updated Report

Land Use	Total Area (acres) Original	% of Total Area Original	Total Area (acres) Updated	% of Total Area Updated	Difference in Percentage Between Original and Updated Calculations
Total Residential	97,400	48%	99,400	49%	1%↑
Low Density Residential	80,100	40%	81,600	40%	<1%↑
Medium Density Residential	14,300	7%	14,800	7%	<1%↑
High Density Residential	3,000	2%	3,100	2%	<1%↑
Commercial	5,100	3%	5,900	3%	<1%↑
Industrial/Office/Institutional	8,700	4%	8,700	4%	No Change
Transportation	13,900	7%	13,900	7%	No Change
Total Developed	125,200	62%	127,900	63%	1%↑
Total Agricultural	37,200	18%	35,600	18%	<1%↓
Total Forested	37,700	19%	36,700	18%	1%↓
Total Other	1,800	1%	1,800	1%	No Change
TOTAL	202,000	100%	202,000	100%	

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Changes in 2030 RPA Percent Impervious by Watershed, Original Report to Updated Report

Watershed Name	Original Impervious Cover	Updated Impervious Cover	Difference in Percentages
Beaverdam Creek	7%	7%	No Change
Richardson Creek (Upper)	18%	18%	<1%↑
Rays Fork	17%	17%	<1%↑
Bearskin Creek	31%	31%	No Change
Richardson Creek (Middle)	29%	29%	No Change
Gourdvine Creek	8%	8%	No Change
Salem Creek	14%	15%	1%↑
Sixmile Creek	30%	30%	No Change
Twelvemile Creek	25%	25%	No Change
Richardson Creek (Lower)	16%	17%	1%↑
Stewarts Creek	22%	22%	No Change
Fourmile Creek	34%	35%	1%↑
Crooked Creek	27%	27%	No Change
Goose Creek	17%	18%	1%↑
Irvins Creek	37%	37%	No Change
McAlpine Creek	37%	37%	No Change
Bakers Branch	8%	8%	No Change
Wide Mouth Branch	12%	12%	No Change

Updated Indirect Land Use Comparison, Build to No Build

Land Use Category	2030 Updated No-Build		2030 Updated RPA		
	Total Area (acres)	% of Total Area	Total Area (acres)	% of Total Area	Difference from 2030 No-Build
Total Residential	97,500	48%	99,400	49%	1%↑
Low Density Residential	80,400	40%	81,600	40%	<1%↑
Medium Density Residential	14,000	7%	14,800	7%	<1%↑
High Density Residential	3,100	2%	3,100	2%	0%
Commercial	5,600	3%	5,900	3%	<1%↑
Industrial/Office/Institutional	8,600	4%	8,700	4%	<1%↑
Transportation	12,800	6%	13,900	7%	1%↑
Total Developed	124,500	62%	127,900	63%	1%↑
Total Agricultural	37,700	19%	35,600	18%	1%↓
Total Forested	38,000	19%	36,700	18%	1%↓
Total Other	1,800	1%	1,800	1%	0%
TOTAL	202,000		202,000		

Notes: Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Incremental Effects of Original 2030 RPA Land Use Changes (in acres) by Watershed

Area/Watershed	Difference From Updated No-Build – Total Developed	Difference From Updated No-Build – Total Agricultural	Difference From Updated No-Build – Total Forested
Study Area	1,000	1,100	-600
Beaverdam Creek	0	0	0
Richardson Creek (Upper)	0	0	0
Rays Fork	0	0	-100
Bearskin Creek	0	0	0
Richardson Creek (Middle)	100	0	-100
Gourdvine Creek	0	0	0
Salem Creek	200	-100	-100
Sixmile Creek	0	0	0
Twelvemile Creek	0	0	0
Richardson Creek (Lower)	200	-100	-100
Stewarts Creek	200	-200	-100
Fourmile Creek	0	0	0
Crooked Creek	200	-100	-100
Goose Creek	0	0	0
Irvins Creek	0	0	0
McAlpine Creek	0	0	0
Bakers Branch	0	0	0
Wide Mouth Branch	0	0	0

Notes: Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

November 8, 2012

Incremental Effects of Updated 2030 RPA Land Use Changes (in acres) by Watershed

Area/Watershed	Difference From Updated No-Build – Total Developed	Difference From Updated No-Build – Total Agricultural	Difference From Updated No-Build – Total Forested
Study Area	3,400	-2,100	-1,300
Beaverdam Creek	0	0	0
Richardson Creek (Upper)	0	0	0
Rays Fork	100	0	0
Bearskin Creek	0	0	0
Richardson Creek (Middle)	300	-100	-200
Gourdvine Creek	0	0	0
Salem Creek	1,400	-1,000	-500
Sixmile Creek	0	0	0
Twelvemile Creek	0	0	0
Richardson Creek (Lower)	900	-600	-300
Stewarts Creek	200	-200	-100
Fourmile Creek	0	0	0
Crooked Creek	200	-100	-100
Goose Creek	0	0	0
Irvins Creek	0	0	0
McAlpine Creek	0	0	0
Bakers Branch	0	0	0
Wide Mouth Branch	0	0	0

Notes: Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

November 8, 2012

Conclusions

- Revising the MUMPO model to remove travel time to employment in Union County had no effect on MUMPO land use allocations
- Union County is anticipated to remain one of the most rapidly growing counties in the region
- After interviews with local agencies, further analysis identified minor changes to anticipated 2030 land use for both the Build and No Build Alternatives

Other considerations

- MUMPO is currently developing a new round of household and employment forecasts
- Forecasts expected to be complete in 1st Quarter of 2013
- Draft Regional and County population totals expected soon
- Discussions with MUMPO staff indicate that regional projected population is expected to be lower than currently adopted forecast
- ICE Guidance recommends using adopted forecasts, thus use of preliminary data in Quantitative ICE not appropriate.

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

Beverly Eaves Perdue
Governor

Charles Wakild, P.E.
Director

Dee Freeman
Secretary

Memo

To: Jennifer Harris
From: Alan Johnson
Date: November 5, 2012
Subject: Monroe Bypass Meeting, November 8th

I reviewed some information submitted by Southern Environmental (SE) dated October 23, 2012. They brought forth some issues that should be clarified or re-clarified.

1) The Top Down approach (pg 3). In reading the submittal and from our last meeting it was mentioned that the Top Down study did not take into consideration "roads". It assumes access from point "A" to "B" was linear or straight line. Therefore, growth was not a factor of a road network but a function primarily of other factors: schools, land availability, etc. The comment by SE is that because access to locations was linear, the Top Down model did not take the transportation network into account, thus the bypass and current road network are essentially the same. Basically growth is coming, but the question is, how does the two transportation possibilities affect growth?

2) The SE states (pg 8) a NCDOT study in 2007 stating that short and long term traffic issues could be "dramatically" reduced with an acceptable level of service along the Hwy 74 corridor in Union County, except for one interchange. Is the group familiar with this study? Has this been discussed?

3) Based on our last meeting, my understanding regarding Legacy Park was that it may or may not be built regardless of the bypass thus it wasn't considered as an indirect impact. Based on the information submitted by SE (pg 9, emails) the bypass is touted as integral to the project. It is also mentioned on the Legacy Park website.

4) It would seem to me redistribution of growth is just as important as total growth. Thus if there is no difference in the construction of the two roads regarding overall growth, would not there be a redistribution of growth and change in growth pressure due to the construction of the bypass?

5) As stated at the last meeting, the Bottom Up study took into account getting to the local 7-Eleven, when it should have been looking at how to get to Charlotte (regional view). We should be sure to compare apple/apple.

Given I have just joined the group; hopefully this isn't a rehash of previous discussions. If you have any questions please let me know.

Thank you

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One NorthCarolina Naturally

Harris, Jennifer

From: Johnson, Alan
Sent: Wednesday, January 16, 2013 12:12 PM
To: Shumate, Christy; Dagnino, Carla S; Lusk, Elizabeth L; Slusser, Scott (SSLUSSER@ncdoj.gov); Harris, Philip S; Wainwright, David; Hair, Sarah E SAW; 'George.Hoops@dot.gov'; Baucom, Richard W; Simes, Amy; Mcfadden, Timothy T; Clawson, Marshall W; Ford, Tris B; Mellor, Colin; marella_buncick@fws.gov; Militscher.Chris@epamail.epa.gov; Scott.Jones@dot.gov; Alavi, J S; Thorpe, Gregory J; Chambers, Marla J; john.sullivan@dot.gov; loretta.barren@dot.gov; Turchy, Michael A; Staley, Mark K; Baucom, Richard W; Michael Wood; Nancy Scott (nscott@thecatenagroup.com); Tim Savidge (tsavidge@thecatenagroup.com); Fischer, Kevin
Cc: Harris, Jennifer; Carl Gibilaro; Gilland, Ken; Parkins, Lorna; swagg@mbakercorp.com; Allen, Thomas B (Thomas.Allen@atkinsglobal.com)
Subject: RE: Monroe Connector/Bypass (R-3329/R-2559) Agency Meetings

To the group:

Coming into the middle of a project such as this can be confusing. Especially as we focus on computer models that most of us don't really have any clue. With that in mind, I have a question that may have been answered already.

First, the purpose of the bypass? My understanding is that the bypass is to relieve traffic congestion on Hwy 74. Yet (and I may be misunderstanding what has been said in the past couple of meeting), at the last meeting, it is stated that travel time to employment centers for the area basically isn't affected.

Second, my understanding of a "bypass" is that the purpose of a bypass is to get through traffic "around" a town, and not about getting local traffic to an employment center. Thus, I would think this would be more an economical benefit to the "region" or county (if you want to say it that way) due to better transportation. Therefore, I would think that regional travel time would be important and the roads affect on that.

And third, my take away from the previous meetings is that regardless of the road, growth is inevitable.

So if the road doesn't affect growth, and it doesn't affect travel times, what is the purpose of the road?

I am probably missing something, but just putting it out there. Christy, if you want to direct me to any person, in general, that would be fine or we can touch on this at the next meeting.

From: Shumate, Christy
Sent: Tuesday, January 15, 2013 12:15 PM
To: Dagnino, Carla S; Lusk, Elizabeth L; Slusser, Scott (SSLUSSER@ncdoj.gov); Harris, Philip S; Wainwright, David; Johnson, Alan; Hair, Sarah E SAW; 'George.Hoops@dot.gov'; Baucom, Richard W; Simes, Amy; Mcfadden, Timothy T; Clawson, Marshall W; Ford, Tris B; Mellor, Colin; marella_buncick@fws.gov; Militscher.Chris@epamail.epa.gov; Scott.Jones@dot.gov; Alavi, J S; Thorpe, Gregory J; Chambers, Marla J; john.sullivan@dot.gov; loretta.barren@dot.gov; Turchy, Michael A; Staley, Mark K; Baucom, Richard W; Michael Wood; Nancy Scott (nscott@thecatenagroup.com); Tim Savidge (tsavidge@thecatenagroup.com); Fischer, Kevin
Cc: Harris, Jennifer; Carl Gibilaro; Gilland, Ken; Parkins, Lorna; swagg@mbakercorp.com; Allen, Thomas B (Thomas.Allen@atkinsglobal.com)
Subject: Monroe Connector/Bypass (R-3329/R-2559) Agency Meetings

Good afternoon,

I hope everyone is having a good new year!

Attached are draft minutes from the November 8, 2012 agency meeting about this project. Comments would be appreciated by February 1.

We are planning to meet in February to continue discussions about updates we have completed in response to the court decision. We also plan to discuss comments that we continue to receive about the project's documentation. If you have questions or topics that you would like to discuss specifically, please let us know.

Thanks!
Christy

Christy Shumate, AICP
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

March 22, 2013

Memorandum to: Alan Johnson, NCDWQ

From: Jennifer Harris, P.E.

Subject: STIP R-3329/R-2559 Monroe Connector/Bypass
Responses to NCDWQ Questions – 11/15/2012 and 1/16/2013

Thank you for meeting with us on February 20, 2013 to discuss this project. We appreciated the opportunity to provide some project history and answer some of your questions. A copy of the presentation reviewed at the meeting is attached. As discussed, we are providing written responses in this memorandum to questions raised in your memo dated November 5, 2012 and your email dated January 16, 2013.

The following responses relate directly to the November 5 letter; however, they are also responsive to the questions in the January 16 email.

Question #1: The Top Down approach (pg 3). In reading the submittal and from our last meeting it was mentioned that the Top Down study did not take into consideration "roads". It assumes access from point "A" to "B" was linear or straight line. Therefore, growth was not a factor of a road network but a function primarily of other factors: schools, land availability, etc. The comment by SE is that because access to locations was linear, the Top Down model did not take the transportation network into account, thus the bypass and current road network are essentially the same. Basically growth is coming, but the question is, how does the two transportation possibilities affect growth?

Response #1: Our reading of the SELC statement in their October 23, 2012, letter to Colonel Baker suggests that their contention is as follows: the top-down forecasting process used distance as a proxy for travel time in calculation of some variables in the modeling process and that distance did not change to reflect growth and possibly increasing travel times in suburban counties. Therefore, this represents an assumption that travel time will not increase along with growth. They contend that this assumption must mean that the transportation infrastructure improvements are assumed to occur to keep up with growth and therefore the proposed project is an underlying assumption in the top-down forecasting process.

However, the methodology for the Hammer Study used in the Top Down model is well summarized in the report and does not support SELC's contention. The methodology is summarized below (I apologize for the length of the explanation, but there are a number of technical factors to go through).

The study looks at statistical relationships between the proximity of various attractors of growth (specifically households in three income groups and earnings in three industry categories). As we have previously documented, the attractors Dr. Hammer analyzed show on their own that Union County would likely see higher than average rates of growth. Dr. Hammer's analysis, however, also analyzed proximity of different counties to those attractors by analyzing each county's proximity to attractors in other counties and within its own county. The essence of the analysis is how close new jobs are able to locate relative to the locations of the labor force and vice-versa. The basis of the analysis is the proximity of attractive land uses, not travel times between activity centers.

Thus, the top-down forecasting did not use distance as a proxy for travel time. The top-down forecasting used distance as a basis for its "proximity" variable. As Dr. Hammer's report indicates on page 33, proximity is an important variable as a major dictum of real estate is location, location, location, or more importantly "relative location – i.e., where the land is located relative to everything else in the built environment." His description of the variable calculation is as follows: "For a given county, the value of a proximity variable was computed by summing the values of the attractor across all counties in the given metro area, when weighted by an inverse function of distance to the county for which the variable was being measured." So for example, for households in the top income group, to get the proximity variable for this attractor for Union County, one would sum together for each county pair (including Union County itself) the following formula.

$$\frac{\text{Total Households in Top Income Group in Union County}}{(\text{Distance from Union County to Other County} + \text{Intra-County Impedance Variable} + \text{Terminal Impedance})^{2 \text{ or } 2.5}}$$

The Intra-County Impedance Variable was the estimated distance of travel within each county and was estimated using a geometrically based function that varied as the square root of the county land area. This was to adjust the assumption to assume greater distances in larger counties and smaller distances in smaller counties. The purpose of this variable is to estimate the proximity of attractors so that two counties that have the same base value of an attractor but where one is smaller and the other larger geographically, the relative proximity of that attractor in the smaller county would be greater as the attractor would be closer to all other points within that county. The Terminal Impedance was a constant for all calculations and represented the terminal distance, or the distance at the end of any trip such as walking to one's car. The factor, constant and variable were adjusted for each calculation based on the best fitting regression analysis when Dr. Hammer analyzed the dataset of 228 counties in 27 metropolitan regions. Therefore, this proximity variable was calculated in a manner that best fit the historical experience of multiple metropolitan regions that have highly variable transportation infrastructure investment histories. To claim that this variable somehow assumes one specific project in one county in the Charlotte metropolitan region is an exceptional stretch of logic.

Furthermore, the distances calculated are very rough approximations as the distance is based on a weighted centroid location. Yet, the manner in which the county centroids were calculated actually assumed increasing distances to the suburban counties in the

future years. The distance was calculated (in miles) between two centroids (or center points) of each county based on the longitude and latitude. The first center point was the geographic center point of each county. The second center point was the centroid of the county's households (initially as computed from the 1990 Census). The model then weighted the two centroid locations in its calculations with the household weighted centroid as three-quarter of the weight and the geographic centroid as one-quarter of the weight. For suburban counties such as Union where households would tend to be located closer to the regional core (Mecklenburg County), their household-weighted centroids would tend to be closer to the regional core than their geographic centroids. However, as applied in the calibrated model, the household-weighted centroid was "progressively shifted toward the county geographic centers to reflect a probably filling-up process" (pg 34). In other words, as the model was applied to calculate the proximity variable for future years, the household-weighted centroid (which accounts for three-fourths of the weighting) was shifted further away from the regional core, reflecting the increasing distance between the center of development as development continued further from the regional core. **Thus, this variable did change in response to the growth in the suburban counties to reflect the greater distances between locations**. This component of the Hammer analysis directly contradicts the assertion made by SELC that the top-down model "inherently" assumes transportation improvements that result in no increases in travel time.

Question #2: The SE states (pg 8) a NCDOT study in 2007 stating that short and long term traffic issues could be "dramatically" reduced with an acceptable level of service along the Hwy 74 corridor in Union County, except for one interchange. Is the group familiar with this study? Has this been discussed? This question relates to the first email question from the January 16, ***Email Question #1:*** What is the Purpose and Need of the Project?

Response #2: This also relates to your first email question on January 16. As we stated in our meeting, it is important to note that the Purpose and Need of the Monroe Connector/Bypass study is:

> *…to improve mobility and capacity within the project study area by providing a facility for the US 74 corridor from near I-485 in Mecklenburg County to between the towns of Wingate and Marshville in Union County that allows for high-speed regional travel consistent with the designations of the North Carolina SHC program and the North Carolina Intrastate System, while maintaining access to properties along existing US 74.*

As such, the *US 74 Corridor Study* (Stantec, 2007) does not, in itself, meet the purpose and need of the project, as the proposed long-term solution (a six-lane Superstreet) would not allow high speed regional traffic in the design year, as discussed in Section 3.3.2 of the Final EIS, where it was considered as an additional Transportation Systems Management (TSM) alternative. Points considered in this determination included:

- Concept 2 could have minor improvements to mobility and capacity due to increased intersection capacity resulting from improved traffic progression with coordinated signals. However, the amount of traffic projected for 2035 (see *Revised Monroe Connector/Bypass Traffic Forecast Memo*, HNTB, March

2010), along US 74 would overwhelm the effectiveness of this concept and congestion would continue to be present along US 74.

- Concept 2 would not serve high-speed regional travel. Average travel speeds with these improvements are expected to be less than 30 mph through the corridor in 2035.

This is not to say that the *US 74 Corridor Study* did not provide useful recommendations for potential improvements to the existing facility. Since the Final EIS was released in May 2010, all of the study's short-term recommendations have been implemented by NCDOT in the corridor, including signal timing optimization, signal phasing modification, increased turn lane storage lengths, and lane assignment modification. Additionally, the recommended long-term improvements, with the exception of converting to a superstreet facility, have been implemented, including implementation of a closed loop signal system and addition of lanes at some intersections.

While these improvements have reduced existing congestion along US 74, they do not provide a long-term solution to high speed travel through the region and as such they are not a reasonable alternative to the Monroe Connector/Bypass. Traffic studies have shown that by the design year of the project, these improvements, even with the installation of a superstreet, would not allow for high speed regional traffic. Thus, they do not meet the purpose and need for this project.

It is clear that the purpose of the *US 74 Corridor Study* was to provide recommendations for interim and immediate actions until such time as the Monroe Connector/Bypass was constructed. The study itself notes that "this vital transportation corridor [US 74] will be in critical need of additional through lanes on US 74 or alternate routes will need to be identified to meet the demands of the public."

Question #3: Based on our last meeting, my understanding regarding Legacy Park was that it may or may not be built regardless of the bypass thus it wasn't considered as an indirect impact. Based on the information submitted by SE (pg 9, emails) the bypass is touted as integral to the project. It is also mentioned on the Legacy Park website.

Response #3: As per our discussion, and the presentation at the October 17' 2012, agency meeting, interviews with local staff, in particular economic development staff, indicate that the Legacy Park project is highly speculative. Summaries of these conversations are attached to this memo. From those discussions, the SELC is correct as per their statement that Legacy will not be built if the Monroe Connector/Bypass is not built.

However, our interviews show that if the Monroe Connector/Bypass is built the Legacy project was still highly speculative. Planning staff stated that their most optimistic estimate was that there was a 25% chance the project would move forward in some form if the Monroe Connector/Bypass were built. We presented this information at the agency meeting.

Subsequent to the October agency meeting, NCDOT conducted further discussions with representatives of CSX on November 29 and 30th and with Union County Planning on

January 31. These discussion summaries (included) provided further documentation as to the speculative nature of any future Legacy Development.

CEQ guidance explains that "It is often possible to consider the likely purchasers and the likely development trends in that area or similar areas in recent years; or that the land will be used for an energy project, shopping center, subdivision, farm or factory". Based on the documented interviews and the fact that the majority of land where the proposed Legacy Park would be located is neither zoned nor planned for residential use, it would be a serious stretch of logic to claim that the construction of the Monroe Connector/Bypass would result in the full build out of the proposed development by the design year of the Monroe Connector/Bypass Project.

CEQ guidance further states that "[t]he agency cannot ignore these uncertain, but probable, effects of its decision." Based on the information we have to date, it would appear that the probability of the development of Legacy Park is relatively low under a Build Scenario. Furthermore, it would seem inaccurate to claim that the entire Legacy Park project as proposed would be a probable induced impact. In essence, while the construction of the Monroe Connector/Bypass may increase the likelihood of the development of Legacy Park, that is not the same as making the development of Legacy Park probable. Nevertheless, we will continue to monitor this potential development and any new information we find will be shared with the agencies and factored into our final determination as to the likelihood of this project as it pertains to our ICE study.

Question #4: It would seem to me redistribution of growth is just as important as total growth. Thus if there is no difference in the construction of the two roads regarding overall growth, would not there be a redistribution of growth and change in growth pressure due to the construction of the bypass?

Response #4: The difference between the No-Build and Build (i.e. the incremental effects) are just as important as the cumulative effects, and the potential for changes in growth pressures under a Build Scenario is certainly an important aspect of how we develop a reasonable Build Land Use Scenario. In NCDOT's 2010 Quantitative ICE report, we documented in detail how we developed a Build Scenario looking at what local staff told us about their growth expectations under a Build Scenario and we documented extensively the differences between a No-Build and Build Scenario.

Based upon our study, it was anticipated that growth would most likely be shifted (at least to some degree) from the western portion of the FLUSA to the eastern portion. However, NCDOT, FHWA, and our agency partners agreed that while redistribution within the study area was possible, using the more conservative scenario with no redistribution was most likely to represent a worst case scenario in each watershed.

This was done in no small part because of the need to present a worst case analysis of the sensitive Goose Creek Watershed in the western portion of the FLUSA. While it would have been defensible to take residential development out of Goose Creek under a Build Scenario, we felt, and the agencies concurred, that it would be most appropriate to maintain a conservative assessment of this area.

Question #5: As stated at the last meeting, the Bottom Up study took into account getting to the local 7-Eleven, when it should have been looking at how to get to Charlotte (regional view). We should be sure to compare apple/apple.

> ***Response #5***: You are correct that the Travel Time to Employment Analysis conducted for the MUMPO bottom-up forecasting process focused on the localized travel time impacts by calculating travel time to the nearest employment center. Those employment centers were in places like Monroe, Matthews and Wingate. This is consistent with their intention of trying to analyze and predict what parts of the metropolitan region would be most attractive for growth at the sub-county area of analysis.
>
> The reason for re-analyzing this factor as part of our current ICE update was to clarify that the Monroe Connector/Bypass had no impact on the final results of the MUMPO forecasts and thus did not bias the control totals that were used in developing the No-Build land use scenario in the 2010 quantitative ICE. The design of MUMPO's travel time analysis, in particular the location of their employment centers, would tend to minimize the travel time benefits of the Monroe Connector/Bypass. This is clear in that a comparison of travel times with and without the Monroe Connector/Bypass shows the greatest travel time change was in the western parts of Union County. This result was not a specific intention of their methodology, but simply a result of the different purpose of their travel time analysis.
>
> The travel time analysis that was conducted by NCDOT and our consultants for the quantitative ICE analysis, and other travel time analyses completed for the EIS, were calculated using completely different methods. As to the travel time analysis completed for the ICE report, the travel time was calculated from every parcel in the study are to the I-485 interchange. This was chosen as the most representative location in the study area for showing travel time benefits on a regional basis. The analysis showed that the greatest travel time savings would accrue to areas in the eastern end of the study area. This analysis was designed to help identify those areas with the greatest travel time benefits relative to regional destinations and therefore those areas most likely to see greater development in a Build Scenario. This accounts for the difference in results of the travel time analysis completed for the ICE compared to the travel time analysis completed by MUMPO for their bottom-up forecasting process.

Email Question #2: My understanding of a "bypass" is that the purpose of a bypass is to get through traffic "around" a town, and not about getting local traffic to an employment center.

> ***Response #6***: Based on previous studies, it is anticipated that users of the Monroe Bypass/Connector will include regional as well as commuter traffic. For those living in the eastern part of Union County and working in Charlotte or for those living in Charlotte and working in eastern Union County, time savings could be significant. It is anticipated that travel at the Monroe Bypass/Connector would travel at approximately 60 miles per hour in both design year (in the DEIS, the Design Year was 2030). The following table shows the 2030 travel time savings that commuters living in the Marshville area would have with the Monroe Connector/Bypass (adapted from Table 1-5 of the DEIS):

	Existing US 74		Monroe Connector/Bypass		
Peak Period	Average Speed (mph)	Travel Time (minutes)	Average Speed (mph)	Travel Time (minutes)	Time Savings
Westbound AM Peak	24	50	60	20	30
Eastbound PM Peak	29	47	60	20	27
Total		97		40	57

However, your point underscores the reasoning behind our freshly validated assumption that the Bottom-up forecasting process does not represent the impacts of the Monroe Connector Bypass because it only measured travel time to the nearest (and therefore local) employment centers.

Email Question #3: my take away from the previous meetings is that regardless of the road, growth is inevitable. So if the road doesn't affect growth, and it doesn't affect travel times, what is the purpose of the road?

Response #7: Response #6 shows the travel time advantage associated with the Monroe Connector/Bypass. Based on the previous Quantitative ICE study, NCDOT has stated that the construction of the Monroe Bypass/Connector will lead to an increase in medium density residential development as well as increased commercial development. We are currently in the process of updating the Quantitative ICE due to changes in land use plans and development since the original Quantitative ICE was finalized, and preliminary data indicates that the Quantitative ICE in the next Monroe environmental document would project similar increases. While we do not anticipate the results of the ICE to cause significant environmental effects, NCDOT has always maintained that a degree of development would be caused by the proposed facility.

I would also point back to Response #2 with regards to the Purpose and Need of the project and the Strategic Highway Corridor (SHC) program. SHC was developed by NCDOT in collaboration with the Department of Commerce and the Department of Environment and Natural Resources to provide a network of high-speed, safe, reliable highways throughout North Carolina. The goal of the SHC is to ensure that our highway system maintains mobility, connectivity to activity centers, connectivity to interstates, interstate relief routes, major hurricane evacuation routes, and corridors that are part of a national or statewide highway system.

Again, we appreciated the opportunity to meet with you to discuss this project. If you have additional questions or comments, please do not hesitate to contact me at 919-707-6025 or jhharris1@ncdot.gov.

Project: R-3329/R2559 Monroe Connector

Subject: Indirect and Cumulative Impacts Quantitative Analysis, Legacy Park Development
Meeting Date/Time: 9/27/12, 2:30pm
Meeting Location: Conference Call

Attendees:

Melanie Underwood – Interim Director, Union County Partnership for Progress
Gretchen Carson – Staff, Union County Partnership for Progress
Ken Gilland – Baker Engineering
Scudder Wagg – Baker Engineering

Meeting Notes:

On Thursday, September 27, 2012, Gretchen Carson and Interim Director Melanie O'Connell Underwood of Union County Partnership for Progress (Partnership) spoke with Scudder Wagg and Ken Gilland of Michael Baker Engineering (Baker) with regards to the Legacy Park Project.

The discussion began with the Partnership asking what had prompted the call. Baker stated that the call was prompted by recent queries by parties associated with the Monroe Connector/Bypass legal case, environmental agencies, and the Charlotte Observer, all of which had asked if the project had been included in the past quantitative indirect and cumulative effects (ICE) study and if it would be included in any updates to the ICE study.

Ms. Carson answered that she and Director O'Connell had recently met with the past director (Maurice Ewing) to make sure that they had all available information about the Legacy Project. There is currently no work underway for the project due to the current economic conditions and the delay in construction of the Monroe Connector/Bypass. No offers have been made on any parcels in the area, and there are currently no plans to request land use plan changes or develop infrastructure plans to support Legacy Park. No financing plans have been developed for Legacy Park. Currently, the Partnership considers the project dead.

It is the case that the area proposed for Legacy Park appears to be suitable for development. Currently, there are no intensive housing developments in the area proposed for the park. CSX has noted to the Partnership that the long, straight railroad alignment in this area would accommodate sidings and the site offers potential benefits with the anticipated expansion of the Port of Wilmington. Anson County and the Town of Marshville have passed resolutions of support for the project. The Union County Planning Department is aware of the project but to date no changes in land use plans or zoning have been adopted or proposed to accommodate the full proposal. The current infrastructure is sufficient to support existing development and some future development but will not support the size or scale of the proposed Legacy Park.

Baker asked, what were the chances of Legacy Park being developed with or without the construction of the Connector. The Partnership answered that there was no chance of Legacy Park being constructed if the Monroe Connector/Bypass were not built. If the Connector/Bypass were built, the chances that some portion of the proposed Legacy Park might develop was about 25 percent in the next 5 to 10 years; however no phasing plan or feasibility study would be developed unless the bypass is constructed.

Baker asked about proposed project phasing if Legacy Park were built. The Partnership answered that of approximately 5,000 acres identified on the Partnership website as comprising Legacy Park, it was anticipated that the first phase of the project would cover approximately 300 acres, but that number was subject to change. The figure was based on preliminary discussions with CSX about one particular tract. The Partnership asked if they could go to the next phase of project development (an environmental study) would CSX think this was a good idea and were informed that the railroad did not believe current

conditions warranted advancing the project. Nothing was purchased and no landowners were directly contacted.

The Partnership stated that if Union County were approached by a developer or business, that they would be open to exploring future prospects. There had been one small rail project in the Legacy Park area in the past few years, but it was not associated with Legacy Park.

The Partnership stated that they were merging with the Monroe Economic Development Council and might cease to exist within a year.

Baker asked about other planned development. The Partnership answered that four communities in the area (Indian Trail, Stallings, Mint Hill, and Mathews) were looking into the possibility of pooling resources to encourage future developments in the form of a business park. A future meeting will determine anticipated next steps in this very preliminary effort.

The Partnership asked if Baker was aware of the Strategic Plan for Economic Development, Town of Marshville, Town of Wingate, and Baker answered that the plan had informed the potential build scenario for that portion of the ICE study area.

Project: R-3329/R2559 Monroe Connector

Subject: Indirect and Cumulative Impacts Quantitative Analysis, Legacy Park Development
Meeting Date/Time: 1/31/2013, 4:15pm
Meeting Location: Conference Call

Attendees:

Richard Black – Director, Union County Planning Department
Scudder Wagg - Baker Engineering

Meeting Notes:

The discussion began with Mr. Wagg asking Mr. Black about his familiarity with the proposed Legacy Park development and in particular, how it was considered in the most recent Union County Land Use Plan (as part of the Comprehensive Plan). Mr. Black noted that he had discussed Legacy Park many times with Maurice Ewing who was the former director of economic development for the county and the main proponent of the project. Mr. Ewing had been a member of the Steering Committee organized to help guide the development of the first draft of the new Union County Comprehensive Plan, produced by Clarion Associates. The draft plan had been developed between 2006 and 2008 and it included a land use plan and map that included planned industrial and commercial land uses on the site of the proposed Legacy Park development. This first draft had been initiated at the request of the Board of Commissioners in 2006. The timing of the plan adoption meant that the draft plan was developed under the supervision of one group of Planning Board and Board of Commissioners. But by the time the draft plan was ready to present to the Planning Board and Board of Commissions, an intervening election had resulted in a new majority on both bodies. These new members wanted to more thoroughly review the draft plan and to revise many parts of it. Thus the Planning Board undertook a year-long review and revision process. During that process, many Planning Board members expressed their skepticism of the likelihood of the Legacy Park proposal, suggesting that it was too big, required cooperation from too many property owners and was unlikely to be realized.

During the Planning Board review and revision process, Mr. Ewing did participate in meetings to encourage the Board to include the Legacy Park project in the plan. Mr. Black noted that Mr. Ewing presented resolutions of support for various jurisdictions including Marshville and Wingate, statements of support from organizations such as the Charlotte Regional Partnership and land use concepts plans developed by consultants. The final plan, however, did not include non-residential development within the proposed Legacy Park site except for areas immediately adjacent to US 74 and the CSX corridor that were identified for industrial development in the previously adopted land use plan from 1998.

Mr. Wagg asked for an assessment of the likelihood that the Legacy Park site would see substantial non-residential development with or without the construction of the Monroe Bypass/Connector. Mr. Black noted that his understanding of the proposal was that it relied on three elements: CSX development of an intermodal terminal, sewer and water utility capacity and improved access to Charlotte via a direct connection to the proposed Monroe Connector/Bypass. Mr. Black was under the impression that without any of those three items, development would be very unlikely to occur. For access to the Monroe Connector/Bypass, the Legacy Park proposal would also require a new road connection to Forest Hills Road and construction of an interchange at Forest Hills Road.

Mr. Black noted that the most essential element of the three was the CSX intermodal terminal. Mr. Black was told by Mr. Ewing and others that the intermodal terminal was key because it would attract a series of industrial businesses related to the intermodal terminal. Mr. Black was under the impression, however, that CSX was not interested in development of an intermodal terminal and therefore, with or without construction of the Monroe Connector/Bypass, the prospects for sizeable development of the Legacy Park site were unlikely.

Mr. Black did note that if the Monroe Connector/Bypass were built, he would expect greater levels of non-residential development in the areas east of Monroe and north of Wingate and Marshville. This section of the county, he noted, was the most supportive of growth, politically. Currently, however, this area of the county is very far from I-485, Charlotte and the rest of the region, limiting its potential for development. The Monroe Connector/Bypass would improve accessibility to that section of the county and therefore likely result in increases in non-residential development. Mr. Black expressed some uncertainty as to the exact location of that non-residential development within the eastern portions of Union County. Mr. Black did note that the Legacy Park site was relatively far from the eastern terminus of the Monroe Connector/Bypass and those areas closer to the proposed interchanges and eastern terminus of the project would be more likely to see development first.

Project: R-3329/R2559 Monroe Connector

Subject: Indirect and Cumulative Impacts Quantitative Analysis
Meeting Date/Time: Various (e-mail communications between 11/29/12 and 11/30/12)

Attendees:

Vance E. Bennett – CSX
Jim Van Derzee: CSX
Scudder Wagg - Baker Engineering

Communication Notes:

The purpose of this communication was to better understand the role of CSX in the Legacy Park development and gather information on the expectations of CSX staff regarding the potential for development of the site. Scudder began the discussion by asking:

> *Our staff spoke with Melanie Underwood and Gretchen Carson about the potential for development and one specific item they noted was that they had spoken recently to CSX staff about possibly conducting an environmental study of the site to advance project development but that CSX staff felt the current conditions did not warrant such action. Can you confirm this or provide any information as to why that decision was made? Also, if there is any additional information you can provide about the likelihood and possible timing of any development at Legacy Park we would greatly appreciate it. Specifically, we would want to know your assessment of whether and how much of the site might be developed by 2030 if the Monroe Connector/Bypass were built and if it were NOT built. Any specific reasons for your assessment would also be helpful.*

Jim responded with the following:

> *This is very difficult to speculate. There are two separate, largely unrelated, development opportunities at Legacy Park for CSX.*
>
> *1. **Rail-Served Industrial Development Projects** The property is adjacent to a CSX main line, which would enable sidetrack construction to serve new industries that locate to the property. Because we don't know what types of industries will locate there, we cannot determine the road access requirements and whether or not the Bypass would make a difference. As far as the timing, this could happen as soon as a project starts that is a suitable fit for Legacy Park, which is impossible to predict. I've offered Legacy Park to numerous industrial development projects, but none have pursued it yet. As CSX's Manager Industrial Development, this is my primary role with Legacy Park.*
> *2. **Construction of a new intermodal** facility that would transfer shipping containers between railcars and trucks. Because the local shipment would be made by truck, the road accessibility is critical to making this work. There are many other challenges that need to be overcome before I would recommend proceeding with an environmental study. As CSX's Director Intermodal Port Strategy, this is Vance's primary role with Legacy Park.*
>
> *I recommend that the environmental study be done after a need has been clearly determined.*

Vance responded by noting the following regarding the possible new intermodal facility:

> *Jim's comments are correct and I would just like to add that CSX normally would conduct a market assessment before an environmental study is conducted to measure the current*

and future if CSX was to build an Intermodal facility at any location. I would suggest that be considered if you have not done so already.

Later Vance further clarified regarding the need and process for doing a market assessment:

CSX would take the lead on such a study if it were a CSX planned facility. In this case, since it is a private terminal facility it would not be CSX's call on developing that research. If it were however, CSX would typically hire a consultant like RS&H, Moffat & Nichol or Tran-Systems to develop such a report.

Lastly, in response to a request to rate the quality of the Legacy Park site for rail-served industrial development and for the potential for the intermodal terminal development, Jim responded:

[O]verall, I rate the Legacy Site very high, with the potential to land some large industrial development projects. Its topography, rail access, and geographic location make this one of the best sites in the greater Charlotte area.

As for the other challenges with the intermodal opportunity, we do not currently have the necessary combination of shipment volume and distance to make rail work.

Monroe Connector/Bypass

Project Update

February 20, 2013

Outline of Today's Discussion

- Project Overview and History
- United States Court of Appeals Decision
- Indirect and Cumulative Effects Analysis
- Development of Metrolina / MUMPO Forecasts
- Schedule for Advancing Project

Project History

- Jan 2007 – Notice of Intent for Monroe Connector/Bypass
- Mar 2009 – Draft EIS
- May 2010 – Final EIS
- Jul 2010 – USFWS Concurrence
- Aug 2010 – Record of Decision
- Sep 2010 – Submitted permit applications
- Nov 2010 – SELC files lawsuit
- Dec 2010 – 401 Water Quality Certification

Project History

- Apr 2011 – USACE EA/FONSI and 404 permit
- Oct 2011 – District Court rules in favor of NCDOT/FHWA
- Oct 2011 – SELC files appeal
- May 2012 – Circuit Court rules against NCDOT/FHWA
- May 2012 – 401 withdrawn/404 suspended
- Jul 2012 – FHWA rescinds ROD

Purpose and Need

- Purpose

…to improve mobility and capacity within the project study area by providing a facility for the US 74 corridor from near I-485 in Mecklenburg County to between the towns of Wingate and Marshville in Union County that allows for high-speed regional travel consistent with the designations of the North Carolina SHC program and the North Carolina Intrastate System, while maintaining access to properties along existing US 74.

Purpose and Need

- Needs
  - Existing and Projected Roadway Capacity Deficiencies
  - Inability to Serve High-Speed Regional Travel Consistent with the Designations and Goals of State and Local Transportation Plans

Alternatives Considered

- TSM
  - Stantec study
- TDM
- Mass transit
- Upgrades to existing US 74
  - Widening
  - Superstreets
- New Location Alternatives

Guidance for Assessing ICE

NCDOT developed a set of approaches for ICE analysis

- Developed in cooperation with
  - FHWA
  - NCDENR
  - North Carolina State Attorney General's Office
  - County and Municipal Officials
- Guidance went into effect in 2001
- Eight-step process

Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina

Volume I: Guidance Policy Report

Prepared For:

State of North Carolina
Department of Transportation/Department of Environment and Natural Resources
Raleigh, North Carolina

Under Project No. 81777722

Prepared By:

The Louis Berger Group, Inc.
Cary, North Carolina

Issued November 2001

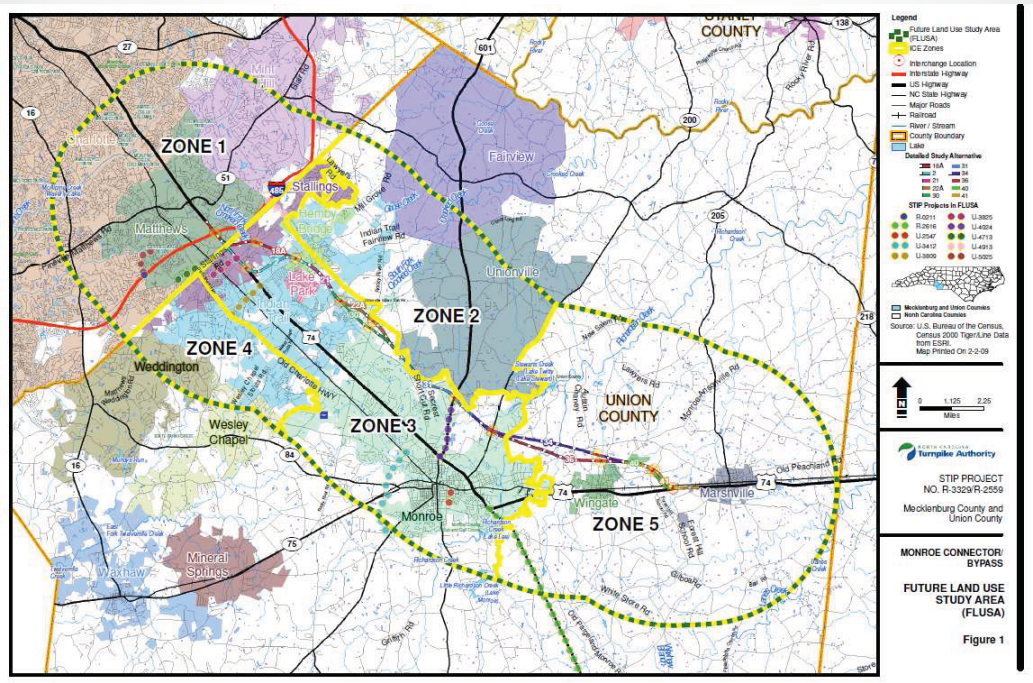
Qualitative Analysis (2009)

Steps that should be taken to assess Qualitative ICE impacts.

- Step 1: Definition of the Future Land Use Study Area (FLUSA)
- Step 2: Identification of the FLUSA's Directions and Goals
- Step 3: Inventory of Notable Features
- Step 4: Identification of Important Impact Causing Activities
- Step 5: Identification and Analysis of Potential Indirect/Cumulative Effects

Reference: Guidance for Assessing ICE of Trans. Proj. in NC (Nov. 2001)

Qualitative Future Land Use Study Area



Reference: Monroe Qualitative ICE (January 2009) – Figure 1

Qualitative Analysis
Potential Indirect Impacts by Zone

Summary of Potential Indirect Impacts by Zone – New Location Alternative

Zone	Potential for improved access and mobility	Potential for accelerated growth as a result of the project	Potential for indirect effects on sensitive resources as a result of accelerated growth
1	None	None	None
2	Moderate	Low	Low
3	Moderate	Moderate	Moderate
4	None	None	None
5	High	High	Moderate

Reference: NCDOT Qualitative ICE Assessment, January 2010

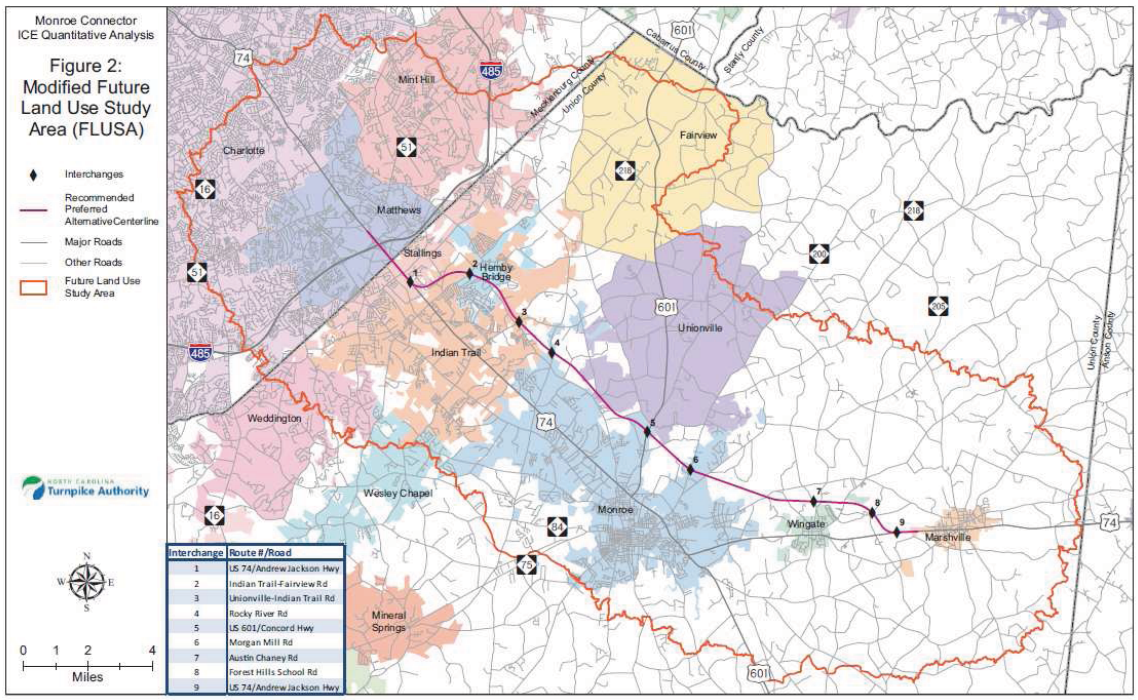
Quantitative Analysis (2010)

- Step 6: Analyze Indirect/Cumulative Effects
- Step 7: Evaluate Analysis Results
- Step 8: Assess the Consequences and Develop Appropriate Mitigation and Enhancement Strategies

Focus of the Quantitative ICE

- Land use
- Water quality
- Threatened and endangered species and habitat

Quantitative ICE Project Study Area



Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
2	Indian Trail-Fairview Rd
3	Unionville-Indian Trail Rd
4	Rocky River Rd
5	US 601/Concord Hwy
6	Morgan Mill Rd
7	Austin Chaney Rd
8	Forest Hills School Rd
9	US 74/Andrew Jackson Hwy

Reference: NCDOT, Monroe Quantitative ICE Assessment, April 2010

Quantitative ICE Methodology

- Existing Land Use (2007)
  - GIS data, NCGAP land cover, aerial photography
  - Categorize as Developed or Undeveloped
    - Developed – Residential (low, medium or high density), Commercial, Industrial/Office/Institutional
    - Undeveloped – Ag, Barren, Forest, Other
- No-Build Land Use (2030)
  - Interviews with planners
  - Review future land use plans and zoning
  - Future population and employment projections

Quantitative ICE – Future Population and Employment Projections

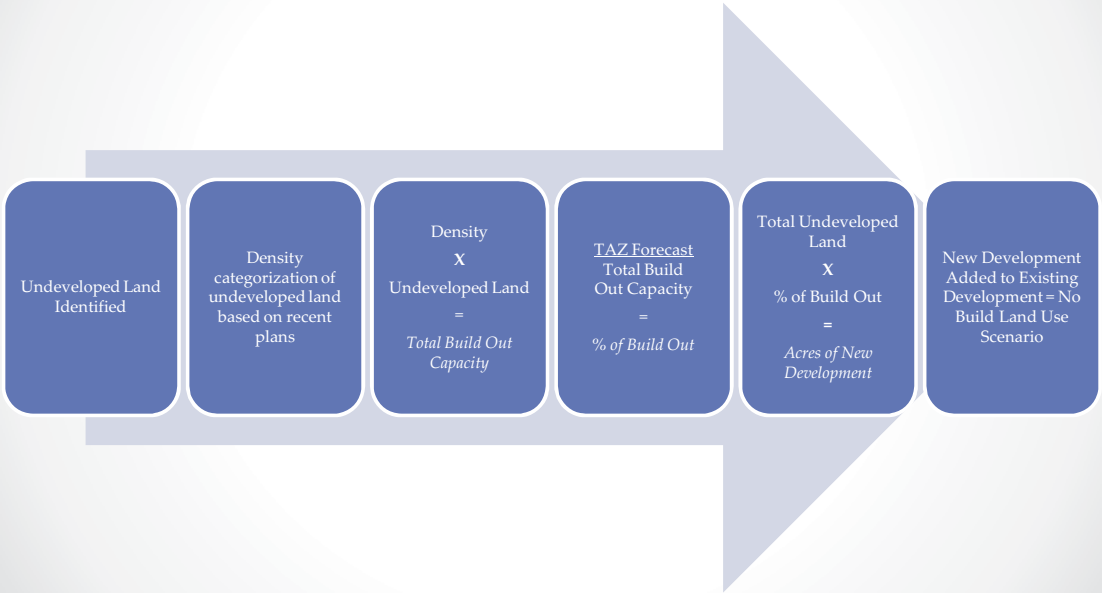
Choice A

- MPO Forecasts Represent **No Build Alternative**
- Guidance from planners and analysis create a (higher) **Build Forecast**

Choice B

- MPO Forecasts Represent **Build Alternative**
- Guidance from planners and analysis create a (lesser) **No Build Forecast**

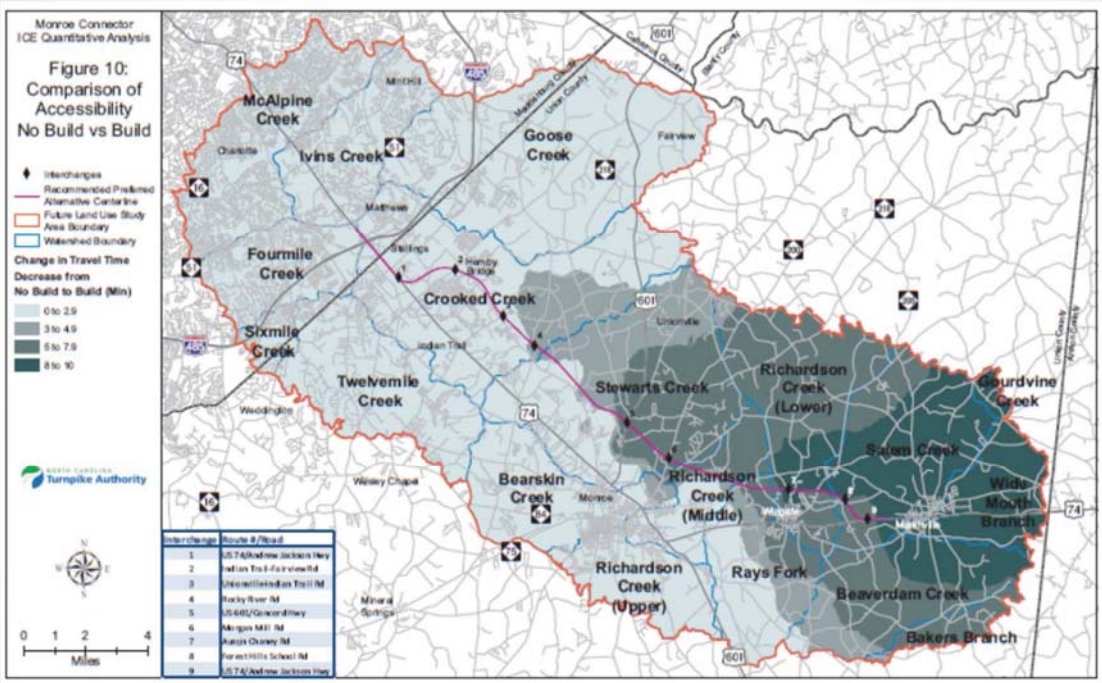
Use of MUMPO Data in No Build Scenario



Quantitative ICE – 2030 No-Build

- MUMPO TAZ data best represents No-Build
  - Residential development (population) allocation
  - Non-residential development (employment) allocation
- Build (added to No-Build)
  - Improvements in accessibility/travel time
  - Hartgen analysis at interchanges

Quantitative ICE – Travel Time Analysis

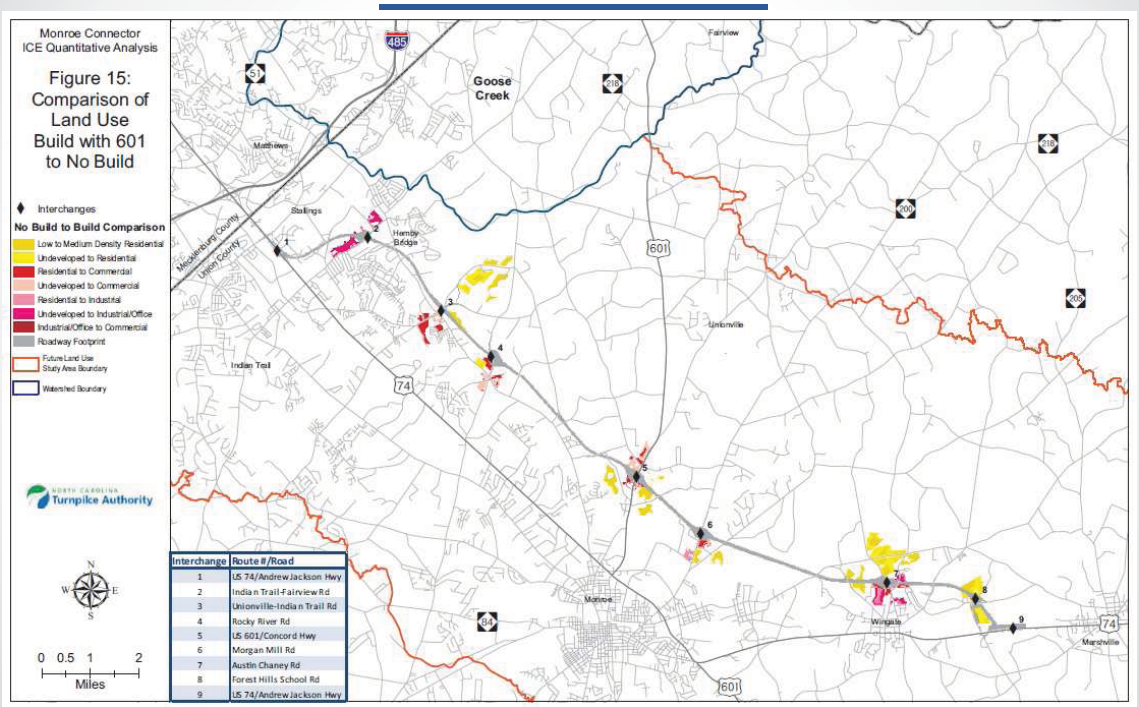


Reference: NCDOT, Monroe Quantitative ICE Assessment, April 2010

Quantitative ICE – Travel Time Analysis

- Regional accessibility
- Measured travel time from each parcel in Study Area to I-485
- Greatest travel time savings in eastern Union County

Quantitative ICE Land Use Comparison Build to No-Build



Reference: NCDOT, Monroe Quantitative ICE Assessment, April 2010

Criticisms

- NCDOT failed to account for the causes of future urbanization in the absence of the project.
  - The record is devoid of evidence establishing that the region is developmentally saturated such that a major toll road will have no appreciable environmental impact.
- NCDOT failed to explain methodology and use accurate inputs.
- NCDOT created a No-Build scenario that assumed the existence of the project and used that baseline to determine the growth-inducing impacts of the project.
- There is an inaccurate Statement in the August 2010 Record of Decision.

Union County Land Development Factors

Factor	Weight		
	2010	2020	2030
Developable Land	3	3	3
Travel Time to Emp	3	3	3
Water	2	2	2
Sewer	2	2	2
Redevelopable	2	3	3
Population Change	3	1	Not used
Expert Panel	2	2	2
Growth Policy	1	1	1

** Travel time to employment factor based on future road network, which included Monroe C/B for year 2030.

Reference: Smith, MUMPO Population Projections and Employment Allocations, 2004

Appeals Court Decision

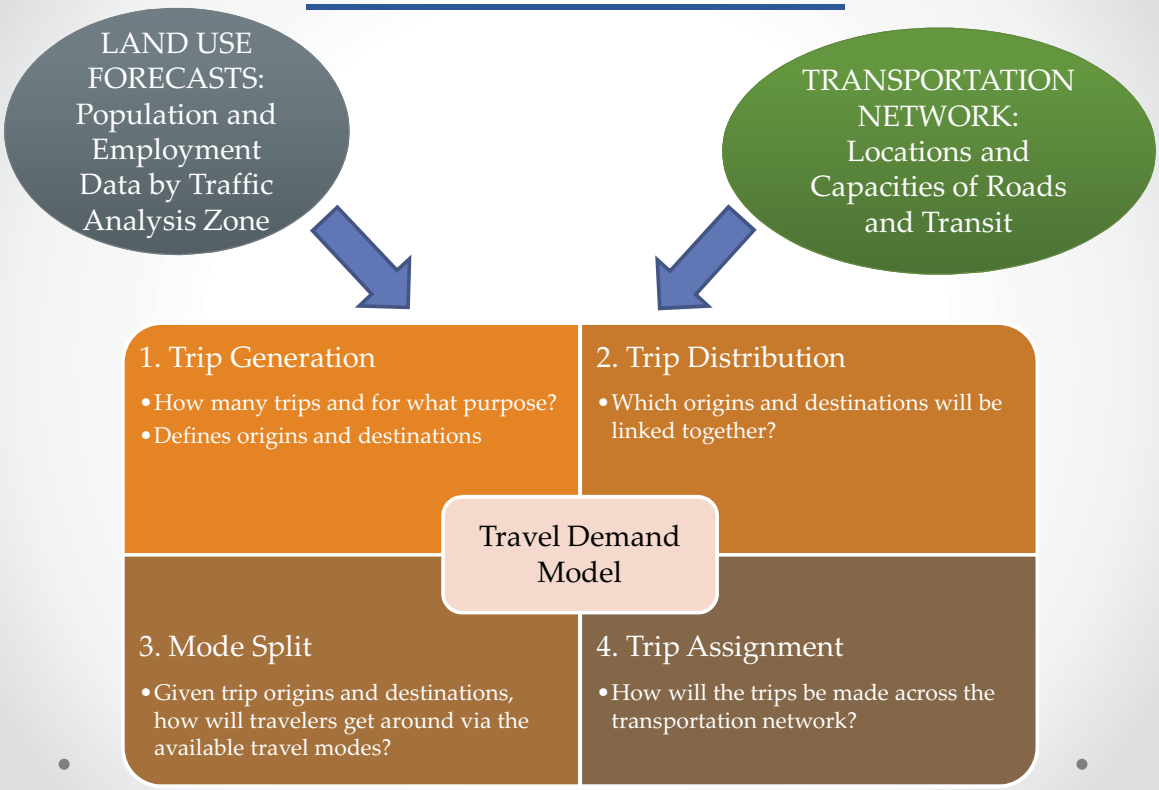
The Court of Appeals for the Fourth Circuit vacated the decision because they found that the agencies failed to take the required "'hard look' at environmental consequences" because the agencies used the MPO's socio-economic data without disclosing the data's underlying assumptions and by falsely responding to public concerns.

Reference: Appeal:11-2210, Document 43

How we are addressing court ruling

- Disclose underlying assumptions of how the socioeconomic forecasts were created – regional, county, TAZ levels
- Re-examine MUMPO's allocation of population and employment
  - Quantify influence of Monroe Connector/Bypass in travel time to employment factor
- Updates/changes due to delay (2010-current)
- Explain why Union County is growing without project

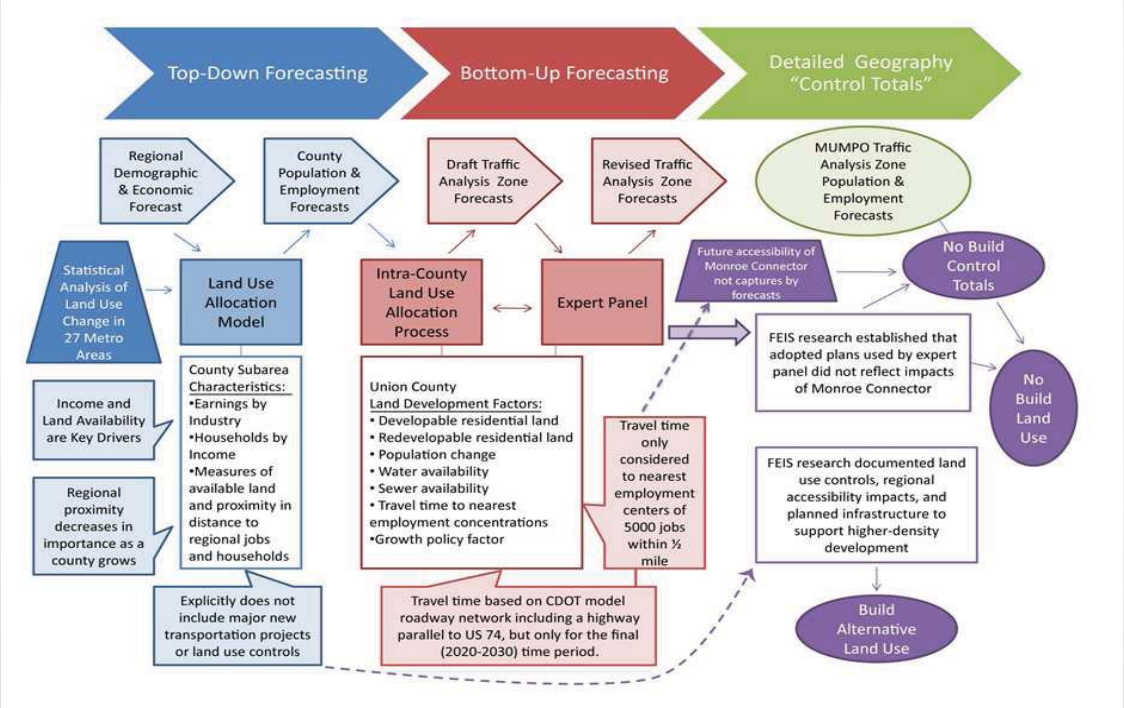
Travel Demand Model



Socioeconomic Forecasts

- Metrolina Region employment and population forecast performed by Dr. Thomas Hammer (CDOT) – basis for county control totals
- MUMPO TAZ Population Projections and Employment Allocations performed by UNCC team led by Mr. Paul Smith
- Final County forecasts and TAZ population projections and employment allocation adjusted by MUMPO

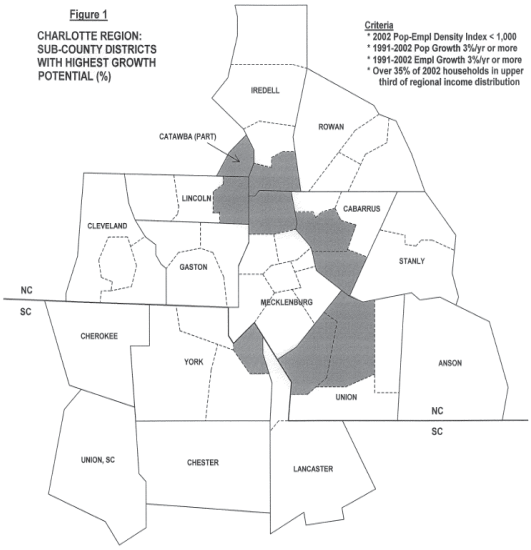
Flow Chart of Population Projects & Employment Allocations



Demographic and Economic Forecast Dr. Thomas Hammer

Regional Analysis

- **Estimation of future national employment by industry**
- **Forecast of regional employment and demographics by straight forward linkage between regional and national economy**



Reference: Hammer, Demographic and Economic Forecast for Charlotte Region, Dec. 2003

Allocation of Regional Totals to Counties

- Dr. Thomas Hammer's growth allocation process included demand side factors including:
  - 32 equations for employment by sector
  - 3 equations for demographic variables of upper, middle and low-income housing

  Dr. Thomas Hammer's growth allocation process included supply side factors including:
  - Land area and land availability
  - Past land use and infrastructure policy
  - Location proximity between employment and households

Reference: Hammer, Demographic and Economic Forecast for Charlotte Region, Dec. 2003

Dr. Hammer's Assumptions

Model allocations are not sensitive to large scale infrastructure projects.

- At the Region Level.
- At the County Level.

See pages 10, 11, 12, 13, 69

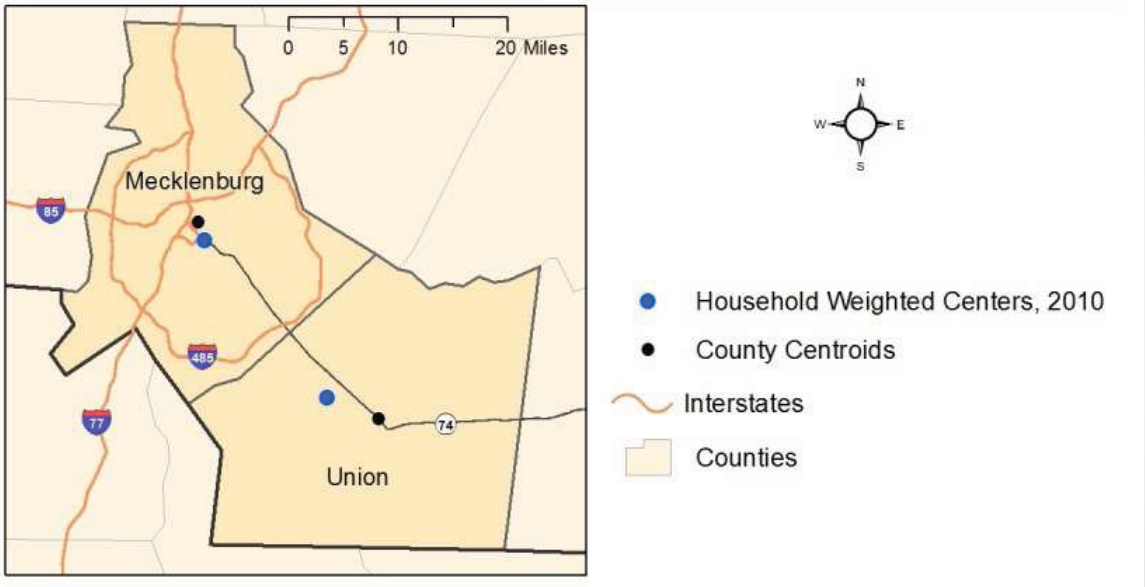
Top Down Forecast Proximity Factor

- SELC Statement on top down forecast assumes that distance is a proxy for travel time.
- Distance was used as a basis for a “proximity factor”
- If County A has high attractiveness for growth then its neighbor County B will also be somewhat attractive to growth.
- SELC claims that by assuming proximity does not change that Dr. Hammer’s analysis assumes transportation infrastructure will be improved to accommodate growth.

Top Down Forecast Proximity Factor

- Proximity factor was calculated by using weighing two “centers” to calculate distance an average proximity
  - Geographic center: the physical center of each county (25%)
  - Household-weighted center: the center of the county if all households were weighted evenly across the county (75%)
    - Based on 1990 Census for first forecast year
    - Shifted progressively farther from regional core for each successive forecast year. (p 33-34)

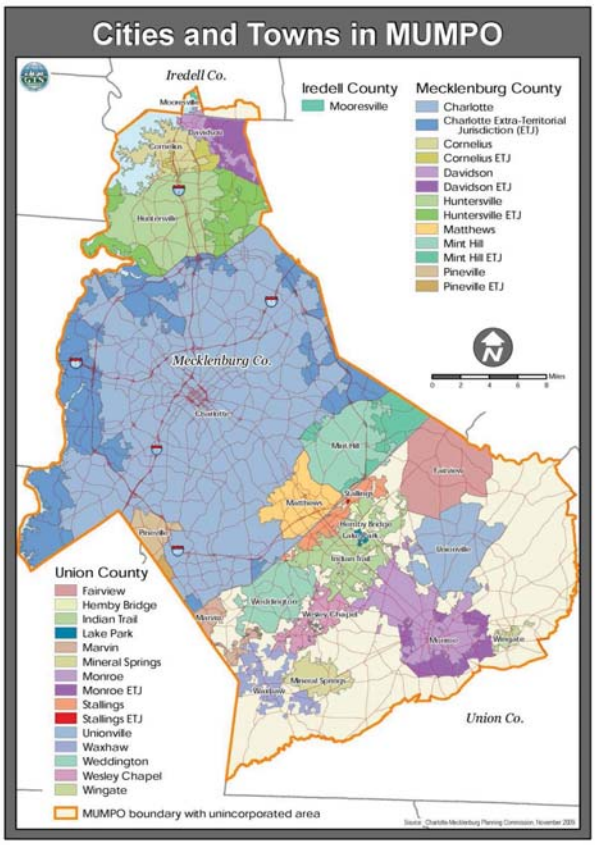
County Centroids



Top Down Forecasting Calibration

- Dr. Hammer's analysis included numerous statistically tested and validated relationship formulae to forecast population and employment.
- His formulae were based on detailed regression analyses looking at 228 counties across 27 metropolitan regions.
- Further, his regressions were calibrated to the 1990 to 2000 time period.
- To claim the proximity variable implicitly assumes one specific roadway project in one county is a stretch.

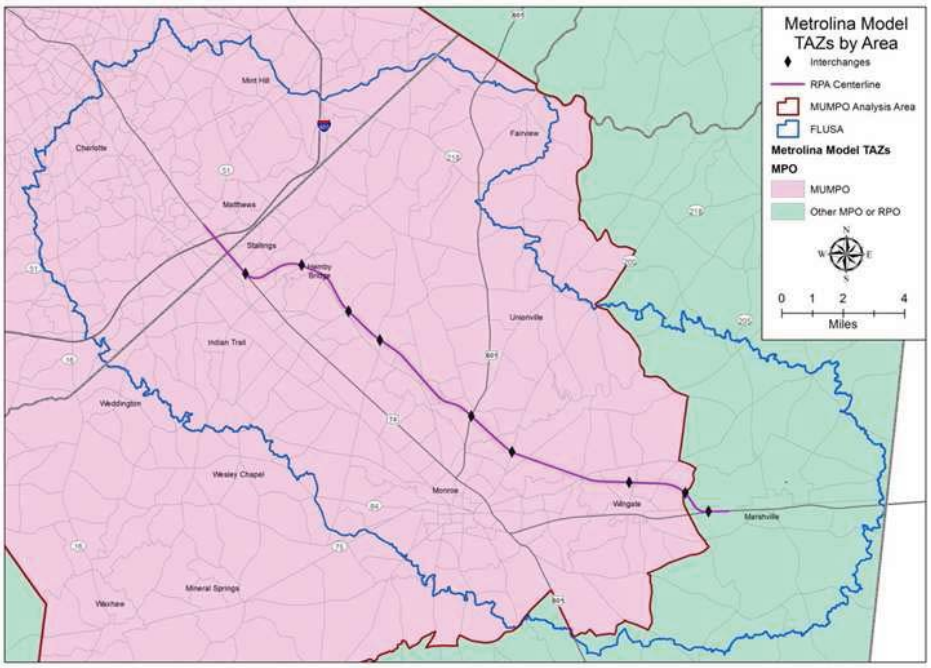
Mecklenburg – Union Metropolitan Planning Organization (MUMPO)



Allocation of County Growth Totals to TAZs

- MUMPO's Population Projections and Employment Allocations 2000 -2030
  - Prepared by UNCC Team led by Mr. Paul Smith
  - Created a model and process to generate TAZ forecasts within the MUMPO planning area boundaries
- Expert panel reviewed model inputs/outputs

Quantitative FLUSA with TAZs

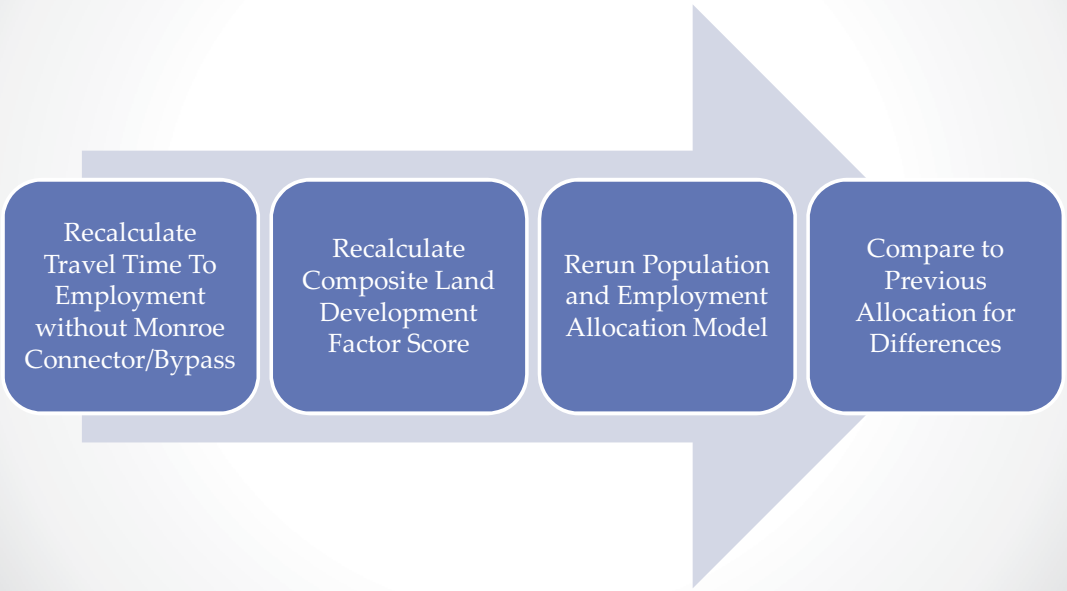


Union County Land Development Factors

Factor	Weight		
	2010	2020	2030
Developable Land	3	3	3
Travel Time to Emp	3	3	3
Water	2	2	2
Sewer	2	2	2
Redevelopable	2	3	3
Population Change	3	1	Not used
Expert Panel	2	2	2
Growth Policy	1	1	1

Reference: Smith, MUMPO Population Projections and Employment Allocations, 2004

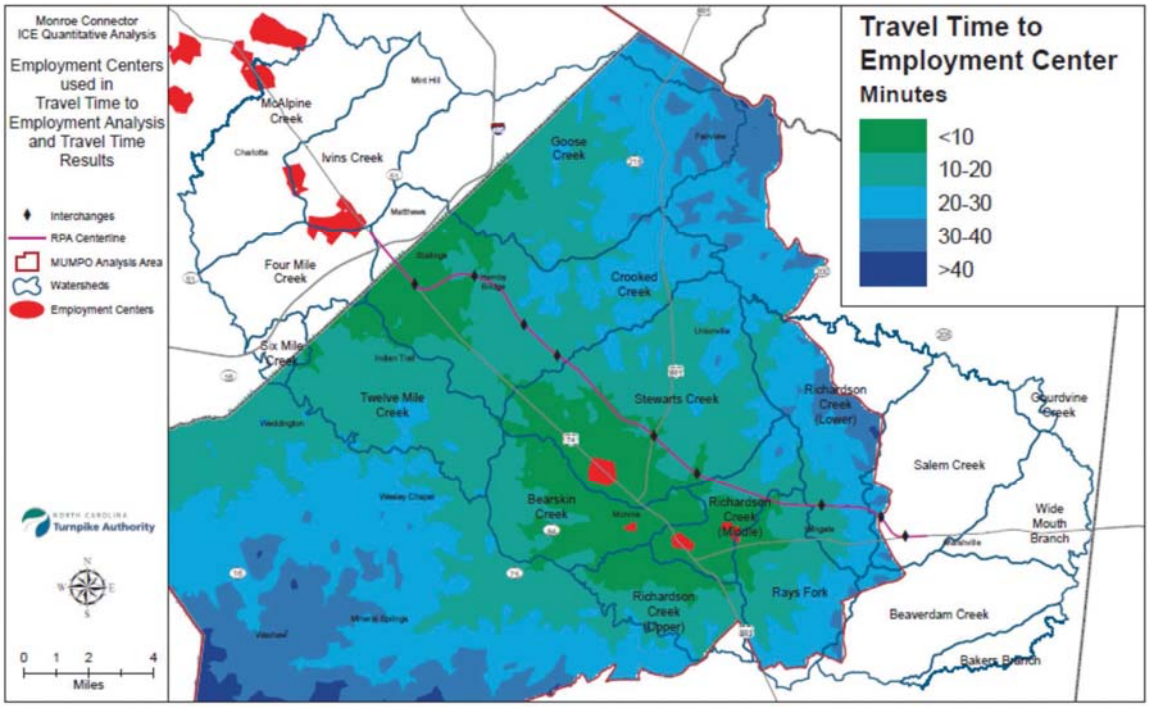
Re-Examination of MUMPO Population Projects and Employment Allocation



TAZ Level Allocation Process Reassessment

- MUMPO, NCDOT and other modelers worked together to reexamine the Travel Time to Employment Factor
  - Assess the differences in travel times with and without the Monroe Connector in the roadway network
  - Assess the resulting changes to the Composite Score
  - Rerun the allocation process to assess any changes to population and employment allocations

Travel Time to Employment



Travel Time Score Changes

Removal of Bypass results in minor changes to travel times scores

Travel Time Changes (out of 256 TAZs)

- 150 TAZs (59%) have no change
- 85 TAZs (33%) have increase of less than 1 minute
- 21 TAZs (8%) increase by more than 1 minute
- Maximum change is 5.7 minutes
- Average change is 18 seconds

Reference: Smith, email: Land Use Allocation, July 2012

Composite Score Changes

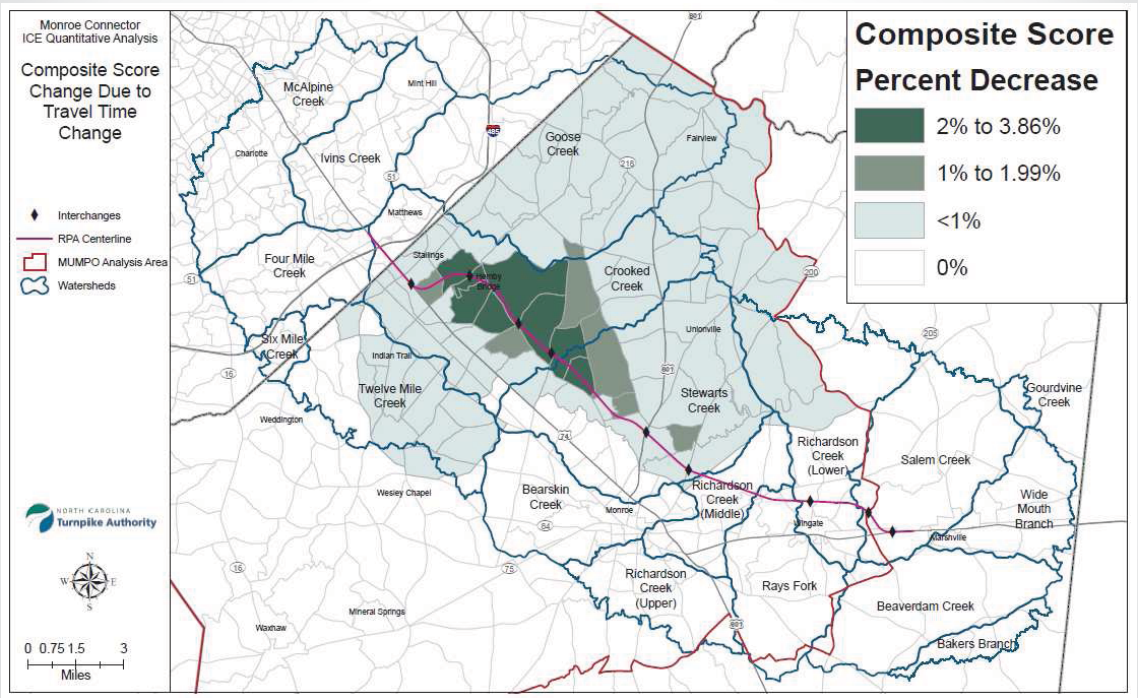
Removal of Bypass results in minor changes to composite scores

Composite Score Changes (out of 256 TAZs)

- 150 TAZs (59%) have no change
- 92 TAZs (36%) have change of less than 1%
- 14 TAZs (5%) have 1% or more change in composite score
- Average Composite Score change is 0.21%
- Maximum Composite Score change is 3.9%

Reference: Smith, email: Land Use Allocation, July 2012

Change in Composite Score



Composite Score Change

Affect on Forecasts

- For those TAZs where the composite score declined, the allocation model had consumed all available land in the original allocation.
- The decrease in composite score did NOT result in the model requesting less land for development than was available in those TAZs.
- The allocation model output once the Monroe Connector/Bypass was removed from the Travel Time analysis was **EXACTLY** the same as the original model output.

Conclusion

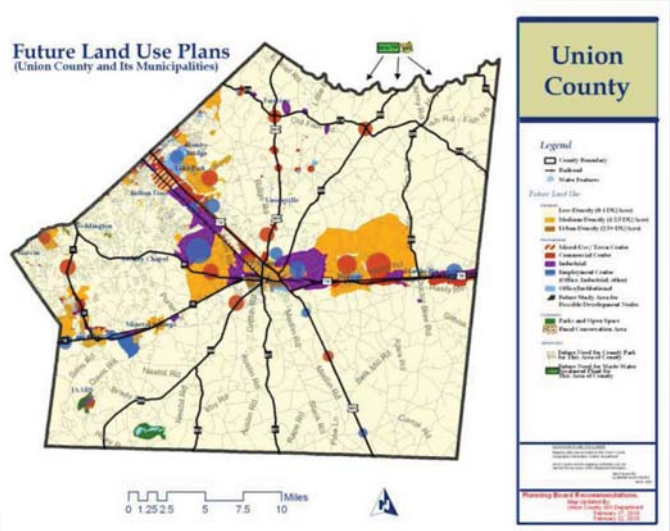
MUMPO population projection and employment allocation is not sensitive to the presence or absence of the Monroe Connector Bypass Project.

Updates due to Delay

- 2010 Census data
- New land use plans

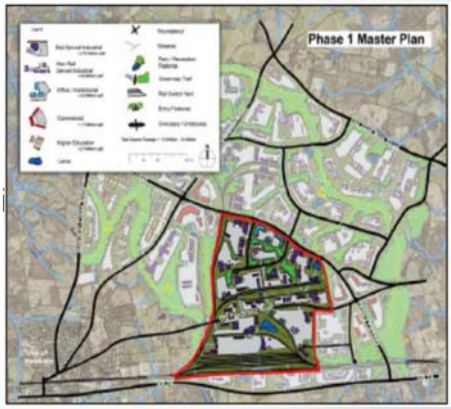
Example of Change: Eastern Union County

- New Union County Land Use Plan
- Explicitly assumes MC in projected land use
- Larger area of medium density housing
- Affects Build Scenario with higher levels of low and medium density residential development.



Example of No Change: Legacy Park

- Interviewed Union County Partnership for Progress (UCPP), Union County Planning Director and CSX Staff
- Proposal is not incorporated into any local plans
  - Three localities have expressed official support for the project
- Vast majority of land is not zoned for use
- No financing plan for development
- Basic utility capacity needs are included in long range plans
  - No funding or plan for building utility infrastructure to site.
- CSX has indicated the site is good and is interested in continuing coordination
  - Not interested in pursing environmental study of the site
  - Do not see the market demand for an intermodal terminal at this time.
- Development is considered highly speculative by UCPP and Planning Staff
- Development of Intermodal Terminal by CSX i key to any significant development at the site
- No changes to either scenario warranted based on current information



Union County Growth Factors

- Household income
- Housing characteristics
- School quality
- Commute times

Schedule

- Finalize analysis and development of Environmental Assessment
  - May 2013
- Conduct Public Hearings / Workshops
  - June 2013
- Finalize ROD*
  - October 2013

***If based on the studies, the FHWA determines that a supplemental EIS is not necessary, the FHWA shall proceed to a ROD.**

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

April 10, 2013

Memorandum to: File

From: Jennifer Harris, P.E.

Subject: STIP R-3329/R-2559 Monroe Connector/Bypass
Meeting with USACE, February 19, 2013

PARTICIPANTS:		
	Carl Pruitt	USACE District Office
	Henry Wicker	USACE Regulatory Division
	Liz Hair	USACE Asheville Field Office
	John Sullivan, III	FHWA Division Administrator
	Clarence Coleman, P.E.	FHWA North Carolina Division
	George Hoops, P.E.	FHWA North Carolina Division
	Scott Jones	FHWA Attorney Advisor
	Jamie Shern	NCDOT Office of the COO
	Scott Slusser	NCDOT Attorney General's Office
	Jennifer Harris, P.E.	NCDOT PDEA Unit
	Michael Turchy	NCDOT PDEA-NES
	Christy Shumate	HNTB
	Scudder Wagg, A.I.C.P.	Michael Baker Engineering
	Ken Gilland, P.G.	Michael Baker Engineering

A meeting was held on February 19, 2013 to discuss the Monroe Connector/Bypass project, in particular the February 5, 2013 letter from the Southern Environmental Law Center (SELC) to the US Army Corps of Engineers (USACE). A PowerPoint presentation was used to facilitate the discussion and a copy is attached.

With Regards to the SELC contention on the Suspended Monroe Permit: We understand the USACE's position that the permit cannot be held in suspension indefinitely. NCDOT and FHWA are in the process of updating the environmental documentation for the Monroe Connector/Bypass and are committed to a thorough, transparent process. We would appreciate further coordination on this issue with USACE as appropriate.

Legacy Park Status: NCDOT has spoken with all parties involved in the potential development of Legacy Park to the east of Marshville. Our discussion summaries were shared with the USACE via email on February 21, 2013 and are attached. Based on these interviews, we conclude that the development of Legacy Park cannot be considered reasonably foreseeable. However, we will continue to monitor this situation and consider new information as it becomes available. We will contact USACE and our agency partners if any information is found that could alter this conclusion.

The process going forward: The determination of a final document has not been made at this time. The options would be to prepare an EA (based on CFR 771.130(c))) or to develop a Supplemental Final Environmental Impact Statement. Based on the results of the information obtained during the environmental review, a decision will be made as to the most appropriate document format.

Meeting with US Fish and Wildlife (USFWS): NCDOT and FHWA are committed to working with USFWS with regards to the Section 7 coordination for the Monroe Connector/Bypass. We are currently gathering/assessing all information and once we have reached a decision on what we believe to be appropriate (based on this information) we plan to meet with USWFS to present our findings and seek feedback on our anticipated approach for moving forward with the project.

Attachments:

Legacy Correspondence Summaries:

- Union County Partnership for Progress (9/27/12)
- CSX Discussions (11/29-30/12)
- Dick Black, Union County Planning Department (1/31/13)

PowerPoint Slides from meeting

Project: R-3329/R2559 Monroe Connector

Subject: Indirect and Cumulative Impacts Quantitative Analysis, Legacy Park Development
Meeting Date/Time: 9/27/12, 2:30pm
Meeting Location: Conference Call

Attendees:

Melanie Underwood – Interim Director, Union County Partnership for Progress
Gretchen Carson – Staff, Union County Partnership for Progress
Ken Gilland – Baker Engineering
Scudder Wagg – Baker Engineering

Meeting Notes:

On Thursday, September 27, 2012, Gretchen Carson and Interim Director Melanie O'Connell Underwood of Union County Partnership for Progress (Partnership) spoke with Scudder Wagg and Ken Gilland of Michael Baker Engineering (Baker) with regards to the Legacy Park Project.

The discussion began with the Partnership asking what had prompted the call. Baker stated that the call was prompted by recent queries by parties associated with the Monroe Connector/Bypass legal case, environmental agencies, and the Charlotte Observer, all of which had asked if the project had been included in the past quantitative indirect and cumulative effects (ICE) study and if it would be included in any updates to the ICE study.

Ms. Carson answered that she and Director O'Connell had recently met with the past director (Maurice Ewing) to make sure that they had all available information about the Legacy Project. There is currently no work underway for the project due to the current economic conditions and the delay in construction of the Monroe Connector/Bypass. No offers have been made on any parcels in the area, and there are currently no plans to request land use plan changes or develop infrastructure plans to support Legacy Park. No financing plans have been developed for Legacy Park. Currently, the Partnership considers the project dead.

It is the case that the area proposed for Legacy Park appears to be suitable for development. Currently, there are no intensive housing developments in the area proposed for the park. CSX has noted to the Partnership that the long, straight railroad alignment in this area would accommodate sidings and the site offers potential benefits with the anticipated expansion of the Port of Wilmington. Anson County and the Town of Marshville have passed resolutions of support for the project. The Union County Planning Department is aware of the project but to date no changes in land use plans or zoning have been adopted or proposed to accommodate the full proposal. The current infrastructure is sufficient to support existing development and some future development but will not support the size or scale of the proposed Legacy Park.

Baker asked, what were the chances of Legacy Park being developed with or without the construction of the Connector. The Partnership answered that there was no chance of Legacy Park being constructed if the Monroe Connector/Bypass were not built. If the Connector/Bypass were built, the chances that some portion of the proposed Legacy Park might develop was about 25 percent in the next 5 to 10 years; however no phasing plan or feasibility study would be developed unless the bypass is constructed.

Baker asked about proposed project phasing if Legacy Park were built. The Partnership answered that of approximately 5,000 acres identified on the Partnership website as comprising Legacy Park, it was anticipated that the first phase of the project would cover approximately 300 acres, but that number was subject to change. The figure was based on preliminary discussions with CSX about one particular tract. The Partnership asked if they could go to the next phase of project development (an environmental study) would CSX think this was a good idea and were informed that the railroad did not believe current conditions warranted advancing the project. Nothing was purchased and no landowners were directly contacted.

The Partnership stated that if Union County were approached by a developer or business, that they would be open to exploring future prospects. There had been one small rail project in the Legacy Park area in the past few years, but it was not associated with Legacy Park.

The Partnership stated that they were merging with the Monroe Economic Development Council and might cease to exist within a year.

Baker asked about other planned development. The Partnership answered that four communities in the area (Indian Trail, Stallings, Mint Hill, and Mathews) were looking into the possibility of pooling resources to encourage future developments in the form of a business park. A future meeting will determine anticipated next steps in this very preliminary effort.

The Partnership asked if Baker was aware of the Strategic Plan for Economic Development, Town of Marshville, Town of Wingate, and Baker answered that the plan had informed the potential build scenario for that portion of the ICE study area.

Project: R-3329/R2559 Monroe Connector

Subject: Indirect and Cumulative Impacts Quantitative Analysis
Meeting Date/Time: Various (e-mail communications between 11/29/12 and 11/30/12)

Attendees:

Vance E. Bennett – CSX
Jim Van Derzee: CSX
Scudder Wagg - Baker Engineering

Communication Notes:

The purpose of this communication was to better understand the role of CSX in the Legacy Park development and gather information on the expectations of CSX staff regarding the potential for development of the site. Scudder began the discussion by asking:

> *Our staff spoke with Melanie Underwood and Gretchen Carson about the potential for development and one specific item they noted was that they had spoken recently to CSX staff about possibly conducting an environmental study of the site to advance project development but that CSX staff felt the current conditions did not warrant such action. Can you confirm this or provide any information as to why that decision was made? Also, if there is any additional information you can provide about the likelihood and possible timing of any development at Legacy Park we would greatly appreciate it. Specifically, we would want to know your assessment of whether and how much of the site might be developed by 2030 if the Monroe Connector/Bypass were built and if it were NOT built. Any specific reasons for your assessment would also be helpful.*

Jim responded with the following:

> *This is very difficult to speculate. There are two separate, largely unrelated, development opportunities at Legacy Park for CSX.*
>
> *1. **Rail-Served Industrial Development Projects** The property is adjacent to a CSX main line, which would enable sidetrack construction to serve new industries that locate to the property. Because we don't know what types of industries will locate there, we cannot determine the road access requirements and whether or not the Bypass would make a difference. As far as the timing, this could happen as soon as a project starts that is a suitable fit for Legacy Park, which is impossible to predict. I've offered Legacy Park to numerous industrial development projects, but none have pursued it yet. As CSX's Manager Industrial Development, this is my primary role with Legacy Park.*
> *2. **Construction of a new intermodal** facility that would transfer shipping containers between railcars and trucks. Because the local shipment would be made by truck, the road accessibility is critical to making this work. There are many other challenges that need to be overcome before I would recommend proceeding with an environmental study. As CSX's Director Intermodal Port Strategy, this is Vance's primary role with Legacy Park.*
>
> *I recommend that the environmental study be done after a need has been clearly determined.*

Vance responded by noting the following regarding the possible new intermodal facility:

> *Jim's comments are correct and I would just like to add that CSX normally would conduct a market assessment before an environmental study is conducted to measure the current and future if CSX was to build an Intermodal facility at any location. I would suggest that be considered if you have not done so already.*

Later Vance further clarified regarding the need and process for doing a market assessment:

> *CSX would take the lead on such a study if it were a CSX planned facility. In this case, since it is a private terminal facility it would not be CSX's call on developing that research. If it were however, CSX would typically hire a consultant like RS&H, Moffat & Nichol or Tran-Systems to develop such a report.*

Lastly, in response to a request to rate the quality of the Legacy Park site for rail-served industrial development and for the potential for the intermodal terminal development, Jim responded:

> *[O]verall, I rate the Legacy Site very high, with the potential to land some large industrial development projects. Its topography, rail access, and geographic location make this one of the best sites in the greater Charlotte area.*
>
> *As for the other challenges with the intermodal opportunity, we do not currently have the necessary combination of shipment volume and distance to make rail work.*

Project: R-3329/R2559 Monroe Connector

Subject: Indirect and Cumulative Impacts Quantitative Analysis, Legacy Park Development
Meeting Date/Time: 1/31/2013, 4:15pm
Meeting Location: Conference Call

Attendees:

Richard Black – Director, Union County Planning Department
Scudder Wagg - Baker Engineering

Meeting Notes:

The discussion began with Mr. Wagg asking Mr. Black about his familiarity with the proposed Legacy Park development and in particular, how it was considered in the most recent Union County Land Use Plan (as part of the Comprehensive Plan). Mr. Black noted that he had discussed Legacy Park many times with Maurice Ewing who was the former director of economic development for the county and the main proponent of the project. Mr. Ewing had been a member of the Steering Committee organized to help guide the development of the first draft of the new Union County Comprehensive Plan, produced by Clarion Associates. The draft plan had been developed between 2006 and 2008 and it included a land use plan and map that included planned industrial and commercial land uses on the site of the proposed Legacy Park development. This first draft had been initiated at the request of the Board of Commissioners in 2006. The timing of the plan adoption meant that the draft plan was developed under the supervision of one group of Planning Board and Board of Commissioners. But by the time the draft plan was ready to present to the Planning Board and Board of Commissions, an intervening election had resulted in a new majority on both bodies. These new members wanted to more thoroughly review the draft plan and to revise many parts of it. Thus the Planning Board undertook a year-long review and revision process. During that process, many Planning Board members expressed their skepticism of the likelihood of the Legacy Park proposal, suggesting that it was too big, required cooperation from too many property owners and was unlikely to be realized.

During the Planning Board review and revision process, Mr. Ewing did participate in meetings to encourage the Board to include the Legacy Park project in the plan. Mr. Black noted that Mr. Ewing presented resolutions of support for various jurisdictions including Marshville and Wingate, statements of support from organizations such as the Charlotte Regional Partnership and land use concepts plans developed by consultants. The final plan, however, did not include non-residential development within the proposed Legacy Park site except for areas immediately adjacent to US 74 and the CSX corridor that were identified for industrial development in the previously adopted land use plan from 1998.

Mr. Wagg asked for an assessment of the likelihood that the Legacy Park site would see substantial non-residential development with or without the construction of the Monroe Bypass/Connector. Mr. Black noted that his understanding of the proposal was that it relied on three elements: CSX development of an intermodal terminal, sewer and water utility capacity and improved access to Charlotte via a direct connection to the proposed Monroe Connector/Bypass. Mr. Black was under the impression that without any of those three items, development would be very unlikely to occur. For access to the Monroe Connector/Bypass, the Legacy Park proposal would also require a new road connection to Forest Hills Road and construction of an interchange at Forest Hills Road.

Mr. Black noted that the most essential element of the three was the CSX intermodal terminal. Mr. Black was told by Mr. Ewing and others that the intermodal terminal was key because it would attract a series of industrial businesses related to the intermodal terminal. Mr. Black was under the impression, however, that CSX was not interested in development of an intermodal terminal and therefore, with or without construction of the Monroe Connector/Bypass, the prospects for sizeable development of the Legacy Park site were unlikely.

Mr. Black did note that if the Monroe Connector/Bypass were built, he would expect greater levels of non-residential development in the areas east of Monroe and north of Wingate and Marshville. This section of the county, he noted, was the most supportive of growth, politically. Currently, however, this area of the county is very far from I-485, Charlotte and the rest of the region, limiting its potential for development. The Monroe Connector/Bypass would improve accessibility to that section of the county and therefore likely result in increases in

non-residential development. Mr. Black expressed some uncertainty as to the exact location of that non-residential development within the eastern portions of Union County. Mr. Black did note that the Legacy Park site was relatively far from the eastern terminus of the Monroe Connector/Bypass and those areas closer to the proposed interchanges and eastern terminus of the project would be more likely to see development first.

Monroe Connector/Bypass

Project Update

February 19, 2013

Outline of Today's Discussion

- United States Court of Appeals Decision
- Indirect and Cumulative Effects Analysis
- Development of Metrolina / MUMPO Forecasts
- Schedule for Advancing Project

Appeals Court Decision

The Court of Appeals for the Fourth Circuit vacated the decision because they found that the agencies failed to take the required "'hard look' at environmental consequences" because the agencies used the MPO's socio-economic data without disclosing the data's underlying assumptions and by falsely responding to public concerns.

Reference: Appeal:11-2210, Document 43

Guidance for Assessing ICE

NCDOT developed a set of approaches for ICE analysis

- Developed in cooperation with
  - FHWA
  - NCDENR
  - North Carolina State Attorney General's Office
  - County and Municipal Officials
- Guidance went into effect in 2001

Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina

Volume I: Guidance Policy Report

Prepared For:

State of North Carolina
Department of Transportation/Department of Environment and Natural Resources
Raleigh, North Carolina

Under Project No. 81777722

Prepared By:

The Louis Berger Group, Inc.
Cary, North Carolina

Issued November 2001

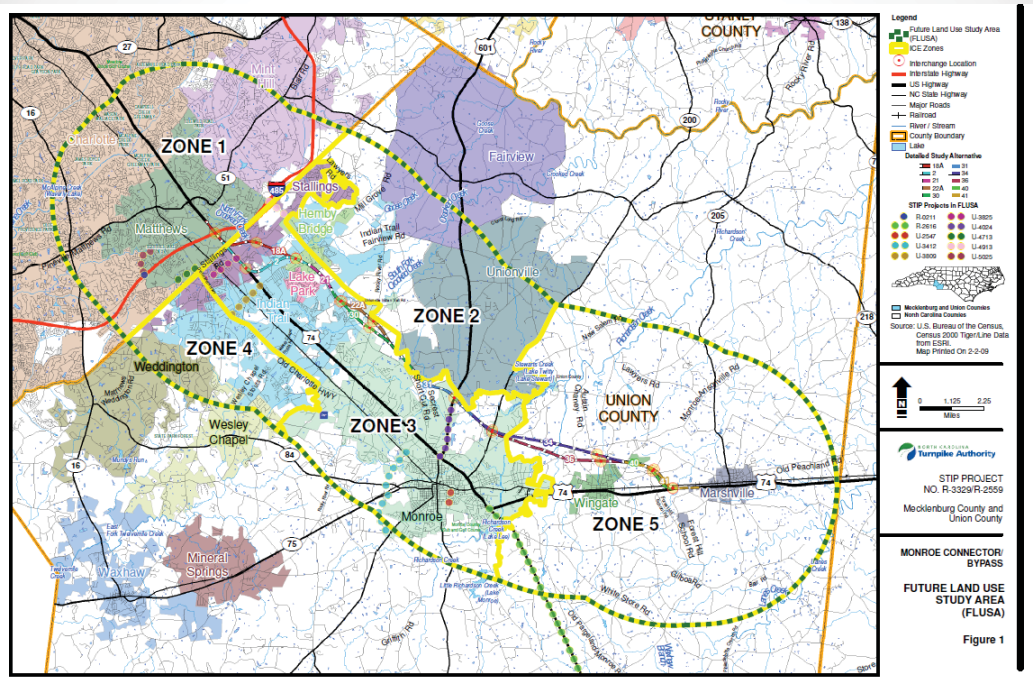
Qualitative Analysis

Steps that should be taken to assess Qualitative ICE impacts.

- **Step 1: Definition of the Future Land Use Study Area (FLUSA)**
- **Step 2: Identification of the FLUSA's Directions and Goals**
- **Step 3: Inventory of Notable Features**
- **Step 4: Identification of Important Impact Causing Activities**
- **Step 5: Identification and Analysis of Potential Indirect/Cumulative Effects**

Reference: Guidance for Assessing ICE of Trans. Proj. in NC (Nov. 2001)

Qualitative Future Land Use Study Area



Reference: Monroe Qualitative ICE (January 2010) – Figure 1

Qualitative Analysis
Potential Indirect Impacts by Zone

Summary of Potential Indirect Impacts by Zone – New Location Alternative

Zone	Potential for improved access and mobility	Potential for accelerated growth as a result of the project	Potential for indirect effects on sensitive resources as a result of accelerated growth
1	None	None	None
2	Moderate	Low	Low
3	Moderate	Moderate	Moderate
4	None	None	None
5	High	High	Moderate

Reference: NCDOT Qualitative ICE Assessment, January 2010

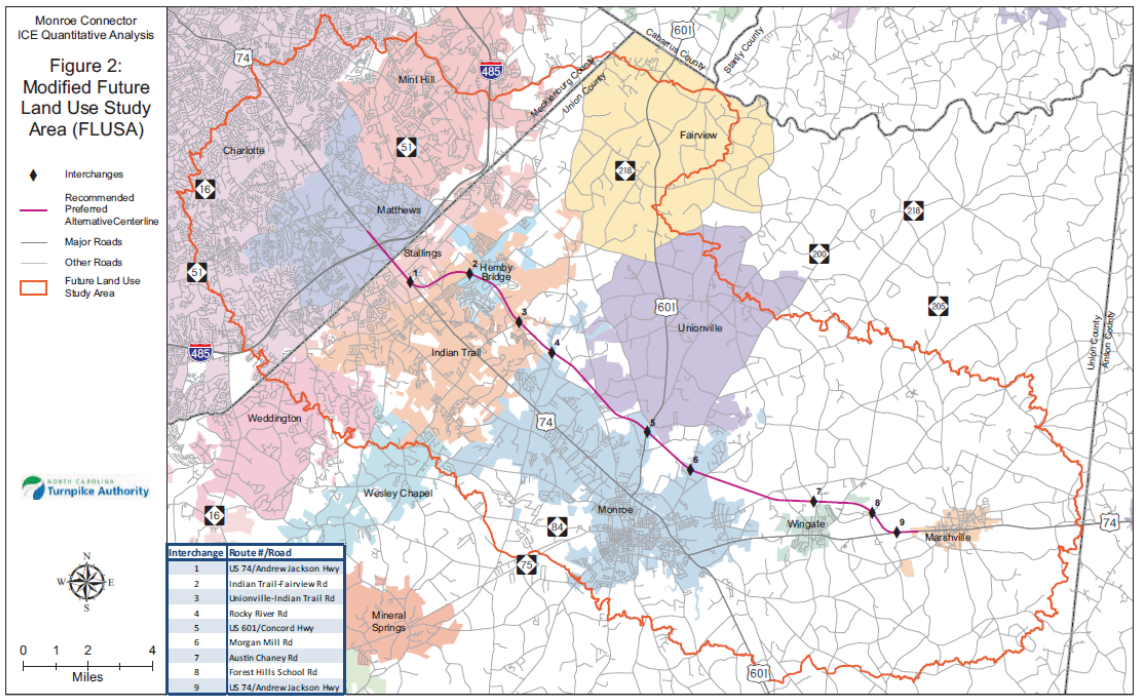
Quantitative ICE Analysis

- Step 6: Analyze Indirect/Cumulative Effects
- Step 7: Evaluate Analysis Results
- Step 8: Assess the Consequences and Develop Appropriate Mitigation and Enhancement Strategies

Focus of the Quantitative ICE

- Land use
- Water quality
- Threatened and endangered species and habitat

Quantitative ICE Project Study Area



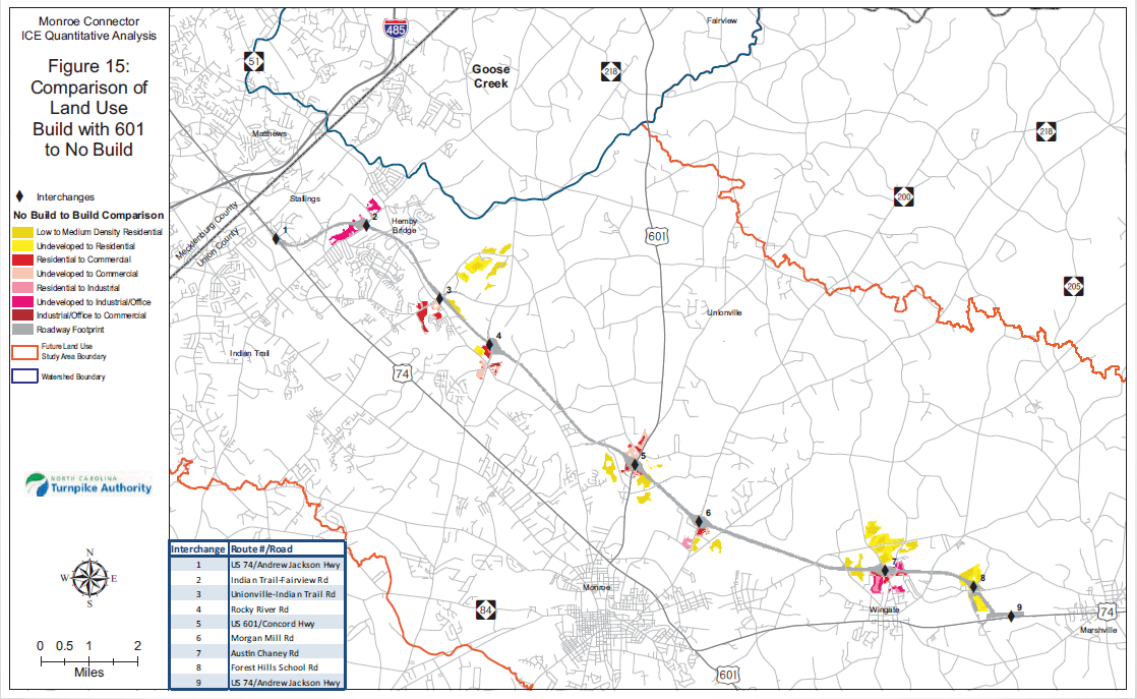
Reference: NCDOT, Monroe Quantitative ICE Assessment, April 2010

Local Land Use Plan Assumptions

Local Land Use Plan included the Project	Local Land Use Plan excluded the Project
Indian Trail	Monroe (except Rocky River Corridor)
Union County	Marshville
Rocky River Corridor in Monroe	Matthews
	Mint Hill
	Stallings
	Wingate
	Central Carolina COG
	Charlotte-Mecklenburg

References: FEIS, Appendix H-10

Quantitative ICE Land Use Comparison
Build to No-Build



Reference: NCDOT, Monroe Quantitative ICE Assessment, April 2010

Quantitative ICE
Future Conditions

The FEIS ICE utilized MUMPO's socio-economic forecasts of employment and population for MUMPO 2030 Long-Range Transportation Plan as an input for the analysis of future land use changes in the project area (per ICE guidance).

Development of Socio-Economic Forecast

Travel Demand Model

LAND USE FORECASTS: Population and Employment Data by Traffic Analysis Zone

TRANSPORTATION NETWORK: Locations and Capacities of Roads and Transit

Travel Demand Model

1. Trip Generation
- How many trips and for what purpose?
- Defines origins and destinations

2. Trip Distribution
- Which origins and destinations will be linked together?

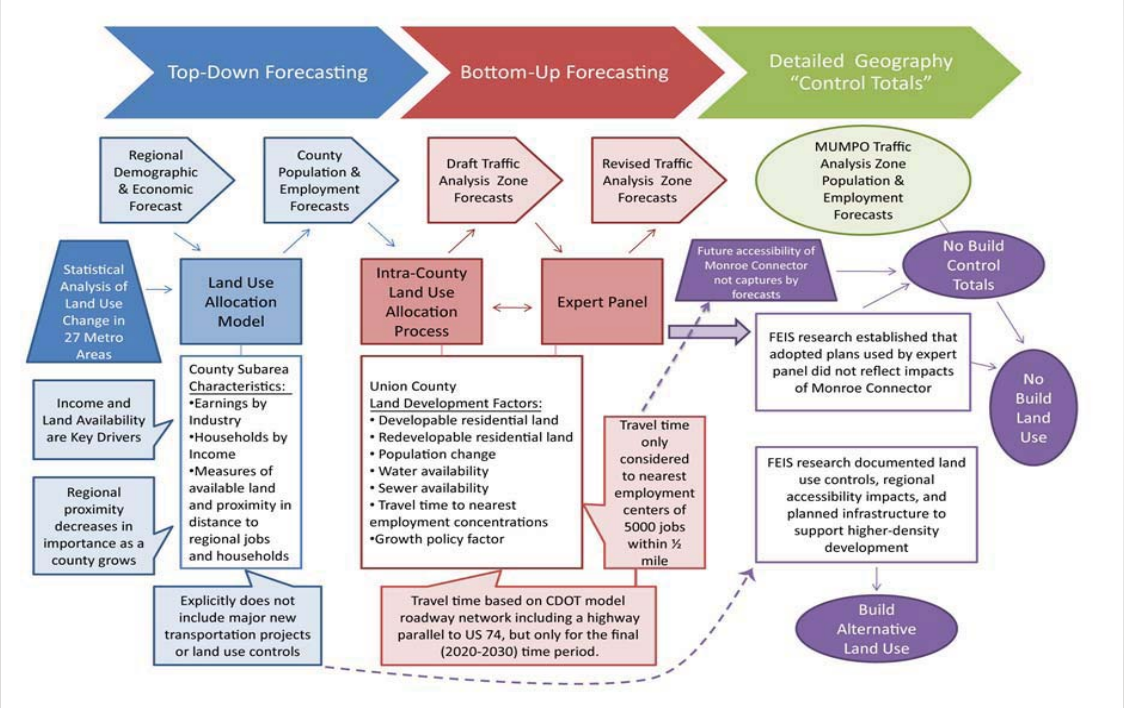
3. Mode Split
- Given trip origins and destinations, how will travelers get around via the available travel modes?

4. Trip Assignment
- How will the trips be made across the transportation network?

Socio-Economic Forecasts

- Metrolina Region employment and population forecast performed by Dr. Thomas Hammer (CDOT) – basis for county control totals
- MUMPO TAZ Population Projections and Employment Allocations performed by UNCC team led by Mr. Paul Smith
- Final County forecasts and TAZ population projections and employment allocation adjusted by MUMPO

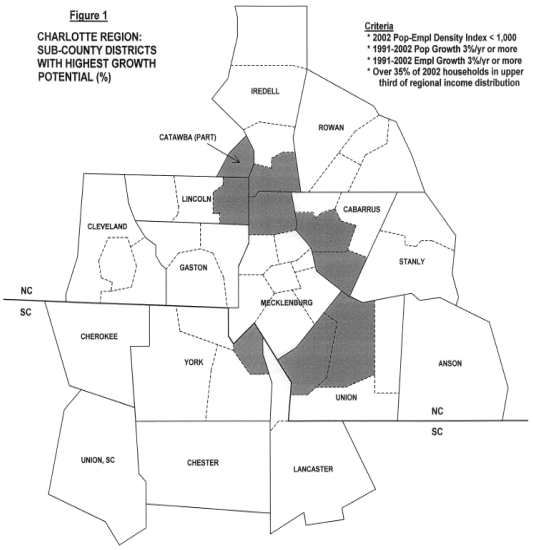
Flow Chart of Population Projects & Employment Allocations



Demographic and Economic Forecast
Dr. Thomas Hammer

Regional Analysis

- Estimation of future national employment by industry
- Forecast of regional employment and demographics by straight forward linkage between regional and national economy



Reference: Hammer, Demographic and Economic Forecast for Charlotte Region, Dec. 2003

Allocation of Regional Totals to Counties

- Dr. Thomas Hammer's growth allocation process included demand side factors including:
  - 32 equations for employment by sector
  - 3 equations for demographic variables of upper, middle and low-income housing

Dr. Thomas Hammer's growth allocation process included supply side factors including:

- Land area and land availability
- Past land use and infrastructure policy
- Location proximity between employment and households

Reference: Hammer, Demographic and Economic Forecast for Charlotte Region, Dec. 2003

Dr. Hammer's Assumptions

Model allocations are not sensitive to large scale infrastructure projects.

- **At the Region Level.**
- **At the County Level.**

See pages 10, 11, 12, 13, 69

MUMPO Adopted Forecast Population

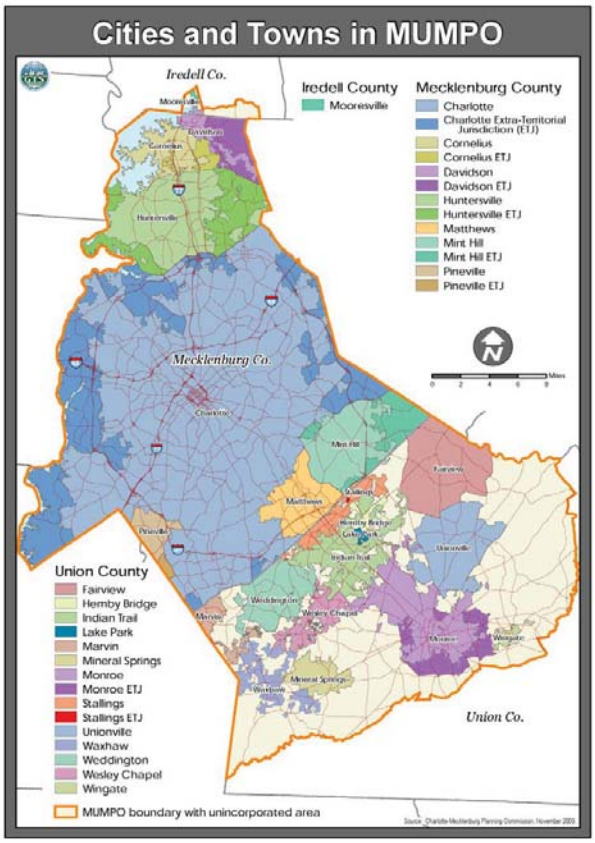
	Dr. Hammer's 2030 Population Forecast			MUMPO Adopted 2030 Population Forecast
County	Lower	Most-Likely	Upper Limit	
Anson County	36,967	40,847	43,175	
Cabarrus County	247,142	283,115	304,699	
Cleveland County	125,373	134,563	140,077	
Gaston County	235,228	249,261	295,071	
Iredell County	227,287	259,906	279,477	
Lincoln County	113,206	128,857	138,247	
Mecklenburg County	1,051,400	1,157,311	1,220,858	1,270,274
Rowan County	183,747	200,639	210,774	
Stanly County	80,171	87,366	91,682	
Union County	268,543	312,147	338,309	337,317
Cherokee County	83,228	93,168	99,132	
Chester County	52,278	58,306	61,923	
Lancaster County	91,781	101,680	107,619	
Union County, SC	38,480	41,466	43,258	
York County	272,096	305,228	334,080	

Reference: Hammer, Demographic and Economic Forecast for Charlotte Region, 2003 & MUMPO Adopted 2030 Population Forecast.

MUMPO Forecasts (2004)

	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change
2005	837,844			168,728		
2010	931,591	93,747	2.1%	200,290	31,562	3.5%
2015	1,024,722	93,131	1.9%	231,986	31,696	3.0%
2020	1,110,893	86,171	1.6%	266,617	34,631	2.8%
2025	1,196,462	85,569	1.5%	301,053	34,436	2.5%
2030	1,270,724	74,262	1.2%	337,317	36,264	2.3%

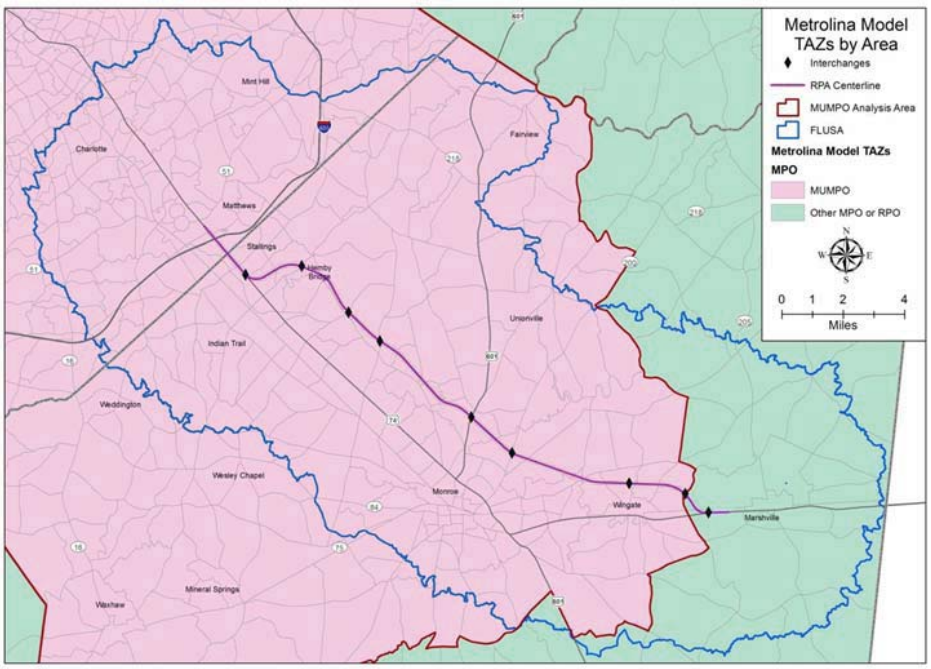
Mecklenburg – Union Metropolitan Planning Organization (MUMPO)



Allocation of County Growth Totals to TAZs

- MUMPO's Population Projections and Employment Allocations 2000 -2030
  - Prepared by UNCC Team led by Mr. Paul Smith
  - Created a model and process to generate TAZ forecasts within the MUMPO planning area boundaries
- Expert panel reviewed model inputs/outputs

Quantitative FLUSA with TAZs

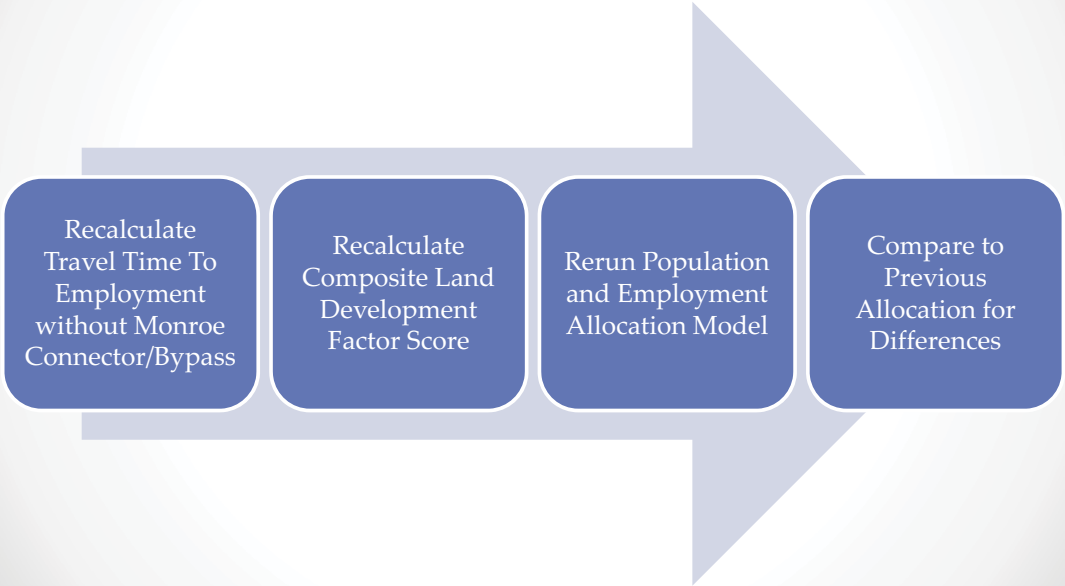


Union County Land Development Factors

Factor	Weight		
	2010	2020	2030
Developable Land	3	3	3
Travel Time to Emp	3	3	3
Water	2	2	2
Sewer	2	2	2
Redevelopable	2	3	3
Population Change	3	1	Not used
Expert Panel	2	2	2
Growth Policy	1	1	1

Reference: Smith, MUMPO Population Projections and Employment Allocations, 2004

Re-Examination of MUMPO Population Projects and Employment Allocation



TAZ Level Allocation Process Reassessment

- MUMPO, NCDOT and other modelers worked together to reexamine the Travel Time to Employment Factor
  - Assess the differences in travel times with and without the Monroe Connector in the roadway network
  - Assess the resulting changes to the Composite Score
  - Rerun the allocation process to assess any changes to population and employment allocations

Travel Time Score Changes

Removal of Bypass results in minor changes to travel times scores

Travel Time Changes (out of 256 TAZs)

- 150 TAZs (59%) have no change
- 85 TAZs (33%) have increase of less than 1 minute
- 21 TAZs (8%) increase by more than 1 minute
- Maximum change is 5.7 minutes
- Average change is 18 seconds

Reference: Smith, email: Land Use Allocation, July 2012

Composite Score Changes

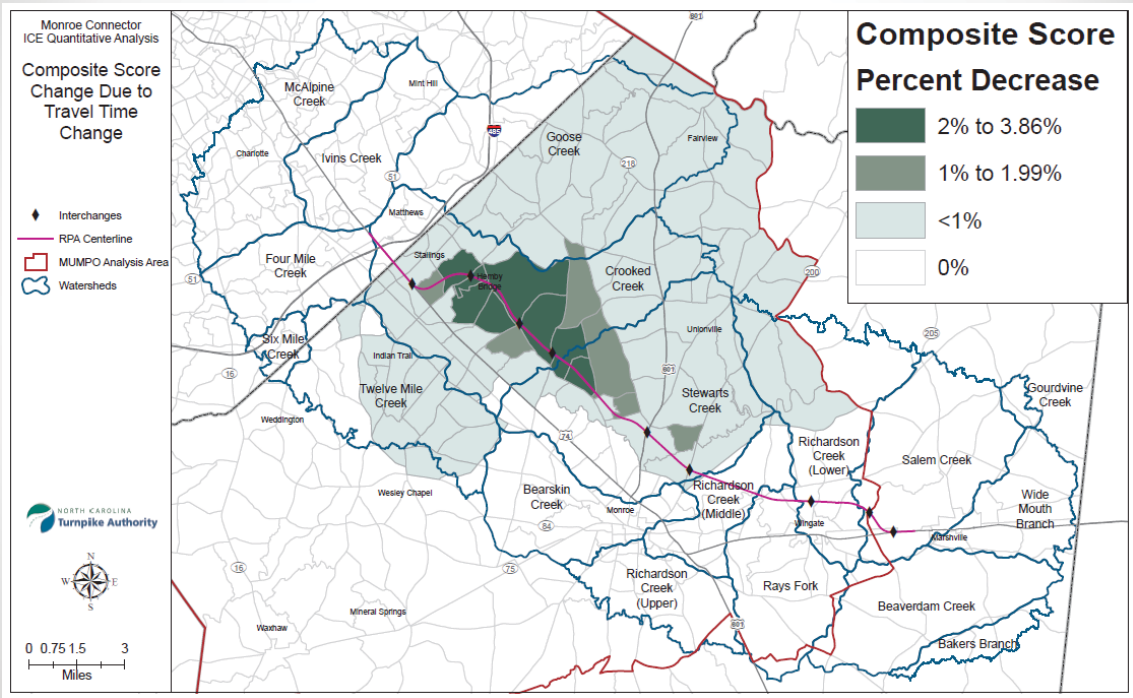
Removal of Bypass results in minor changes to composite scores

Composite Score Changes (out of 256 TAZs)

- 150 TAZs (59%) have no change
- 92 TAZs (36%) have change of less than 1%
- 14 TAZs (5%) have 1% or more change in composite score
- Average Composite Score change is 0.21%
- Maximum Composite Score change is 3.9%

Reference: Smith, email: Land Use Allocation, July 2012

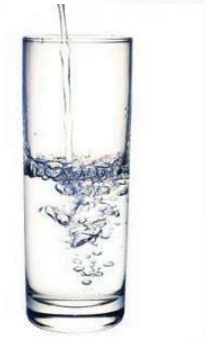
Change in Composite Score



Composite Score Change

Affect on Forecasts

- For those TAZs where the composite score declined, the allocation model had consumed all available land in the original allocation.
- The decrease in composite score did NOT result in the model requesting less land for development than was available in those TAZs.
- The allocation model output once the Monroe Connector/Bypass was removed from the Travel Time analysis was **EXACTLY** the same as the original model output.



Conclusion

MUMPO population projection and employment allocation is not sensitive to the presence or absence of the Monroe Connector Bypass Project.

Other Project Studies

Project Studies

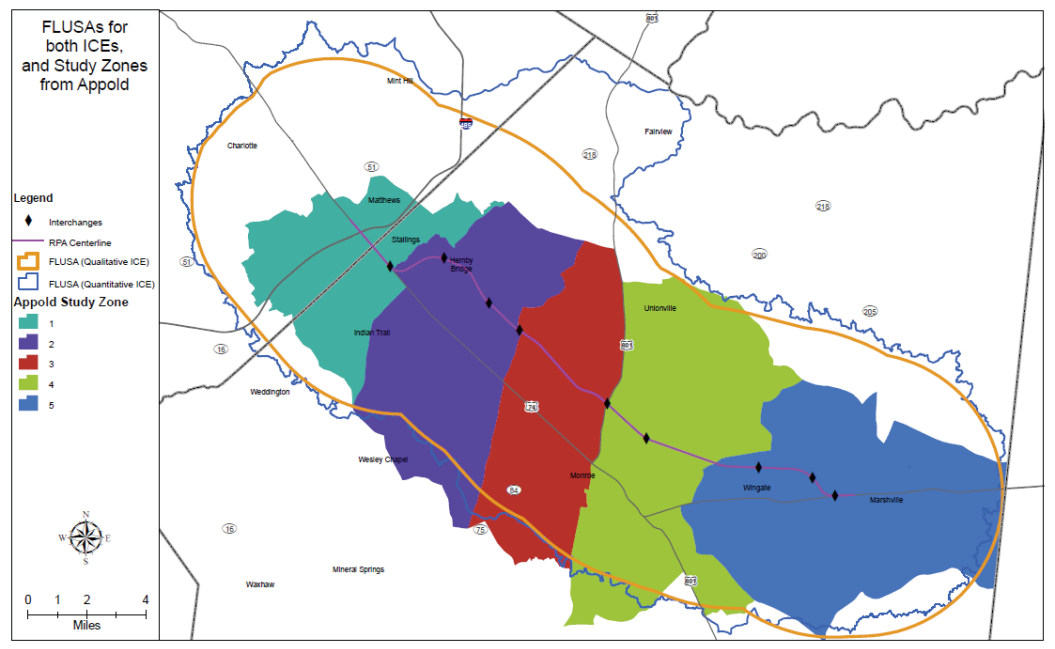
- Proposed Monroe Connector Preliminary Traffic and Revenue Study (2006)
- Technical Memorandum, Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, Initial Report of Independent Economist (2009)
- Final Report Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study (2010)

Traffic and Revenue Study

- Wilbur Smith Associates conducted a study to assess the feasibility of toll-backed financing for the Monroe Connector / Bypass
- Kenan Institute of Private Enterprise at the University of North Carolina's Kenan-Flagler Business School independently reviewed the socio-economic estimates prepared under the leadership of MUMPO

Kenan Institute Study Area

(Shown with the Draft and Final ICE FLUSA)



Household and Population Forecasts for the Corridor Study Area (132,436 acres)

	MUMPO Projections		Kenan Adjustments for "National Correction		Kenan Adjustments due to Project	
	Households	Population	Households	Population	Households	Population
2005	42,595	120,054	42,595	120,054	42,595	120,054
2010	49,393	140,267	45,164	128,258	45,346	128,732
2015	56,454	161,371	51,556	147,364	51,968	148,486
2020	62,479	178,152	57,056	162,689	57,974	165,207
2025	68,407	194,812	62,469	177,902	63,869	181,775
2030	74,497	211,973	68,029	193,573	69,843	198,613

Reference: Appold, Evaluation of the Socio-economic Estimates Underlying the Study of the Feasibility of the Proposed Monroe Connector/Bypass, September 2009

Change in Household and Population Forecasts within the Corridor Study Area

	MPO Forecast		Kenan National Correction Adjusted		Kenan Project Adjusted		Change in Kenan Forecast due to project 2005 to 2030 (%)	
	Households	Population	Households	Population	Households	Population	Households	Population
Corridor								
2005	42,595	120,054	42,595	120,054	42,595	120,054		
2030	74,497	211,973	68,029	193,573	69,843	198,613	4%	4%
Zone 1								
2005	14,118	38,774	14,118	38,774	14,118	38,774		
2030	19,307	55,413	17,631	50,603	17,730	50,871	1%	1%
Zone 2								
2005	11,017	30,859	11,017	30,859	11,017	30,859		
2030	16,676	47,280	15,228	43,176	15,474	43,842	2%	2%
Zone 3								
2005	7,617	20,404	7,617	20,404	7,617	20,404		
2030	11,369	30,980	10,382	28,291	11,074	30,225	9%	9%
Zone 4								
2005	6,164	19,084	6,164	19,084	6,164	19,084		
2030	17,827	51,435	16,279	46,970	16,455	47,580	3%	3%
Zone 5								
2005	3,679	10,933	3,679	10,933	3,679	10,933		
2030	9,318	26,865	8,509	24,533	9,110	26,095	16%	14%

Reference: Appold, Evaluation of the Socio-economic Estimates Underlying the Study of the Feasibility of the Proposed Monroe Connector/Bypass, September 2009

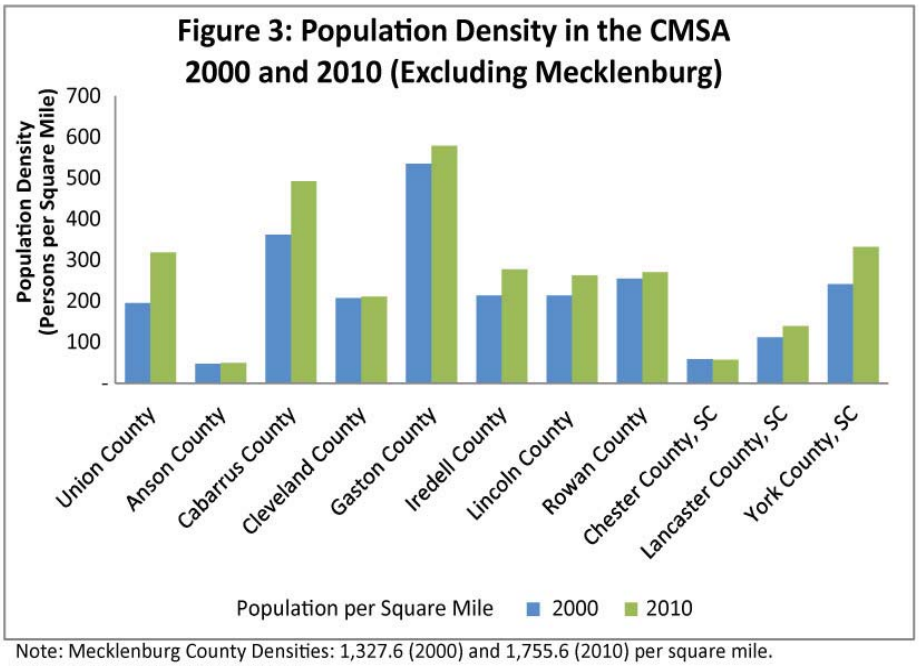
Kenan Institute Conclusion

Growth trends via zones are similar to the Qualitative and Quantitative ICEs developed by NCDOT.

Reference: Appold, Evaluation of the Socio-economic Estimates Underlying the Study of the Feasibility of the Proposed Monroe Connector/Bypass, September 2009

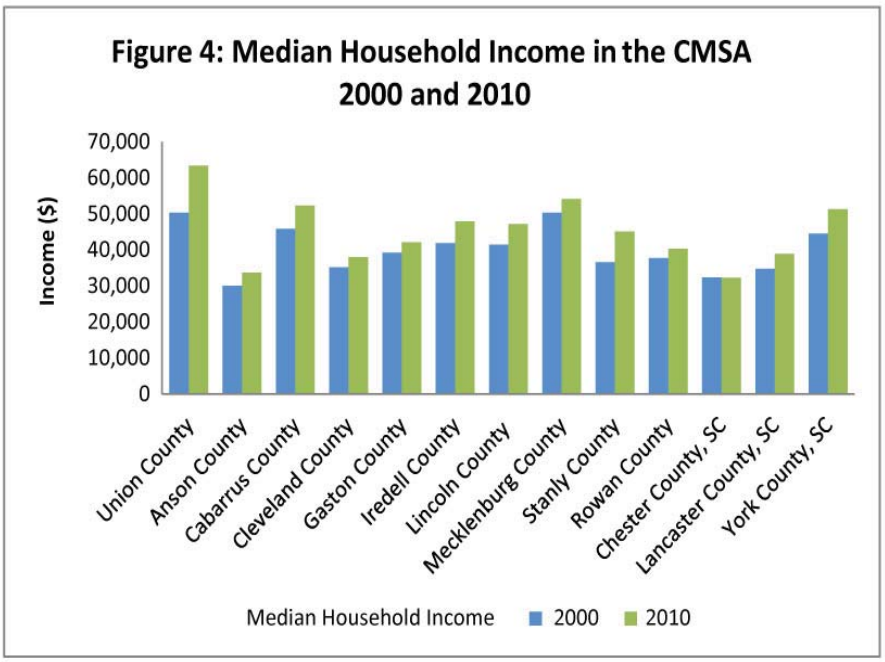
Union County Growth Factors

Population Density (per Sq Mi)



Note: Mecklenburg County Densities: 1,327.6 (2000) and 1,755.6 (2010) per square mile.
Source: US Census 2000 and 2010

Median Household Income



Source: American Community Survey 2008-2010, 3-Year Estimates, Table S2503 (Financial Characteristics)

Housing Characteristics for the CMSA

	Union County	Anson County	Cabarrus County	Cleveland County	Gaston County	Iredell County	Lincoln County	Mecklenburg County	Stanly County	Rowan County	Chester County, SC	Lancaster County, SC	York County, SC
% Owner-occupied	83.3	65.3	74.1	66.2	68.1	74.1	74.9	61.9	69.7	69.7	76.4	73.1	72.1
% Renter-occupied	16.7	34.7	25.9	33.8	31.9	25.9	25.1	38.1	30.3	30.3	23.6	26.9	27.9
Median Home Value ($)	203,200	81,700	172,200	104,800	124,500	168,200	156,700	190,900	124,000	128,700	85,800	129,400	164,700
% Single Family Detached Housing	84.9	68.2	76.6	67.5	75.0	73.0	67.9	60.3	74.9	67.5	68.5	75.0	68.1
Median Number of Rooms per Unit	6.4	5.3	5.7	5.3	5.3	5.7	5.6	5.6	5.5	5.4	5.5	5.6	5.7
Percentage of Units by Number of Bedrooms													
No bedroom	0.7	0.5	0.8	0.8	1.3	0.6	0.6	1.2	0.9	1.5	0.1	1.2	0.7
1 bedroom	2.6	5.0	4.5	4.8	5.7	3.7	2.5	10.9	5.2	3.8	4.5	3.0	5.7
2 bedrooms	14.4	30.4	24.4	31.8	30.9	24.4	27.5	25.1	27.5	31.7	32.6	27.5	24.5
3 bedrooms	49.7	52.3	47.1	52.4	47.3	50.3	53.0	39.1	54.4	48.1	48.1	52.9	48.6
4 bedrooms	22.6	10.5	17.7	8.7	12.3	16.6	12.9	19.1	9.5	11.9	11.2	12.7	16.1
5 or more bedrooms	10.0	1.4	5.5	1.5	2.5	4.3	3.5	4.5	2.7	3.0	3.5	2.7	4.3

School Quality (SAT Scores)

Average SAT Scores for County-Wide School Districts in the CMSA

School System	# Tested	% Tested	Math (M) Score	Critical Reading (CR) Score	Writing (W) Score	M+CR	M+CR+W
Anson County Schools	159	53.7	436	427	407	863	1270
Cabarrus County Schools	1169	65.3	522	497	483	1019	1502
Cleveland County Schools	589	58.6	500	470	451	970	1421
Gaston County Schools	1136	58.3	495	480	455	975	1430
Iredell-Statesville Schools	847	60.4	524	502	480	1026	1506
Lincoln County Schools	449	58.7	513	478	456	991	1447
Charlotte-Mecklenburg Schools	5240	68.5	507	495	480	1002	1482
Rowan-Salisbury Schools	676	51.9	495	474	453	969	1422
Stanly County Schools	339	57	495	465	442	960	1402
Union County Public Schools	1635	68.7	524	503	491	1027	1518
Chester, SC	93	27	491	451	453	942	1395
Lancaster, SC	399	54	454	440	423	894	1317

School Quality (Graduation Rates)

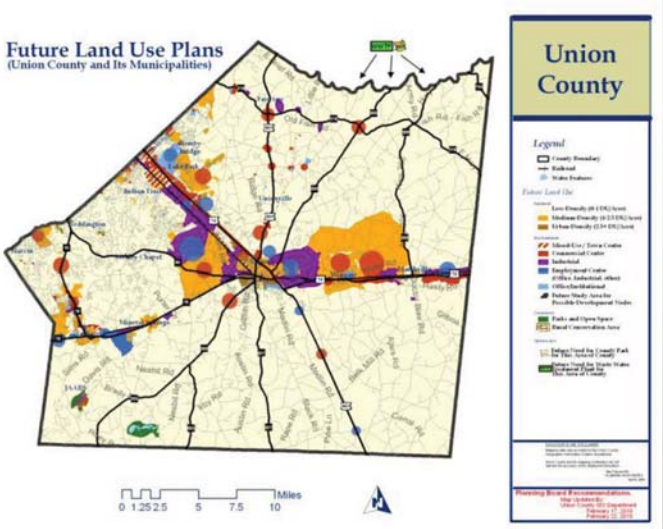
School System	Graduation Rate (%)
Anson County Schools	75.9
Cabarrus County Schools	84.1
Cleveland County Schools	73.2
Gaston County Schools	75.4
Iredell-Statesville Schools	85.1
Lincoln County Schools	81.6
Charlotte-Mecklenburg Schools	73.5
Rowan-Salisbury Schools	76.9
Stanly County Schools	77.9
Union County Public Schools	89.1
Chester, SC	73.1
Lancaster, SC	73.7
York 1	78.3
York 2 - Clover	77.3
York 3 - Rock Hill	73.5
York 4 - Fort Mill	91.2

Commute Times

	2010		2000	
	Mean Travel Time to Work	Difference from Regional Average	Mean Travel Time to Work	Difference from Regional Average
Anson County	-	-	27.5	
Cabarrus County	26.0	3.6%	27.0	3.4%
Cleveland County	-	-	23.5	-
Gaston County	25.0	-0.4%	24.6	-5.7%
Iredell County	24.2	-3.6%	24.5	-6.1%
Lincoln County	-	-	27.1	3.8%
Mecklenburg County	24.7	-1.6%	26.0	-0.4%
Rowan County	23.2	-7.6%	23.3	-10.7%
Stanly County	-	-	25.3	
Union County	27.8	10.8%	29.0	11.1%
Chester County	28.1	11.9%	27.8	6.5%
Lancaster County	27.9	11.1%	27.0	3.4%
York County	24.0	-4.4%	27.2	4.2%
Charlotte MSA	25.1		26.1	

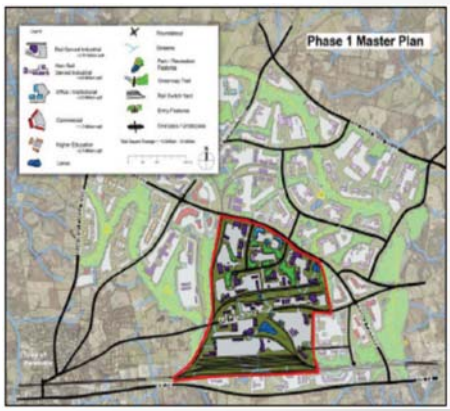
Example of Change: Eastern Union County

- New Union County Land Use Plan
- Explicitly assumes MC in projected land use
- Larger area of medium density housing
- Affects Build Scenario with higher levels of low and medium density residential development.



Example of No Change: Legacy Park

- **Interviewed Union County Partnership for Progress (UCPP), Union County Planning Director and CSX Staff**
- **Proposal is not incorporated into any local plans**
  - **Three localities have expressed official support for the project**
- **Vast majority of land is not zoned for use**
- **No financing plan for development**
- **Basic utility capacity needs are included in long range plans**
  - **No funding or plan for building utility infrastructure to site.**
- **CSX has indicated the site is good and is interested in continuing coordination**
  - **Not interested in pursing environmental study of the site**
  - **Do not see the market demand for an intermodal terminal at this time.**
- **Development is considered highly speculative by UCPP and Planning Staff**
- **Development of Intermodal Terminal by CSX is key to any significant development at the site**
- **No changes to either scenario warranted based on current information**



Schedule

- **Finalize analysis and development of Environmental Assessment**
  - **May 2013**
- **Conduct Public Hearings / Workshops**
  - **June 2013**
- **Finalize ROD***
  - **October 2013**

***If based on the studies, the FHWA determines that a supplemental EIS is not necessary, the FHWA shall proceed to a ROD.**

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

April 17, 2013

Regulatory Division

Action ID No. SAW-2009-0876
Monroe Bypass, Turnpike Authority/North Carolina Department of Transportation STIP No. R-2559 and R-3329, State Project No. 8.T690401

Mr. Terry Gibson. P.E.
NC Department of Transportation,
Division of Highways
1578 Mail Service Center
Raleigh, North Carolina 27699

Dear Mr. Gibson:

Please reference the Department of the Army (DA) permit issued to the North Carolina Turnpike Authority (NCTA) on April 15, 2011, for construction of approximately 20 miles of a four to six-lane controlled-access highway and service roads, the majority of which will be on a new location in Mecklenburg and Union Counties, North Carolina.

As you know the Southern Environmental Law Center (SELC) filed suit against the Federal Highway Administration (FHWA) and State of North Carolina, alleging that information provided in the Final Environmental Impact Statement (FEIS) was inadequate and incomplete, thereby invalidating FHWA's National Environmental Policy Act (NEPA) documentation and the NC Division of Water Quality's Section 401 Water Quality Certification issued for the project. A final decision on the federal complaint was rendered on October 25, 2011, by Chief, United States District Court Judge James Dever which denied the plaintiff's motion for summary judgment. In the case against the NC Department of Transportation (NC DOT) and NCTA, the court ruled in favor of NC DOT and NCTA by finding that their analysis complied with NEPA. The SELC immediately appealed this decision to the 4th Circuit Court of Appeals, which on May 3, 2012, vacated and remanded the lower court ruling by finding that NC DOT and FHWA "did violate NEPA by failing to disclose critical assumptions underlying their decision to build the road and instead provided the public with incorrect information."

By letter dated May 21, 2012, at the request of NC DOT, the Wilmington District, U.S. Army, Corps of Engineers, (District) suspended the 404 authorization for the Monroe Bypass pursuant to our regulations found at 33 CFR 325.7 (c). The NC Division of Water Quality withdrew the 401 Certification for the Monroe Bypass on June 8, 2012.

The District understands that you are presently reevaluating the data as part of the NEPA process associated with this project to make sure that you disclose critical assumptions underlying your decision to build the road and provide the public with detailed and accurate information. However, at this point the District believes that it is necessary to revoke your permit pursuant to 33 CFR 325.7 (d). When the permit was initially suspended, it was anticipated that the reevaluation would be limited and quickly finished. However, NC DOT has conducted a reevaluation that is more thorough than anticipated, and the process is not likely to be concluded until an in-determinant time in the future. As a decision cannot be made on the DA Permit until your reevaluation is concluded, we believe that it is not in the public interest to delay a decision until an in-determinant time in the future. Once your reevaluation is completed you may submit the updated information in a new application, and we will consider it accordingly. Please be aware that since your permit is revoked, no work in waters and wetlands should be under-taken.

Please feel free to coordinate with us as you continue your process. Questions or comments may be addressed to Mr. Henry Wicker at the Wilmington Regulatory Division, telephone number (910) 251-4930.

Sincerely,

Steven A. Baker
Colonel, U. S. Army
District Commander

Copies Furnished:

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

Mr. Christopher A. Militscher, REM, CHMM
USEPA Region 4 NEPA Program Office
61 Forsyth Street, SW
Atlanta, GA 30303

Ms. Marella Buncick
US Fish and Wildlife Service
160 Zillicoa St.
Asheville, NC 28801

Ms. Amy Chapman
Transportation Permitting Supervisor
NCDWQ
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Raleigh, NC 27699-1650

Mr. Alan Johnson
NCDWQ, Transportation Permitting
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Ms. Jennifer Harris
NCDOT, Project Development
1548 Mail Service Center
Raleigh, NC 27699

Ms. Marla Chambers
Western NCDOT Permit Coordinator
North Carolina Wildlife Resources Commission
12275 Swift Road
Oakboro, NC 28129

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APPENDIX C-2

USFWS COORDINATION

Document	Date	Page
USFWS Endangered Species Concurrence Letter	07/29/10	C2-1
Letter from USFWS re: Request for Clarification Regarding Potential Impacts to Federally Listed Species	08/18/11	C2-5
Letter from USFWS re: Proposed Meeting to Discuss Administrative Record in Pending Litigation	08/23/11	C2-8
Letter from USFWS re: Recommendation to Reinstate Consultation	12/20/12	C2-11
Meeting Summary from 7/10/13 meeting with USFWS	07/10/13	C2-14
Letter from USFWS re: Comments on Draft Technical Report	09/30/13	C2-43
Letter from NCDOT to USFWS re: Re-initiation of Section 7 Informal Consultation	10/23/13	C2-47
Biological Assessment	10/23/13	C2-49
Draft Technical Report on Direct, Indirect, and Cumulative Impacts to Federally Listed Species (Response to FWS Letter dated December 20, 2012)	10/23/13	C2-137
Responses to FWS Letter Dated September 30, 2013	10/23/13	C2-255

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United States Department of the Interior

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

AUG 2 2010

July 29, 2010

Mr. Steven D. DeWitt, P.E.
North Carolina Turnpike Authority
1578 Mail Service Center
Raleigh, North Carolina 27699-1578

Dear Mr. DeWitt:

Subject: Endangered Species Concurrence and Comments on the Final Environmental Impact Statement for the Proposed Monroe Connector/Bypass Project, Mecklenburg and Union Counties, North Carolina, TIP Nos. R-3329 and R-2559

We have reviewed the Biological Assessment (BA) and your concurrence request regarding potential impacts to federally listed species for the subject project and the final Environmental Impact Statement (EIS). We provide the following comments in accordance with the provisions of section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

The North Carolina Turnpike Authority proposes to construct a new-location, controlled-access toll facility from I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, about 20 miles in length. The project is known as the Monroe Connector/ Bypass, and the recommended preferred alternative (RPA) roughly parallels existing US 74 to the north, connecting to existing US 74 on both the eastern and western termini.

We have been involved in the development of this project and have provided extensive comments in writing and through participation in agency coordination meetings. Our concerns for the implementation of the project have included impacts to streams and wetlands and wildlife habitat and, in particular, the potential for indirect impacts to the Goose and Sixmile Creek watersheds, both of which are occupied by the federally endangered Carolina heelsplitter (*Lasmigona decorata*) and are designated critical habitat for the heelsplitter in Goose and Duck Creeks. The RPA has no direct impacts to the Goose or Sixmile Creek watersheds or federally listed species. The following provides our concurrence with your conclusions for federally listed species for the RPA.

Carolina heelsplitter (*Lasmigona decorata*)

We have reviewed the BA and your conclusions regarding the impacts of this project on the federally endangered Carolina heelsplitter and its designated critical habitat in the Goose Creek watershed. In addition, we have carefully reviewed the source documents for the BA, including the draft and final EISs, the Qualitative and Quantitative Indirect and Cumulative Effects Assessments, and the Indirect and Cumulative Effects Water Quality Analysis. According to the information provided, levels of impervious surface and water quality parameters were the primary indirect effects analyzed. Current levels of imperviousness in the Goose and Sixmile Creek watersheds are at 13 percent and 25 percent, respectively, and are expected to increase to 17 percent and 30 percent in the 2030 no-build scenario. These changes are independent of the project, which shows little change in the levels of imperviousness between the build and no-build scenarios. Given that aquatic habitat degradation begins at levels of 6 percent imperviousness, these watersheds are already experiencing negative changes affecting the long-term viability of the heelsplitter in both Goose and Sixmile Creeks. Water quality parameters modeled for these watersheds show similar trends for the build and no-build scenarios.

Although the analysis concluded that the effects to the Carolina heelsplitter from the proposed project are very similar to the no-build scenario, it acknowledged that there is a level of uncertainty associated with the conclusions because of the assumptions used in the analysis of effects. In order to address this uncertainty, you have agreed to fund conservation in the Flat Creek watershed in South Carolina to help offset any potential but unpredictable impacts to the species. In addition, you have agreed to fund the continued operation of the U.S. Geological Survey's stream gauge on Goose Creek for 5 years. Based on the analysis, the information provided, and the proposed conservation, we concur that the proposed project is "not likely to adversely affect" the Carolina heelsplitter in the project area. However, the Carolina heelsplitter is one of the most critically endangered species in the Southeastern United States and is rapidly declining throughout its range, primarily from the effects of increased impervious surface area as a result of urbanization. Without significant conservation efforts this species is likely to become extinct in the near future. Given the degree of imperilment of the Carolina heelsplitter and in accordance with section 7(a)(1) of the Act, we encourage you to consider implementing additional measures to help further the purposes of the Act, such as conservation and restoration within the Goose and Duck Creek watershed and/or the purchase of additional land or credits in the Flat Creek watershed.

Schweinitz's sunflower (*Helianthus schweinitzii*)

We have reviewed the BA and your conclusions regarding the impacts of this project on the federally endangered Schweinitz's sunflower (*Helianthus schweinitzii*). Multiple surveys of the proposed project corridors located no sunflowers in the corridors, but there are two occurrences of the Schweinitz's sunflower in the vicinity of the RPA. The plants occur near Interchange 3 (Indian Trail/Fairview Road), and portions of both occurrences are in a Union Power Utility right-of-way. One group of plants is a known Element Occurrence (EO) 77; the other group, newly found during surveys, currently is named ESI 1. There will be no direct impacts to these plants from project construction. However, given the proximity of the sunflowers to the project, there were concerns about indirect impacts. In order to avoid and minimize impacts to the plants

at this location, the area will be fenced during construction. In addition, to prevent negative impacts after construction, you have agreed to manage EO 77 and ESI 1 by posting "No Mow" signs at each occurrence, managing the plants using the "NCDOT Roadside Vegetation Management Guidelines in Marked Areas," and working with Union Power to include these sites in their Schweinitz's Sunflower Restricted Sites Plan. Based on the negative survey data in the project right-of-way, the fencing to protect the plants close to the project during construction, and the proposed post-construction measures, we concur that the proposed project is "not likely to adversely affect" the Schweinitz's sunflower in the project area.

Based on the information provided and the conservation measures proposed for the Carolina heelsplitter and the Schweinitz's sunflower, we believe the requirements under section 7(c) of the Act are fulfilled. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

Comments on the Final EIS

Our letter of June 12, 2009, identifies a number of concerns regarding the draft EIS. We continue to be concerned about the level of impacts to streams and wetlands and the impacts to terrestrial wildlife habitat. As indicated in the table on page 2-33 of the final EIS, the impacts to streams (perennial and intermittent combined) are still over 23,000 linear feet, and there are over 8 acres of impacts to wetlands. Even with further minimization, the impacts to streams are likely to remain at about 4 miles of streams directly impacted by the project. Every opportunity to further minimize these impacts should be made; and, where possible and feasible, mitigation for the unavoidable impacts should be on or near the site. Impacts to terrestrial wildlife habitat, particularly fragmentation as a direct impact of the project, have not been addressed. There still is no analysis of patch size and the degree to which the RPA fragments those patches. If wildlife passage is needed on parts of the project, such an analysis is a tool to appropriately identify and design the type of structures needed to conserve wildlife and protect the traveling public.

We appreciate the opportunity to provide these comments and will continue to participate in the planning process for this project. If you have any questions, please contact Ms. Marella Buncick of our staff at 828/258-3939, Ext. 237. In any future correspondence concerning this project, please reference our Log Number 4-2-07-132.

Sincerely,

Brian P. Cole

Brian P. Cole
Field Supervisor

cc:

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

Mr. Chris Militscher, U.S. Environmental Protection Agency, 1313 Alderman Circle, Raleigh, NC 27603

Mr. Brian Wrenn, North Carolina Division of Water Quality, Central Office, 2321 Crabtree Boulevard, Suite 250, Raleigh, NC 27604

Ms. Marla J. Chambers, Western NCDOT Permit Coordinator, North Carolina Wildlife Resources Commission, 12275 Swift Road, Oakboro, NC 28129

Ms. Liz Hair, Asheville Regulatory Field Office, U.S. Army Corps of Engineers, 151 Patton Avenue, Room 208, Asheville, NC 28801-5006

United States Department of the Interior

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

August 18, 2011

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

Dear Mr. Sullivan:

Subject: Request for Clarification Regarding Potential Impacts to Federally Listed Species for the Proposed Monroe Connector/Bypass Project, Mecklenburg and Union Counties, North Carolina, TIP Nos. R-3329 and R-2559

In our letter of July 29, 2010, in accordance with the provisions of section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act), we concurred with your determination of "Not Likely to Adversely Affect" regarding construction of the subject project and associated impacts to the federally endangered Carolina heelsplitter (*Lasmigona decorata*) and its designated critical habitat. In that letter, we also stated the following:

> However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

We are concerned that the first criterion (new information) has been triggered for this project, and we are requesting further information and clarification.

We have been involved with proposals to construct a bypass of Monroe for more than a decade, and we have consistently stated our concerns about impacts to the Carolina heelsplitter and its designated critical habitat from the indirect and cumulative effects of induced growth in the Goose and Duck Creek watersheds. In past analyses for the North Carolina Department of Transportation (NCDOT) and, most recently, the North Carolina Turnpike Authority (NCTA), we provided comments and suggestions regarding the biological parameters we thought

important to determine the project's potential impacts. Our concurrence with your determination of "Not Likely to Adversely Affect" for the Carolina heelsplitter was based on the analyses and conclusions you generated and provided to us in your biological assessment. Your data showing only minor changes in impervious surface and water quality degradation between the build and no-build scenarios were critical to our concurrence.

In the fall of 2010, questions arose regarding the baseline information for your analysis of indirect and cumulative impacts and whether or not the Monroe Bypass and Connector facility was included in the no-build scenario. We repeatedly asked for clarification from both your staff and the NCTA regarding the model inputs and assumptions, and we were assured that the project was not included in the baseline for analysis of the no-build scenario. Further questioning of the local planners appeared to confirm the assertions by the NCTA staff.

On August 1, 2011, we received electronic copies of briefs from the Southern Environmental Law Center that were submitted to the U.S. District Court by the U.S. Attorney on behalf of the Federal Highway Administration (FHWA). In the June 30, 2011, "Memo of Law in Support of Defendant's Motion . . . ," pages 33-34 state: "To the extent one statement regarding the content of the no-build model is incorrect . . . ." Thus, it appears that the FHWA acknowledges the Monroe Bypass and Connector project was included in the basis for the no-build scenario. The State's June 30, 2011, brief to the court (on page 12) states: "The project was in MUMPO's long-range transportation plan roadway network," and further goes on to explain that although the project was included in the network, it is not an important factor. In addition, this same brief (on page 29) states: "Defendants took extensive steps to ensure the project did not unduly influence . . . ." We believe these statements contradict statements that were made to us earlier regarding the project's inclusion in the no-build scenario and thus require clarification.

As we stated previously, your data showing minimal differences in key factors between the background of growth in the area and growth induced from your project was critical to our concurrence. We believe that including the project and its land-use impacts in the no-build scenario confounds any attempt to compare growth attributable to the project to the background development of the area. We request detailed answers to the following questions:

1. Is the project a component of the no-build scenario presented as the baseline for your analysis?

2. If the project is included, how was it determined that it is not an important factor as stated in the court documents?

3. Can you remove the project and its influence from the no-build scenario to make a true comparison between the build and no-build scenarios?

Our concurrence with your "Not Likely to Adversely Affect" determination was based on the analysis you provided. We do not understand how a fair comparison of impacts can be made between the build and no-build scenarios without removing the project from the baseline and reanalyzing project impacts. Upon submission of a new analysis, we will review it and your determination of effect and provide our conclusion.

If you have any questions about this request, please contact Ms. Marella Buncick of our staff at 828/258-3939, Ext. 237. We would appreciate being informed of your intent regarding this request. In any future correspondence concerning this project, please reference our Log Number 4-2-07-132.

Sincerely,

Brian P. Cole

Brian P. Cole
Field Supervisor

Electronic copy to:

Ms. Liz Hair, Asheville Regulatory Field Office, U.S. Army Corps of Engineers, 151 Patton Avenue, Room 208, Asheville, NC 28801-5006

Mr. Chris Militscher, U.S. Environmental Protection Agency, 1313 Alderman Circle, Raleigh, NC 27603

Ms. Marla J. Chambers, Western NCDOT Permit Coordinator, North Carolina Wildlife Resources Commission, 12275 Swift Road, Oakboro, NC 28129

Mr. Brian Wrenn, North Carolina Division of Water Quality, Central Office, 2321 Crabtree Boulevard, Suite 250, Raleigh, NC 27604

Ms. Jennifer H. Harris, P.E., Staff Engineer, North Carolina Turnpike Authority, 1578 Mail Service Center, Raleigh, NC 27699-1578

Mr. Rudy Renfer, U.S. Department of Justice, Raleigh, NC

Mr. Jeff Weller, Ecological Services Division, U.S. Fish and Wildlife Service, Atlanta, GA

United States Department of the Interior

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

August 23, 2011

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

Dear Mr. Sullivan:

Subject: Proposed Meeting to Discuss Administrative Record in Pending Litigation – North Carolina Wildlife Federation v. North Carolina Department of Transportation, C.A. No. 5:10-CV-476-D, U.S.D.C., E.D.N.C

In our August 18, 2011, letter to you, we requested additional information about the analysis of impacts by the Federal Highway Administration (FHWA) and the North Carolina Turnpike Authority concerning the proposed Monroe Connector/Bypass Project (Project) on which we issued an Endangered Species Act Not Likely to Adversely Affect (NLTAA) concurrence last year. It has come to our attention that our letter raised numerous concerns within the FHWA and the North Carolina Department of Transportation. We recognize that our letter referenced legal issues outside our primary area of expertise. We referred to legal briefs without knowledge of the entire administrative record before the Court in the above-referenced litigation and without legal counsel. We acknowledge that our letter should not have referenced these documents, and we did not intend to imply that we have taken any action or plan to take any action based on our limited review of the briefs. We would, however, appreciate the opportunity to speak with you about the information available.

We are concerned about any potential for miscommunication between our agencies. As I stated in my August 18, 2011, phone call to you informing you about the letter, I am willing and would like to meet with you to discuss the information considered regarding the Project. To that end, I suggest that we meet at the earliest opportunity in Atlanta. A representative from our Regional Office management will be at the meeting.

Please let me know when you would be available for such a meeting and if you have questions. We would welcome your input on an agenda for this meeting. I can be reached 828/258-3939, Ext. 223.

Sincerely,

Brian P. Cole

Brian P. Cole
Field Supervisor

Table C-1: US Fish and Wildlife Service

Document: USFWS Letter dated August 23, 2011

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Protected Species	USFWS sent a letter to FHWA requesting an opportunity to discuss the information available about the project in light of the legal briefs provided during pending litigation on the project.	As documented in **Section 4.4.5** of the Draft Supplemental Final EIS, NCDOT and FHWA have been coordinating with USFWS throughout the project development process. On October 23, 2013, NCDOT submitted a letter to USFWS requesting re-initiation of Section 7 informal consultation for the project, along with a new *Biological Assessment* (October 2013) and the *Technical Report on Direct, Indirect, and Cumulative Impacts to Federally Listed Species* (Michael Baker Engineering, Inc., October 2013). The biological conclusions presented in the October 2013 Biological Assessment are the same as those presented in the original May 2010 Biological Assessment. NCDOT and FHWA are currently working with USFWS to reach concurrence on the biological conclusions presented in the new Biological Assessment. USFWS consultation will be complete prior to issuance of the Combined Final Supplemental Final EIS/ROD.

United States Department of the Interior

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

December 20, 2012

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

Dear Mr. Sullivan:

Subject: Recommendation to Reinitiate Consultation Regarding Potential Impacts to Federally Listed Species for the Proposed Monroe Connector/Bypass Project, Mecklenburg and Union Counties, North Carolina, TIP Nos. R-3329 and R-2559

In a letter dated July 29, 2010, in accordance with the provisions of section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act), the U.S. Fish and Wildlife Service (Service) concurred with Federal Highway Administration's (FHWA) determination of "Not Likely to Adversely Affect" regarding construction of the subject project and associated impacts to federally listed species, including the endangered Carolina heelsplitter and its designated critical habitat and the endangered Schweinitz's sunflower. This determination was based on the Biological Assessment (BA) prepared by the FHWA and the North Carolina Turnpike Authority/ Department of Transportation (NCDOT) (May 25, 2010) and submitted for our review (received complete July 26, 2010). The Record of Decision (ROD) for the project was issued on September 1, 2010.

Since our July 29, 2010, concurrence letter, there have been a number of significant events related to this project. Most notably, a series of legal actions and decisions, beginning with a 2011 lawsuit filed on behalf of several environmental groups citing a number of deficiencies in the National Environmental Policy Act (NEPA) analysis and documentation for the project. In October 2011, the United States District Court for the Eastern District of North Carolina ruled in favor of the transportation agencies (FHWA and NCDOT). However, the District Court decision was appealed, and on May 3, 2012, the 4th Circuit Court of Appeals ruled against the transportation agencies. Subsequent to that decision, the FHWA rescinded its ROD for the

project Environmental Impact Statement and began addressing the elements of concern stated in the appellate court opinion document. Work on the project was halted in May 2012.

Impacts to Carolina Heelsplitter

While there are no direct impacts to the Carolina heelsplitter from constructing the bypass of Monroe as designed, the Service is concerned about the indirect effects on the Carolina heelsplitter and its designated critical habitat from the indirect and cumulative effects (ICE) of induced growth in the Goose and Sixmile Creek watersheds. The original BA relied heavily on the ICE analysis, which disclosed the impacts of the project and compared those with a "no-build" scenario. Prior to concurring with the FHWA's determination of effects, we asked for clarification regarding whether the project was included in the "no-build" scenario. We were assured that it was not. Documents submitted initially to the District Court stated that the project was included as part of the "no-build" scenario but that its influence had been factored out or was not significant for the Goose and Sixmile Creek watersheds and the Carolina heelsplitter. According to the appellate court opinion, one of the primary areas of concern was the inclusion of the project in data used to develop the "no-build" scenario.

In order to address the concerns of the appellate court, the NCDOT has chosen to rerun models specifically excluding the project from the "no-build" baseline and reanalyze the resulting data. Since June 2012, we have participated in monthly meetings regarding the project and have provided comments about various aspects of the revised modeling process. Specifically, we have explained that data generated for the entire study must also be scalable to the Goose and Sixmile Creek watersheds in such a way that it is clear which changes in these watersheds are attributable to the project and what the impacts of these changes are to the Carolina heelsplitter and its designated critical habitat.

Given the confusion regarding the inputs to various models, the interaction of those models, the data produced, and the changes in conditions in the Goose and Sixmile Creek watersheds since data were gathered in 2009, we recommend that the FHWA prepare a new BA or substantially revise the 2010 BA and reinitiate consultation. The new or revised document should include a thorough explanation of the process and analysis of the data resulting from the rerun of the model for the "no-build" and the "build" scenarios specific to the Goose and Sixmile Creek watersheds.

Impacts to Schweinitz's Sunflower

The Service's concurrence for impacts to the Schweinitz's sunflower also was included in the July 29, 2010, letter. Since that time, more refined project design information regarding utility relocations and other activities outside of the previously surveyed corridor revealed additional areas of suitable habitat for the Schweinitz's sunflower that could be affected by project construction. In project meetings in the spring of 2012, we requested that surveys be conducted and the results documented. These data also should be included in a new or revised BA.

We are committed to working with the FHWA to ensure it remains in compliance with the Act and NEPA. Reinitiating consultation at this stage of the project will help ensure unnecessary delays do

not occur later as the project planning process nears completion. If you have questions or comments regarding our request, please contact me at (828) 258-3939, Ext. 223 or Marella Buncick at (828) 258-3939, Ext. 237.

Sincerely yours,

Brian P. Cole

Brian P. Cole
Field Supervisor

Electronic copy to:
Ms. Michelle Everson, U.S. Fish and Wildlife Service, Atlanta, GA
Ms. Catherine Liller, U.S. Fish and Wildlife Service, Lakewood, CO
Mr. Chris Militscher, Environmental Protection Agency, Atlanta, GA
Ms. Marla Chambers, North Carolina Wildlife Resources Commission, Oakboro, NC
Ms. Liz Hair, U.S. Army Corps of Engineers, Asheville, NC
Ms. Amy Euliss, North Carolina Division of Water Quality, Raleigh, NC
Ms. Jennifer Harris, North Carolina Turnpike Authority, Raleigh, NC

MEETING INFORMATION	
Meeting Description:	The Monroe Connector/Bypass Project (Connector/Bypass)
Meeting Purpose:	Meeting with Fish and Wildlife Service representatives to discuss the project's current status and findings from work completed on the Indirect and Cumulative Effects Analysis.
Location, Date, Time:	FWS Regional Office, Atlanta, Georgia, July 10, 2013, 10:00

ATTENDEES			
John Sullivan (FHWA)	George Hoops (FHWA)	Leopoldo Minanda (FWS)	Jack Arnold (FWS)*
Marella Buncick (FWS)*	Mark Cantrell (FWS)*	Michelle Eversen (FWS)	Janet Mizzi(FWS)
Jennifer Harris (NCDOT)*	Carl Gibilaro (Atkins)*	Tim Savidge (Catena)*	Elizabeth Scherrer (Atkins)*
Scudder Wagg (M. Baker)*			

***PARTICIPATED IN MEETING VIA PHONE**

DECISIONS AND ACTION ITEMS:

Provide the individuals from Fish and Wildlife Service (FWS) with a summary of the results of our Draft ICE analysis and discuss next steps for their review and comment on the ICE report and updated Section 7 information. The powerpoint presentation and handouts are attached.

MEETING HIGHLIGHTS:

FHWA intends to issue a Draft Supplemental Final Environmental Impact Statement (FEIS) followed by the possibility of a combined Final Supplemental FEIS and Record of Decision (ROD).

Mr. Savidge asked what the Vacant Property input represented in the Land Use Allocation Model (LUSAM) model presented in Slide 8. Mr. Wagg responded that it represented undeveloped and redeveloped land and added that it was only used for properties in Mecklenberg County.

Ms. Eversen asked how the employment centers were chosen by Paul Smith. Mr. Wagg responded that Mr. Smith chose to include local employment centers in his model to forecast Mecklenburg-Union Metropolitan Planning Organization (MUMPO) growth and that at the time, any number of definitions could have been chosen to represent this input in the model.

Ms. Eversen asked if the project provided travel time savings. Mr. Wagg responded that Mr. Smith's model will minimize travel time benefits due to the employment centers he chose. At this point, Slide 16 was shown to the group. This slide showed only minor changes to travel time scores with and without the project under Mr. Smith's methodology. Afterwards, Mr. Wagg explained that this should not be confused with the travel time benefit provided by the project based on NCDOT's analysis to regional employment centers shown in Slide 33.

Ms. Mizzi asked that if there are no changes in impervious surfaces, did we then assumed there is no change in water quality? Mr. Wagg explained that once the Socio-Economic (SE) data was reallocated for the build condition, through the land-use analysis, the changes in impervious surface throughout the study area were identified. Overall, there was little difference in impervious surface change throughout the study area and no change in impervious surface in the Goose or Sixmile Creek watersheds as shown on Slide 38.

Upon Mr. Savidge's species update for the Carolina Heelsplitter as shown on Slides 40 & 41 and the lack of changes in impervious surface previously discussed, Ms. Mizzi asked why we did not consider changing the conclusion to *No Effect* for this species. Mr. Savidge responded that it was considered, but due to the proximity of the project (approximately 1.5 miles), and the inherent level of uncertainty with land forecast models, it was more appropriate to maintain the *May Effect Not Likely to Adversely Effect* determination. Ms. Eversen then asked if Mr. Savidge believed that this was being conservative. Mr. Sullivan responded that it was and added that there are several factors that were included in the analysis that were also conservative, including the proposed roadway being modeled as a free facility. By assuming a free facility (non-toll), the impacts may be greater than those of a tolled facility.

Ms. Scherrer next provided a plant survey and effects update for the Schweinitz's Sunflower, Michaux's Sumac, and Smooth Coneflower in addition to confirming that the previous effects determination remains valid as shown on Slides 42 thru 44. Ms. Mizzi asked how Ms. Scherrer believed that the effects determination of *Not Likely to Adversely Effect* can remain valid when Ms. Scherrer described a 4% decrease in the Schweinitz's potential habitat. Ms. Scherrer explained that the change described was a rough approximation of *potential* habitat reduction from the indirect effects associated with the project based on the limited land use data available. Ms. Scherrer added that the species is quick to colonize newly disturbed habitats and she and others discussed the lack of impacts to occupied habitat and the fact that the 4% decrease of potential habitat expected with the project is a very small amount of the potential habitat in the action area.

Ms. Buncick stated that additional water services are now allowable in Goose Creek, whereas under the previous Indirect and Cumulative Effects (ICE) analysis, they were prohibited and this impediment to growth should be included in the ICE analysis. Mr. Wagg noted that the ICE analysis did not consider the inter-basin transfer moratorium a limitation on development in the long term and therefore the recent change in rules would not affect the methodology, results or conclusions of the ICE analysis. Ms. Buncick than asked how far north along US 601 from the new interchange with the project would development occur due to this project. Mr. Wagg responded that growth is expected to occur close to the interchange (within one mile) in the Stewarts Creek watershed and no change in growth is expected to occur along US 601within the Goose Creek Watershed. Then Ms. Buncick asked if US 601 were widened, would growth associated with the project occur within the Goose Creek watershed? Mr. Wagg responded that the potential for US 601 being widened is low and that he believes that there is neither induced growth nor potential for development or traffic increase in Goose Creek due to this project and it was agreed that NCDOT would include information regarding this issue.

Ms. Harris described the schedule moving forward with the approval of the Draft Supplemental FEIS occurring in July or August followed by Public Involvement. Thereafter, we are currently considering combining the Final SFEIS and ROD into one document and completing it by the end of the year.

Mr. Sullivan sought to clarify what remained to be completed towards updating our consultation with the FWS. Ms. Buncick recommended that an updated Biological Assessment (BA) be submitted. Ms. Harris asked if that would require a new concurrence. Ms. Mizzi replied that it would. Mr. Sullivan had a differing opinion on the length of time a concurrence is valid, as long as there is no information pertaining to impacts to the species that were not previously considered. Mr. Sullivan asked if new mitigation would be required and noted that, based on FWS's previous concurrence, mitigation was already paid for the conservation of the Carolina Heelsplitter in South Carolina. Ms. Buncick acknowledged that mitigation was previously paid for by NCDOT.

Ms. Buncick than asked if NCDOT planned on completing an update to the ICE – Water Quality Analysis. Mr. Sullivan described the limited changes that have been identified and presented during the meeting, which led the team to believe that a new water quality analysis would not be necessary. Mr. Cantrell responded that he would prefer to see a new BA and water quality analysis.

Mr. Cantrell asked about the status of the Savannah Lilliput within the action area streams, as this species could become listed during the life of the project. Mr. Savidge indicated that updated mussel surveys were conducted in 2012, and results were similar to 2009, and the Savannah Lilliput still persists in South Fork Crooked Creek, and is most concentrated within the proposed crossing area of the creek.

Ms. Buncick then stated that she believed that there is new information and that the project has changed. Mr. Sullivan responded that the project has not changed and that the new data has resulted in the same conclusion as previously described. Ms. Buncick provided no examples of changes that would trigger the need to develop a new BA or water quality analysis. Ms. Eversen then asked if Mr. Sullivan was only looking to supplement the existing documentation and he and Ms. Harris confirmed this approach. Mr. Minanda and Ms. Mizzi indicated that an alternate approach instead of a new BA may be sufficient based on the information presented to the FWS that FHWA and NCDOT would be able to respond to the FWS's last letter and include any updated information along with an update to the effects determination. They also recommended that the team work with Ms. Buncick to identify what she will need as part of this documentation. Afterwards, FWS will respond to the updated request for concurrence in the effects determinations. Ms. Buncick indicated that the alternate approach to an updated BA may be possible as long as the questions raised in the letter were addressed. Ms. Buncick recommended that the request for concurrence include updated graphics to the original BA specific to Goose and Sixmile Creek in addition to updates to the BA for new surveys and analyses. Ms. Harris stated that she would send the updated mussel survey and plant survey reports (which were e-mailed before the conference call was completed). Ms. Buncick also reaffirmed that the FWS concurrence will only be good for approximately six months. Then Ms. Buncick stated that she would recommend that the letter include that "original conclusions not changed based on new information".

Monroe Connector/Bypass

Indirect and Cumulative Impact Analysis Update

July 2013

Outline of Today's Discussion

1. Introductions
2. Project Status
3. Indirect and Cumulative Effect Analysis
4. Endangered Species
5. Conclusion
6. Open Discussion

2

Monroe Connector/Bypass Project Status

We are preparing Draft Supplemental FEIS to assess changes:

- Traffic
- Alternatives
- Land Use

3

ICE Significant Issues?

We determined, after consulting with resource agencies and the public, that we must evaluate the following issues through quantitative analysis.

- Land Use Changes, then effect on
- Water Quality
- Carolina Heelsplitter and its critical habitat

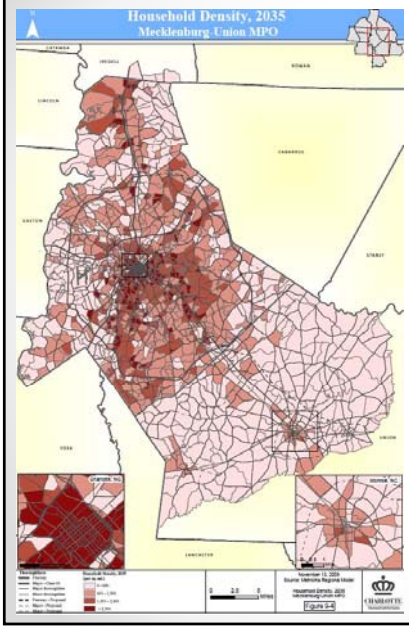
4

How Did We Evaluate Land Use Changes?

- We reviewed MUMPO's land use models to evaluate land use changes without the project
- We reviewed other research on Union County land use forecasts
- We evaluated the induced growth effect of the project

5

MUMPO 2035 LRTP



The 2035 LRTP forecasts less than one household/acre in most TAZs adjacent to the Monroe Connector/Bypass

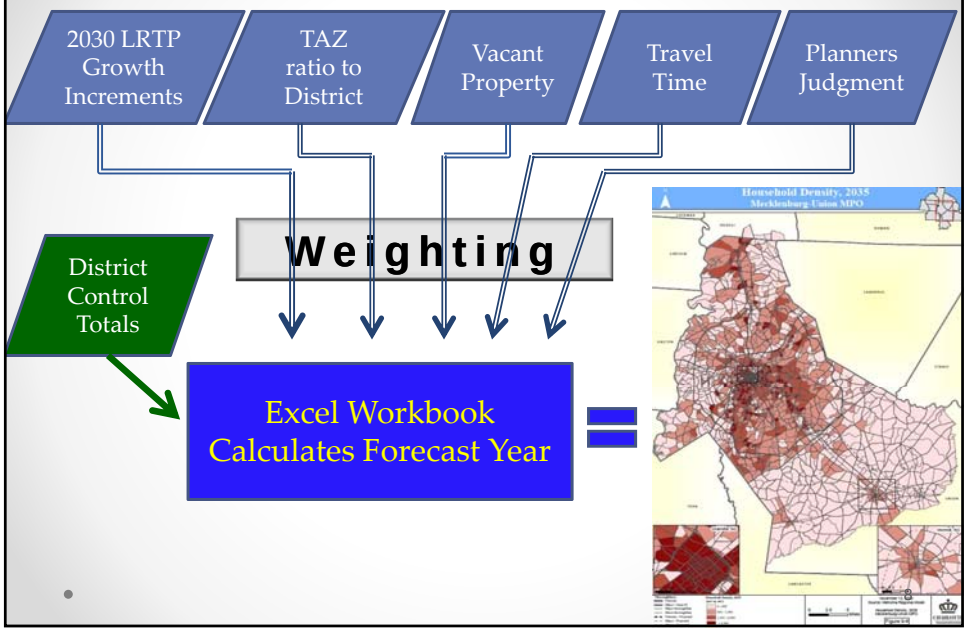
6

How would MUMPO's Forecasts Change without the Monroe Connector/Bypass?

We found that the MUMPO's 2035 LRTP socioeconomic forecasts for household, population, and employment in Union County **would not** change if the Monroe Connector/Bypass was not included in the socioeconomic allocation models.

7

2035 LRTP Land Use Allocation Model (LUSAM)



Weighting Used in LUSAM for Union Co.

Input	Forecast Year 2015	2025	2035
2030 LRTP Growth Increments	100	100	40
TAZ Ratio to District Control	0	0	60
TAZ Vacant Land	0	0	0
Travel Time to TAZ 10010	0	0	0
Planner Judgment	0	0	0

9

Does the Project Affect MUMPO's Land Use Model Calculations for Union County?

1. Based on the weighting, the project can't influence the following inputs
   - Travel time to TAZ 10010
   - Planner judgment
2. We need to evaluate whether the project influences the change over time from the 2030 LRTP population projections and employment allocations (Mr. Paul Smith)

10

LUSAM Change Factor

LUSAM calculations for the 2035 horizon years used the difference between forecasts for the 2030 LRTP horizons as shown in the table:

2035 LTRP Base Year	2035 LRTP Forecast Year	Change Factor Δ between 2030 LRTP Horizon Years
2005	2015	2010 & 2020
2015	2025	2020 & 2030
2025	2035	2020 & 2030

11

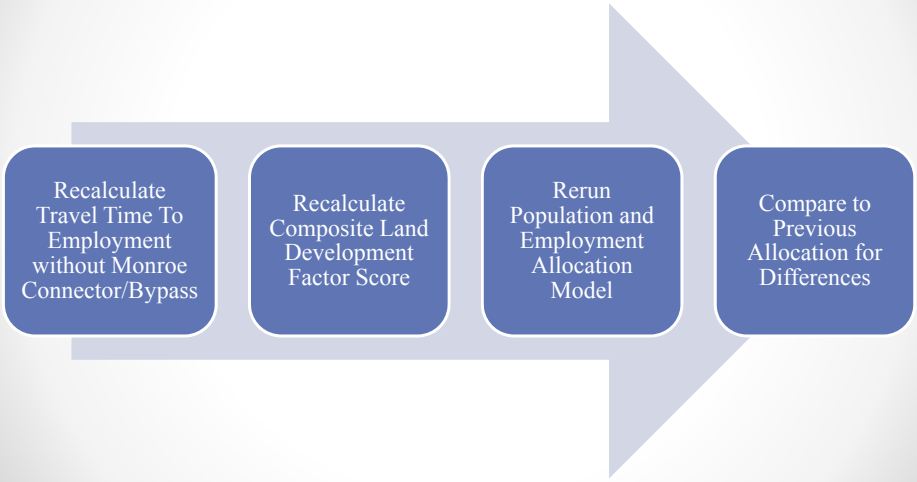
The 2030 LRTP Population Projections and Employment Allocation Model for Union Co.

Factor	Weight		
	2010	2020	2030
Developable land	3	3	3
Travel time to employment	3	3	3
Water	2	2	2
Sewer	2	2	2
Redevelopable	2	3	3
Population Change	3	1	Not used
Expert Panel	2	2	2
Growth Policy	1	1	1

- Developable land also a model constraint

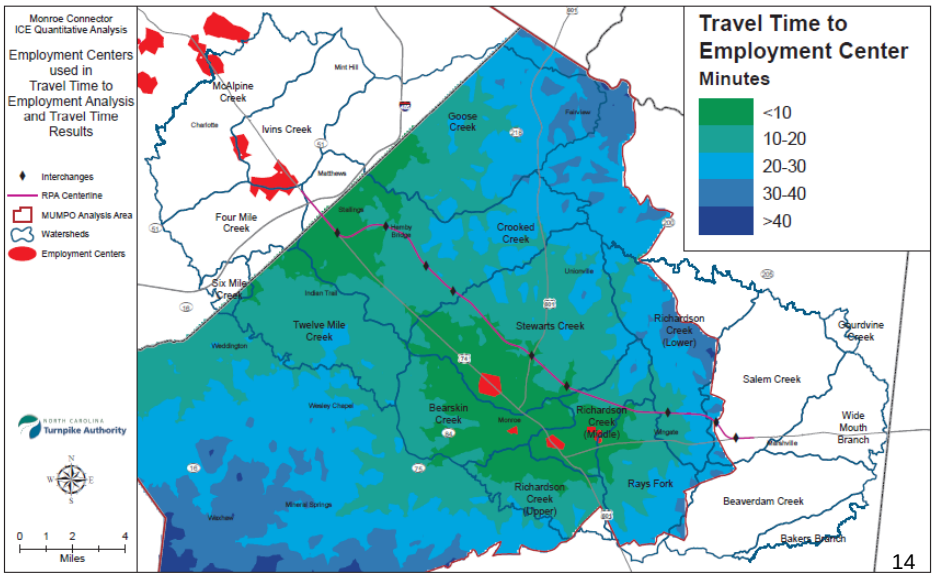
12

Mr. Smith's Process for Calculating TAZ Allocations without the Project



13

Location of Employment Centers Used in MUMPO's (Mr. Smith) Travel Time to Employment Factor



14

Mr. Smith's Travel Time to Employment Factor Results without the Project

He calculated the removal of the Connector / Bypass results in minor changes to travel times scores

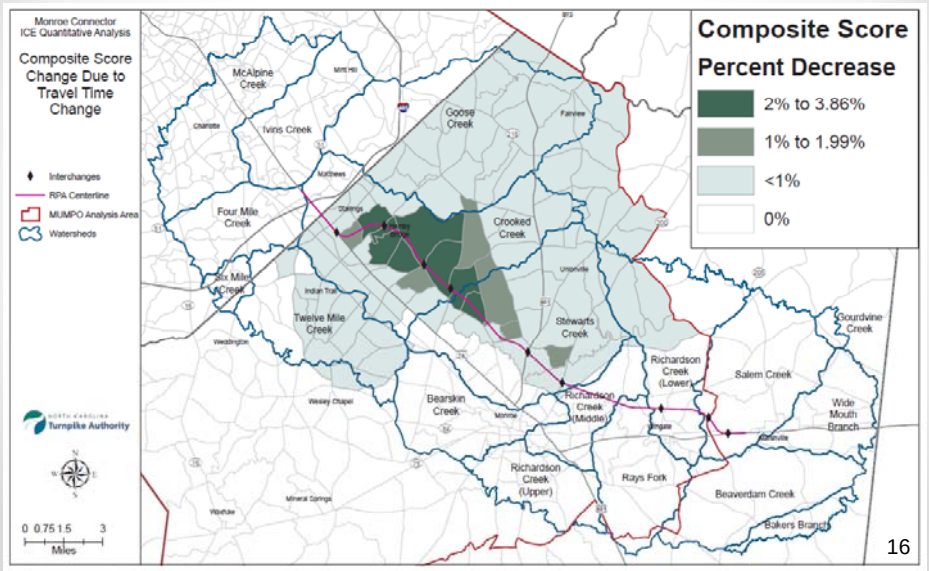
Travel Time Changes (out of 256 TAZs)

- 150 TAZs (59%) have no change
- 85 TAZs (33%) have increase of less than 1 minute
- 21 TAZs (8%) increase by more than 1 minute
- Maximum change is 5.7 minutes
- Average change is 18 seconds

Reference: Smith, email: Land Use Allocation, July 2012

15

Mr. Smith's Composite Score Results without the Project



16

Mr. Smith's Results Without the Project are the Same as the Results with the Project

The allocation model output once the Monroe Connector/Bypass was removed from the Travel Time analysis was **EXACTLY** the same as the original model output

17

Conclusion

The inputs for the LUSAM workbooks for the socioeconomic forecasts for the 2035 LRTP would not change if the project was not included in the LRTP.

18

How Did MUMPO Establish LUSAM District Control Totals In Union County?

MUMPO set the household, population and employment targets in the LUSAM workbooks based on the following inputs:

- Interpolation and extrapolation of the 2030 LRTP forecasts (2005 Forecasts),
- NC State Data Center Demographic Projections (Summer 2007) and
- Hammer Report Five-Year Forecasts.

19

How Did We Determine That The Project Did Not Influence Dr. Hammer's Regional Forecasts?

- Dr. Hammer's regional forecasts were developed by an employment led model
- Dr. Hammer's forecasts were based on straight forward linkage between regional and national economy of 42 industry sectors
- Dr. Hammer's regional forecasts does not include transportation projects as a variable.

20

Dr. Thomas Hammer, Demographic and Economic Forecast for Charlotte Region, Dec. 2003

Dr. Hammer documents that his allocation models and outputs do not include large scale infrastructure projects.

See pages 10, 11, 12, 13, 14, & 69

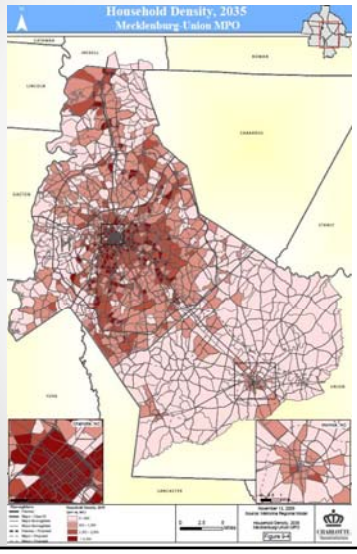
He notes two adjustments he makes to his model results

- He adjusted model outputs to account for NC 16 in Lincoln County – p.16
- He raised upper limits for the crossing over the Catawba River – p. 69

21

MUMPO's 2035 LRTP Land Use Model Shows No Difference Between Build and No-Build

Build Connector/Bypass



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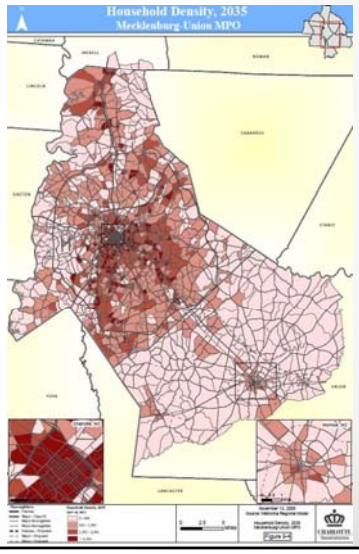
No-Build



22

What Does Other Research Conclude About Union County Land Use Change?

23

Operations Research and Education Laboratory at ITRE/NCSU

Land Use Study Final Report for Union Co. Public School System 2006-2007

Factors Contributing to Growth

- Low taxes
- Good quality schools
- Comparatively reasonable land prices

Possible Constraints to Growth

- Highway Congestion
- Lack of water/sewer
- Presence of Carolina Heel Splitter in Goose Creek
- Delay in Monroe C/B Project

24

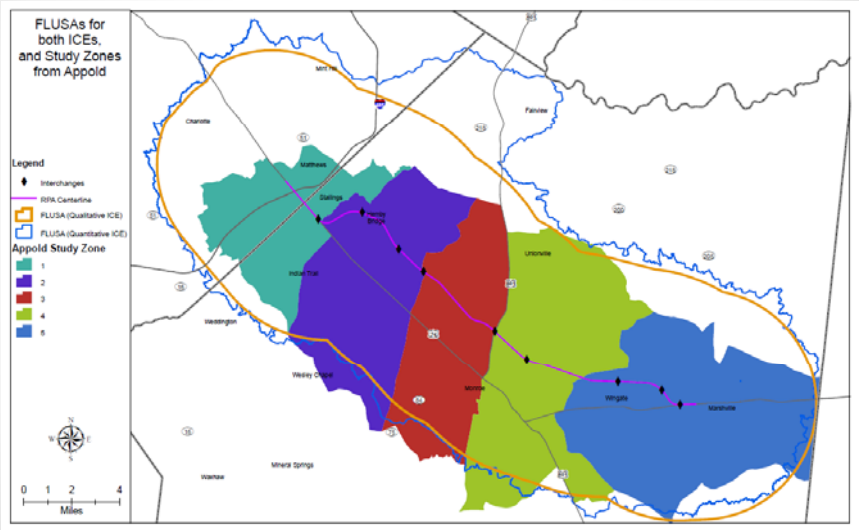
Kenan Institute of Private Enterprise at the UNC Chapel Hill Kenan-Flagler Business School

Work to support Comprehensive Traffic and Revenue Study for Toll Revenue Bond Ratings

- Independent review of MUMPO socioeconomic forecasts
  - o Dr. Hammer's work
  - o MUMPO TAZ allocation model and projections
- Interviews with business leaders planners,
- Regional Scan

25

Kenan Institute Study Area



- Study Area 132,436 acres compared to FLUSA 202,000 acres

26

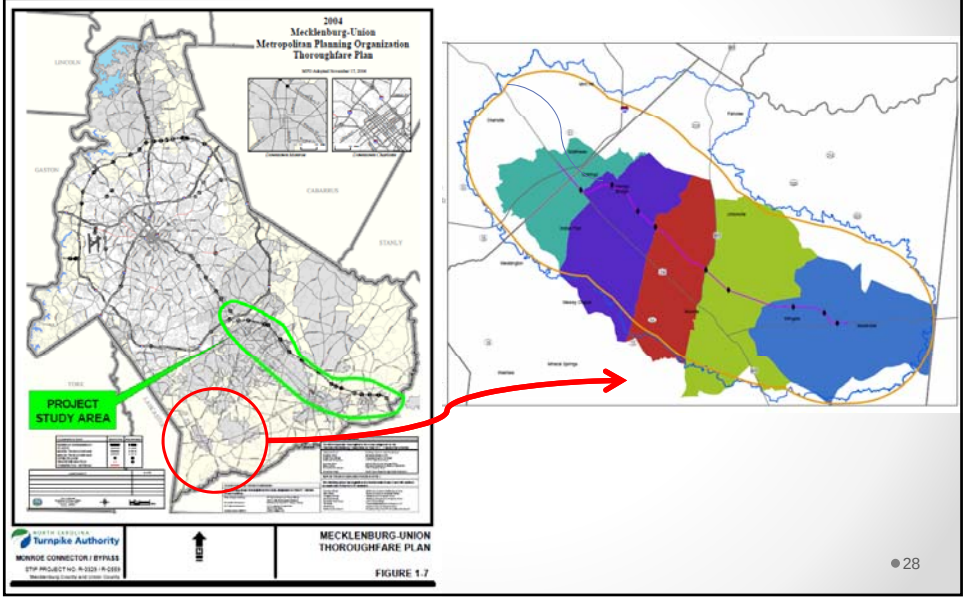
Kenan Institute Forecasts Compared to MUMPO 2035 LRTP Forecasts for the Corridor

	MUMPO Projections (2008)		Kenan Adjustments due to Project		FHWA calculated Projections based on National Correction	
	HH	Pop.	HH	Pop.	HH	Pop.
2005	42,595	120,054	42,595	120,054	42,595	120,054
2010	49,393	140,267	45,346	128,732	45,164	128,258
2015	56,454	161,371	51,968	148,486	51,556	147,364
2020	62,479	178,152	57,974	165,207	57,056	162,689
2025	68,407	194,812	63,869	181,775	62,469	177,902
2030	74,497	211,973	69,843	198,613	68,029	193,573

Reference: Appold, Evaluation of the Socio-economic Estimates Underlying the Study of the Feasibility of the Proposed Monroe Connector/Bypass, September 2009

27

Kenan Institute Growth Redistribution



28

We Calculated Household and Population Forecasts Change with the Corridor Study Area due to the project

Change in Household and Population Forecasts within the Corridor Study Area (Map)								
	MPO Forecast[20]		Kenan Project Adjusted		FHWA Calculated Adjustment due to Correction		Change Calculated due to project in 2030 (%)	
	Households	Population	Households	Population	Households	Population	Households	Population
Corridor								
2005	42,595	120,054	42,595	120,054	42,595	120,054		
2030	74,497	211,973	69,843	198,613	68,029	193,573	3%	3%
Zone 1								
2005	14,118	38,774	14,118	38,774	14,118	38,774		
2030	19,307	55,413	17,730	50,871	17,631	50,603	1%	1%
Zone 2								
2005	11,017	30,859	11,017	30,859	11,017	30,859		
2030	16,676	47,280	15,474	43,842	15,228	43,176	2%	2%
Zone 3								
2005	7,617	20,404	7,617	20,404	7,617	20,404		
2030	11,369	30,980	11,074	30,225	10,382	28,291	7%	7%
Zone 4								
2005	6,164	19,084	6,164	19,084	6,164	19,084		
2030	17,827	51,435	16,455	47,580	16,279	46,970	1%	1%
Zone 5								
2005	3,679	10,933	3,679	10,933	3,679	10,933		
2030	9,318	26,865	9,110	26,095	8,509	24,533	7%	6%

Reference: Appold, Evaluation of the Socio-economic Estimates Underlying the Study of the Feasibility of the Proposed Monroe Connector/Bypass, September 2009

29

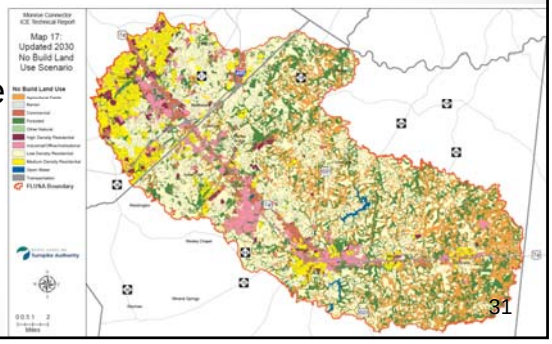
Our Review of the Kenan Institute Report

When we isolated the change in corridor shown in the Kenan Institute report due to the project, we found a shift of 1814 households to the project corridor above MUMPO's 2030 forecasts for the corridor.

30

How Are We Considering Potential For Induced Growth in the ICE?

1. We used the MUMPO Forecast as control totals to develop a No-Build Scenario.
2. We applied the control totals to land use plans and zoning plan estimates of build out growth.
3. We converted that growth to an image of land cover of a No-Build Scenario.
4. We estimated induced growth and added the additional growth to the No-Build Scenario to create the Build Scenario



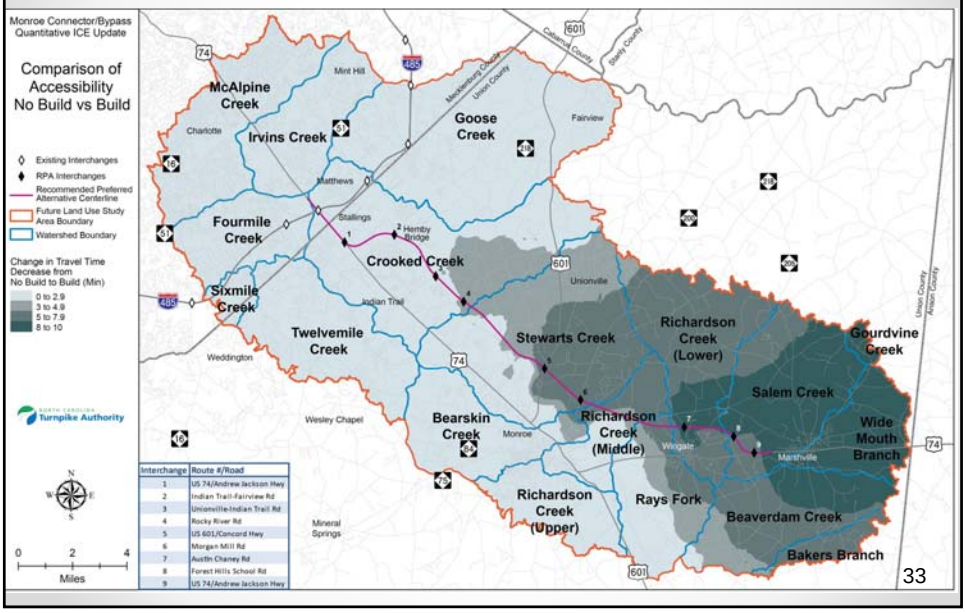
31

Induced Growth Estimation

- **Accessibility Analysis:** to see which areas would most benefit from the proposed project and thus most likely to see induced growth,
- **Scenario Writing Approach:** to identify areas most likely to see induced growth based on planning information and interviews,
- **Build-out Analysis:** to see which areas had the most capacity for induced growth,
- **Hartgen Analysis:** to estimate potential commercial growth at interchange areas.

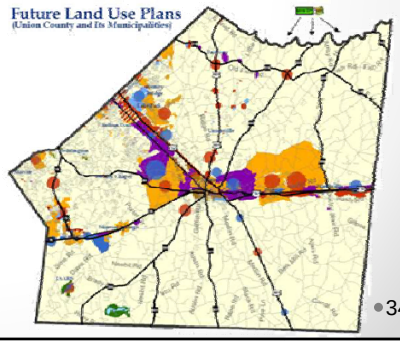
32

Accessibility Analysis



Scenario Writing and Build-Out Analyses

- Based on interviews and planning information
  - o Wingate and Marshville Economic Development Plan
  - o Updated Union County Comprehensive Plan



34

Hartgen Analysis

Yields a qualitative level of likely commercial and industrial development at interchange areas.

Hartgen Analysis of Interchanges

	Crossing Road	Characteristics				Suitable Development			
		Crossing Road Traffic Volumes	Distance from Nearest Town Center	Distance from Public Water and Sewer	Distance to Interstate Highway	Motel	Gas Station	Fast-Food Restaurant	Sit-Down Restaurant
1	US 74 Business	95,600	1.8	0	1.5	Good	Fair	Good	Good
2	Indian Trail-Fairview Road	25,700	1.4	0	3.5	Good	Fair	Good	Good
3	Unionville-Indian Trail Road	18,200	1.1	0	5.7	Good	Fair	Good	Poor
4	Rocky River Road	16,100	1.1	0	7.1	Good	Fair	Good	Poor
5	Concord Highway	54,300	2.1	0	11.0	Good	Fair	Good	Poor
6	Morgan Mill Road	20,400	2.1	0	12.7	Good	Fair	Good	Poor
7	Austin Chaney Road	17,400	0.9	0	16.7	Fair	Good	Fair	Poor
8	Forest Hills School Road	3,600	1.9	0	18.6	Poor	Poor	Poor	Poor
9	US 74 Business	37,100	1.9	0	19.6	Fair	Fair	Fair	Poor

35

ICE Land Use Results

Land Use Category	2030 Updated No-Build		2030 Updated Build		
	Total Area (acres)	% of Total Area	Total Area (acres)	% of Total Area	Difference from 2030 No-Build
Total Residential	97,900	48%	99,700	49%	1%↑
Low Density Residential	*79,500*	*40%*	*80,600*	*40%*	*<1%↑*
Medium Density Residential	*14,900*	*7%*	*15,600*	*8%*	*1%↑*
High Density Residential	*3,500*	*2%*	*3,500*	*2%*	*0%*
Commercial	5,600	3%	5,900	3%	0%
Industrial/Office/ Institutional	8,700	4%	8,800	4%	0%
Transportation	12,800	6%	13,900	7%	1%↑
Total Developed	125,000	62%	128,200	63%	<2%↑
Total Agricultural	37,500	19%	35,500	18%	1%↓
Total Forested	37,700	19%	36,500	18%	1%↓
Total Other	1,800	1%	1,800	1%	0%
TOTAL	202,000	100%	202,000	100%	

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

36

ICE Land Use Results

Impact	Project Study Area (Acres)	Goose Creek Watershed (Acres)	Six Mile Creek Watershed (Acres)
Direct Project	1,200	0	0
Induced Development Estimate	2,100	0	0
Residential	*1,800*	*0*	*0*
Commercial	*300*	*0*	*0*
Industrial/Office	*100*	*0*	*0*

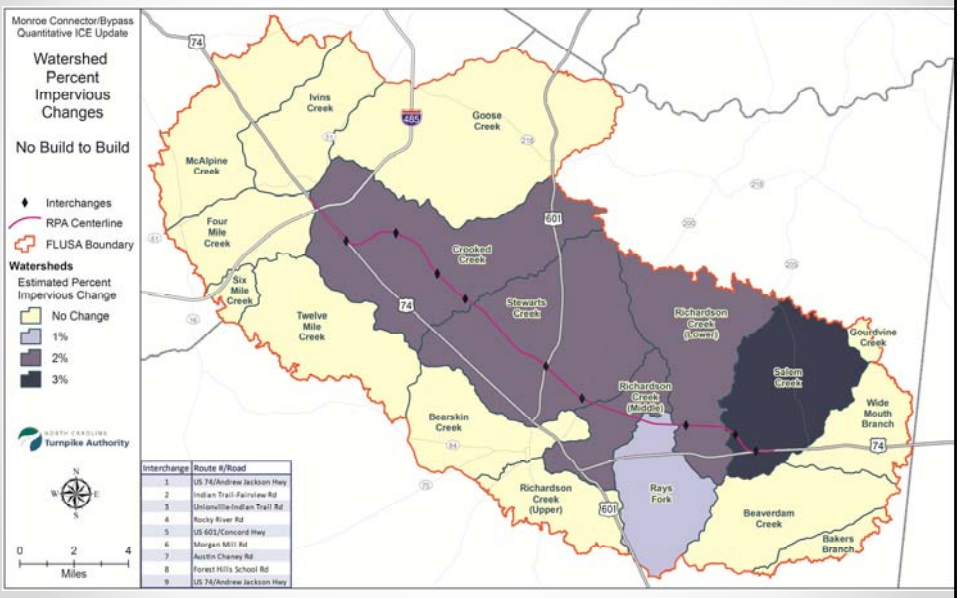
- Results have been rounded to the nearest 100 acres. Differences were calculated prior to rounding.

37

ICE Percent Impervious Surface by Watershed

Watershed Name	Original (2010 Report)				Updated (2013 Report)				Difference
	2007 Baseline	2030 No-Build	2030 Build	Change in Build from No-Build	2010 Baseline	2030 No-Build	2030 Build Updated	Change in Build from No-Build	Change in Updates from Original
Beaverdam Creek	6%	7%	7%	0%	6%	7%	7%	0%	0%
Richardson Creek (Upper)	14%	18%	18%	0%	14%	18%	18%	0%	0%
Rays Fork	12%	16%	17%	1%	12%	16%	17%	1%	0%
Bearskin Creek	24%	31%	31%	0%	24%	31%	31%	0%	0%
Richardson Creek (Middle)	23%	27%	29%	2%	23%	27%	30%	3%	1%
Gourdvine Creek	6%	8%	8%	0%	6%	8%	8%	0%	0%
Salem Creek	9%	13%	14%	1%	9%	13%	16%	3%	2%
Sixmile Creek	25%	30%	30%	0%	26%	31%	31%	0%	0%
Twelvemile Creek	22%	25%	25%	0%	22%	25%	25%	0%	0%
Richardson Creek (Lower)	10%	15%	16%	1%	10%	15%	17%	2%	1%
Stewarts Creek	15%	20%	22%	2%	15%	21%	23%	2%	0%
Fourmile Creek	32%	34%	34%	0%	32%	35%	35%	0%	0%
Crooked Creek	21%	25%	27%	2%	22%	26%	28%	2%	0%
Goose Creek	13%	17%	17%	0%	13%	18%	18%	0%	0%
Irvins Creek	35%	37%	37%	0%	35%	38%	38%	0%	0%
McAlpine Creek	36%	37%	37%	0%	36%	38%	38%	0%	0%
Bakers Branch	6%	8%	8%	0%	5%	8%	8%	0%	0%
Wide Mouth Branch	10%	12%	12%	0%	10%	12%	12%	0%	0%

ICE Impervious Surface Results



Species Updates

Carolina Heelsplitter (*Lasmigona decorata*)

Survey Results (Updated in 2011/2012):

- No new populations found.
- No change in known populations in Six Mile Creek.
- Change in known populations (numbers not range)in Goose Creek.

Finding to be included in the ICE (2013):

- No measureable differences in impervious surface were found between the 2030 No-Build and 2030 Build within the Goose Creek or Six Mile Creek watersheds consistent with the previous finding.

40

Conclusion

Carolina Heelsplitter (*Lasmigona decorata*)

Biological Conclusion of
May Effect Not Likely to Adversely Effect
remains valid.

41

Species Update

Schweinitz's Sunflower, Michaux's Sumac, & Smooth Coneflower

Project Study Area Survey Results (Updated in 2012):

- No populations found of Smooth Coneflower nor Michaux's Sumac.
- Change in two known populations of the Schweinitz's Sunflower were found (in decline).
- Approximately 35 acres of potential habitat exists for these species.

Note: This included additional survey in areas of possible design modifications and utility relocations.

42

Effects Update

Schweinitz's Sunflower, Michaux's Sumac, & Smooth Coneflower

Finding included in the Draft ICE (2013):

Schweinitz's Sunflower: There are potential effects associated with the proposed project resulting in approximately a four percent decrease in potential suitable habitat.

Michaux's Sumac & Smooth Coneflower: No direct, indirect, nor cumulative effects anticipated to occur as a result of the proposed action.

43

Conclusion

Schweinitz's Sunflower

Biological Conclusion of
May Effect Not Likely to Adversely Effect
remains valid.

Michaux's Sumac & Smooth Coneflower

Biological Conclusion of
No Effect
remains valid.

44

Candidate Species

Georgia Aster

Finding included in the Draft ICE (2013):

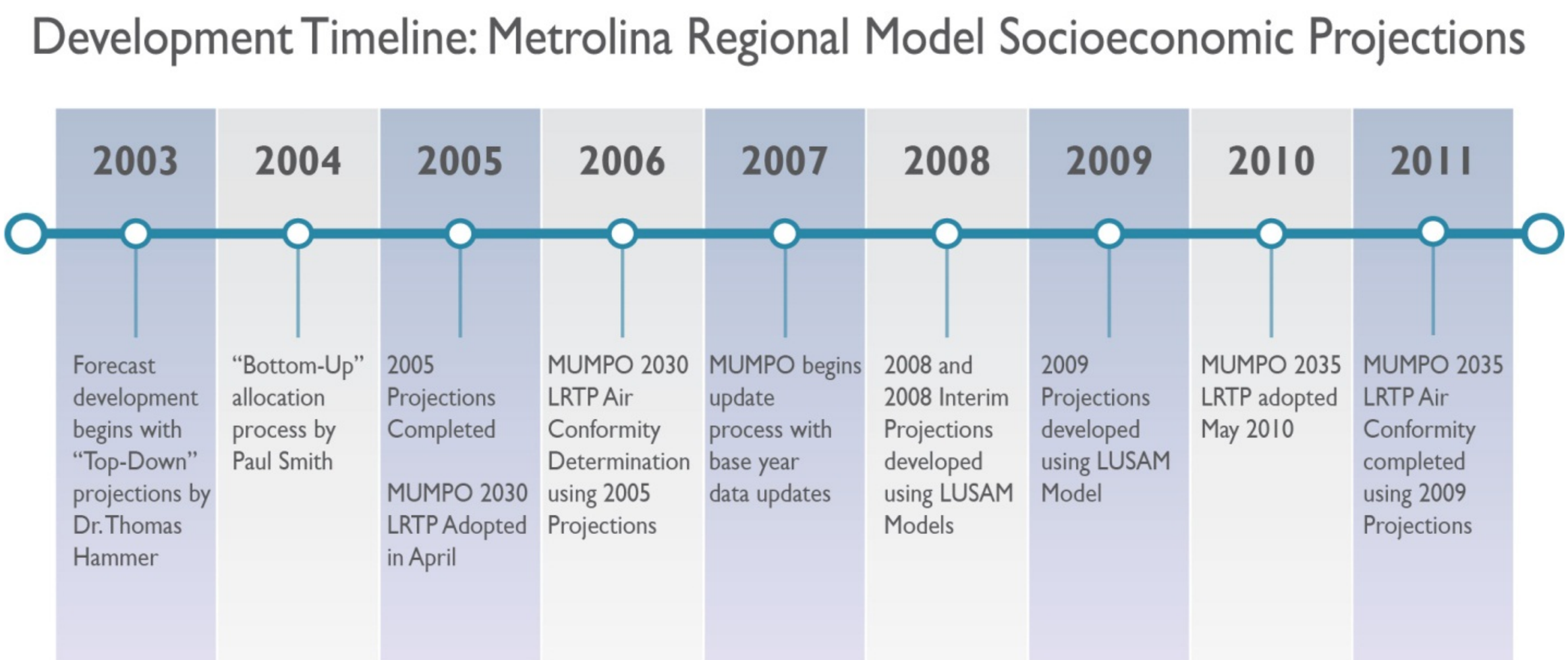
- As its habit typically overlaps substantially with that of the Schweinitz's sunflower, the analysis of potential indirect and cumulative habitat losses found for the Schweinitz's Sunflower would be generally valid for the Georgia aster.

45

Questions?

46

Timeline of MRM Projection Development



Monroe Connector/Bypass
Quantitative ICE Update

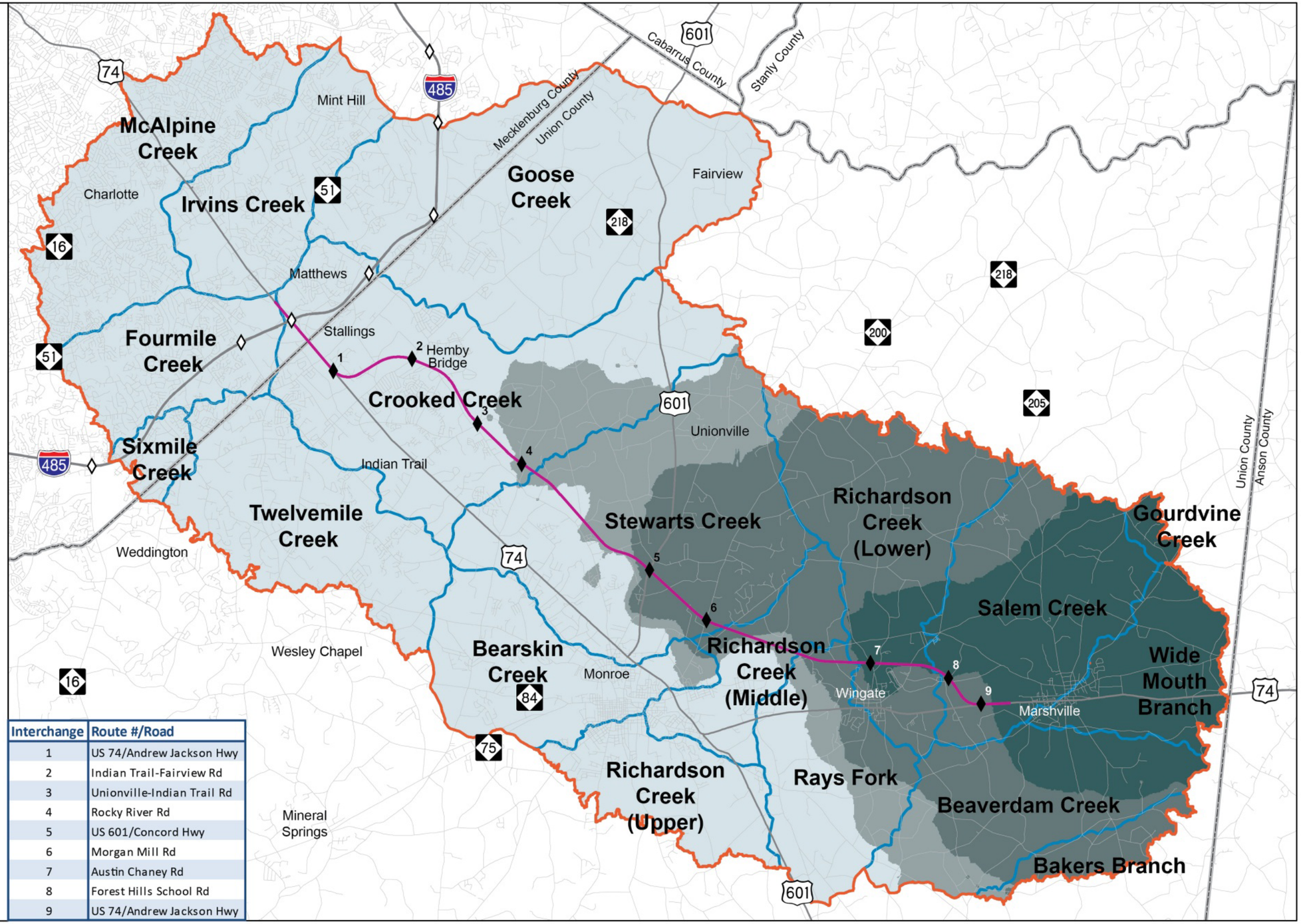
Comparison of Accessibility No Build vs Build

- Existing Interchanges
- RPA Interchanges
- Recommended Preferred Alternative Centerline
- Future Land Use Study Area Boundary
- Watershed Boundary

Change in Travel Time Decrease from No Build to Build (Min)

- 0 to 2.9
- 3 to 4.9
- 5 to 7.9
- 8 to 10

NORTH CAROLINA Turnpike Authority

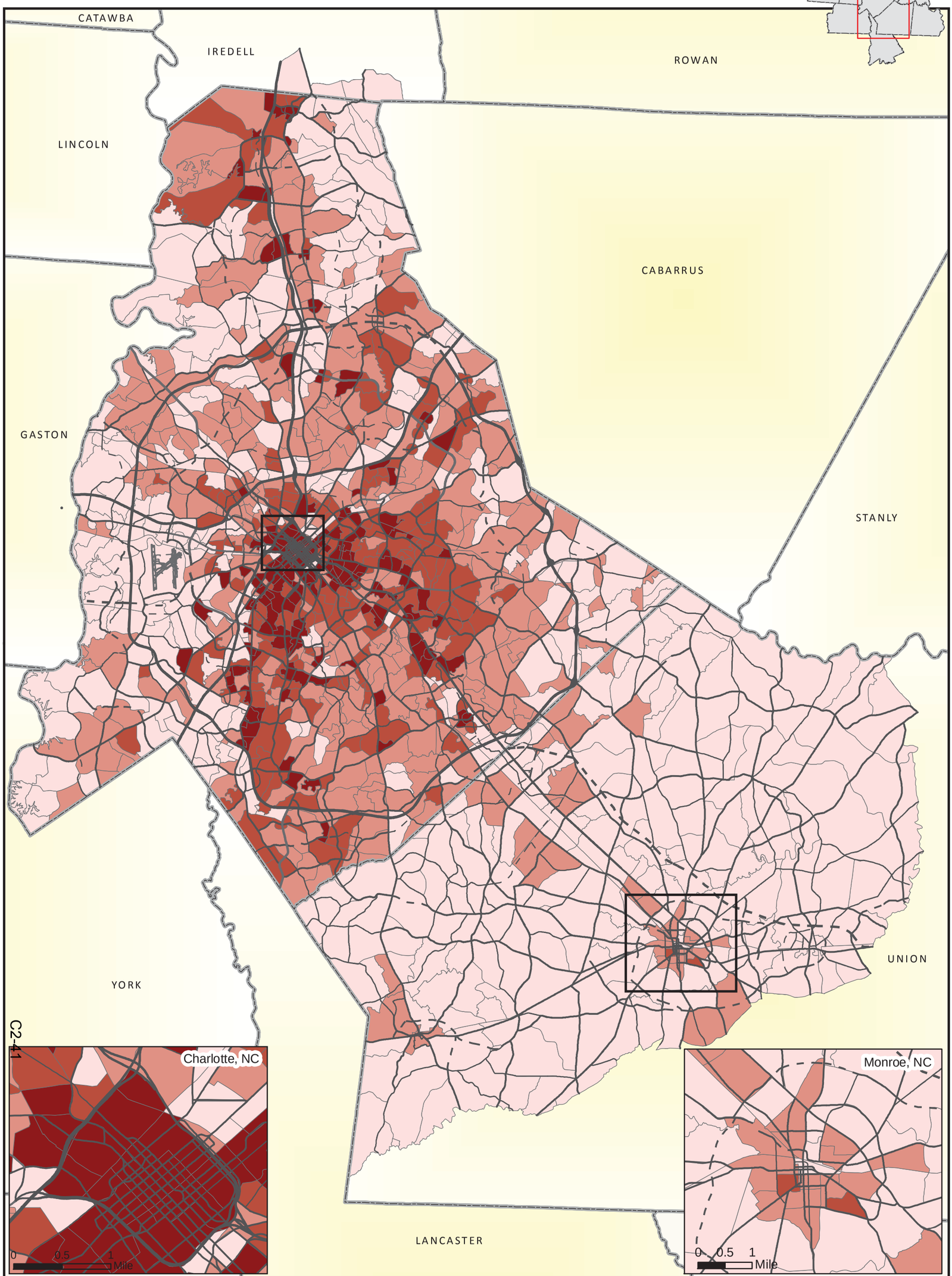


Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
2	Indian Trail-Fairview Rd
3	Unionville-Indian Trail Rd
4	Rocky River Rd
5	US 601/Concord Hwy
6	Morgan Mill Rd
7	Austin Chaney Rd
8	Forest Hills School Rd
9	US 74/Andrew Jackson Hwy

N W E S

0 2 4
Miles

Household Density, 2035
Mecklenburg-Union MPO



Thoroughfares
- Freeway
- Major - Class III
- Major thoroughfare
- Minor thoroughfare
- Freeway - Proposed
- Major - Proposed
- Minor - Proposed

Household Density, 2035 (per sq. mi.)
- 0 - 600
- 601 - 1,500
- 1,501 - 2,500
- > 2,500

0 2.5 5 Miles

November 13, 2009
Source: Metrolina Regional Model

Household Density, 2035
Mecklenburg-Union MPO

Figure 9-4

CHARLOTTE TRANSPORTATION

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September 30, 2013

Jennifer Harris
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, NC 27699-1548

George W. Hoops, P.E.
Major Projects Engineer
North Carolina Division
Federal Highway Administration
310 New Bern Avenue
Suite 410,
Raleigh, NC 27601

Dear Ms. Harris and Mr. Hoops:

Subject: US Fish and Wildlife Service Comments on the Draft Technical Report on Direct, Indirect and Cumulative Impacts to Federally Listed Species for the Monroe Connector/Bypass.

On August 28h, 2013, we received your request (via email and phone call) for review of the Draft Technical Report on Direct, Indirect and Cumulative Impacts to Federally Listed Species for the Monroe Connector/Bypass (Technical Report). The following comments are provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

The reanalysis and Technical Report were prepared as the result of a court decision in May 2012 and subsequent discussions with the U.S. Fish and Wildlife Service (Service), including a December 2012 letter and a meeting held in July 2013, in which the Service recommended that FHWA reinitiate section 7 consultation with the Service based on the changes in information and the new data developed for the project. The Service committed to review and respond promptly to a new or revised biological assessment.

The Technical Report is not a biological assessment, nor does it request consultation from the Service; rather it is a technical report of new information concerning the indirect and cumulative impacts to federally listed species. The Act requires action agencies to provide the best scientific and commercial data available concerning the impact of the proposed project on listed species or designated critical habitat. Therefore, the Service's review and comments provided below are only intended to provide a technical and biological review of the Draft Technical Report such that it contains the best scientific and commercial data available.

General Comments
Throughout the document multiple data sets are discussed making it difficult for the reader to determine which data set was being discussed at any given time. For ease of review and clarification, we recommend removing discussion of previous results and focusing this document on the updated/revised no build and build alternative comparison. Attempting to show the differences between the last version and the new version makes this document very difficult to understand. Similarly, as this document should stand alone in any review, please provide a full name for the first use of any acronyms used.

The document reportedly summarizes the conclusions reached in the evaluation of indirect and cumulative impacts (ICI). Can the larger ICI report be made available for review as well? It is helpful to have all the original data when reviewing a document of this nature. How does Federal Highways anticipate procedurally incorporating comments and moving forward?

Generally, there are a number of locations throughout the Technical Report where the baseline has changed or ongoing planning efforts are mentioned. However, there is a lack of any follow up discussion concerning these issues. These are noted below.

Section 1.3
As noted in the Services letter of December 2012 and later in the July 2013 meeting with the Service, the update is also required because our previous concurrence regarding impacts to listed species was based largely on the analysis of indirect and cumulative impacts resulting from development induced from the project. The updated information regarding these impacts represents a changed condition, and therefore, requires re-initiation of section 7 consultation.

Section 3.4
On page 9, the Technical Report notes that water and sewer moratoria were rescinded in Union County in 2012; however, there is no further discussion of this. What is the impact or potential impact of Union county rescinding the water and sewer moratorium? We recommend adding a discussion of the potential impacts of this rescission.

The Technical Report also notes that Mecklenburg County now administers the Goose Creek Management Plan. The Management Plan was completed in 2009. We recommend adding an update of any progress that has been made on the Goose Creek management plan under Mecklenburg County administration?

The Technical Report notes that both Unionville and Fairview are concentrating plans for development along the US 601corridor. In particular, Unionville expects to grow because of the new interchange with the project and US 601. We recommend including a cumulative impact analysis of the towns of Fairview and Unionville plans for development in the Goose Creek watershed?

Section 5.0
This section is critical to an accurate assessment of indirect and cumulative impacts. However, the Technical Report does not identify whether this section has been updated or not. The first

reference to the data is on page 58 and that reference is to the 2009 MPO projections. Are those the projections that include the project in the no build analysis? Please clarify.

On pages 62-63, the Technical Report notes that there is travel time savings and new water and sewer potential in the southeastern section of the Goose Creek basin, yet concludes that additional development is unlikely to be spurred by the addition of a freeway. Please provide further justification for this conclusion given that it would be logical to conclude that proximity plus time savings plus water and sewer expansion would result in a greater potential for development?

While The Technical Report is intended to summarize Direct, Indirect and Cumulative Impacts to federally listed species, there is no conclusion or summary of Section 5.0 that pulls together the information in the section or makes a conclusion as to the impacts to listed species. We recommend adding a summary and conclusion at the end of Section 5.0.

Section 6.2

On the bottom of page 68, the reference to the last observation of Michaux's sumac in the FLUSA identifies 1794. This must be a typographical error as the species was not identified until 1875. Please correct this information.

At the bottom of page 69, the Technical Report notes that according to the Biological Assessment the NCTA will commit to on-site conservation of two extant populations of Schweinitz's sunflower? Please provide additional information as to what type of protection will be provided. Will it be in perpetuity?

At the top of page 70, the Technical Report notes that "It is not anticipated that future development will cause substantial cumulative effects. This terminology is vague and, while possibly suitable in a National Environmental Policy document, has no relevance an assessment of possible affects to a federally listed species during the consultation process. Please provide clarification as to specific definition of "substantial". Are adverse effects likely to occur, and if so, in what form will they occur and how will they be avoided, minimized and mitigated?

Additionally, the reference on page 69 to the 2010 Biological Assessment raises the question of whether this assessment will be updated. The Federal Highway Administration is required to provide the best available scientific and commercial information during the consultation process and the existing biological assessment is now over three years old. Is the species status information still accurate? Is there any new information that should be updated? We recommend that this be addressed in the request for re-initiation of consultation.

Section 6.5

In the discussion of impervious surface on page 72, the first paragraph refers to the **previous** ICE for land use. Is this the data that includes the project? It is difficult to follow which data sets are being used in this section. Please clarify.

On page 73, there is reference to Section 5.3 but the Technical Report does not contain a Section 5.3. Please correct this reference.

On page 73, it appears that there is a 1% increase in imperviousness from the previous data presented. Please provide a more detailed explanation of the reason for this increase. For example, has the baseline changed and if so, how and where was it changed relative to the location of the listed species?

Section 6.7
This section is rather confusing, referencing a no build as well as two build scenarios on page 74, whereas other Sections of the Technical Report only reference one build scenario. Please provide clarification as to which data were used for this discussion and what this section is concluding regarding traffic pattern changes.

On page 76 there is a discussion of the changes to US 601 north of the project. The Technical Report notes that there is not a project to improve US 601 north of the project in the long range plan for MUMPO. Given the discussion of the planned development in Unionville and Fairview on US 601 north of the Monroe Connector Bypass, it would seem that such improvements would be being considered at least at the comprehensive transportation plan level.

Section 6.9
This Section of the Technical Report does not provide a definitive conclusion as to the impacts to federally listed species; rather it assesses the difference between any conclusions drawn from the 2010 Biological Assessment and those based on the new modeling. We recommend that in any re-initiation letter to the Service, specific determination be spelled out for each federally listed species that may occur within the action area.

Section 7.0
The purpose of this section is unclear. Efforts for local governments to voluntarily protect sensitive resources could be discussed if they are implementing any protective measures. The FHWA/NC Turnpike Authority/NCDOT could discuss any measures that are being taken to further conservation of listed species.

The Service continues to recommend re-initiation of consultation to fulfill Federal Highways section 7 responsibilities under the Act. If Federal Highways concludes that the proposed action may affect listed species, we request that you address our comments on this document and prepare a request for concurrence which includes your determination of effects for federally listed species. We appreciate the opportunity to comment on this draft Technical Report and look forward to continued coordination on this project. If you have any questions regarding these comments, please contact Marella Buncick (828) 258-3939 x237 or myself at (828) 258-3939 x223.

Field Supervisor

Janet A. Mizzi

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

October 23, 2013

Ms. Marella Buncick
U. S. Fish and Wildlife Service
160 Zillicoa Street
Asheville, North Carolina 28801

SUBJECT: Re-initiation of Section 7 Informal Consultation for Carolina heelsplitter (*Lasmigona decorata*), Schweinitz's sunflower (*Heliantus schweinitzii*), Michaux's sumac (*Rhus michauxii*), and smooth coneflower (*Echinacea laevigata*) relating to Monroe Connector/Bypass, Mecklenburg and Union Counties, North Carolina. Federal Aid Project Number STP-NHF-74(90), WBS Element 34533.1.TA1, STIP Project Numbers R-3329 and R-2559

Dear Ms. Buncick:

We are providing a Biological Assessment, Draft Technical Report on Direct, Indirect and Cumulative Impacts to Federally Listed Species Response to FWS Letter dated December 20, 2012 (DTR), and Responses to the FWS Letter Dated September 30, 2013. By submittal of these documents, NCDOT is requesting re-initiation of Section 7 informal consultation for the subject project.

The Biological Assessment is based primarily on the information in the DTR. The DTR is a subset of the Indirect and Cumulative Effects (ICE) report that are relevant to the federally listed species. The DTR takes information provided in the ICE and then performs a more detailed, scaled-down analysis of the potential for the project to impact federally listed species. The August 14, 2013 Draft ICE was provided to you via email on October 2, 2013.

In the Biological Assessment, we have concluded the proposed action will have "No Effect" on the smooth coneflower and Michaux's sumac. A conclusion of "May Affect/Not Likely to Adversely Affect" was reached for the Carolina heelsplitter and Schweinitz's sunflower. In addition it was concluded that the proposed action "May Affect/Not Likely to Adversely Affect" designated Critical Habitat (Unit 1) for the Carolina heelsplitter.

We are requesting your written concurrence with these findings. We would appreciate a response by November 6, 2013, if possible. Your timely attention to this matter is greatly

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appreciated. If you need further information, or have any questions concerning these materials, please contact me at 919-707-6025 or jhharris1@ncdot.gov.

Sincerely,

Jennifer Harris

Jennifer Harris, P.E.
Project Development Section Head – Western Region and Turnpike

cc: George Hoops, P.E., FHWA

BIOLOGICAL ASSESSMENT

AN ASSESSMENT OF POTENTIAL IMPACTS TO CAROLINA HEELSPLITTER (*Lasmigona decorata*) and DESIGNATED CRITICAL HABITAT, SCHWEINITZ'S SUNFLOWER (*Helianthus schweinitzii*), MICHAUX'S SUMAC (*Rhus michauxii*), and SMOOTH CONEFLOWER (*Echinacea laevigata*)

MONROE CONNECTOR/BYPASS

MECKLENBURG and UNION COUNTIES, NORTH CAROLINA

FEDERAL AID PROJECT NUMBER STP-NHF-74(90)
WBS ELEMENT 34533.1.TA1
STIP PROJECT NUMBER R-3329/R-2559

PREPARED FOR:

Federal Highway Administration
Raleigh, North Carolina

AND

North Carolina Turnpike Authority
A Division of North Carolina Department of Transportation
Raleigh, North Carolina

October 2013

Table of Contents

1.0 Introduction 1
1.1 Statutory Authority of Action 1
1.2 Summary of Consultation History 2
1.3 Habitat Conservation Plans In Action Area 10
2.0 PROJECT DESCRIPTION 10
2.1 Avoidance and Minimization 10
3.0 DESCRIPTION OF ACTION AREA 11
3.1 Areas of Direct Effects 11
3.2 Areas of Indirect Effects 11
3.3 Conservation Measures 12
4.0 Environmental baseline – carolina heelsplitter 12
4.1 Species Description: Carolina Heelsplitter 12
4.1.1 Designation (Legal Status) 12
4.1.1 Characteristics 12
4.1.2 Distribution and Habitat Requirements 14
4.1.3 Threats to Species (Particularly Goose/Duck Creek and Sixmile Creek Populations) 15
4.1.4 Habitat Alterations 19
4.2 Designated Critical Habitat 24
4.3 Potential Effects of Roadway Projects on Freshwater Mussels and Habitat 27
4.3.1 Potential Direct Effects 27
4.3.2 Potential Indirect Effects 28
4.3.2 Potential Cumulative Effects 29
4.4 Presence within Action Area 29
4.4.1 Project Alignment 29
4.4.2 Mussel Fauna in Project Footprint 30
4.5 Watershed Conditions 32
4.5.1 Goose Creek Subbasin (03-07-12) 32
4.5.2 Water Quality 33
4.5.3 Goose Creek TMDL 42
4.5.4 Summary of regulatory effects 42
4.5.5 Sixmile Creek Subbasin (03-08-38) 43
4.5.6 Water Quality 44
5.0 ENVIRONMenTAL BASELINE – SCHWEINITZ'S SUNFLOWER 46
5.1 Species Description 46
5.1.1 Designation (Legal Status) 46
5.1.2 Characteristics 46
5.1.3 Distribution and Habitat Requirements 47

5.1.4 General Threats to Species 48
5.1.5 Roadway-Related Threats to Species 48
5.2 Presence in Action Area 50
5.2.1 FLUSA 53
5.2.2 Conservation Areas 54
6.0 ENVIRONMENTAL BASELINE – MICHAUX'S SUMAC 54
6.1 Species Description 54
6.1.1 Designation (Legal Status) 54
6.1.2 Characteristics 55
6.1.3 Distribution and Habitat Requirements 55
6.1.4 General Threats to Species 56
6.1.5 Roadway-Related Threats to Species 57
6.2 Presence in Action Area 57
7.0 ENVIRONMNETAL BASELINE – SMOOTH CONEFLOWER 58
7.1 Species Description 58
7.1.1 Designation (Legal Status) 58
7.1.2 Characteristics 58
7.1.3 Distribution and Habitat Requirements 59
7.1.4 General Threats to Species *60*
7.1.5 Roadway-Related Threats to Species *60*
7.2 Presence in Action Area 60
8.0 EFFECTS OF PROPOSED ACTION– CAROLINA HEELSPLITTER AND CRITICAL HABITAT *60*
8.1 Direct Effects 61
8.2 Indirect Effects 61
8.3 Cumulative Effects 61
8.4 Conclusions of Effects – Carolina heelsplitter 62
8.5 Conclusions of Effects-Critical Habitat 63
8.6 Conservation Measures –Carolina Heelsplitter & Critical Habitat 63
9.0 EFFECTS OF PROPOSED ACTION – SCHWEINITZ'S SUNFLOWER 64
9.1 Direct Effects 64
9.2 Indirect Effects 64
9.3 Cumulative Effects 64
9.4 Conclusion of Effects 65
9.4.1 Direct Effects 65
9.4.2 Indirect Effects *66*
9.4.3 Cumulative Effects *66*
9.4.4 Biological Conclusion *66*
9.5 Schweinitz's Sunflower Conservation Measures 66
9.5.1 On Site Preservation *67*

10.0 EFFECTS OF PROPOSED ACTION – MICHAUX'S SUMAC 68
10.1 Direct Effects 68
10.2 Indirect Effects 68
10.3 Cumulative Effects 68
10.4 Conclusion of Effects 68
11.0 EFFECTS OF PROPOSED ACTION – SMOOTH CONEFLOWER 68
11.1 Direct Effects 68
11.2 Indirect Effects 68
11.3 Cumulative Effects 69
11.4 Conclusion of Effects 69
12.0 Literature Cited *70*

1.0 INTRODUCTION

The North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), proposes to construct a project known as the "Monroe Connector/Bypass" in Mecklenburg and Union Counties, North Carolina. The purpose of this Biological Assessment (BA) is to review the project and determine whether the proposed action may affect federally listed species that occur in the Action Area (Figure 1).

The proposed roadway is included in the NCDOT's *2013-2023 State Transportation Improvement Project* (STIP), project numbers R-3329 (Monroe Connector) and R-2559 (Monroe Bypass), as a controlled-access toll road extending from US 74 near I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, a distance of approximately 20 miles. NCDOT previously studied these as two separate projects; however, the two projects are now being advanced by NCTA as a single project at the request of the Mecklenburg-Union Metropolitan Planning Organization (MUMPO).

This Biological Assessment (BA) is based upon information provided in the Draft Technical Report on Direct, Indirect and Cumulative Impacts to Federally Listed Species *Response to FWS Letter dated December 20, 2012* (DTR), the Responses To USFWS September 30, 2013 Comments on the Draft Technical Report, and analyses detailed in this report.

This BA addresses likely effects to federally protected species associated with the proposed Monroe Connector/Bypass. This BA is prepared in accordance with legal requirements established under Section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1536 (c)), and is consistent with the standards established in U.S. Fish and Wildlife Service (USFWS) Region 4 guidance (USFWS 2005), FHWA guidelines (USDOT 2002), and NCDOT guidance (NCDOT 2002).

The species evaluated in this BA are:

- Carolina heelsplitter (*Lasmigona decorata*) and its designated Critical Habitat
- Schweinitz's sunflower (*Helianthus schweinitzii*)
- Michaux's sumac (*Rhus michauxii*)
- Smooth coneflower (*Echinacea laevigata*).

1.1 Statutory Authority of Action

Section 7(a)(2) of the ESA (16 USC 1531-1544 and Section 1536) requires that each Federal agency shall, in consultation with USFWS, insure that any action authorized, funded, or carried

out by such agency, is not likely to jeopardize the continued existence of an endangered or threatened species, or result in the destruction or adverse modification of critical habitat.

NCDOT derives their statutory authority via North Carolina General Statutes (NCGS) 143B-345 and 346 and FHWA derives their statutory authority via 49 US Code (USC) 104.

As defined in 50 Code of Federal Regulations (CFR) Part 402.02, "actions" include all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas. Since the proposed project includes both funding by FHWA and approval by the U.S. Army Corps of Engineers (USACE) pursuant to the Clean Water Act, it is subject to consultation under Section 7 of the ESA.

1.2 Summary of Consultation History

The section describes the consultation history of this project, beginning with the two projects separately and then as single project as it is currently proposed.

Monroe Bypass (R-2559)

An Environmental Assessment (EA) was issued on March 14, 1996, and a Finding of No Significant Impact (FONSI) was completed on June 20, 1997 for the Monroe Bypass (a new location freeway facility from US 601 to US 74 near Marshville in Union County). As part of that FONSI, comments concerning the Monroe Bypass were solicited from various agencies, including the USFWS. In letter dated April 18, 1997 the USFWS issued a concurrence that the project is "not likely to adversely affect" the federally endangered Carolina heelsplitter or Schweinitz's sunflower. However, the USFWS subsequently rescinded their "not likely to adversely affect" concurrence for the USACE's determination of effect. In a letter dated August 8, 2002, written in response to the public notice issued for the Section 404 Permit Application, the USFWS stated that based on "new information and a changed condition" their previous concurrence was no longer valid.

Monroe Connector (R-3329)

NCDOT began the planning process in 1999 for the Monroe Connector (from near I-485 in Mecklenburg County to US 601 in Union County). A Draft EIS was issued on October 17, 2003, and released for review and comment by the public and environmental resource and regulatory agencies in November 2003. Based on comments received from the various federal and state agencies and the public, and due to concerns regarding logical termini of the Monroe Connector and Monroe Bypass projects, the 2003 Draft EIS was rescinded on January 30, 2006 by notice in the Federal Register (Vol. 71, No. 19, page 4958). The notice stated that FHWA, NCDOT and NCTA plan to prepare a new Draft EIS for the combined Monroe Connector/Bypass project.

2005 Draft BA

A Draft BA was originally prepared on October 28, 2005 which assessed effects from both the Monroe Bypass (R-2559) and the Monroe Connector (R-3329) on the Carolina heelsplitter and Schweinitz's sunflower. Consultation with USFWS was not initiated due to the rescission of the Monroe Connector Draft EIS.

Monroe Connector/Bypass Draft EIS

A Draft EIS, prepared by PBS&J (2009) was issued for the Monroe Connector/Bypass on March 31, 2009. It included discussion of federally-protected species in the project area, including biological conclusions for potential effects to these species as follows:

- Carolina heelsplitter (*Lasmigona decorata*) and its designated Critical Habitat – Unresolved
- Schweinitz's sunflower (*Helianthus schweinitzii*) – May Affect/Not Likely to Adversely Affect
- Michaux's sumac (*Rhus michauxii*) – No Effect
- Smooth coneflower (*Echinacea laevigata*) – No Effect

USFWS commented on the Draft EIS via letter dated June 12, 2009. USFWS comments relating to the ESA and NCTA responses to those comments follow:

Schweinitz's sunflower

- USFWS stated, "*…it is premature to determine that there will be no impacts to the Schweinitz's sunflower (Helianthus schweinitzii) from this project. Until more specifics about design and any changes that may result from public comment or other information are available we believe the appropriate conclusion for this species is 'unresolved.'*"
- NCTA responded that two populations of Schweinitz's sunflower were identified near Interchange 3 and per Draft EIS comments; a subsequent interchange redesign changed the configuration to a compressed urban diamond. FHWA and NCTA are coordinating with USFWS in accordance with Section 7 of the ESA in the preparation of this BA.

Goose Creek

- USFWS stated, "*We remain concerned about the overall impacts to streams and wetlands and wildlife habitat…in particular, the potential for impacts to the Goose Creek watershed, which is occupied by and designated critical habitat for the federally endangered Carolina heelsplitter.*"
- NCTA responded with reference to Section 2.3.3 of the Final EIS which includes measures to avoid and minimize impacts to streams and wetlands as well as a Section PC, which includes a special project commitment to implement BMPs based on NCDOT's *Design Standards in Sensitive Watersheds*. NCTA further stated that the DSAs would

not be located within the Goose Creek watershed and that indirect and cumulative land use and impervious surface changes were analyzed in the Quantitative ICE.

Forest / Habitat Fragmentation

- USFWS stated, "*Forest fragmentation is described as an indirect effect of highway projects, but we believe that the impacts of fragmentation are direct effects that should be quantified.*"
- NCTA responded that habitat fragmentation has been addressed in the Quantitative ICE.

Indirect and Cumulative Impacts

- USFWS stated, "*Indirect and cumulative impacts continue to be a great concern for this project. … This is a significant omission in determining environmental impacts from the project, especially regarding potential impacts to the Carolina heelsplitter and its critical habitat.*"
- NCTA responded, stating that the USFWS comment refers to the Qualitative ICE. Subsequently, a Quantitative ICE Analysis and a Quantitative Water Quality ICE Analysis were prepared to quantify indirect and cumulative impacts. These reports are summarized in Section 2.5.5 of the Final EIS.

Habitat Protection

- USFWS stated, "*Any new development that occurs without measures adequate to protect the species and its habitat is likely to result in extirpation of the species and adverse impacts to its designated critical habitat.*"
- NCTA responded by referencing Section 7 coordination and the development of this BA. They also referenced the Quantitative ICE which found no measurable differences in percent impervious surface between the Preferred Alternative and the No Build Alternative for the FLUSA as a whole, and no change in the Goose Creek Watershed.

On July 22, 2009, representatives of NCTA, FHWA, and USFWS met to discuss design revisions incorporated into the Preferred Alternative as a result of public comments on the Draft EIS. This included revising the proposed interchange configuration at Unionville-Indian Trail Road to reduce the footprint of the design. Two populations of Schweinitz's sunflower were identified along Secrest Shortcut Road in the vicinity of this proposed interchange. USFWS indicated that based on the design change, which would increase the potential for future development adjacent to the interchange, it would be highly likely that the populations would be lost due to indirect impacts of this project, either related to future road improvements along Secrest Shortcut Road or to future development. USFWS recommended formal Section 7 consultation for these impacts to Schweinitz's sunflower.

Additional coordination with USFWS occurred during Turnpike Environmental Agency Coordination (TEAC) meetings and various other meetings and types of correspondence regarding the ESA and protected species. This information is summarized below.

- May 17, 2007, TEAC meeting: In identifying potential corridors/study alternatives, the study area was developed to avoid direct impacts to Goose Creek basin in an effort to minimize impacts to Carolina heelsplitter. It was suggested that impacts to Stewarts Creek be minimized as it feeds Lake Twitty and the Goose Creek watershed. Additionally, USFWS planned to provide information about the Schweinitz's sunflower population near Secrest Shortcut Road. USFWS suggested the team consider a new approach to indirect and cumulative impacts which may be useful. NCTA planned to follow up with USFWS.
- June 29, 2007, Meeting: FHWA and NCTA met with USFWS and WRC to discuss the scope of work, study area, and methodologies for the ICE study. USFWS stated that previous ICE studies have used a standard five to seven mile distance from interchanges as an assumed study area for induced growth. NCTA stated that the assumption would be revisited as part of this study. FHWA and NCTA asked USFWS to provide input on which indicators should be used for analyzing impacts to the mussels. USFWS noted that impact analysis will be influenced by NPDES permit decisions. USFWS also suggested NCTA determine the current status of land use controls and regulations in the project area. WRC requested analysis of impervious surface increase for the land use analysis. WRC also stated that stormwater and 303(d) streams may be issues. NCTA addressed these comments and incorporated these suggestions into the project documents.
- December 5, 2007, TEAC Meeting: USFWS suggested that NCTA consider eliminating the interchange at US 601 with new location alternatives to reduce potential indirect impacts on the Goose Creek watershed. NCTA has moved forward with the project considering both with the US 601 option and without the US 601 option in the quantitative ICE analyses.
- September 23, 2008, TEAC Meeting: NCTA noted that two populations of Schweinitz's sunflower were identified near the proposed Unionville Indian Trail Road interchange. No direct impacts are anticipated; however, the biological conclusion in the Draft Natural Resources Technical Report will be "unresolved" until NCTA/FHWA and USFWS coordinate on this issue.
- August 12, 2009, TEAC Meeting: NCTA noted that formal Section 7 consultation for Carolina heelsplitter and its designated critical habitat and Schweinitz's sunflower is anticipated. USFWS clarified that a decision to enter formal consultation has not yet been made and a final decision will be based on results of the quantitative land use studies / ICE analyses. It was noted that the FLUSA would be expanded to include the entire Goose Creek watershed. USFWS suggested that localities should be asked specifically about how the *Site Specific Water Quality Management Plan for the Goose Creek Watershed* will be implemented. NCDWQ responded that their agency will be implementing the plan initially and that training will be provided to the local governments. USFWS also stressed the importance of documentation of assumptions and rationale regarding future land use. USFWS suggested that the water quality component of the ICE may be useful for Section 7 consultation. The agencies will identify which parameters they will require in the final water quality analysis.
- September 8, 2009, TEAC Meeting: Per USFWS request, NCTA agreed to evaluate ICE with and without the US 601 interchange in the Quantitative ICE study. (US 601 is the

closest major interchange to the Goose Creek watershed.) USFWS requested more information about the water quality ICE model (i.e. input parameters, adaption to suburban landscapes, groundwater, etc.). Sixmile Creek watershed was suggested to be included in the modeling efforts.

- October 31, 2009, TEAC Meeting: The Generalized Water Loading Function (GWLF) model was presented to describe water quality modeling and analysis. Agencies were requested to identify and provide stressors in addition to those presented. USFWS suggested NCTA review the Goose Creek watershed management plan for other sources of impairment. NCTA will proceed with the study area as identified for water quality modeling. If the Quantitative ICE indicates indirect impacts in Sixmile Creek watershed, NCTA will reevaluate whether to include more of the watershed in the analysis and/or perform additional analysis.
- November 11, 2009, TEAC Meeting: Preliminary results of the Quantitative ICE were presented at this meeting. Several agency representatives expressed uncertainty as to the accuracy of the projections and NCTA asked if there were any suggestions for another method to determine future growth that would be defensible. None were offered. Agencies were requested to provide opinions / recommendations regarding methodologies throughout the planning process (see June 29, 2007 meeting, above). USFWS requested a discussion on how the Hartgen method was used to perform validation. NCTA hosted additional meetings to discuss and explain methodologies and associated reports also included detailed discussions regarding chosen methodologies.
- February 2, 18, 22, 2010, Telephone Correspondence: USFWS provided updated data from the Draft 5-year Status Reviews for smooth coneflower and Michaux's sumac (Suiter 2010a and 2010b, USFWS, pers. comm.).
- February 10, 2010, Email Correspondence: USFWS provided updated data (narrative from a recent Biological Opinion) for Schweinitz's sunflower (Wells 2010, USFWS, pers. comm.).
- February 10-11, 2010, Email Correspondence: USFWS stated that a previous relocation of Schweinitz's sunflower from Secrest Shortcut Road (Natural Heritage Program Element Occurrence #77) to Cane Creek Preserve was associated with a NCDOT Division level project with no federal nexus to trigger Section 7 consultation (Buncick 2010a, USFWS, pers. comm.).
- March 30-April 1, 2010, Email Correspondence: USFWS provided details about other Section 7 consultations in the Action Area (Buncick, 2010b, pers. comm.) (Section 1.3).
- May 25, 2010, Draft Biological Assessment completed by Catena and submitted to NCTA
- July 26, 2010, completed BA package prepared by FHWA and NCDOT received by USFWS.
- July 29, 2010 USFWS concurred with FHWA's determination of "Not Likely to Adversely Affect" regarding construction of the subject project and associated impacts to

federally listed Carolina heelsplitter and its designated critical habitat and the Schweinitz's Sunflower, and "no effect" to Michaux Sumac and Smooth Coneflower.

- September 1, 2010 the Record of Decision (ROD) issued.
- In November, 2010, the Southern Environmental Law Center (SELC) on behalf of the North Carolina Wildlife Federation, Clean Air Carolina and Yadkin Riverkeeper, filed suit against NCTA and FHWA, alleging failures to correctly follow procedures for studying the environmental effects of the proposed project.
- April 2011 USACE issued 404 permit.
- In October 2011, a US District Court Judge ruled in favor of NCTA and FHWA regarding the environmental study.
- On October 31, 2012, SELC filed an appeal of the U.S. District judge's decision.
- On May 3, 2012, the Fourth Circuit Court of Appeals overturned the ruling of the lower court and found that the agencies failed to disclose the underlying assumptions of their analysis and falsely responded to public concerns. The Court remanded the matter so the agencies could publically and fully evaluate the "no-build" data.
- Design on the project was halted in May 2012.
- On June 15, 2012, NCDOT filed a petition to the Fourth Circuit Court of Appeals for rehearing of the case to address technical data and other facts that the state believes the higher court misunderstood.
- On June 29, 2012, the Fourth Circuit denied the petition for rehearing.
- Subsequent to the Fourth Circuit Court's decision, the FHWA rescinded the ROD on July 3, 2012.
- NCTA and FHWA commenced work to address the issues raised by the Fourth Circuit Court of Appeals.
- July 18, 2012, TEAC Meeting: USFWS asked if a merger type process to review the new data and provide comments had been considered. NCTA and FHWA agreed to discuss this and determine some key points for agency involvement and input in this process. Agencies will be asked to provide input and comments on all documents. USFWS noted that depending on the outcome of NCTA's current studies, they may need to revisit consultations under Section 7 of the Endangered Species Act. At that time, no modifications appear to be needed. NCTA and FHWA agreed to continue to coordinate with USFWS to determine an appropriate course of action.
- November 7, 2012, NCDOT and USFWS met in preparation of the TEAC meeting taking place the following day (see below).
- November 8, 2012, TEAC Meeting: USFWS requested verification that since there are no changes in the land use, the water quality impacts will not be remodeled. Ms. Harris explained that pursuant to the meeting that took place between NCDOT and USFWS on 11/7, this issue needs further discussion in regards to if and where additional water quality modeling needs to be completed. FHWA feels that additional modeling is not

necessary and once a thorough explanation of the differences found in the most recent study is provided to the agencies, stakeholders, and the public, then sufficient information will have been provided to show that no additional water quality analysis would be necessary.

- On December 20, 2012, the USFWS sent NCTA a letter that among other items, recommended a re-initiation of Section 7.
- July 10, 2013; FHWA met with USFWS in Atlanta, GA to discuss the project's status and findings from new ICE Analysis
- August 28, 2013, FHWA submitted the following draft ESA information to USFWS:
    - Report on Effect to Species for FWS_DRAFT_082613 MW_toFHWA_rev.docx
    - Copy of FWS_Monroe_Maps 081913.pdf
    - Appendix A Interview Summaries.pdf
    - Appendix B Union_County_Growth_Memo_091112_Final.pdf
    - Appendix C Reports of Independent Economist.pdf
- September 30, 2013, the USFWS provided a letter with comments to the FHWA August 28, 2013 draft ESA information submittal.

<u>Other Consultations in Action Area</u>

There have been several previous consultations within the Action Area (as defined in Section 3.0) of the project:

- B-2647 (Carolina heelsplitter): Bridge No. 3 on SR 1547 over Goose Creek in Union County (TIP B-2647) was replaced during 1998. The findings of an informal consultation were transmitted to the USFWS in a letter dated May 14, 1998.
- R-2123 (Carolina heelsplitter): During the 1990s and early part of the present decade, the Charlotte Outer Loop (TIP R-2123) was designed and constructed within the Goose Creek Subbasin. There were several consultations and re-initiations throughout the development and construction of the project.
- <u>(Carolina heelsplitter)</u>: Wal-Mart Real Estate Business Trust development of a commercial center (Wal-Mart Supercenter) on an approximately 50-acre site near the intersection of US Hwy 521 and SC 160, within the Sixmile Creek watershed in Lancaster County, South Carolina. The project site drains into the North Carolina portion of Sixmile Creek, and the entire Sixmile Creek watershed was evaluated in the Biological Assessment (TCG 2007) that concluded that the project was "Not Likely to Adversely Affect" the Carolina heelsplitter.
- U-2506 (Carolina heelsplitter): Involved the extension of Rea Road (SR 3624) on new alignment from its former terminus at the then proposed Charlotte Outer Loop (I-485) in Mecklenburg County, NC to NC 16 in Union County, NC. The roadway extension involved a new crossing of Sixmile Creek in between the NC 16 and SR 3635 (Marvin

Road) crossings. Although the project itself is located outside of the Action Area, the Sixmile Creek watershed as a whole was evaluated in the consultation. Freshwater mussel surveys were conducted in 1999 prior to the authorization of the USACE 404 permit, for a standard distance of 1,312 feet below and 328 feet above the proposed crossing. A large number of mussels, primarily the eastern elliptio, were found during this survey effort; however, typical Carolina heelsplitter habitat is not present in this reach of the stream. Based on the survey results, and the lack of typical habitat, it was concluded that the project was "Not Likely to Adversely Affect" the Carolina heelsplitter. The USFWS concurred with these findings, and the project was let for construction later that year and completed the following year. NOTE: Schweinitz's sunflower was also addressed as part of this project, but its occurrence was outside of the Action Area.

- U-2510 (Carolina heelsplitter): Involved the widening of NC 16 from the intersection with the Rea Road Extension in Union County, NC north to I-485. The widening of the roadway involved replacing the existing culvert over Sixmile Creek with a bridge. As with the Rea Road Extension project, mussel surveys were completed for this project in August 2004, with similar results and a concurrence of "Not Likely to Adversely Affect" was issued by USFWS. As a result of the discovery of Carolina heelsplitter in Sixmile Creek, the USFWS asked NCDOT to reinitiate consultation in April 2006, and perform additional surveys. These surveys were conducted later that month, with similar results to the previous surveys. Again a "Not Likely to Adversely Affect" conclusion was reached and concurred with by USFWS.
- R-5114 (Carolina heelsplitter): Involved the rehabilitation of NC 218 in Mecklenburg, Union, and Anson Counties. This was an American Recovery and Reinvestment Act (ARRA) project which involved repairing deteriorated sections of the existing roadway, overlaying with asphalt and several culvert replacements (Duck Creek).
- (Carolina heelsplitter): USFWS consulted on a natural gas pipeline project that involved crossings of Goose and Duck Creeks. Based on results of surveys for listed plants and measures incorporated into the project to avoid impacts to the Carolina heelsplitter, USFWS concurred with the determination of a "Not Likely to Adversely Affect" conclusion.
- (Carolina heelsplitter): USFWS consulted with NCWRC in the past on several restoration projects in the Goose Creek watershed. A "Not Likely to Adversely Affect" conclusion was reached and concurred with by USFWS.
- B-5109 (Carolina heelsplitter): Bridge No. 29 on NC 218 over Goose Creek. A BA was submitted on April 5, 2013 with the determination of a "May Affect, Likely to Adversely Affect" conclusion. A BO was issued on May 20, 2013 which concurred that "implementing this project is not likely to jeopardize the continued existence of the Carolina heelsplitter or adversely modify its critical habitat" (USFWS 2013).
- Carolina heelsplitter: Bridge No. 6 on SR 1600 over Duck Creek in Union County. Biological Assessment concluded the project "May Affect, Likely to Adversely Affect"

the Carolina heelsplitter. The BA was submitted in May 2012. A concurrence has not been issued as of the writing of this document.

1.3 Habitat Conservation Plans In Action Area

There have been no Habitat Conservation Plans developed for any listed species within the Action Area.

2.0 PROJECT DESCRIPTION

The Monroe Connector/Bypass is proposed to be a controlled-access toll road extending from US 74 near I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, a distance of approximately 20 miles. The project will occupy approximately 1,240 acres within the proposed right of way (ROW). The proposed action will improve mobility and capacity within the project study area by providing a facility for the US 74 corridor that allows for high-speed regional travel consistent with the designations of the North Carolina Strategic Highway Corridor (SHC) program and the North Carolina Intrastate System, while maintaining access to properties along existing US 74.

2.1 Avoidance and Minimization

Consideration was given to the location of endangered species throughout the alternatives development and design process, based on the best available information regarding the known locations of the protected species populations. As stated in Section 2.3.1 in the Draft EIS (excerpt below), all alternatives were purposely kept from encroaching on the Goose Creek watershed in an effort to avoid direct effects to the Carolina heelsplitter and its designated critical habitat (PBS&J 2009).

> *To the north, the boundary does not encroach on either the Goose Creek watershed or on Lake Twitty (a water supply). Previous studies included these areas, but because of concerns surrounding the presence of the federally-endangered Carolina heelsplitter mussel in Goose Creek and because Lake Twitty is a critical watershed, these areas were eliminated from the current project study area. Previously identified corridors for the Monroe Connector and Monroe Bypass that would result in direct impacts to the Goose Creek watershed or Lake Twitty are not included in this analysis.*

Additionally, alternatives were kept outside of the Waxhaw Creek watershed, known Carolina heelsplitter habitat, as stated in Section 2.3.1 in the Draft EIS (PBS&J 2009):

A corridor south of the Lake Lee critical watershed would not be reasonable or practical due to substantially greater length and potential impacts to the Waxhaw Creek watershed, which is also a known Carolina heelsplitter habitat.

3.0 DESCRIPTION OF ACTION AREA

The action area, as defined in 50 CFR 402.02, means areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The defined Action Area for the proposed project includes several area types: those directly impacted by construction activities; those potentially impacted by indirect effects or cumulative effects; and those in which conservation measures are utilized to offset any impacts are proposed outside of the construction areas and the identified zone of indirect impacts. The Action Area for this BA is also referred to as the Future Land Use Study Area (FLUSA) in this and other associated NEPA documents.

Defining the Action Area / FLUSA was coordinated with the environmental regulatory agencies at the January 25, 2007 TEAC meeting. The limits of the FLUSA was also discussed at the February 14, 2007 TEAC meeting, with discussions concluding at the March 22, 2007 TEAC meeting. The FLUSA was expanded to include the entire Goose Creek Watershed.

3.1 Areas of Direct Effects

Direct effects are caused by the proposed action and generally occur at the same time and place as the project. Areas of direct effects will include, but are not limited to: the footprint or ROW of the facility, construction areas, or any other activity that causes ground disturbing activities that can be directly associated with the project. Direct effects of the proposed action are documented in the Final EIS Section S-8 (Table S-2) (PBS&J 2010a).

Direct effects also refer to other activities that are interrelated or interdependent with the proposed action. Interrelated actions are defined as federal actions that are part of a larger action and depend on the larger action for their justification [50 CFR 402.02]. Interrelated action areas include project-associated utility relocations, as well as construction borrow pits, haul roads, and staging areas. Interdependent actions, defined as federal actions having no independent utility apart from the proposed action [50 CFR 402.02], were evaluated with regard to direct effects to endangered species and critical habitat. No direct interdependent actions are anticipated.

3.2 Areas of Indirect Effects

Areas of indirect effects include, but are not limited to, those areas that are impacted by, or will result from, the proposed action and are later in time, but are still reasonably certain to occur [50 CFR 402.02]. These types of impacts can include natural responses to the proposed action's direct impacts, or can include human induced impacts associated with the proposed action. The

indirect impacts are assessed in the DTR. Indirect effects also refer to activities that are interrelated or interdependent with the proposed action. These actions were evaluated with regard to indirect effects to endangered species and critical habitat.

3.3 Conservation Measures

Conservation measures are those measures that facilitate conservation of the species and offer some level of protection to the population.

4.0 ENVIRONMENTAL BASELINE – CAROLINA HEELSPLITTER

4.1 Species Description: Carolina Heelsplitter

4.1.1 Designation (Legal Status)

The Carolina heelsplitter, of the family Unionidae, was listed as Endangered on June 30, 1993, under provisions of the Endangered Species Act of 1973 (as amended) (58 FR 34926-34932) (USFWS 1993a). Critical habitat was designated for Carolina heelsplitter on September 2, 2002, (67 FR 44501-44522), described in detail in Section 4.2.

4.1.1 Characteristics

The Carolina heelsplitter (*Lasmigona decorata*), originally described as *Unio decoratus* by (Lea 1852), synonymized with *Lasmigona subviridis* (Conrad 1835, Johnson 1970), and later separated as a distinct species (Clarke 1985), is a federally Endangered freshwater mussel, historically known from several locations within the Catawba and Pee Dee River systems in North Carolina and the Pee Dee, Savannah, and possibly the Saluda River systems in South Carolina.

The Carolina heelsplitter is characterized as having an ovate, trapezoid-shaped, unsculptured shell. The outer surface of the shell ranges from greenish brown to dark brown in color, with younger specimens often having faint greenish brown or black rays. The shell's nacre is often pearly white to bluish white, grading to orange in the area of the umbo (Keferl 1991). The hinge teeth are well developed and heavy and the beak sculpture is double looped (Keferl and Shelly 1988). Morphologically, the shell of the Carolina heelsplitter is very similar to the shell of the green floater (Clarke 1985), with the exception of a much larger size and thickness in the Carolina heelsplitter (Keferl and Shelly 1988).

Prior to collections in 1987 and 1990 by Keferl (1991), the Carolina heelsplitter had not been collected in the 20th century and was known only from shell characteristics. Because of its rarity, very little information of this species' biology, life history, and habitat requirements was known

until very recently. Feeding strategy and reproductive cycle of the Carolina heelsplitter have not been documented, but are likely similar to other native freshwater mussels (USFWS 1996).

The feeding processes of freshwater mussels are specialized for the removal (filtering) of suspended microscopic food particles from the water column (Pennak 1989). Documented food sources for freshwater mussels include detritus, diatoms, phytoplankton, and zooplankton (USFWS 1996).

McMahon and Bogan (2001) and Pennak (1989) should be consulted for a general overview of freshwater mussel reproductive biology. Freshwater mussels have complex reproductive cycles, which usually include a larval stage (glochidium) that is an obligatory parasite on a fish. The glochidia develop into juvenile mussels and detach from the "fish host" and sink to the stream bottom where they continue to develop, provided suitable substrate and water conditions are available (USFWS 1996). Often, this relationship is quite species-specific with a mussel being able to infect only one species of fish or a small group of closely related species. Many of the fish host associations have been documented by direct evidence on wild-caught fishes or implicated in laboratory infestation experiments (Watters 1994).

Until recently, nothing was known about the host species(s) for the Carolina heelsplitter (USFWS 1996, Bogan 2002). Starnes and Hogue (2005) identified the most likely fish host candidates (15 species) based on fish community surveys in occupied streams throughout the range of the Carolina heelsplitter.

Captive propagation efforts for this species had not been attempted in the past; however, due to the critical level of imperilment of the North Carolina populations, acting on recommendations from the NC Scientific Council on Mollusks, the NC Wildlife Resources Commission (NCWRC) funded a life history/captive propagation study, which allowed for salvage of individuals from the Goose/Duck and Sixmile Creek populations to be used in the study. A total of nine minnow species (Cyprinidae) were identified as suitable, and two sunfish species (*Lepomis* spp.) were identified as marginally suitable host species (Eads et al. 2010). All of these species may occur in habitat types known to be occupied by the Carolina heelsplitter; however, "it is always possible that it may use a combination of fish host species and some may not be native to all streams inhabited by this mussel" (Starnes and Hogue 2005).

Another member of the genus *Lasmigona*, the green floater (*Lasmigona subviridis*), perhaps a close relative to the Carolina heelsplitter, has been documented to be capable of in situ early development with glochidia developing within the marsupium of the female (Barfield and Watters 1998), thus it is possible that the Carolina heelsplitter may also be able to propagate by direct transformation.

4.1.2 Distribution and Habitat Requirements

Currently the Carolina heelsplitter has a very fragmented, relict distribution. At the time of listing, it was known to be surviving in only six streams and one small river (USFWS 1996); however, subsequent discoveries have increased the number of known populations to eleven.

Pee Dee River Basin:

1. Duck Creek/Goose Creek – Mecklenburg/Union Counties, NC
2. Flat Creek/Lynches River – Lancaster/Chesterfield/Kershaw Counties, SC

Catawba River Basin:

3. Sixmile Creek (Twelvemile Creek Subbasin) – Union/Mecklenburg Counties, NC and Lancaster County, SC
4. Waxhaw Creek – Union County, NC and Lancaster County, SC
5. Cane Creek/Gills Creek – Lancaster County, SC
6. Fishing Creek Subbasin – Chester County, SC
7. Rocky Creek Subbasin (Bull Run Creek/UT Bull Run Creek/Beaverdam Creek – Chester County, SC

Saluda River Basin:

8. Redbank Creek – Saluda County, SC
9. Halfway Swamp Creek – Greenwood/Saluda Counties, SC

Savannah River Basin:

10. Little Stevens Creek/Mountain Creek/Sleepy Creek /Turkey Creek (Stevens Creek Subbasin) – Edgefield/McCormick Counties, SC.
11. Cuffytown Creek (Stevens Creek Subbasin) – Greenwood/McCormick Counties, SC

All of these populations occur in stream reaches within the Piedmont Physiographic Province, particularly within two northeast trending lithostratigraphic belts of the Carolina Terrane, the Carolina Slate Belt and the Charlotte Belt. The Carolina Slate Belt is a band of greenschist faces metavolcanic rock formations positioned in the central and lower Piedmont province extending from south-central Virginia to extreme eastern Georgia (Howell 2005, Butler and Secor 1991). The Charlotte Belt extends from north central North Carolina to eastern Georgia and is comprised of amphibolite faces metavolcanic and metaplutonic rock (Howell 2005, Butler and Secor 1991). These hard formations strongly dictate the channel morphology and character of stream substrates where they intersect. Starnes and Hogue (2005) describe such reaches as "generally characterized by dark, often tilted, bedrock stream bottom with associated large and small rock rubble interspersed with pockets of sand, silt, and gravel."

Habitat for this species has been reported from small to large streams and rivers as well as ponds. The ponds are believed to be millponds on some of the smaller streams within the species' historic range (Keferl 1991). Keferl and Shelly (1988) and Keferl (1991) reported that most individuals have been found along well-shaded streambanks with mud, muddy sand, or muddy gravel substrates; however, numerous individuals in several of the populations have been found in cobble and gravel dominated substrate in stream reaches intersecting the hard rock formations described above (TCG personal observations). The stability of stream banks appears to be very important to this species (Keferl 1991).

4.1.3 Threats to Species (Particularly Goose/Duck Creek and Sixmile Creek Populations)

Habitat degradation, water quality degradation, and changes in stream flow (water quantity) are the primary identified threats to the Carolina heelsplitter. Specific types of activities that lead to these threats have been documented by the USFWS in the Recovery Plan, Federal Register and other publications (USFWS 1996, 2002a, 2003). These specific threats include the following:

- Siltation resulting from poorly implemented agricultural, forestry and developmental activities;
- Golf course construction;
- Road construction and maintenance;
- Runoff and discharge of municipal, industrial and agricultural pollutants;
- Habitat alterations associated with impoundments, channelization, dredging, and sand mining operations; and
- Other natural and human-related factors that adversely modify the aquatic environment.

These threats, alone and collectively, have contributed to the loss of the Carolina heelsplitter in streams previously known to support the species (USFWS 2002a). In addition, many of the remaining populations occur in areas experiencing high rates of urbanization, such as the Charlotte, NC and Augusta, GA greater metropolitan areas. The low numbers of individuals and the restricted range of each of the surviving populations make them extremely vulnerable to extirpation from a single catastrophic event or activity (USFWS 1996). The cumulative effects of several factors, including sedimentation, water quality degradation, habitat modification (impoundments, channelization, etc.), urbanization and associated alteration of natural stream discharge, invasive species, and other causes of habitat degradation have contributed to the decline of this species throughout its range (USFWS 1996).

Extensive threats to the species, including sedimentation, toxic contaminants, habitat alterations, urbanization/impervious surface area, thermal pollution, invasive species, and other causes of habitat degradation, are discussed in further detail below.

4.1.3.1 Sedimentation

Sedimentation resulting from improper erosion control of various land usage practices, including agriculture, forestry, and development activities, has been recognized as a major contributing factor to the degradation of mussel populations (USFWS 1996, Brim Box and Mossa 1999, Chapman and Smith 2008). Siltation has been documented to be extremely detrimental to mussel populations by degrading substrate and water quality, increasing potential exposure to other pollutants, and by direct smothering of mussels (Ellis 1936, Markings and Bills 1979). Sediment accumulations of less than one inch have been shown to cause high mortality in most mussel species (Ellis 1936). Accelerated sedimentation and erosion resulting from a bridge construction project in Massachusetts lead to the extirpation of a population of the dwarf wedgemussel (*Alasmidonta heterodon*), a federally endangered freshwater mussel (Smith 1981).

4.1.3.2 Toxic Contaminants

The presence of toxic contaminants has been attributed as a contributor to widespread declines of freshwater mussel populations (Havlik and Marking 1987; Bogan 1993; Neves et al. 1997). Toxic contaminants can produce lethal or sub-lethal responses to freshwater mussels. The sensitivities of freshwater mussels to toxic contaminants is variable based on species, life stage (glochidium, juvenile, or adult), and environmental conditions, as well as concentration and exposure route (water column, sediments, etc.), frequency, and duration. Several studies have indicated that freshwater mussels are among the most sensitive aquatic organisms to various toxicants, particularly cadmium, copper and ammonia (Grabarkiewicz and Davis 2008).

Freshwater mussels are extremely sensitive to ammonia, a form of nitrogen (Goudreau et al. 1993; Augspurger et al. 2003, Bartsch et al. 2003, Newton et al. 2003; Wang et al. 2007a; 2007b). Anthropogenic sources of ammonia in surface waters include sewage treatment effluent, industrial wastewater effluent, and runoff and ground water contamination from lawn/turf management, livestock operations and faulty septic systems. Sewage treatment effluent has been documented to significantly affect the diversity and abundance of mussel fauna (Goudreau et al. 1988). Goudreau et al. (1988) found that recovery of mussel populations might not occur for up to two miles below discharges of chlorinated sewage effluent. Similarly, surveys in the Goose Creek watershed show a dramatic absence of mussel fauna below the Oxford Glen WWTP on Stevens Creek for a considerable distance (approximately 1.6 km/1mi) below the discharge point (NCWRC 2010). A study conducted in the Goose Creek watershed documented that baseflow concentrations of chlorine nearly double directly downstream of the Hunley Creek WWTP located on Goose Creek (Allan 2004).

Recent studies indicate that current federal and state water quality standards for many pollutants commonly found in wastewater discharges and stormwater runoff are likely not protective of freshwater mussels and current regulations controlling the discharge or runoff of these pollutants

are not protective (Augspurger et al. 2003). The U.S. Environmental Protection Agency (EPA) has been evaluating potential revision of the current federal standards (acute and chronic standards) for ammonia, but has yet to revise them to a protective level (USFWS 2007). Water quality monitoring by the North Carolina Division of Water Quality [Note: North Carolina Division of Water Quality changed its name to North Carolina Division of Water Resources in 2013] (NCDWQ 2002) identified average and maximum concentrations of ammonia in Goose Creek as being among the highest of any monitored sites in the Yadkin/Pee Dee River Basin.

In addition to ammonia, several other pollutants have been identified as exceeding levels of concern in Goose Creek, including, but not limited to, sediment/suspended solids (NCDWQ 2000; Chen et al. 2001; Allan 2005), copper (NCDWQ 2002), chlorine (NCDWQ 1998), and phosphate, a form of phosphorus (Chen et al. 2001; NCDWQ 2002, 2003; Allan 2005). While phosphate itself is not toxic, concerns with extremely high concentrations of phosphate pertain to increased biological production, such as algal blooms, which can result in lowering of dissolved oxygen (Binkley et al. 1999).

Concentrations of several of these pollutants in Goose Creek, including ammonia, appear to be on an increasing trend (Chen et al. 2001; Service et al. 2005). Currently there are no water quality standards, or monitoring requirements for ammonia, copper and phosphorus in North Carolina (USFWS 2007); however, the Goose Creek Site Specific Management Plan (NCDENR 2009) requires that any direct or indirect discharge that may cause ammonia toxicity to the Carolina heelsplitter, action shall be taken to reduce ammonia (NH3-N) inputs to achieve 0.5 milligrams per liter or less of total ammonia based on chronic toxicity defined in 15A NCAC 02B .0202. This level of total ammonia is based on ambient water temperature equal to or greater than 25 degrees Celsius (NCDENR 2009).

In addition, recent studies indicate other toxicants present in wastewater effluent such as pharmaceuticals and personal care products (fluoxitine, estrogenic compounds, opiate derivatives etc.) cause a wide array of neurotoxicological (Gagné et al 2007a), reproductive (Bringolf et al. 2007, Gagné et al 2007b) and behavioral (Heltsley et al. 2006) impacts to freshwater mussels.

Other sources of toxic contaminants in surface waters arise from highway and urban runoff. Numerous pollutants have been identified in highway runoff, including various metals (lead, zinc, iron, etc.), sediment, pesticides, deicing salts, nutrients (nitrogen, phosphorus), and petroleum hydrocarbons (Yousef et al. 1985, Gupta et al. 1981). The sources of these runoff constituents range from construction and maintenance activities to daily vehicular use. Hoffman et al. (1984) concluded that highway runoff can contribute up to 80% of the total pollutant loadings to receiving water bodies. Petroleum hydrocarbons, polycyclic aromatic hydrocarbons, lead, and zinc were some of the pollutants identified in this study.

The toxicity of highway runoff to aquatic ecosystems is poorly understood. A major reason for this poor understanding is a lack of studies focusing solely on highway runoff. Potential impacts of highway runoff have often been inferred from studies conducted on urban runoff; however, the relative loadings of pollutants are often much greater in urban runoff, because of a larger drainage area and lower receiving water dilution ratios (Dupuis et al. 1985). The negative effects of urban runoff inputs on benthic macroinvertebrate communities have been well documented (Garie and McIntosh 1986; Jones and Clark 1987; Field and Pitt 1990). Lied (1998) found the macroinvertebrate community of a headwater stream in Pennsylvania to be highly degraded by urban runoff via a detention pond. Improvements were observed at continual distances downstream from the discharge point, however all sites examined were still impaired compared to a reference community.

The few studies that examined actual highway runoff show that some species demonstrate little sensitivity to highway runoff exposure, while others are much more sensitive (Dupuis et al. 1985). Maltby et al. (1995) found elevated levels of hydrocarbons and metals in both stream sediments and the water column below a heavily traveled British motorway. They demonstrated that the benthic amphipod (*Gammarus pulex*) experienced a decrease in survival when exposed to sediments contaminated with roadway runoff. However, this species showed no increase in mortality when exposed to water contaminated with roadway runoff. Unfortunately, most of these studies only measured acute toxicity to runoff and did not examine long-term effects.

The effects of highway runoff on freshwater bivalves have not been studied extensively. Augspurger (1992) compared sediment samples and soft tissues of three eastern elliptio (*Elliptio complanata*), a relatively common species upstream and downstream of the I-95 crossing of Swift Creek in Nash County, North Carolina. The sediment samples as well as the mussels exhibited higher levels of aliphatic hydrocarbons, arsenic, lead, zinc, and other heavy metal contaminants in the downstream samples. Because of the small sample size, the effect on the health of these mussels was not studied. In another study, contaminant analysis of stream sediments showed an increase of polycyclic aromatic hydrocarbons and some metals downstream of road crossings, although there was no direct correlation found between increasing contaminant levels and decreasing mussel abundance at these crossings (Levine et al. 2005). The eastern elliptio was the only mussel species that was found in large enough numbers for statistically valid comparisons. The eastern elliptio is generally considered more tolerant of water quality degradation than many other mussel species. Further research is needed before the effects of highway runoff on sensitive mussel species such as the Carolina heelsplitter can be determined.

In addition, contamination of surface water from toxic spills along roadways is known to have significant impacts to aquatic communities. A toxic spill resulting from a tanker truck accident that was carrying Octocure 554 (a chemical liquid used in the rubber making process), killed several miles of mussel populations in the Clinch River near Cedar Bluff, Virginia. The spill

killed thousands of fish and mussels, including three federally protected species. The Clinch River contains one of the most diverse mussel faunas in the United States. The stretch of the river affected by the spill was one of the few remaining areas that contained a reproducing population of the Endangered tan riffleshell (*Epioblasma florentina walkeri*). The toxic spill is believed to have eliminated this population (Richmond Times Dispatch 1998).

4.1.4 Habitat Alterations

The impact of impoundments on freshwater mussels has been well-documented (USFWS 1992a, Neves 1993). Dam construction transforms lotic habitats into lentic habitats, which results in changes within aquatic community composition. Muscle Shoals on the Tennessee River in northern Alabama, once the richest site for mussels) in the world, is now at the bottom of Wilson Reservoir, covered with 19 feet of muck (USFWS 1992b). Large portions of all of the river basins within the Carolina heelsplitter's range have been impounded; this is believed to be a major factor contributing to the species decline (USFWS 1996). This is especially true in the larger river habitats within the species historic range, such as the Catawba and Savannah Rivers, where impoundments have significantly altered habitat. The two extant populations in the Savannah River Basin are functionally isolated from each other by an impoundment on Stevens Creek, as such, there are considered two separate units for management (USFWS 1996).

4.1.4.1 Urbanization/Impervious Surface Area

The correlation of increasing development within a watershed and decreasing water quality is well documented (Lieb 1998, Crawford and Lenat 1989, Garie and McIntosh 1986, Lenat et al. 1979), and is largely associated with increases in impervious surface area. These increases in impervious surface area can indirectly affect water quality in a variety of ways, particularly with regard to changes to stream flow, water temperature, total suspended sediment, and pollutant loadings.

Multiple studies have demonstrated that water quality and stream ecosystem degradation begins to occur in watersheds that have approximately 10% coverage by impervious surfaces (Stewart et al. 2000, Schueler 1994, Arnold and Gibbons 1996). The NCWRC recommendations for management of protected aquatic species watersheds are to limit imperviousness to 6% of the watershed (NCWRC 2002). These impacts are examined in Section 6.5 of the DTR.

Increases in impervious surface area within a watershed can result in extremes in peak discharge, runoff volume and base flow conditions. The Carolina heelsplitter may inherently be more susceptible to the consequences of these extremes than other mussels. While most mussels will usually dig into the substrate such that only the siphons are exposed or the very top of the shell, the Carolina heelsplitter is usually found with about 1/3 of its shell lodged in the substrate (Catena personal observations). As a result, it is much more prone to dislodgement during high

base flows and less able to bury itself in the substrate during low flow conditions. This factor likely makes the Carolina heelsplitter more prone to predation and desiccation, even during periods of normal precipitation, than other freshwater mussels.

- *Peak Discharge*

Peak discharge is the maximum rate of stormwater flow expected from a storm event, measured in cubic feet per second (cfs). Peak discharge is often one metric used in analyzing impacts from development. Peak discharge affects channel stability (or instability), which is one of the identified constituent elements. Increases in peak discharge equates to higher velocity, which in turn increases the scouring effect (surface erodibility) of the runoff. Accordingly, sedimentation will increase as erosion rates increase. Allan (2005) documented dramatic increases in sediment and nutrient concentrations during high flow events in the Goose Creek subbasin.

Increases of peak discharge rates, coupled with deforestation, have been shown to result in stream narrowing and incision and subsequent loss of ecosystem function (Sweeney et al. 2004). Increased runoff volume and peak discharge (from typical and atypical storm events) destabilize the stream channel.

- *Runoff Volume*

Runoff volume is the amount of stormwater expected from a storm event, measured in acre-feet. Like peak discharge, runoff volume is another metric often used in determining impacts of development, especially on the aquatic environment. For example, increases in the amount of runoff normally equates to increased sediment. While the two indicators are related, when analyzed separately, both are useful in assessing impacts to aquatic systems.

In a stable system, an increase in the velocity may have little impact if volume does not change, provided that measures to slow the increased velocity have been implemented. However, the increased runoff volume may have enough sediment to cause detrimental impacts. Regardless, it is important to consider both the rate (peak discharge) and the amount (runoff volume) when assessing impacts to aquatic systems. Again, sufficient stormwater controls accompanying future development activities in any given watershed is essential for conservation of sensitive aquatic species such as the Carolina heelsplitter.

- *Decreased Base Flow*

Increases of impervious surface lead to decreases in infiltration and base flow (groundwater flow) within adjacent streams. This can result in the following:

- During periods of reduced base flow, there is less water to cover the stream bottom.

- Widened streams have less overhanging tree cover and are exposed to more sunlight, resulting in increased water evaporation and temperature, especially in areas with shallower water.
- If base flow is reduced, yet WWTP discharge remains constant or increases, it takes longer for the stream to dilute the nutrients and other toxins in the effluent, thereby extending the WWTP effluent "plume" further downstream.
- Permitted and un-permitted water withdrawals for crop and turf/lawn irrigation further exacerbate this effect. Currently, there is an irrigation withdrawal from Goose Creek at approximately mid-length of its course for a golf course at approximately mid-length of its course. During summer months withdrawals of up to 188 gallons per minute (gpm), or 0.42 cfs can significantly affect the available dilution for downstream dischargers (Belnick, 2001).

4.1.4.2 Thermal Pollution

Concerns over effects of thermal pollution from urban runoff on aquatic systems have increased in recent years. Elevation of stream temperature can raise Biochemical Oxygen Demand (BOD), lower dissolved oxygen (DO), and alter faunal composition (Roa-Espinosa et al. 2003, Poole et al. 2001). Typically, runoff from a developed impervious area will have a temperature similar to the temperature of the impervious area. During the hot summer months, this could potentially make the stormwater runoff reach temperatures up to and above 90°F, which could be detrimental to the aquatic life. Traditional structural stormwater controls, such as open storm-water detention ponds/basins that do not allow for infiltration, do not protect receiving water bodies against adverse temperature effects. For these and other reasons, the USFWS feels that the Goose Creek Site Specific Management Plan (NCDENR 2009), will not provide adequate protection to the Carolina heelsplitter, because the plan states that although measures to promote infiltration and groundwater recharge are to be "considered," such measures will not be required (USFWS 2008). Various stormwater BMPs have been shown to be effective in ameliorating temperature effects (NC State Cooperative Extension 2006a). Bioretention devices were shown to reduce runoff temperature by 5-10°F in Greensboro, NC (NC State Cooperative Extension 2006b).

The loss of riparian buffers as well as peak discharge-related channel widening can also contribute to stream temperature increases, by increasing sunlight exposure and decreasing water depth.

4.1.4.3 Invasive Species

The introduction of exotic species such as the Asian clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*) has also been shown to pose significant threats to native freshwater mussels. The zebra mussel is not known from any waterbodies supporting the Carolina heelsplitter (USFWS 1996); however, the Asian clam is established in most of the major river

systems in the United States (Fuller and Powell 1973), including those streams still supporting surviving populations of the Carolina heelsplitter (USFWS 1996).

Concern has been raised over competitive interactions for space, food, and oxygen with the Asian clam and native mussels, possibly at the juvenile stages (Neves and Widlack 1987, Alderman 1997). In addition, under high densities, Asian clam beds are subject to large die-offs, which have been shown to dramatically increase porewater ammonia, and reduce DO during low-flow summer months (Cooper et al. 2005).

4.1.4.4 Other Causes of Habitat Degradation

Loss of riparian buffers can lead to degradation of adjacent aquatic habitats. The role of forested riparian buffers in protecting aquatic habitats is well documented (NCWRC 2002). The Recovery Plan for the Carolina heelsplitter (USFWS 1996) identifies the establishment of stream buffer zones as a major Recovery Objective (Task 1.4). Riparian buffers provide many functions including pollutant reduction and filtration, a primary source of carbon for aquatic food web, stream channel stability, and maintenance of water and air temperatures. Numerous studies have recommended a range of buffer widths needed to maintain these functions. Recommended widths vary greatly depending on the parameter or function evaluated. Wide contiguous buffers of 100-300 feet (30-91 meters) are recommended to adequately perform all functions (NCWRC 2002). The NCWRC recommends a minimum of 200 foot (61 meter) native, forested buffer on perennial streams and a 100 foot (30 meter) forested buffer on intermittent streams in watersheds that support federally endangered and threatened aquatic species (NCWRC 2002). Although not officially adopted, the USFWS uses the NCWRC recommendations as guidance when addressing federally protected aquatic species in North Carolina. The Site Specific Water Quality Management Plan for the Goose Creek Watershed (NCDWQ 2009) requires undisturbed riparian buffers within 200 feet of waterbodies within the 100-year floodplain and within 100 feet of waterbodies not within the 100-year floodplain. The USFWS feels that this level of protection is not sufficient to protect the Carolina heelsplitter, as Rule 15A NCAC 02B.0607 exempts or potentially allows (with NCDWQ approval) numerous activities within the “undisturbed” buffers, with no requirement for mitigation (USFWS 2008).

Another human-related factor adversely impacting habitat of the Carolina heelsplitter is recreational all-terrain vehicle (ATV) use. ATV tracks have been noted crossing streams as well as traveling stream channels within Carolina heelsplitter habitat, in particular in several segments of Goose Creek. In addition to directly running over mussels, ATVs destabilize stream banks and floodplains, causing sedimentation and buffer degradation. While there is no quantitative data available on ATV use, locally, this can have significant impacts.

4.1.4.5 Identified Action Area Threats

The Goose Creek and Sixmile Creek populations of the Carolina heelsplitter are threatened by numerous sources of degradation. Both of these watersheds have experienced rapid urbanization in recent years (TCG 2007, HNTB 2009, Baker Engineering 2013), which have contributed to, or exacerbated these threats. Specific threats to Carolina heelsplitter populations in these two watersheds are listed in Table 1.

Table 1. Threats to Carolina heelsplitter in the Goose Creek Basin and Action Area

Threat/Concern	Specific Problems	Potential Sources
Water Quality Degradation	Fecal coliform Ammonia Nitrate/Nitrite Chlorine Phosphorus Dissolved oxygen Copper Pesticides Other toxicants	Wastewater treatment facilities Agricultural runoff Golf course runoff Lawn care chemicals Urban runoff Fertilizer applications Isolated spills
Habitat Degradation	Sediment Total suspended solids Riparian buffer loss Stream scour Stream/bank instability	Changes in stream flow Increased stormwater runoff Construction Land development Recreational use (ATV) Poor land management practices
Water Quantity Degradation	Mussel dislodgement Drought mortality (desiccation and increased predation)	Increased stormwater volume/velocity Reduced infiltration and ground water recharge Increased impervious cover

Threat/Concern	Specific Problems	Potential Sources
Invasive Species	Competitive interactions, water quality effects	Asian clam

4.2 Designated Critical Habitat

In accordance of Section 4 of the ESA, Critical Habitat for listed species consists of:

(1) The specific areas within the geographical area occupied by the species at the time it is listed in which are found those physical or biological features (constituent elements) that are:
   a. essential to the conservation of the species, and
   b. which may require special management considerations or protection
(2) Specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Act, upon a determination by the Secretary that such areas are "essential for the conservation of the species."

When designating Critical Habitat, the USFWS identifies physical and biological features (primary constituent elements) that are essential to the conservation of the species and that may require special management considerations or protection. The primary constituent elements essential for the conservation of the Carolina heelsplitter (USFWS 2002a) include:

1. permanent flowing, cool, clean water
2. geomorphically stable stream and river channels and banks
3. pool, riffle, and run sequences within the channel
4. stable substrates with no more than low amounts of fine sediment
5. moderate stream gradient
6. periodic natural flooding
7. fish hosts, with adequate living, foraging, and spawning areas for them.

Critical Habitat for the Carolina heelsplitter was designated in 2002 (USFWS 2002a). The designated area totals approximately 148 kilometers (92 miles) of nine creeks and one river in North and South Carolina (Figures 2 and 3). Six areas (Units) have been designated as critical habitat and a description of each follows.

<u>Unit 1. Goose Creek and Duck Creek (Pee Dee River system), Union County, NC</u>

Unit 1 encompasses approximately 7.2 km (4.5 mi) of the main stem of Goose Creek, Union County, NC, from the N.C. Highway 218 Bridge, downstream to its confluence with the Rocky River, and approximately 8.8 km (5.5 mi) of the main stem of Duck Creek, Union County, NC, from the Mecklenburg/Union County line downstream to its confluence with Goose Creek.

Details regarding recent surveys in Goose/Duck Creeks, and conditions within the Critical Habitat Unit are discussed in Section 4.4.

Unit 2. Waxhaw Creek (Catawba River system), Union County, NC

Unit 2 encompasses approximately 19.6 km (12.2 mi) of the main stem of Waxhaw Creek, Union County, NC, from the N.C. Highway 200 Bridge, downstream to the North Carolina/South Carolina state line. Very few Carolina heelsplitter individuals have been found in Waxhaw Creek since they were first discovered in 1987. Keferl (1991) found one live individual in 1987 and two in 1990. Subsequent surveys failed to find any individuals until one weathered shell was found in 1996, followed by one live individual in 1998, one weathered shell in 2005, three live individuals at three separate sites in 2006 (NCWRC Database) and no live individuals in 2011 (USFWS 2012a). Surveys of Waxhaw Creek in South Carolina, conducted in 2004, documented only two live individuals at a single site – one of only a couple of sites in the stream below the North Carolina/South Carolina state line that appeared to provide suitable substrate for the heelsplitter (USFWS 2007). The population level in Waxhaw Creek is therefore very low, making it extremely vulnerable to extirpation.

Unit 3. Gills Creek (Catawba River system), Lancaster County, SC

Unit 3 encompasses approximately 9.6 km (6.0 mi) of the main stem of Gills Creek, Lancaster County, SC, from the County Route S-29-875, downstream to the SC Route 51 Bridge, east of the City of Lancaster. One 88.0 mm fresh shell and one 67.0 mm live individual discovered in 1998 represent this population (Alderman 1998). No additional surveys have been completed in this section of Gills Creek since 1998. In 2006 Catena discovered the species (two live and one shell) at three sites in Cane Creek, a tributary to Gills Creek (USFWS 2007). While Cane Creek is not within the boundaries of Unit 3, Gills Creek and Cane Creek are considered a single population from a management perspective, as there are no physical barriers that would isolate the two areas. The discovery of the Carolina heelsplitter in Cane Creek demonstrates that this population has been reduced to small pockets of habitat in the watershed. Additional surveys in 2011 in Gills Creek from the South Carolina Highway 9 Bridge upstream to the Langley Road crossing resulted in the discovery of one live individual (USFWS 2012a). This population is very small, consisting of a few individuals, and increasingly at risk of being extirpated.

Unit 4. Flat Creek (Pee Dee River system), Lancaster County, SC, and the Lynches River (Pee Dee River system), Lancaster, Chesterfield, and Kershaw Counties, SC

Unit 4 encompasses approximately 18.4 km (11.4 mi) of the main stem of Flat Creek, Lancaster County, SC, from the SC Route 204 Bridge, downstream to its confluence with the Lynches River. Additionally, Unit 4 encompasses approximately 23.6 km (14.6 mi) of the main stem of the Lynches River, in Lancaster and Chesterfield Counties, SC, from the confluence of Belk

Branch, Lancaster County, northeast (upstream) of the U.S. Highway 601 Bridge, downstream to the SC Highway 903 Bridge in Kershaw County, SC.

Within this unit in 2005 to 2007, the Lynches River local population was represented by 14 live and two fresh dead shells (54-87mm) found above SC 265 in Chesterfield/Lancaster Counties, SC (USFWS 2012a). In 2011, 13 live and one shell were found in this area (Catena 2011). Between 1994 and 1997, the Flat Creek local population was represented by 28 live individuals ranging in length from 54.15 to 94.1 mm and by four shells ranging in length from 41.0 to 86.1 mm (Alderman 1998). In 2007, Alderman conducted surveys of two reaches of Flat Creek, one in upper Flat Creek and one in middle-lower Flat Creek, and documented 16 live Carolina heelsplitters, including several age classes, some likely less than five years of age based on shell measurements (USFWS 2007). In 2010, Alderman and USFWS found 50 live and one weathered shell in Flat Creek, with a large number of size classes represented (USFWS 2012a). The population in Flat/Lynches Creek exists in relatively low numbers, and in Lynches Creek has a highly fragmented distribution (USFWS 2012a).

Unit 5. Mountain and Beaverdam Creeks (Savannah River system), Edgefield County, South Carolina, and Turkey Creek (Savannah River system), Edgefield and McCormick Counties, SC

Unit 5 encompasses approximately 11.2 km (7.0 mi) of the main stem of Mountain Creek, Edgefield County, SC, from the SC Route 36 Bridge, downstream to its confluence with Turkey Creek; approximately 10.8 km (6.7 mi) of Beaverdam Creek, Edgefield County, from the SC Route 51 Bridge, downstream to its confluence with Turkey Creek; and approximately 18.4 km (11.4 mi) of Turkey Creek, from the SC Route 36 Bridge, Edgefield County, downstream to the SC Route 68 Bridge, Edgefield and McCormick Counties, SC. Within this unit, only a single shell of the Carolina heelsplitter had been found in Beaverdam Creek since its discovery there (Alderman 1995). Additional surveys of the Beaverdam Creek between 1995 and 2007 failed to locate any individuals (USFWS 2007). Extensive surveys of the creek in 2010, however, resulted in the discovery of one live heelsplitter and one shell (USFWS 2012a).

Until recently, the Turkey Creek local population was represented by a few shells discovered in 1995 and by one live individual discovered in 1997 (Mcdougal 1997). Subsequent surveys have yielded several more live individuals: two in 2006, two in 2007, one in 2010 (USFWS 2012a), and 10 individuals in 2012 (1) and 2013 (9) (Catena 2013). The Mountain Creek local population is represented by 15 live individuals ranging in length from 38.7 to 84.9 mm and by 15 shells ranging in length from 53.0 to 98.0 mm (Alderman 1998, 2002). During surveys conducted in 2009 and 2010, USFWS biologists recorded nine live heelsplitters at sites scattered throughout the stream (USFWS 2012a). During 2002, two additional local populations of Carolina heelsplitter were discovered within the Turkey Creek Subbasin, one in Little Stevens Creek represented by a shell fragment, and one in Sleepy Creek represented by seven live

individuals ranging in length from 51.1 to 73.0 mm and by three shells ranging in length from 61.4 to 71.0 mm (Alderman 2002). Most recently, seven live and one moribund individuals were documented in Little Stevens Creek in 2007 (USFWS 2007). A survey in 2011 of Little Stevens Creek yielded just one live individual. Additionally, during surveys conducted in Sleepy Creek in 2011, USFWS biologists recorded a total of 18 live individuals in a ~6.63-km (~4.12-mi) reach of the stream (USFWS 2012a). Overall, this population of Carolina heelsplitter consists of several small populations that are fragmented throughout the watershed. This distribution of individuals makes the population highly vulnerable to extirpation, though it appears that a few of these pockets may be rebounding.

Unit 6. Cuffytown Creek (Savannah River system), Greenwood and McCormick Counties, SC

Unit 6 encompasses approximately 20.8 km (12.9 mi) of the main stem of Cuffytown Creek, from the confluence of Horsepen Creek, northeast (upstream) of the SC Route 62 Bridge in Greenwood County, SC, downstream to the U.S. Highway 378 Bridge in McCormick County. Within this unit, three live individuals were discovered in 1998 and two live individuals were discovered in 2001, with lengths ranging from 53.5 to 71.5 mm. One shell was discovered in 1998 with a length of 63.0 mm (Alderman 1998, 2002). Biologists conducting surveys in 2010 found two live individuals at two separate sites. This appears to be a very small population and highly vulnerable to extirpation (USFWS 2012a).

Five of the eleven Carolina heelsplitter populations listed in Section 4.1.3: Sixmile Creek, Fishing Creek, Rocky Creek, Redbank Creek, and Halfway Swamp Creek, were discovered after Critical Habitat was designated. These populations are all limited in size and distribution.

4.3 Potential Effects of Roadway Projects on Freshwater Mussels and Habitat

A number of potential direct and indirect effects to the freshwater mussels and their habitat, which could result from roadway projects, are identified here. Potential cumulative effects are also discussed in this section. While several threats to the Carolina heelsplitter are recognized (Section 4.1.4), potential roadway-related threats fall into three main categories:

1) physical effects (habitat degradation , direct mortality of individuals),
2) water quality effects (chemical, temperature, and biological pollutants),
3) water quantity effects (changes in peak and base flows).

4.3.1 Potential Direct Effects

Direct effects refer to consequences that can be directly attributed to the project. Direct impacts associated with road construction include, but are not limited to, land-clearing, loss of habitat, stream re-channelization, hydrologic modification, and erosion associated with construction in the project corridor as well as within fill/borrow areas, and construction staging/access areas

outside of the project corridor. The potential effects of these activities on aquatic species, especially freshwater mussels, include degradation of habitat due to siltation, substrate disturbance (resulting in physical injury to individual mussels, and reduced habitat suitability), temporary, and permanent alteration of flows (temporary dewatering, causeway construction, channel restriction etc.), and runoff of pollutants, that originate from the project corridor during construction, and once in operation, that result in mortality, or harm (stress, adverse behavioral responses, or limited viability etc.) to individual mussels. Potential impacts to mussel habitat include channel and stream bank scouring, erosion, and runoff of pollutants that originate from the project corridor during construction, and once in operation.

4.3.2 Potential Indirect Effects

Indirect effects are those effects that are caused by, or will result from, the proposed action and are later in time, but are still reasonably certain to occur [50 CFR 402.02]. These types of impacts can include natural responses to the proposed action's direct impacts, or can include human induced impacts associated with the proposed action.

4.3.1.1 Indirect Effects on Land Use

Project-induced changes in land use are also considered part of the indirect impacts of a proposed action. These types of land use changes are not direct consequences of the road construction, but result from modifications in access to parcels of land and from modifications in travel time between various areas (Mulligan and Horowitz 1986). Indirect land use impacts of highway projects include residential, commercial, and industrial developments and linear urban sprawl along a highway corridor or in the vicinity of interchanges.

Economic development is often used as a criterion in highway funding (Eagle and Stephanedes 1987). Historically, transportation has been viewed as a necessary precursor to economic development (Anderson et al. 1992), and transportation infrastructure is "one of the principle policy levers that state and local governments can use to increase their attractiveness to business investors" (Forkenbrock 1990).

Depending upon local land development regulations, development demand, water/sewer availability, and other factors, roadway improvements can also result in encouragement of additional unintended development and sprawl. Improvements to levels of service, better accommodation of merging and exiting traffic, and reductions in travel times can have land development impacts outside of the direct project area. Any induced growth and development within this area has the potential to degrade water quality, scenic values, and recreational opportunities unless proper planning and development regulations are utilized. This potential increases in areas with minimal or no planning programs and virtually non-existent development controls

4.3.1.2 Indirect Changes in Traffic Patterns

Project-induced development has the potential to effect traffic patterns on the existing road network within the action area of roadway construction projects. Increased traffic volumes on the road networks traversing the watersheds could potentially affect the associated aquatic communities, including freshwater mussels, by causing water quality degradation, while decreases in traffic volume could have a potential beneficial effect, by decreasing concentrations of toxicants originating from roadway runoff, and/or toxic spills along roadways.

4.3.2 Potential Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving federal actions, which are reasonably certain to occur within the action area of the proposed federal action. Cumulative effects to mussels and their habitat include continued non-federal development pressures, and their subsequent environmental consequences in the watersheds that are independent of the federal action.

4.4 Presence within Action Area

The Action Area / FLUSA encompasses streams within two major River Basins, the Catawba and Yadkin/Pee Dee. This includes portions of the subbasins within the project alignment, as well as others that are not, including McAlpine Creek (Irvins Creek, Campbell Creek, and Fourmile Creek), Goose Creek (Stevens Creek, Duck Creek, and Paddle Branch), Sixmile Creek, Twelvemile Creek (West Fork, Davis Mine Creek and East Fork), Bearskin Creek, (Horsepen Creek, Camp Branch and Lick Fork), and Lanes Creek (Henry Branch and Barkers Branch). These watersheds are depicted in Figure 4. As the Carolina heelsplitter is known to occur in water bodies ranging in size from large rivers to headwater streams, all perennial streams within the action area were evaluated for presence of this species

4.4.1 Project Alignment

The 31 perennial streams within the project alignment were evaluated for the presence of this species (Catena 2009). The streams are within the following subbasins: Crooked Creek (North and South Forks), Stewarts Creek, and Richardson Creek (includes Ray Fork, Salem Branch and Meadow Branch). The Carolina heelsplitter was not found in any of these water bodies (Catena 2009). Surveys conducted in 2009 were updated in 2012. In order to determine the location for the 2012 mussel surveys, the location of potential effects and/or impacts within the Project Study Area (PSA) were overlaid with streams identified during the 2009 surveys that contain a robust freshwater mussel population that could potentially support the Carolina heelsplitter. Accordingly, South Fork Crooked Creek and Stewarts Creek in the vicinity of the project alignment, and portions of Crooked Creek and Richardson Creek were surveyed.

Overall the results of the 2012 survey efforts are very similar to the 2009 surveys, and as was the case in 2009, the Carolina heelsplitter was not found in any of the surveyed streams. In addition, the Savannah Lilliput remains extant in South Fork Crooked Creek, and like in 2009, a concentration of individuals was found within the proposed roadway crossing. The survey report is included as Appendix A.

The difference in results between the two surveys are likely a result of differences in time of year, survey conditions, and level of effort, rather than an indication of changes in mussel abundances. For example, while the Savannah Lilliput was found in low numbers (3 individuals) in Richardson Creek in 2009, it was not located in 2012, but is likely still present. There was a large amount of leaf pack covering the substrate in 2012 generally making surveying difficult. This coupled with the very small size of the Savannah Lilliput (< 2 inches) is likely the reason it was not detected. The fact that most of the other species occurring in Richardson Creek were found in similar numbers further supports this assumption. Furthermore, the difficulty of detecting a species that is present in low numbers during a one-time survey is highlighted by the fact that the Paper Pondshell was found (one individual) in Richardson Creek in 2012, but not in 2009, although it was known from the stream prior to 2009 (NCWRC Unpublished Aquatic Species Database).

4.4.2 Mussel Fauna in Project Footprint

Existing mussel survey data within the project footprint were reviewed by Catena. Data sources consulted included the NCWRC Unpublished Aquatic Species Database, which was reviewed in October 2013, the NC Natural Heritage Program (NCNHP) database (NCNHP 2013), reviewed in February 2010, and Johnson (1970), and surveys conducted by Catena. Habitat evaluations/ mussel surveys were conducted in the perennial streams within the project alignment in 2009 (Catena 2009). Catena also conducted surveys in the streams that were outside of the project alignment but needed updated survey information to determine the presence/absence of the Carolina heelsplitter: Lanes Creek, Richardson Creek upstream of the project alignment, and Crooked Creek downstream of the project alignment (Catena 2009, 2010).

A total of 15 freshwater mussel species have been recorded in the action area watersheds (Table 2). In addition to the Carolina heelsplitter, other rare freshwater mussel species known from Action Area streams include the Federal Species of Concern (FSC) and State Endangered (E) Atlantic Pigtoe (*Fusconaia masoni*), Brook Floater (*Alasmidonta varicosa*), Carolina Creekshell (*Villosa vaughnaniana*), and Savannah Liliput (*Toxolasma pullus*); the state Threatened (T) Creeper (*Strophitus undulatus*); the State Special Concern (SC) Notched Rainbow (*Villosa constricta*); and the State Significantly Rare (SR) Eastern Creekshell (*Villosa delumbis*).

Table 2. Freshwater Mussel Species in Action Area Streams

Scientific Name	Common Name	Federal Status	State Status	Action Area Streams*
Alasmidonta varicosa	Brook Floater	FSC	E	RC
Elliptio angustata	Carolina Lance	~	~	CC,GC
Elliptio complanata	Eastern Elliptio	~	~	All
Elliptio icterina	Variable Spike	~	~	BC,GC,LC,RC,XC,TC
Elliptio producta	Carolina Spike	~	W	GC,XC,TC
Fusconaia masoni	Atlantic Pigtoe	FSC	E	GC,LC
Lasmigona decorata	Carolina heelsplitter	E	E	GC,XC,TC**
Pyganodon cataracta	Eastern Floater	~	~	BC,CC,LC,RC,SC,XC,TC
Strophitus undulatus	Creeper	~	T	GC,BC,LC
Toxolasma pullus	Savannah Lilliput	FSC	E	CC, LC, RC
Uniomerus carolinianus	Florida Pondhorn	~	~	BC,CC,LC,RC,TC
Utterbackia imbecillis	Paper Pondshell	~	~	CC,RC,SC
Villosa constricta	Notched Rainbow	~	SC	GC,TC
Villosa delumbis	Eastern Creekshell	~	SR	All
Villosa vaughaniana	Carolina Creekshell	FSC	E	CC,GC,LC,RC,XC,TC

*BC, CC, GC, LC, MC, RC, SC, XC, and TC denote Bearskin Creek, Crooked Creek, Goose Creek, Lanes Creek, McAlpine Creek, Richardson Creek, Stewarts Creek, Sixmile Creek and Twelvemile Creek subbasins, respectively.

**Historic Record

Based on location, geology, life history and distribution, it is likely that the Carolina heelsplitter occurred in portions of most, if not all, of the subbasins in the surveyed area at one point in time. However, it is currently limited to the Goose Creek and Sixmile Creek subbasins.

4.4.2.1 Distribution in Goose/Duck Creek

The Carolina heelsplitter was first discovered in Goose Creek in 1987 (Keferl 1991) and in Duck Creek in 2000 (NCWRC Database). Between 1993 and 1999 a total of 15 live individuals had been recorded in Goose Creek. NCWRC surveys in early 2002 found 16 live individuals in Duck Creek (NCWRC Database); however, following extreme drought conditions in late 2002, where much of the streambed in both creeks was dry, status surveys in Duck Creek yielded only four live and more than 40 fresh dead. One fresh-dead shell was also found in Goose Creek during the 2002 drought surveys just below US 601. Pools and wet streambeds were much more common in lower Goose Creek, apparently providing refuge from desiccation during the drought.

Between 2004 and 2005, four live individuals were found at two locations within Goose Creek, and 12 live individuals were found at six locations within Duck Creek. Prolonged severe drought conditions persisted in the Goose Creek watershed in 2006 through 2007. A total of

nine individuals have been found in Duck Creek between 2006 and 2009. Three of the individuals were found on more than one occasion. Four of these individuals were taken into captivity, as much of the stream channel was dry when they were found. A survey conducted in 2011 of the critical habitat portion of Goose Creek, from the Rocky River confluence to the NC 218 crossing, located a total of 12 live individuals, and one fresh dead shell (TCG 2007). All of the live individuals were taken into captivity for a joint propagation effort between North Carolina State University and the North Carolina Wildlife Resources Commission. The majority of the individuals were estimated to be <5 years of age based on shell condition and growth rests, indicating relatively recent reproduction. Repeated survey efforts in Duck Creek in 2011 and 2012 have not located any live individuals post drought.

Distribution and relative abundances (based on Catch Per Unit Effort) of freshwater mussel species known to occur in the Goose Creek watershed have generally declined since 2003, to the extent that mussels are increasingly rare in the subbasin. Species like the Atlantic Pigtoe (*Fusconaia masoni*) and Notched Rainbow (*Villosa constricta*) may be extirpated (NCWRC Database).

4.4.2.2 Distribution in Sixmile Creek

The Carolina heelsplitter was first discovered in Sixmile Creek in 2006 (Catena 2007). A total of 16 live individuals and 3 dead shells were found in the creek extending from near the confluence with Twelvemile Creek in Lancaster County, SC, upstream to the vicinity of the Marvin Road (SR 1312) crossing on the Mecklenburg/Union County line. In 2009, two live individuals were found between the SC/NC state line and the Marvin Road crossing (NCWRC Database), and in 2011 one live individual was found in the same area in 2011 (USFWS 2012a).

4.5 Watershed Conditions

Characteristics and conditions of the two watersheds within the Action Area supporting the Carolina heelsplitter, Goose Creek and Sixmile Creek are discussed below.

4.5.1 Goose Creek Subbasin (03-07-12)

The Goose Creek subbasin occupies an area of 29 square miles in Union and Mecklenburg Counties. There are 163 miles of identified perennial streams within the subbasin. From the headwaters in Mecklenburg County approximately 7.5 km (4.7 mi) east of the town of Matthews to the confluence with the Rocky River 5.2 km (3.2 mi) south of Midland on the Union/Stanly County line, Goose Creek is approximately 25 km (15.5 mi) in length. Major tributaries include Stevens Creek, Paddle Branch and Duck Creek.

4.5.2 Water Quality

4.5.2.1 Best Usage Classification

The NCDENR assigns a best usage classification to all waters of North Carolina. These classifications, which are the responsibility of the NCDWR, provide a level of water quality protection to ensure that the designated usage of that water body is maintained. Class C imposes a minimum standard of protection for all waters of North Carolina. Table 3 lists the streams in the Action Area within the Goose Creek Subbasin and their Usage Classification and NCDWR Index number (#).

Table 3. Streams Within Goose Creek Subbasin

Steam Name	Usage Classification	DWQ Index #
Stevens Creek	C	13-17-18-1
Paddle Branch*	C	13-17-18-2
Duck Creek	C	13-17-18-3
Goose Creek	C	13-17-18

* Paddle Branch is a tributary to Duck Creek

Class C waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture, and other uses suitable for Class C. There are no restrictions on watershed development or types of discharges.

4.5.2.2 Impaired 303(d) Listing

As mandated in Section 303(d) of the Clean Water Act., states, territories, and authorized tribes are required to develop lists of impaired waters, which are defined as water bodies that do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. These water quality standards include designated uses, numeric and narrative criteria, and anti-degradation requirements as defined in 40 CFR 131. Failures to meet standards may be due to an individual pollutant, multiple pollutants, or unknown causes of impairment, originating from point and non-point sources and/or atmospheric deposition. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop Total Maximum Daily Load limits (TMDLs) of identified pollutants for these waters.

In recent years, both Goose (from SR 1524 to the Rocky River) and Duck Creek (from its source to Goose Creek) in Union County had been on the NCDWQ's Section 303(d) Category 5 list of impaired streams. However, the 2012 303(d) List, which only includes Category 5 waters, does not list Goose or Duck Creek. Category 5 waters are those impaired for one or more designated uses by a pollutant(s), and require a TMDL for the pollutant(s).

Since 1998, Goose Creek had been on the 303(d) for various impairments, such as fecal coliform. Currently, it is listed as a Category 4b for turbidity and ecological/biological integrity benthos, indicating that, while the stream is still impaired, a management strategy is in place to address exceedances (NCDWR 2013). Goose Creek from SR 1524 to Rocky River is categorized as 4t for fecal coliform, indicating that the stream is impaired, but that a TMDL has been approved (NCDWR, 2013). Duck Creek, which was included on the 2008 draft list for the first time, has also been downgraded to a Category 4b for ecological/biological integrity benthos.

The 303(d) Category 5 streams in the FLUSA are listed in Tables 4 and 5 along with details of the impairments, and shown in Figure 4.

Table 4. Catawba River Basin Impaired (Category 5) Streams 2012. Use of listed streams is "Aquatic Life".

Stream	AU Number	Length/Area	Reason for Rating	Parameter (Year)
Sixmile Creek (030501030203)	11-138-3	8.8 FW Miles	Fair Bioclassification	Ecological/Bio Int, Fish Comm (2006)
McAlpine Creek (030501030107)	11-137-9b	6.3 FW Miles	Fair Bioclassification	Ecological/Bio Int. Benthos (1998)
McAlpine Creek (030501030107)	11-137-9a	8.2 FW Miles	Fair Bioclassification	Ecological/Bio Int. Benthos (1998)

Table 5. Yadkin-Pee Dee River Basin Impaired (Category 5) Streams 2012. Use of listed streams is "Aquatic Life".

Stream	AU Number	Length/Area	Reason for Rating	Parameter (Year)
Little Richardson Creek (030401050504)	13-17-36-4-(0.5)	77.1 FW Acres	Standard Violation	Chlorophyll a (2008)
Little Richardson Creek (030401050504)	13-17-36-4-(2)	38.7 FW Acres	Standard Violation	Chlorophyll a (2008)
Richardson Creek (030401050504)	13-17-36-(3.5)b	106.4 FW Acres	Standard Violation	Chlr a (2008), pH (2008)
Richardson Creek (030401050506)	13-17-36-(5)a1a	8.2 FW Miles	Fair Bioclassification	Eco/Bio Int. Benthos (1998)
Stewarts Creek (030401050503)	13-17-36-9-(1)	8.3 FW Miles	Fair Bioclassification	Eco/Bio Int. Benthos (2008)
Stewarts Creek (030401050503)	13-17-36-9-(4.5)	131.1 FW Acres	Standard Violation	DO (2012), Copper (2008), Chlr. a (2008)
Richardson Creek (030401050501)	13-17-36-(5)a1b	3.9 FW Miles	Standard Violation	Copper (2008)
Richardson Creek (030401050501)	13-17-36-(5)a2	4.7 FW Miles	Standard Violation	Copper (2008)
Beaverdam Creek (030401050602)	13-17-40-11	12.1 FW Miles	Standard Violation	Copper (2008), DO (2008)

Stream	AU Number	Length/Area	Reason for Rating	Parameter (Year)
Crooked Creek (030401050702)	13-17-20-2a	5.6 FW Miles	Fair/Poor Bioclassification	Eco/Bio Int. Fish Comm/Benthos (1998)
Crooked Creek (030401050702)	13-17-20-2b	8.8 FW Miles	Fair Bioclassification	Eco/Bio Int. Benthos (1998)
Crooked Creek (030401050702)	13-17-20-1	12.0 FW Miles	Standard Violation	Turbidity (2004)
Crooked Creek (030401050702)	13-17-20	12.9 FW Miles	Standard Violation/Fair Bioclassification	Turbidity (2010), Eco/Bio Int. Benthos (2012)

4.5.2.3 Nonpoint Source Pollution

Nonpoint source (NPS) pollution refers to runoff that enters surface waters through stormwater or snowmelt. There are many types of land use activities that are sources of NPS pollution including land development, construction activity, animal waste disposal, mining, agriculture and forestry operations, and impervious surfaces such as roadways and parking lots. Various nonpoint source management programs have been developed by a number of agencies to control specific types of nonpoint source pollution (e.g. forestry, pesticide, urban, and construction-related pollution etc.). Each of these management programs develops Best Management Practices (BMPs) to control the specific type of NPS pollution.

The Nonpoint Discharge Elimination System (NPDES) Stormwater Permitting program institutes permitting requirements for municipal separate storm sewer systems (MS4) and also established post-construction stormwater management requirements in both incorporated and unincorporated areas for development activities outside of the permitted MS4s (NPDES Phase II). Development activities in these areas must meet post-construction requirements. Within the Action Area, Mecklenburg County enforces the Phase II and post-construction requirements within the county while NCDWR currently enforces the same regulations within Union County and any communities which do not have Phase II permits. The post-construction ordinance allows NCDWR to implement undisturbed riparian buffer rules within the Goose Creek, Sixmile Creek, and Waxhaw Creek watersheds, which are habitat to the Carolina heelsplitter. These buffer requirements are only implemented when NCDWR receives a permit application, whether stormwater or Section 401 (Randall 2010, pers. comm.). The NCDWR requires that permits in the Goose Creek watershed include post-construction requirements of 200 foot undisturbed riparian buffers on perennial streams, 100 foot riparian buffers on intermittent streams, and a ten percent impervious surface threshold for engineered stormwater controls (NCDWQ 2009).

NCDWR also implements the buffer requirements from the Goose Creek Site Specific Management Plan (NCDENR 2009), which requires all projects disturbing more than one acre of

land to control stormwater as described in Rule .0602 of the plan (see Section 4.5.2.7 of this report).

4.5.2.4 Point Source Pollution

Point source discharges of pollution are defined as pollutants that enter surface waters through a pipe, ditch, or other well-defined point of discharge. These include municipal and industrial wastewater treatment facilities, small domestic discharging treatment systems (schools, commercial offices, subdivisions and individual residents), and stormwater systems from large urban areas and industrial sites. The primary pollutants associated with point source discharges include nutrients, solids/sediments, oxygen demanding wastes, and toxic substances such as chlorine, ammonia and metals.

There are five permitted wastewater discharges in the Goose Creek subbasin (Table 6), two of which have been decommissioned (Figure 5). These facilities currently fall under the Goose Creek Site Specific Management Plan (NCDENR 2009b) NPDES Permitting Policy, which was implemented by NCDWR (formerly NCDWQ) in conjunction with other resource agencies.

Table 6. Permitted Wastewater Treatment Plants (WWTP) in the Goose Creek Watershed

Permit	Facility	Receiving Stream	Flow (GPD)	Owner
NC0063584	Oxford Glen	Stevens Creek	75,000	Aqua NC
NC0065749	Ashe Plantation	Duck Creek	100,000	Aqua NC
NC0072508	Hunley Creek	Goose Creek	Decommissioned (2006)	Union County
NC0034762	Fairfield Plantation	Goose Creek	Decommissioned (2011)	Goose Creek Utility Co
NC0065684	Country Wood	Goose Creek	670,000	Aqua NC

The NPDES Permitting Policy includes limits on various parameters, including, but not limited to chlorine (since October 2002), ammonia, fecal coliform, BOD, DO, flow, and temperature, for the existing facilities. Compliance reports from the 2005-2010 review period show routine problems with several parameter limits exceeded at the Fairfield Plantation and Hunley Creek WWTPs, which have since been decommissioned. A summary of violations obtained from NCDENR Central Files on April 6, 2010, October 17, 2012 and November 2, 2012 is provided below.

Oxford Glen (Aqua North Carolina)

- No records available for 2005
- No violations recorded for 2006-2009

- A notice of violation (NOV) was documented on September 22, 2010 due to failing to report dissolved oxygen, temperature and pH during the May 2010 self-monitoring period. No civil penalties were issued.

Ashe Plantation (Aqua North Carolina)

- A NOV from DWQ was documented on March 1, 2010 due to exceeding the daily maximum of total suspended solids (TSS) in the November 2009 self-monitoring report. No civil penalties were assessed.

Hunley Creek (Union County)

- Numerous NOVs and civil penalties were documented throughout 2005-2006 monitoring period due primarily to exceedences of BOD, with occasional exceedences of flow, fecal coliform, TSS, and total suspended residue (TSR). Civil penalties assessed included approximately $30,510.11 while receipts of payment received included $24,436.08.
- In May 2006, this facility was decommissioned. Wastewater previously directed to the Hunley Creek WWTP was redirected to the Crooked Creek watershed for treatment. No NOVs were identified for this WWTP throughout 2007-2010 due to decommission (Union County 2006).

Fairfield Plantation (Goose Creek Utility Company)

- DWQ sent a memorandum to the Attorney General's Office on January 13, 2010, requesting Injunctive Relief with regard to the Fairfield Plantation WWTP. DWQ described how the WWTP is in a "state of disrepair" with questionable structural integrity and a history of deteriorating conditions. Improvements to the structure were not made due to the fact that connection to the Union County Public Works sewer system was imminent. In February 2011, NCDWQ terminated the NPDES permit for this facility, and Union County Public Works commenced treating the wastewater previously treated by the Goose Creek Utility Company (Black & Veatch Holding Co 2011).
- DWQ sent a letter to NC Utilities Commission dated February 4, 2010, requesting its advice, counsel and assistance in addressing the situation with this WWTP:

> "This WWTP currently operates under the terms of a NPDES permit issued in 1994. As such, effluent limitations and monitoring requirements are not as stringent as those found in contemporary permits for facilities discharging to Goose Creek. This WWTP has deteriorated to the point that its structural integrity is questionable and its owners attest that it cannot consistently meet currently applicable (1994) permit limits."

- Numerous NOVs and civil penalties were documented throughout 2009-2010 monitoring period due primarily to exceedences of flow, with occasional exceedences of fecal coliform, DO, and ammonia. Civil penalties assessed included approximately $12,899.37 for this period. No receipts of payment were documented for these penalties.

Country Wood (Aqua North Carolina)

- There are no documented violations at this facility between 2006 and September 2011; though there were no records for 2005.
- Ammonia violations were recorded in September and November 2011, for which civil penalties totaling $1,289.34 were issued and $894.67 in payment was received.

In addition to chlorine limits, a moratorium on new facilities or expansion of existing facilities within the Goose Creek watershed was instituted under the Goose Creek Site Specific Management Plan (NCDENR 2009b), but was subsequently lifted in May 9, 2013.

4.5.2.5 Ecological Significance

The NCNHP maintains a database of rare plant and animal species, as well as significant natural areas, for the state of North Carolina. The NCNHP compiles the NCDENR priority list of "Natural Heritage Areas" as required by the Nature Preserves Act (NCGS 113A-164 of Article 9). Natural areas (sites) are inventoried and evaluated on the basis of rare plant and animal species, rare or high quality natural communities, and geologic features occurring in the particular site. These sites are rated with regard to national, state, and regional significance. This list contains those areas which should be given priority for protection; however, it does not imply that all of the areas currently receive protection (NCDENR 2009). The Goose Creek Subbasin Aquatic Habitat is considered to be of "National Significance".

The Goose Creek Subbasin supports several other rare aquatic species besides the Carolina heelsplitter. They are listed Table 7 along with their state and federal status.

Table 7. Rare Aquatic Species in Goose Creek Subbasin

Scientific Name	Common Name	NC Status	Federal Status	Species Type
Etheostoma collis collis	Carolina darter	SC	FSC	Fish
Fuscanaia masoni	Atlantic pigtoe	E	FSC	Mussel
Lasmigona decorata	Carolina heelsplitter	E	E	Mussel
Strophitus undulatus	Creeper	T	~	Mussel
Villosa vaughaniana	Carolina creekshell	E	FSC	Mussel
Villosa delumbus	Eastern creekshell	SR	~	Mussel
Villosa constricta	notched rainbow	SC	~	Mussel

E = Endangered, T = Threatened, FSC = Federal Species of Concern, SC = Special Concern, SR = Significantly Rare, ~ = no rating (NCNHP 2010)

The Goose Creek watershed is considered to be a globally significant ecosystem; as such several efforts have been undertaken by USFWS, NCDOT and NCWRC to preserve this ecosystem. NCWRC has acquired 23 conservation easements on 156 acres along Goose Creek and Duck Creek, using a $1.8 million NC Clean Water Management Trust Fund grant specifically awarded to address Goose Creek's water pollution problems. In addition to buying conservation easements, NCWRC has used grants to fund other projects, including the stream restoration and stabilization of five streams and ditches in the watershed (PBS&J 2010b). NCDOT has acquired, or funded stream mitigation projects in the Goose Creek watershed; however, those projects were utilized towards mitigation requirements associated with other NCDOT projects.

4.5.2.6 Conditions within Critical Habitat Unit 1

Water quality and stream habitat conditions within the Goose Creek have deteriorated significantly in recent years, to the level that several of the Constituent Elements have been significantly altered to the extent that they may no longer be present. The habitat degradation has coincided with the rapid urbanization of the watershed, which was discussed in Section 4.1.5.1. Each of the Constituent Elements of Unit 1 and the way they have been compromised are discussed below:

1) permanent flowing, cool, clean water: The mainstems of both Goose and Duck Creeks have experienced several prolonged periods of interrupted flow (TCG personal observations, John Fridell, pers. comm.). This has resulted in mortality of several individuals (John Fridell, pers. comm.). In addition, various toxic contaminants have been reported in the watershed (Section 4.1.4.2), and both Goose and Duck Creeks are listed as impaired (Section 4.5.4.2).

2) geomorphically stable stream and river channels and banks: The effects of urbanization on peak discharge and channel stability were discussed in Section 4.1.5.1. Channel inscision,

headcutting, and numerous streambank failures leading to new channel cuts have occurred in the Goose Creek watershed in recent years, especially in the mainstem of Goose Creek (TCG personal observations, John Alderman and John Fridell, pers. comm., Allen 2005).

3) pool, riffle, and run sequences within the channel: While these habitat sequences are still present within the Critical Habitat Unit, large accumulations of fine sediments occur in many of these areas (see below).

4) stable substrates with no more than low amounts of fine sediment: As a result of channel instability, and erosion from the landscape, large accumulations of fine sediment occur throughout the channel of Goose Creek, and to a lesser extent Duck Creek (TCG personal observations, John Alderman and John Fridell, pers. comm., Allen 2005). As stated above, Allan (2005) documented dramatic increases in sediment concentrations during high flow events in the Goose Creek subbasin.

5) moderate stream gradient: This constituent element is generally still present; however significant channel incision has occurred throughout much of the Goose Creek channel (see below).

6) periodic natural flooding: The effects of urbanization on stream channel scour, and the subsequent effects on freshwater mussels and mussel habitat are discussed in Section 4.1.5.1. The mainstem of Goose Creek has incised significantly in recent years to the level that in many areas the floodplain is inaccessible from the channel except during extremely high flows (TCG personal observations, John Alderman and John Fridell, pers. comm.), which further contributes to channel instability and habitat degradation.

7) fish hosts, with adequate living, foraging, and spawning areas for them: There have been no documented extirpations of any fish species within the Goose Creek watershed, and Starnes and Hogue (2005), found several of the species of cyprinids (minnows) in the watershed, which have been identified as fish hosts for the Carolina heelsplitter (Eads et al. 2010). However, the habitat degradation (high levels of silt, channel scour etc.) discussed above may be compromising spawning habitat for the host species.

4.5.2.7 Goose Creek Watershed Site Specific Water Quality Management Plan

In 2009, a Site Specific Management Plan for the Goose Creek Watershed was adopted to protect the Carolina heelsplitter (NCDENR 2009). The purpose of the actions required by this site-specific management strategy that comprises the site-specific water quality management plan (Plan) is for the maintenance and recovery of the water quality conditions required to sustain and recover the Carolina heelsplitter population in the Goose Creek Watershed. The site-specific management strategies shall be implemented to:

(1) Control stormwater for projects disturbing one acre or more of land
(2) Control wastewater discharges
(3) Control toxicity to streams supporting the Carolina heelsplitter
(4) Maintain riparian buffers

Charlotte-Mecklenburg Storm Water Services began administering the Plan in October, 2009. This Plan stemmed from the Water Quality Recovery Plan (WQRP) for the Goose Creek Watershed, required as part of Charlotte-Mecklenburg's Phase II Storm Water Permit application. The required WQRP was implemented to comply with the pollutant load limitations set forth in the 2007 Goose Creek total maximum daily load (TMDL) for Fecal Coliform. In the NC 2010 Integrated Report, 303(d) List, the Mecklenburg County reach of Goose Creek was changed from a 4a to a 1t designation because that part of the water body was compliant with the TMDL. In 2011, the County was informed that it was no longer required to implement the WQRP, but it must continue to implement six expanded and/or tailored BMP's, that were identified in the WQRP. These have been included in the Charlotte-Mecklenburg Storm Water Management Plan and implementation is ongoing.

As part of the Goose Creek TMDL (Section C.2.), Mecklenburg County collects water quality samples, including Fecal Coliform, from Goose Creek at Steven's Mill Road, in Union County. In the most recent sample year, FY2013, sixteen samples were collected and analyzed for Fecal Coliform. Based on the results of these analyses, when compared with data collected during the last five years, Fecal Coliform concentrations for this reach of Goose Creek have remained essentially unchanged. This reach of Goose Creek remains as a Category 4t stream in the 2012 Integrated Report, 303(d) List.

Additionally, during FY2013, Mecklenburg County completed a specialized sampling effort in order to characterize Fecal Coliform distribution in five catchment areas of the Goose Creek watershed, for a variety of land covers, as well as during regular base flow and storm impacted events. Sampling results indicated that sediment is a primary source of elevated Fecal Coliform levels in Goose Creek. It was concluded that while enhanced erosion control measures required in Goose Creek were proving effective at controlling development related sediment run off, stream bed and bank stability were also a contributor elevated Fecal Coliform levels and that Stream Restoration projects are an effective tool for reducing this sediment source.

The specifics of the Plan are contained in North Carolina Administration Cods: 15A NCAC 2B .0600-.0609.

During the drafting of the Management Plan, the USFWS noted that they believed the management plan is insufficient to protect the Carolina heelsplitter, and does not allow for recovery of the species in the creek, as was stated as the purpose of the plan (USFWS 2008). Specifically, the USFWS stated that "the subject rules: (1) affect primarily only certain future

development activities within the Goose Creek watershed, and, it is the Service's belief, are inadequate to prevent further decline of water quality and the Carolina heelsplitter from the effects of the future development activities subject to the rules; (2) fail to address the likely detrimental effects to water quality associated with numerous other potential future land use activities within the watershed; and, (3) do practically nothing to address the affects of existing landuse activities affecting water quality within the watershed which have contributed the decline of the Carolina heelsplitter within the Goose Creek watershed" (USFWS 2008).

4.5.3 Goose Creek TMDL

TMDLs were established for fecal coliforms in Goose Creek (MCWQP, 2005). Fecal coliform load reductions of 92.5 percent would be required for water quality in Goose Creek to be considered no longer impaired and removed from the 303(d) list.

4.5.4 Summary of regulatory effects

a) Responsible entities for enforcement of Site Specific Water Quality Management Plan

In Union County, the NCDWR maintains enforcement of the Plan. Requests for variances to allow an activity not allowed by the Plan must be submitted to the NCDWR and eventually proposed to the Environmental Management Commission for approval.

Enforcement of the Plan in Mecklenburg County has been designated by the NCDWR to the Charlotte-Mecklenburg Stormwater Services. Requests for variances must proceed through Charlotte-Mecklenburg Stormwater Services to the Charlotte-Mecklenburg Storm Water Advisory Committee. If approved, it goes to NCDWR and the EMC for final approval.

b) Issuance of Variances to the Plan

According to Rusty Rozzelle with Charlotte-Mecklenburg Stormwater Services, since the implementation of the rule, no variances have been requested to use or develop riparian buffer areas within Goose Creek in Mecklenburg County. Likewise, according to Jennifer Burdette with the NCDWR, no variances have been requested to use or develop riparian buffer areas within Union County.

c) Removal of the Inter-basin Transfer Restrictions

On May 9, 2013, the March 14, 2002 ban on transferring water from the Catawba River Basin to the Goose Creek River Basin was eliminated, the effects of which are considered in the Environmental Assessment (EA) for the Addition of the Goose Creek Watershed to the IBT Certificate under the Provisions of G.S 143-215.22I (CH2M Hill, 2013). The EA concludes that the direct, indirect, and secondary and cumulative impacts of removing the ban from the IBT

Certificate on Goose Creek Watershed would be insignificant given the watershed mitigation measures that have been implemented by the Town of Mint Hill through its post construction ordinance.

To date, no transfers have taken place since the ban on interbasin transfers was eliminated. Infrastructure is typically installed either via citizen requests for service through the City of Charlotte's Street Main policy or extensions by developers that are donated. The City of Charlotte did have one water line on Thompson Road that was incomplete, and there are plans to finish it, though no construction date has been set. There are no other plans for extensions by Charlotte-Mecklenburg Utility Department (Barry Shearin, City of Charlotte, personal communication, July 22, 2013 and July 24, 2013).

4.5.5 Sixmile Creek Subbasin (03-08-38)

Sixmile Creek arises in Mecklenburg County, approximately three miles west of Stallings, and flows in a general southwest direction for approximately 8.8 miles before entering Lancaster County, SC. The stream then flows approximately 10 miles before entering Twelvemile Creek near Hancock, SC, which in turn flows approximately six more miles before entering the Catawba River near Van Wyck, SC. Sixmile Creek and Twelvemile Creek are included in North Carolina Catawba River Subbasin 03-08-38 (NCDWQ 2004) and are located within Union and Mecklenburg Counties, NC. Sixmile Creek forms the boundary between these two counties for much of its course. The Sixmile Creek watershed drains the southeastern and southwestern portions of Mecklenburg and Union Counties, respectively, while Twelvemile Creek drains southwestern Union County (NCDWQ 2004). Both streams have very low flows during the summer months and may stop flowing during periods of drought (NCDWQ 2004).

The Sixmile Creek watershed has undergone a significant amount of economic development, including residential, commercial and office space has occurred along the US 521 corridor between I-485 in Mecklenburg County, NC and US 160 in Lancaster County, SC. Over the eight-year period between 1998 and 2006, developed land use increased by approximately 18 percent. Agricultural lands decreased by a total of 1,996 acres and forested lands decreased by 2,579 acres between 1998 and 2006 (TCG 2007). The agricultural and forested lands were replaced with residential properties, industrial / commercial properties and paved roads. The residential land use category increased by 4,017 acres and the industrial / commercial and paved roads categories increased by 400 acres and 200 acres, respectively (TCG 2007). High density residential areas increased by approximately 6.6 percent whereas moderate and low density residential areas increased by almost 5 and 3 percent, respectively from 1998 to 2006 (TCG 2007). The population of Stallings and Weddington, which occur within the Sixmile Creek watershed increased 287% and 117% respectively between the year 2000 and 2008 (Baker Engineering 2010) Continued growth is projected in this area to year 2030 (Baker Engineering 2010).

4.5.6 Water Quality

4.5.6.1 Best Usage Classification

In North Carolina, Sixmile Creek is assigned a Best Usage Classification of C from its source to the NC/SC state line. The South Carolina portion of Sixmile Creek is contained within the Twelvemile Creek subbasin (classification 03050103-030). Water quality standards are assigned and assessed using basically similar methods to those described in North Carolina (SCDHEC 2005).

4.5.6.2 Impaired 303(d) Listing

Currently the 8.8-mile segment of Sixmile Creek from its headwaters to the South Carolina border is classified as "Impaired for Aquatic Life" due to Fair bioclassification (NCDENR 2010) (Figure 4). In the mid 1990's, the South Carolina portion of Sixmile Creek was place on the 303(d) list for several years. In the mid 1990's, zinc levels exceeded impairment thresholds and the creek was placed on the 303(d) list of impaired waters. By 2002, the zinc level was sufficiently reduced and the stream was fully supporting of aquatic life; however, the recreational use was not supported due to fecal coliform levels. Additionally, trends of decreasing DO, decreasing pH, increasing BOD, increasing turbidity, and increasing total phosphorus and total nitrogen were identified (SCDHEC 2005).

4.5.6.3 Nonpoint Source Pollution

Nonpoint source pollution, runoff that enters surface waters through stormwater or snowmelt, is identified as a major source of water quality degradation in this subbasin (NCDENR 2004, NCDENR 2008). Land development, construction activities, animal waste disposal, mining, forestry operations, agriculture, and impervious surfaces (urban runoff) are examples of land uses that contribute to NPS pollution. Many NPS management programs have been developed to control runoff with BMPs for stormwater management.

The naturally low flow of Sixmile Creek increases stream sensitivity to nonpoint source runoff (NCDENR 2004).

4.5.6.4 Point Source Pollution

Point source pollution includes discharges of pollutants directly to surface waters through a pipe, ditch, or other well-defined point of discharge. Point sources include municipal and industrial WWTPs, small domestic discharging treatment systems, and stormwater systems from municipal areas and industrial sites.

One major municipal NPDES facility was located on Sixmile Creek (NPDES Permit NC0066559/001). Between 1997 and 2003 in Union County, this site failed two effluent toxicity

tests. Since that time the NPDES point source has been removed from Sixmile Creek (NCDENR 2004). However, despite the removal of the NDPES point source, Sixmile Creek received the highest conductivity rating (185 µmhos/cm) of any stream in the basin during the 2004 sampling effort (NCDENR 2004), indicating the likely presence of pollutants such as chloride, phosphate, or nitrate.

4.5.6.5 Point Source and NPS Pollution Control

Stormwater management to control point and nonpoint source pollution is implemented by NCDWR under the NPDES stormwater permitting Phase II requirements [Session Law 2006-246]. These requirements are implemented in the Sixmile Creek watershed through the City of Charlotte's NPDES municipal separate storm sewer system (MS4) permit in Mecklenburg County and through the NCDWR's post-construction stormwater permitting in Union County and the Village of Marvin (NCDWQ 2009).

Projects that disturb an acre or more of land within Union County and the Village of Marvin are subject to NCDWR stormwater review under the post-construction stormwater permitting program (NCDWQ 2009). NCDWQ requires that projects meet not only the post-construction requirements but also the more stringent buffer and stormwater requirements for the protection of the Carolina heelsplitter within the Sixmile Creek watershed, similar to the Goose Creek Site Specific Management Plan (Randall 2010, NCDWQ Stormwater, pers. comm.). These buffer requirements are only implemented when NCDWR receives a permit application, whether stormwater or Section 401 (Randall 2010, pers. comm.). The NCDWQ requires that permits in the Sixmile Creek watershed include post-construction requirements of 200 foot undisturbed riparian buffers on perennial streams, 100 foot riparian buffers on intermittent streams, and a ten percent impervious surface threshold for engineered stormwater controls (NCDWQ 2009).

4.5.6.6 Ecological Significance

The Sixmile Creek Subbasin supports several other rare aquatic species besides the Carolina heelsplitter. They are listed Table 8 along with their state and federal status.

Table 8. Rare Aquatic Species in Sixmile Creek Subbasin

Scientific Name	Common Name	NC Status	Federal Status	Species Type
Etheostoma collis collis	Carolina darter	SC	FSC	Fish
Lasmigona decorata	Carolina heelsplitter	E	E	Mussel
Strophitus undulatus	Creeper	T	~	Mussel
Villosa vaughaniana	Carolina creekshell	E	FSC	Mussel
Villosa delumbus	Eastern creekshell	SR	~	Mussel

E = Endangered, T = Threatened, FSC = Federal Species of Concern, SC = Special Concern, SR = Significantly Rare, ~ = no rating (NCNHP 2010)

5.0 ENVIRONMENTAL BASELINE – SCHWEINITZ'S SUNFLOWER

This section discusses the characteristics and current status of the Schweinitz's sunflower throughout its range and within the proposed action area. There have been no 5-year status reviews completed for this species as of the date of this report; therefore, most of the following text has referenced personal communication with USFWS and older documents, including the 1994 USFWS Recovery Plan for Schweinitz's sunflower.

5.1 Species Description

A detailed description of characteristics, habitat requirements, legal status, and primary threats to the species are summarized below.

5.1.1 Designation (Legal Status)

Schweinitz's sunflower was listed as Endangered on May 7, 1991, under provisions of the Endangered Species Act of 1973 (as amended) (FR 56(88): 21087-21091) (USFWS 1991). Currently there is no critical habitat designated for Schweinitz's sunflower.

5.1.2 Characteristics

Schweinitz's sunflower is a rhizomatous perennial herb described from North Carolina by Torrey and Gray (1841) that grows 1 to 2 meters tall from a cluster of carrot-like tuberous roots (USFWS 1994, Radford et al. 1968). Stems are usually solitary, branching only at or above mid-stem,

with the branches departing from the stem at about a 45-degree angle. The stem is usually pubescent but can be nearly glabrous and is often purple in color.

The leaves are opposite on the lower portion of the stem, changing to alternate above. In shape, the leaves are lanceolate, wider near their bases, but variable in size, being generally larger on the lower portion of the stem, and gradually reduced upwards. Lower stem leaves average 10 to 20 centimeters long and 1.5 to 2.5 centimeters wide (about 5 to 10 times as long as wide). Upper stem leaves (subtending branches of the inflorescence) average about 5 centimeters long and 1 centimeter wide. Leaf margins are entire with a few obscure serrations and are generally also somewhat revolute.

Texture of the leaves is rather thick and stiff and the pubescence of the leaves is distinctive. The upper surface of the leaves is rough, with the broad-based spinose hairs directed toward the tip of the leaf. The lower surface is more or less densely pubescent, with soft white hairs obscuring the leaf surface. From September to frost, Schweinitz's sunflower blooms with comparatively small heads of yellow flowers. The nutlets are 3.3 to 3.5 millimeters long and are glabrous with rounded tips. (NC-ES 2010, USFWS 1994)

The pubescence of the leaves is distinctive and is one of the best characteristics to distinguish Schweinitz's sunflower from its relatives. Additionally, the following characteristics separates Schweinitz's sunflower from all other eastern North American species in the genus: the heads are generally small (the involucre is less than 1 centimeter across), stems are generally sparsely strigose or hirsute below the inflorescence, the leaves are typically sessile to short-petiolate (petiole less than 1.5 centimeter long, very rarely to 3 cm long), scabrous above with dense soft white hairs below, lanceolate, and broadest near the base (USFWS 1994).

5.1.3 Distribution and Habitat Requirements

Schweinitz's sunflower is endemic to the Piedmont physiographic region of North and South Carolina. At the time of its listing in 1991, Schweinitz's sunflower was distributed across five counties in NC and one county in SC. As of 2006, the global range of Schweinitz's sunflower included more than 85 populations distributed across Anson, Cabarrus, Davidson, Gaston, Mecklenburg, Montgomery, Randolph, Richmond, Rowan, Stanly, Stokes, Surry, and Union Counties, NC, and Lancaster and York Counties, SC (Wells 2010, pers. comm.). There are currently 75 extant populations in NC (NCNHP 2010) and 41 extant populations in SC (Holling 2010, SCDNR pers. comm.), all known from the aforementioned counties.

Historically, it is believed that Schweinitz's sunflower occupied open prairie and Post Oak-Blackjack Oak Savannas that were maintained by relatively frequent fire (USFWS 1994). Current habitats include roadsides, periodically disturbed or maintained utility rights of way, old pastures, and sunny or semi-sunny woodland openings. While the plant occurs on a variety of

soils, it is generally found on shallow, poor, clayey or rocky soils, especially those derived from mafic rock. Where Schweinitz's sunflower occurs in relatively natural (undisturbed) areas, the natural community is considered a Xeric Hardpan Forest (Schafale and Weakley 1990).

NatureServe (2010) characterizes Schweinitz's sunflower habitat as "clearings in, and edges of, upland oak-pine-hickory woods and piedmont longleaf pine forests in moist to dryish sandy loams." In addition, Schweinitz's sunflower requires the "full to partial sun of an open habitat, which was formerly maintained over the species' range by wildfires and grazing by herds of bison and elk" (NatureServe 2010). Now most occurrences are confined to roadsides and utility rights of way that are periodically maintained or disturbed and/or managed for the species.

5.1.4 General Threats to Species

Schweinitz's sunflower is endangered by the loss of historic levels of natural disturbance (i.e. fire, grazing by herbivores), development, mining and encroachment by exotic species (USFWS 1994). The species requires fire or other vegetation management to maintain an open canopy (NatureServe 2010). Primary threats to this species occur from direct habitat loss, degradation, and fragmentation due to residential, commercial, and industrial development, highway construction and improvement, and intensive maintenance of roadsides and utility rights of way (USFWS 1994).

5.1.5 Roadway-Related Threats to Species

A number of potential direct and indirect effects to plant species resulting from road construction projects were evaluated for this BA. These potential effects are discussed within their respective sections below.

5.1.5.1 Potential Direct Effects

Direct effects refer to consequences that can be directly attributed to a project. Direct effects associated with roadway projects include, but are not limited to, land clearing and loss, degradation, and/or modification of habitat in the project corridor, in fill/borrow/spoil areas, and in construction staging/access areas outside of the project corridor. Potential direct effects to plant species associated with transportation projects include habitat modification and/or destruction resulting from highway construction and improvement, utility relocation, and intensive maintenance of roadside and utility ROWs. Intensive maintenance includes herbicidal treatments, mowing, and ground disturbing activities, particularly during critical growth periods of the species.

5.1.5.2 Potential Indirect Effects

Indirect effects, together with the effects of other activities that are interrelated or interdependent with the action, have been evaluated in this assessment and DTR. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur [50 CFR 402.02]. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification while interdependent actions are those that have no independent utility apart from the action under consideration [50 CFR 402.02]. These types of indirect effects can include natural responses to the direct effects of the proposed action, or can include human-induced effects associated with the proposed action.

Potential indirect effects to plant species associated with transportation projects include the loss, degradation, destruction, fragmentation, or modification of habitat resulting from land conversion induced by roadway construction. Land conversion (changes in land use) includes residential, commercial, and industrial development as well as linear urban sprawl along the highway corridor or in the vicinity of interchanges. Also included as indirect effects are reasonably foreseeable local roadway improvements (e.g. widening) necessitated by increased traffic associated with the proposed action. These types of land use changes are not direct consequences of road construction, but rather a result of modifications in access to parcels of land and modifications in travel time between different areas (Mulligan and Horowitz 1986).

Economic development is often used as a criterion in highway funding (Eagle and Stephanedes 1987). Historically, transportation has been viewed as a necessary precursor to economic development (Anderson et al. 1992), and transportation infrastructure is "one of the principle policy levers that state and local governments can use to increase their attractiveness to business investors" (Forkenbrock 1990). Thus, planned or forecasted project-induced changes in land use are considered to be indirect effects of a proposed action.

Alternatively, depending on the extent of local land development regulations, development demand, and water/sewer availability, among other factors, roadway improvements may result in unintentional development and sprawl. These unintended land use changes are also project-induced and therefore are considered to be indirect effects of the proposed action. Improvements to levels of service, better accommodation of traffic, and reductions in travel times may encourage changes in land development outside of the direct project area. This induced growth and development with limited or no proper planning programs along with unchecked development controls, has the potential to degrade suitable habitat for endangered plant species as a result of a proposed action.

5.1.5.3 Potential Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving federal activities, which are reasonably certain to occur within the action area of the proposed federal action [50 CFR 402.02]. Cumulative effects within an action area may include foreseeable infrastructure projects independent of the federal action, such as water and sewer service expansion, which have the potential to stimulate land development and associated roadway improvements. Other small-scale adverse effects to plant species may also occur within the project action area. Though difficult to predict or quantify, other potential cumulative effects may also include mismanagement of the species or its habitat by private landowners (i.e. poor conservation maintenance or herbicide use), habitat degradation caused by traffic accidents occurring within roadside populations, private harvesting of the species for medicinal or otherwise personal use, or habitat impairment caused by emergency repair efforts within utility ROW.

5.2 Presence in Action Area

In order to determine presence of the species within the Action Area, the NCNHP natural heritage database was searched for known populations (Element Occurrence), suitable habitat was evaluated, and presence/absence surveys were conducted. Species surveys were conducted within the preferred alignment and vicinity (ESI 2007, Atkins 2012).

The NCNHP identified six Element Occurrences (EO) of Schweinitz's sunflower within the FLUSA (Figure 2) in July 2013 (NCNHP 2013) within the Action Area. Table 9 summarizes the location within the project alignment, FLUSA, or Conservation Area.

Table 9. NCNHP Schweinitz's sunflower EO populations within Action Area (NCNHP 2013)

EO #	EO Rank*	Population	Status	Last Observed	Details/Comments
5	X	0 stems	Destroyed	Sept. 1957	No suitable habitat identified in 1982 and 1990. Presumed extirpated.
18	C	183 stems	Extant	Oct. 21, 2008	North Fork Crooked Creek Site: Located within utility and roadway ROWs along south side Indian Trail-Fairview Road. Union Electric mows the utility ROW on a 5-yr rotation. NCDOT mows roadside ROW.
31	X	0 stems	Destroyed	July 31, 1995	In 1998, 210 stems transplanted to McDowell Prairie Site.
77	CD	192 stems	Extant	Oct. 11, 2003	South Fork Crooked Creek Site: Located along roadside, southwest bank of Secrest Shortcut Road. "Do Not Mow" sign marks population.
78	D	62 stems	Extant	Nov. 4, 2003	Bearskin Creek Site: Located along south side of Gold Mine Road within utility and NCDOT ROWs.
230	D	12 stems	Current	Sep, 2009	South Fork Crooked Creek, Secrest Shortcut Road West of Unionville-Indian Trail Road

* EO Rank description: X = extirpated; C = Fair estimated viability/ecological integrity; CD = Fair or poor estimated viability/ecological integrity; D = Poor estimated viability/ecological integrity

Atkins performed field survey within the footprint of the Monroe Bypass / Connector in 2012. The footprint was based upon the final design, including utility relocations, from the Design-Build team. Prior to performing the surveys, Atkins reviewed aerial photos of the affected area to identify suitable habitat, which consists of roadsides, utility right-of-ways, field edges, and other areas that receive abundant sunlight and are infrequently but regularly maintained. A total of approximately 35 acres, or 13.5 miles of linear transects, were targeted for field surveys. Surveys were performed visually using systematic overlapping transects to cover suitable habitat areas. Atkins scientists visited the known locations of Schweinitz's sunflower along Secrest Shortcut Road to determine the local phenology of the species and to establish a search image. The two populations on the east side of the road appeared to be declining due to encroachment of shrubs and saplings. Four plants with eight stems were found at the more northerly location, while three plants with six stems were seen at the more southerly location. In the powerline population east of Secrest Shortcut Road, an estimated 17 plants with 60 stems were found. Maintenance in this right-of-way area appears to be more regular and timed to ensure survival and increase of Schweinitz's sunflower. Atkins scientists visited a known location along

Highway 601 just north of the project corridor, but did not find any plants (Atkins 2012). The report is appended (Appendix B).

EO# 230

EO# 230 is located on Secrest Shortcut Road (SR 1501), approximately 600 feet west of the intersection with Unionville-Indian Trail Road along the southern side of the road near GPS location 35.0759^{o} N, -80.6136^{o} W (ESI 2007). It is noted in Figure 7 and labeled as ESI 1. It was located by ESI in 2007 and is a very small population (12 stems) that occurs primarily between the roadside swale and the power line adjacent to Secrest Shortcut Road (Petitgout 2010b, pers. comm.). Due to its small size and its location in and along a roadside ditch swale (also within the distribution power line ROW), this population has a poor chance of persisting for an extended period of time, unless specific management actions are undertaken.

EO# 77

EO# 77 is located on Secrest Shortcut Road (SR 1501) between Unionville-Indian Trail Road (SR 1367) and the crossing of the South Fork Crooked Creek near GPS location 35.0721^{o}N, -80.6097^{o}W (Figure 7). This roadside population was located in 2003 by Larry Thompson (NCDOT Div. 10) with a total count of 192 stems and a NCNHP element occurrence rank of CD (NCNHP 2010). This 2003 survey is the only survey event NCNHP currently has on record in their database (see Table 6 in Section 5.2).

NCDOT Division-level road improvements on Secrest Shortcut Road associated with a NCDOT "Moving Ahead" project led to subsequent monitoring of EO# 77. A total of 314 stems were counted by NCDOT, all of which were on the southwestern side of the road in 2004 (Frazer 2010, NCDOT-NEU, pers. comm.), earning it an NCNHP EO rank of B. Due to the proximity of the population to the roadway, NCDOT consulted USFWS regarding efforts to protect this population from a combination of impacts during the planned roadway resurfacing and shoulder widening (Buncick 2010a, pers. comm.; Thompson 2010a, NCDOT Div. 10, pers. comm.). Ultimately, in October 2006, NCDOT relocated a total of 418 plants from EO# 77 to the newly developed Cane Creek Park Piedmont Prairie Restoration Area (Cane Creek Park), a five acre conservation easement which serves as a permanent refuge for protected plant species (NCDOT et al. 2006, HARP 2009). NCDOT arranged the creation of the Cane Creek Park conservation / management area with Union County and provided the funds for initial site preparation, maintenance, and monitoring.

Although the EO# 77 population was transplanted from the southwestern bank of Secrest Shortcut Road to Cane Creek Park in October 2006 (HARP 2009), the species was able to re-colonize this area from either germination of remaining seeds, or by vegetative propagation from remaining underground rhizomes as was noted by ESI in the 2009 surveys. The remnant

population of EO# 77 includes 103 stems on the northern side and 31 stems on the southwestern side of Secrest Shortcut Road (Petitgout 2010b, pers. comm.). This population is located within NCDOT ROW and within Union Power ROW.

5.2.1 FLUSA

In addition to the two aforementioned occurrences of Schweinitz's sunflower in the Project Alignment Section 5.2.1, a review of NCNHP (2013) database records indicated an additional four EOs. Two of the four EOs are extant populations (EO# 18, EO# 78), one population had been relocated (EO #31), and one is considered extirpated (EO# 5).

<u>EO# 18</u>

EO# 18 is the most northern population in the FLUSA and is referred to as the "North Fork Crooked Creek Sunflower Site" by NCNHP. It is located mostly along the southern side of Indian Trail-Fairview Road (SR 1520) approximately halfway between Rocky River Road (SR 1514) and Cunningham Lane (SR 1526) near GPS location 35.1014^{o} N, -80.5985^{o} W. A total of 183 plants were last observed within the utility easement on October 21, 2008 during a survey conducted by J. R. Siler, of Environmental Resources of the Carolinas (NCNHP 2010). This population has a current element occurrence rating of C. Union Power (2010) mows and/or hand clears the utility line ROW as needed, per their agreement with USFWS regarding access to Schweinitz's sunflower restricted sites.

<u>EO# 78</u>

EO#78 is the most southern population within the FLUSA and is referred to as the "Bearskin Creek Sunflower Site" by NCNHP. It is located along the south side of Gold Mine Road (SR 1162) near GPS location 35.1184^{o} N, -80.7790^{o} W (NCNHP 2010). According to NCNHP (2010), the most recent survey was conducted by Larry Thompson (NCDOT Div. 10) on November 4, 2003. A total of 62 stems were observed mostly on the back side of a ditch maintained by the NCDOT; however, some plants are also within Union Power's right-of-way. This population has an element occurrence rating of D. As a management commitment, NCDOT installed "Do Not Mow" signs marking the boundaries of the population and Union Power was notified of the population within their right-of-way (NCNHP 2010, Union Power 2010).

<u>EO# 31</u>

EO# 31 is located along the western end of the FLUSA and is referred to as the Rea Road Sunflower Site by NCNHP. This EO is located along NC 16, approximately 0.05 mile north of the intersection with Rea Road (SR 3624). NCNHP's (2010) current status for this population

is “destroyed” since the population (210 stems) was transplanted to McDowell Prairie in 1998. According to NCNHP (2010), this population was reported by NCDOT as having been sprayed with herbicide in September 1993. This population was recognized as extirpated in 2005 (NCNHP 2010), and as such, will not be further discussed in the effects section of this report.

EO# 5

EO#5 is located in the central portion of the FLUSA, just west of US 601, south of its intersection with Sikes Mill Road (SR 1001) and north of the US 601 crossing of Stumplick Branch. It was originally located in 1957 by H. E. Ahles; however, additional surveys by Matthews and Creel in 1982 and Weakley in 1990 failed to confirm an extant population. NCNHP (2010) considers this an extirpated population and as such, this population will not be further discussed in the effects section of this report.

5.2.2 Conservation Areas

Proposed conservation areas do not occur outside of the alignment or the FLUSA. Conservation measures for Schweinitz’s sunflower are discussed in Section 9.5.

6.0 ENVIRONMENTAL BASELINE – MICHAUX’S SUMAC

This section discusses the characteristics and current status of the Michaux’s sumac throughout its range and within the proposed action area. Most of the following text references data from the draft 5-year status review, obtained through personal communication with Mr. Dale Suiter, USFWS, in addition to the 1993 USFWS Recovery Plan for Michaux’s sumac.

6.1 Species Description

A detailed description of characteristics and habitat requirements, as well as the legal status for Michaux’s sumac is provided below. In addition, primary threats to the species are also summarized below.

6.1.1 Designation (Legal Status)

Michaux’s sumac was listed as Endangered on September 28, 1989, under provisions of the Endangered Species Act of 1973 (as amended) (FR 54(187): 39853-39857) (USFWS 1989). Currently there is no critical habitat designated for Michaux’s sumac.

6.1.2 Characteristics

Michaux's sumac is a rhizomatous shrub that grows 0.2 to 1.0 meter in height. Although it is usually dioecious, monoecious individuals have been reported in some populations (USFWS 1993b). The entire plant is densely pubescent. The narrowly winged or wingless rachis supports 9 to 13 sessile, oblong to oblong-lanceolate leaflets that are each four to nine centimeters long, two to five centimeters wide, and acute to acuminate (USFWS 1993b, NatureServe 2010). The bases of the leaflets are rounded, and their edges are simply or doubly serrate. Flowering occurs in June and the small flowers are borne in a terminal, erect, dense cluster, with each one being four- to five-parted and greenish-yellow to white (USFWS 1993b). The fruit is a red, densely short-pubescent drupe, five to six millimeters broad, and is visible on female plants from August to October (USFWS 1993b). Michaux's sumac can generally be distinguished from other species in the genus due to its small stature, dense pubescence, and evenly serrate leaflets. Michaux's sumac, also called false poison sumac, is quite harmless compared to poison sumacs of superficial resemblance.

Little information is available on the population biology and reproductive requirements of Michaux's sumac. Most of the surviving populations appear to contain plants of only one sex and therefore reproduce only vegetatively, if at all (USFWS 1993b). Due to the rhizomatous nature of the species, this may mean that the single-sex populations may be clones of one or a few individuals. Limited genetic variation within populations may also contribute to the observed low rates of seed production and seed viability has been shown to be extremely low (Suiter 2010a, pers. comm.).

6.1.3 Distribution and Habitat Requirements

Michaux's sumac was originally described from "Mecklenburg County, North Carolina" as *Rhus pumula* by André Michaux in 1803, but later changed to *R. michauxii* by Sargent in 1895, to correct Michaux's use of a homonym (pullus) and to honor its discoverer (Barden and Matthews 2004). Historically, Michaux's sumac has been documented in Davie, Durham, Franklin, Hoke, Johnston, Lincoln, Mecklenburg, Moore, Orange, Richmond, Robeson, Scotland, Wake, and Wilson Counties in North Carolina; Florence, Kershaw, and Oconee Counties in South Carolina; Columbia, Elbert, Gwinnett, Muscogee, Newton, and Rabun Counties in Georgia; and Alachua County, Florida (USFWS 1993b). Many of theses populations have been extirpated. As of 2009, there are 40 populations range-wide (Suiter 2010a, pers. comm.). The NCNHP currently lists 32 extant populations in NC known from Cumberland, Davie, Durham, Franklin, Hoke,

Moore, Nash, Richmond, Robeson, Scotland, Union, and Wake Counties (NCNHP 2010). Four extant occurrences are known in Georgia and four extant occurrences are known in Virginia (Suiter 2010a, pers. comm.). All previously known populations in South Carolina and Florida are currently considered extinct (Suiter 2010a, pers. comm.; Holling 2012, pers. comm.).

Michaux's sumac grows in sandy or rocky open woods on sandy or sandy loam soils with low cation exchange capacities and appears to depend upon some form of disturbance to maintain the open quality of its habitat (USFWS 1993b, Suiter 2010a, pers. comm.). Michaux's sumac can occur on circumneutral soils, loamy swales, or on clayey soils derived from mafic rocks, depending on the physiographic province where it occurs (NatureServe 2010). Most extant populations can be found on open disturbed areas, such as railroad, road, and utility rights-of-way that are periodically maintained and/or managed for the species.

Not much is known about the population dynamics of Michaux's sumac. Fire or some other forms of disturbance, such as mowing or hand clearing (outside the normal flowering and fruiting time), appears to be essential for maintaining the open habitat preferred by Michaux's sumac (USFWS 1993b). Without periodic disturbance, this type of habitat is overgrown by woody vegetation. As this overgrowth occurs, Michaux's sumac begins to decline due to its intolerance of shade. The current distribution of Michaux's sumac demonstrates its dependence on disturbance. Of the remaining populations, most are located in areas that receive significant disturbance through periodic clearing or maintenance by fire.

6.1.4 General Threats to Species

Michaux's sumac is threatened by fire suppression and ecological succession (competition/shading by woody species) that occurs in areas not burned on a regular basis (Suiter 2010a, pers. comm.). Additionally, forested populations are threatened by timber and utility rights of way populations are threatened by herbicide use, ground disturbing activities, and mowing during critical growth periods (Suiter 2010a, pers. comm.). Multiple observations also suggest that limited seed production continues to be a problem at most populations (Suiter 2010a, pers. comm.).

The greatest threat to Michaux's sumac comes from the loss/degradation or modification of habitat from activities such as development (residential, commercial, or industrial), highway construction and improvement, and intensive and/or untimely maintenance of existing utility and roadside rights of way (USFWS 1993b, USFWS 2010). Other threats include low genetic diversity within the existing populations and hybridization with other species of Rhus.

6.1.5 Roadway-Related Threats to Species

A number of potential direct and indirect effects to plant species resulting from road construction projects were evaluated for this BA. These potential effects are discussed in Section 5.1.6 for Schweinitz's sunflower, and are applicable to Michaux's sumac as well.

6.2 Presence in Action Area

A review of NCNHP (2013) natural heritage database records indicated one known occurrence (EO# 40) of Michaux's sumac within the FLUSA and none in the Conservation Areas (Figure 6)

<u>EO# 40</u>

EO# 40 is actually the type locality of Michaux's sumac, as André Michaux discovered it here on July 21, 1794 (Barden and Matthews 2004). This site is located along the southwestern portion of the FLUSA, "probably…no more than a mile or two north of New Town Road (SR 1315), probably along Providence Road (NC 16) or Antioch Church Road (SR 1338)" (Barden and Matthews 2004). Although Michaux described the type locality as Mecklenburg County, this location is now in Union County, which was formed in 1842 from portions of Mecklenburg County and Anson County. As such, the type locality for this species occurs in Union County (Barden and Matthews 2004). The EO is mapped by NCNHP as an area rather than an exact location due to difficulty in determining the exact location of the population based on the original survey (Buchanan 2010a, pers. comm.). Barden and Matthews (2004) spent two days searching along Michaux's route for the population, but did not find the species as little suitable habitat remains. NCNHP (2010) currently ranks this population as "historical", which indicates a lack of recent field information verifying the existence of the EO; this EO is based only on historical collections data.

Surveys for federally threatened and endangered plant species were conducted by ESI within the project study area (PSA). At the time of the surveys in 2007, the PSA included several detailed study alternatives and was therefore much larger than the final selected alternative, but much smaller than the FLUSA (Figure 8). Survey methodologies and results are included in a Nov. 15, 2007 Endangered Plant Survey Update letter (ESI 2007).

Atkins (2012) performed updated field survey within the final footprint of the Monroe Bypass / Connector in 2012. Prior to performing the surveys, Atkins reviewed aerial photos of the affected area to identify suitable habitat, which consists of roadsides, utility right-of-ways, field edges, and other areas that receive abundant sunlight and are infrequently but regularly maintained. A total of approximately 35 acres, or 13.5 miles of linear transects, were targeted for field surveys. Surveys were performed visually using systematic overlapping transects to

cover suitable habitat areas. No Michaux's Sumac populations were identified during the 2012 field surveys.

Based on the results of these surveys and the NCNHP natural heritage database search, there are no known documented occurrences of Michaux's sumac within the proposed project alignment.

7.0 ENVIRONMNETAL BASELINE – SMOOTH CONEFLOWER

This section discusses the characteristics and current status of the smooth coneflower throughout its range and within the proposed action area. Most of the following text references data from the draft 5-year status review, obtained through personal communication with Mr. Dale Suiter, USFWS, in addition to the 1993 USFWS Recovery Plan for smooth coneflower.

7.1 Species Description

A detailed description of characteristics, habitat requirements, legal status, and primary threats to the species are summarized below.

7.1.1 Designation (Legal Status)

Smooth coneflower was federally listed as endangered on October 8, 1992, under provisions of the Endangered Species Act of 1973 (as amended) (FR 57(196):46340-46344) (USFWS 1992c). Currently there is no critical habitat designated for smooth coneflower.

7.1.2 Characteristics

Smooth coneflower was described from material collected in South Carolina by Boynton and Beadle (1903). It is a rhizomatus perennial herb that grows up to 1.5 meters tall from a vertical root stock and the stems are typically smooth, with few leaves (USFWS 1995). The largest leaves are the basal leaves, reaching 20 cm long and 7.5 cm wide, with long petioles, an elliptical to broadly lanceolate shape, tapering to the base. Texture of the basal leaves is smooth to slightly rough. The midstem leaves, if present, have shorter petioles and are smaller than the basal leaves. Flower heads are usually solitary, consisting of light pink to purplish ray flowers, usually drooping at a length of 5 to 8 cm (USFWS 1995). Disk flowers are approximately 5 mm long and have tubular purple corollas and with generally erect, short, triangular teeth (USFWS 1995, NatureServe 2010).

Information is limited on the life history and species biology of smooth coneflower. Flowering occurs from May through July, and fruits develop from late June to September (USFWS 1995). The fruit is a gray-brown, oblong-prismatic achene, usually four-angled, and 4 to 4.5 mm long (USFWS 1995). Seeds are 0.5 cm long. Reproduction is generally only by sexual means; however, vegetative reproduction has been reported from some of the southern National Forest populations (USFWS 1995).

The smooth coneflower can be distinguished from its most similar relative, the purple coneflower (*Echinacea purpurea*), by its leaves (USFWS 1995). Smooth coneflower leaves are never cordate (heart-shaped) like those of the purple coneflower. In addition, the chaffy scales at the base of the fruit in the smooth coneflower are incurved, while those of the purple coneflower are straight. The vertical rootstock of smooth coneflower also distinguishes itself from purple coneflower, which typically has a horizontal rootstock (USFWS 1995).

7.1.3 Distribution and Habitat Requirements

Smooth coneflower is endemic to the Piedmont or Mountain physiographic provinces. At the time of its listing in 1995, 24 known populations of smooth coneflower was distributed across Virginia, North Carolina, South Carolina, and Georgia (USFWS 1995). Currently there are 11 extant populations in Georgia, eight in North Carolina (USFWS 2011), 34 in South Carolina (Holling 2012), and 16 in Virginia (Suiter 2010b, pers. comm.). Extant populations of Smooth Coneflower in the Carolinas are located in Durham, Granville, and Mecklenburg Counties, North Carolina (Buchanan 2010b, pers. comm.) and Allendale, Anderson, Barnwell, Oconee, Pickens, and Richland Counties, South Carolina (Holling 2012, pers. comm.).

Smooth coneflower populations naturally occur in xeric hardpan forests and diabase glades natural communities in North Carolina (as described by Schafale and Weakley 1990), in dolomite woodlands or glades natural communities in Virginia (as described by Rawinski 1994) (USFWS 1995) and in distinct physiographic provinces / habitats in open woodlands over marble, sandy loams, chert, and amphibolites in South Carolina (Suiter 2010b, pers. comm.). Smooth coneflower is typically found in open woods, cedar barrens, roadsides, clear cuts, dry limestone bluffs, and periodically maintained utility ROWs (USFWS 1995, Suiter 2010b pers. comm.). The species is usually found on soils rich in magnesium and/or calcium, associated with amphibolite, dolomite, or limestone, gabbro, diabase, and marble (USFWS 1995).

Optimal sites for smooth coneflower include areas with abundant sunlight and little competition in the herbaceous layer, with periodic disturbance (historically by natural fires and large herbivores) to reduce the shade and competition of woody plants (USFWS 1995).

7.1.4 General Threats to Species

Smooth coneflower is threatened range-wide by the suppression of fire and ecological succession (competition/shading by woody species) that occurs in areas not burned on a regular basis (USFWS 1995; Suiter 2010b, pers. comm.). Additional threats include timber operations as well as intensive maintenance of utility ROW populations (herbicide use and/or mowing during critical growth periods). Also a threat to this species, but to a lesser degree, is habitat modification and/or destruction resulting from land conversion or highway construction and residential, commercial, and industrial development (Suiter 2010b, pers. comm.).

7.1.5 Roadway-Related Threats to Species

A number of potential direct and indirect effects to plant species resulting from road construction projects were evaluated for this BA. These potential effects are discussed in Section 5.1.6 for Schweinitz's sunflower, and are applicable to smooth coneflower as well.

7.2 Presence in Action Area

A review of NCNHP (2013) natural heritage database indicated no documented occurrences of Smooth Coneflower within the FLUSA or Conservation Areas. Plant surveys conducted by Environmental Services, Inc. (ESI) within what was termed the PSA, or "project study area" in 2007 did not find locate any species. Survey methodologies and results are included in a Nov. 15, 2007 Endangered Plant Survey Update letter (ESI 2007). The footprint of the Monroe Bypass / Connector is entirely within Union County. Since smooth coneflower is only listed for Mecklenburg County, it was not included in the Atkins 2012 field surveys (Atkins 2012). Based on the results of this survey and the NCNHP natural heritage database search, there are no known documented occurrences of smooth coneflower within the proposed project alignment.

8.0 EFFECTS OF PROPOSED ACTION– CAROLINA HEELSPLITTER AND CRITICAL HABITAT

Potential effects to the freshwater mussels (i.e. Carolina heelsplitter) and mussel habitat discussed in Sections 4.1 and 4.3 were thoroughly evaluated with regard to this project. In order to determine the project effects on the Carolina heelsplitter and its designated Critical Habitat, effects with and without the proposed project (Build vs. No-Build scenarios) were evaluated.

While it is documented that both populations of this species in the Action Area are critically imperiled, adverse effects to these populations associated with the proposed project are unlikely to occur.

8.1 Direct Effects

Based on mussel survey data and habitat evaluations, the Carolina heelsplitter does not occur in any of the waterbodies within the project corridor of the proposed action. However, because of proximity to the project corridor, the contractor may use areas within the Goose Creek and Sixmile Creek watersheds for staging, storage, refueling, borrow pit or spoil areas. Although buffer areas of intermittent or perennial streams within these watersheds would be excluded from being used for borrow/spoil per the Goose Creek Watershed Site Specific Management Plan and the similar post construction ordinance requirements for the Sixmile Creek watershed, borrow/spoil areas outside of the buffers still have the potential to affect water quality and in turn the Carolina heelsplitter from sedimentation,/erosion and introduction of toxic compounds from entering streams via storm-water channels, ditches, and overland runoff. The potential for these effects to occur can be eliminated, or minimized by developing measures to control sedimentation, erosion and introduction of toxic compounds from entering streams in these areas.

The NCDOT will strongly discourage the location of borrow sites, staging areas, equipment storage areas, and refueling areas within Goose Creek or Sixmile Creek watersheds in association with this project. As such, the likelihood of the contractor choosing such a site is remote. However, if it is decided that such a site is ultimately the best way to move the project forward, the NCDOT Division Environmental Officer will coordinate with the NCTA, USFWS, and the contractor to develop BMPs for each site to avoid/minimize the potential for adverse effects.

8.2 Indirect Effects

Potential project related indirect effects to the Carolina heelsplitter and Critical Habitat are assessed at a detailed, Goose and Sixmile Creek watersheds scale, the results of which are provided in Section 6.0 of the DTR. The assessment found that the indirect land use differences between the Updated No-Build and Updated Build scenarios for Goose Creek watershed have no measurable differences in effect on the amount of developed land, water quality, water quantity, and changes in traffic patterns in the Goose Creek or Sixmile Creek watersheds.

8.3 Cumulative Effects

Although the cumulative definition under ESA differs from that under NEPA, the cumulative analysis was performed using the NEPA definition. Therefore, the cumulative effects discussed in this BA, as defined per ESA, may be somewhat overestimated since the Quantitative ICE analysis included the effects of future federal actions *as well as* non-federal actions.

Potential project related cumulative effects to the Carolina heelsplitter and Critical Habitat are assessed at a focused, Goose and Sixmile Creek watersheds scaled detail, the results of which are

provided in Sections 6.8 and 6.9 of the DTR. Future state and private activities, including federal actions, are reasonably certain to occur within the Goose Creek and Sixmile Creek watersheds that will continue to impact the Carolina heelsplitter. However, these impacts are expected to occur with or without (Build vs. No-build) the proposed action. As there are no anticipated direct, or indirect effects, the project is not expected to contribute an incremental effect that would yield potential cumulative effects. .

8.4 Conclusions of Effects – Carolina heelsplitter

While it is documented that both the Goose Creek and Sixmile Creek populations of the Carolina heelsplitter are imperiled and continue to be threatened by future adverse impacts, direct and indirect effects to these populations are very unlikely to occur as a result of the proposed project.

Direct Effects

As discussed in Section 8.1, the project alignment does not occur within either the Goose Creek or Sixmile Creek watersheds; thus, the only potential direct effects associated with project construction would be sedimentation/erosion and introduction of toxic compounds originating from borrow/spoil areas, staging areas, equipment storage areas, and refueling areas and entering Goose Creek or Sixmile Creek via unregulated stormwater channels, ditches, and overland runoff. At this time, the locations of potential borrow/spoil sites staging areas, equipment storage areas, and refueling areas have not been chosen. In the event that any of these sites are selected within either the Goose Creek or Sixmile Creek watersheds, existing regulations excluding stream buffer areas from being used for these purposes, and the commitment of NCDOT to adopt measures to avoid/minimize the potential for adverse effects in non-regulated areas within the respective watersheds, make it extremely unlikely (discountable) that project-related direct effects could occur.

Indirect Effects

The DTR found that the indirect land use differences between the Updated No-Build and Updated Build scenarios for Goose Creek watershed have no measurable differences in effect on the amount of developed land, the water quality, and changes in traffic patterns in the Goose Creek or Sixmile Creek watersheds.

Cumulative Effects

Direct effects are extremely unlikely, though cannot be unquestionably discounted. The DTR analysis found that there are no anticipated indirect effects. Accordingly, cumulative effects to the Carolina heelsplitter, however unlikely, could occur.

Biological Conclusion

Construction of the Monroe Bypass/ Connector is not anticipated to have any direct, indirect, or cumulative effect on the Carolina heelsplitter populations in Goose Creek and Sixmile Creek. However, as noted in Section 6.9 of the DTR, there are limitations to the accuracy and certainty of the results of any analysis that attempts to project future growth or development. As such, given the inherent level of uncertainty in the forecasting models for this project and the proximity of these two watersheds to the project corridor, a "No Effect" determination cannot be concluded. Therefore, it is concluded that the proposed action **"May Affect, Not Likely to Adversely Affect"** the Carolina heelsplitter.

8.5 Conclusions of Effects-Critical Habitat

Construction of the Monroe Bypass/ Connector is not anticipated to have any direct, indirect, or cumulative effect on the Carolina heelsplitter Critical Habitat Unit 1. However, as noted in Section 6.9 of the DTR, there are limitations to the accuracy and certainty of the results of any analysis that attempts to project future growth or development. As such, given the inherent level of uncertainty and the proximity of these two watersheds to the project corridor, a "No Effect" determination cannot be concluded. Therefore, it is concluded that the proposed action **"May Affect, Not Likely to Adversely Affect"** Critical Habitat Unit 1.

8.6 Conservation Measures –Carolina Heelsplitter & Critical Habitat

In an effort to off-set potential impacts from some unanticipated event associated with construction of the Monroe Bypass/ Connector, NCDOT has either completed, or proposes, the following:

- IF any construction staging, storage, refueling, borrow pit or spoil areas are to occur in the Goose Creek and Sixmile Creek watersheds, the NCTA will coordinate with the NCDOT DEO, USFWS, and the contractor to develop BMPs for each site to avoid and minimize the potential for adverse effects. Additionally, NCTA will follow NCDOT's *Design Standards in Sensitive Watersheds* for implementing erosion and sediment control BMPs along the entire project.
- In collaboration with, and at the request of, the USFWS, a payment in the amount of $150,000 was provided to the Carolina heelsplitter Conservation Bank in the Flat Creek watershed in Lancaster County on August 4, 2010. The details of the transaction are in Appendix C.
- In collaboration with, and at the request of, the USFWS, NCDOT continued its funding of the USGS stream gauges on the US 601 crossing of Goose Creek and the SR 1103 crossing of Waxhaw Creek. A payment of $150,200 was provided on September 14, 2010 to fund operation through June 2015 (Appendix C).

9.0 EFFECTS OF PROPOSED ACTION – SCHWEINITZ'S SUNFLOWER

9.1 Direct Effects

There is suitable habitat for Schweinitz's Sunflower in the project alignment; however, there are no known populations within the proposed project alignment, right-of-way (ROW), or clearing limits. Based on NCNHP (2013) EO data as well as project study area surveys (ATKINS 2012), there are two populations of this species (EO# 230 and EO# 77) within approximately 500 feet of the proposed project alignment in the vicinity of the proposed interchange at Indian Trail-Fairview Road. The interchange has been specifically designed to avoid encroachment on these two populations. NCDOT has further committed to preserving and managing these populations during construction as noted in Section PC (Special Project Commitments) of the Final EIS (PBS&J 2010a).

The two populations are located partially within the Union Power utility ROW. As part of the proposed roadway construction, the power lines above EO #77 will be raised, but kept in the same location (Shumate 2010, NCTA, pers. comm.). Union Power agreed to manage the populations in their utility easement per their agreement with USFWS: Union Power's Schweinitz's Sunflower Restricted Sites Plan (Union Power 2010) (Appendix D). The project will not require utility coordination near EO #230.

Therefore, direct effects to Schweinitz's Sunflower are not anticipated to occur as a result of the proposed project.

9.2 Indirect Effects

Section 6.6 of the DTR performs a detailed, magnified assessment of the specific land use changes in the vicinity of the Elemental Occurrences. While there is expected to be induced land use changes near EO#77 and EO# 230 (Figure 22 in DTR), it is not expected to impact these populations. Likewise, the analysis found that the four percent loss of potentially suitable is not expected to impact the species. However, given the proximity of the construction project coupled with the inherent uncertainty of forecasting models, indirect effects, while not anticipated, cannot be unquestionably discounted.

9.3 Cumulative Effects

Although the cumulative definition under ESA differs from that under NEPA, the cumulative analysis was performed using the NEPA definition. Therefore, the cumulative effects discussed in this BA, as defined per ESA, may be somewhat overestimated since the Quantitative ICE analysis included the effects of future federal actions *as well as* non-federal actions.

Future state and private activities, not involving federal actions, are reasonably certain to occur throughout the FLUSA, specifically in the vicinity of EO# 18 and EO# 78, which could affect these populations (Figure 21 in DTR). The area around EO# 18 is expected to incur a change in land use from Undeveloped to Residential and the area around EO# 78 is expected to incur a change in land use from undeveloped to Non-Residential, independent of the proposed Monroe Connector/Bypass. The anticipated growth will likely affect these populations by degrading potentially suitable habitat through the expansion of residential and industrial development in areas currently undeveloped. Additional development in the vicinity of EO# 78 may include future infrastructure projects (i.e. sewer and water expansion) associated with the anticipated land use changes since this area is currently slated for future County sewer service. This future growth is expected to occur through future state, local, and private actions, not requiring federal permits or funds to complete.

Reasonably foreseeable small-scale adverse effects to Schweinitz's Sunflower may also occur within the Action Area; however, they are difficult to predict or quantify. Poor conservation management of the species at EO# 77 by the landowner has occurred in the past, namely excessive mowing (Thompson 2010b, pers. comm.). In addition, a past traffic accident caused habitat degradation in the vicinity of EO# 77 (Thompson 2010b, pers. comm.). The NCDOT has since widened Secrest Shortcut Road, which will likely aid in minimizing minor traffic accidents.

9.4 Conclusion of Effects

Direct and indirect effects to these populations of Schweinitz's Sunflower are unlikely to occur as a result of the proposed project.

9.4.1 Direct Effects

The project alignment does not occur within the bounds of any known Schweinitz's Sunflower populations; therefore, the only potential direct effects associated with the proposed project include the raising of the utility lines above EO# 77, which is not anticipated to adversely affect this population. Given the proximity of these two populations to the project corridor, NCDOT has committed to taking extra precautions, such as installing construction fencing around these populations, to ensure construction activities (e.g. worker parking, etc.) do not affect these populations. The Special Project Commitments of the Final EIS (Section PC; PBS&J 2010a) further detail NCDOT's commitment to avoid/minimize the potential for project-related adverse direct effects to Schweinitz's Sunflower.

9.4.2 Indirect Effects

As summarized in Section 6.6 of the DTR, no indirect effects to Schweinitz's Sunflower are anticipated.

9.4.3 Cumulative Effects

Direct, indirect effects are not anticipated, but as detailed above cannot be unquestionably discounted for various reasons. Further, cumulative effects, independent of the proposed action, in the form of loss of potential habitat is expected, though not anticipated to effect the viability of the species.

9.4.4 Biological Conclusion

Project-related direct and indirect effects to Schweinitz's Sunflower are extremely unlikely to occur (or are discountable). Potential direct and indirect effects are anticipated to be avoided by on-site preservation and management, the details of which are provided in Section 9.5. Cumulative effects independent of the proposed action are expected, though not anticipated to effect the viability of the species. Therefore, it can be concluded that the proposed action "**May Affect, Not Likely To Adversely Affect"** Schweinitz's Sunflower.

9.5 Schweinitz's Sunflower Conservation Measures

The Recovery Plan for Schweinitz's Sunflower lists several actions needed for the conservation of the species. This includes surveying suitable habitat for additional populations and potential reintroduction sites, protecting known remnant populations and viable populations through various protective management tools (i.e. management and cooperative agreements, acquisition of parcels containing preferred habitat, etc.), monitoring existing populations, conducting research, and implementing management plans on protected populations (USFWS 1994).

Conservation measures are those measures that can be taken to offset potential adverse effects to a protected species. Conservation measures for plant species typically fall into two categories: (1) Protection of extant populations through the use of management / cooperative agreements, and (2) relocation of extant populations to areas where they can be preserved and maintained. Conservation, relocation, or preservation of known populations may help alleviate potential direct, indirect, and cumulative effects to plant species within the Action Area.

The conservation measure of preference is most always to preserve the species in place, with relocation / transplanting being a viable alternate option if on site preservation is not feasible. After evaluating the potential effects, NCTA and FHWA determined on site preservation of EO# 230 and EO# 77 to be a feasible, preferable option, which conserves the species in its present habitat within the Action Area. This population has flourished at its current location, despite the

past instances of excessive maintenance by the local landowner, a traffic accident, and even removal and relocation of the original population. The impressive re-growth of EO# 77 leads to the determination of on site preservation as the preferred conservation measure for this population.

9.5.1 On Site Preservation

NCDOT has been protecting roadside populations of rare plants since 1989, marking these populations in order to prevent them from being mowed (AASHTO 2009). NCDOT signed a Memorandum of Understanding (MOU) with NCDENR in 1990 that committed NCDOT to protect populations of threatened and endangered species that occur within NCDOT ROW. Working to protect roadside populations of federal and state-listed endangered and threatened species, NCDOT established general statewide management guidelines for areas marked for rare species; "NCDOT Roadside Vegetation Management Guidelines in Marked Areas" (Appendix E).

On site preservation of EO# 230 and EO# 77 will be the responsibility of NCDOT. Funds will be designated for the resources and labor to mark the extent of both populations with "Do Not Mow" signs. Additionally, NCDOT Division personnel and field maintenance crews will conduct vegetation management and maintenance activities per "NCDOT Roadside Vegetation Management Guidelines in Marked Areas". NCDOT did not immediately install signage since it was anticipated that they could conflict with construction of the Monroe Bypass/ Connector Project and other protective measures (fencing, other signs) would be used during construction. Nonetheless, NCDOT Division 10 personnel are aware of the populations and will continue to follow aforementioned vegetation management guidelines. NCDOT Division 10 has committed to preserving the species in place (NCTA 2010a).

NCTA has also notified Union Power of these populations (NCTA 2010b) and Union Power has committed to including these sites in their Schweinitz's Sunflower Restricted Sites plan (Ortiz 2010, Union Power, pers. comm.). Letters from NCTA to Division 10 and Union Power requesting onsite preservation are included in Appendix F. The commitments from both NCDOT and Union Power will be adhered to for as long as the respective conservation areas are under their ownership. While this can't necessarily be considered "in perpetuity", ownership of such areas are very rarely relinquished. As such, there is no reason to assume these sites will not continue to be managed for Schweinitz's sunflowers for the foreseeable future.

In addition, continued NCDOT management of EO# 78 and EO# 18 within the ROW, per "NCDOT Roadside Vegetation Management Guidelines in Marked Areas" as well as continued Union Power management of these populations, would lessen the likelihood of the anticipated impacts to these populations. Union Power currently manages these populations under their Schweinitz's Sunflower Restricted Sites plan.

10.0EFFECTS OF PROPOSED ACTION – MICHAUX'S SUMAC

10.1 Direct Effects

Based on NCNHP (2013) Natural Heritage EO data as well as project study area surveys (ATKINS 2012), Michaux's Sumac is not currently known within the proposed project alignment, ROW, or clearing limits. As such, direct effects to Michaux's sumac are not anticipated.

10.2 Indirect Effects

Based on NCNHP (2013) Natural Heritage EO data as well as project study area surveys (ATKINS 2012), Michaux's Sumac is not currently known within the FLUSA. Therefore, indirect effects to Michaux's Sumac are not anticipated.

10.3 Cumulative Effects

Cumulative effects to Michaux's Sumac are not anticipated as neither direct nor indirect effects are anticipated to occur to this species as a result of the proposed action.

10.4 Conclusion of Effects

Based on NCNHP (2013) Natural Heritage EO data as well as project study area surveys (ESI 2007), Michaux's sumac is not known within the Action Area, and therefore the project will have **No Effect** on this species.

11.0EFFECTS OF PROPOSED ACTION – SMOOTH CONEFLOWER

11.1 Direct Effects

Smooth Coneflower is not listed by the USFWS as occurring in Union County nor are there NCNHP (2013) Natural Heritage EO records near the proposed project alignment, ROW, or clearing limits. As such, direct effects to Smooth Coneflower are not anticipated.

11.2 Indirect Effects

Based on the DTR, there are no indirect effects anticipated in Mecklenburg County. Further, there are no known NCNHP (2013) Natural Heritage EOs of this species within the FLUSA. Therefore, indirect effects to Smooth Coneflower are not anticipated.

11.3 Cumulative Effects

Cumulative effects to Smooth Coneflower are not anticipated as neither direct nor indirect effects are anticipated to occur to this species as a result of the proposed action.

11.4 Conclusion of Effects

Since there will be no direct or indirect effects within Mecklenburg County and the lack of EO records within or near the FLUSA, the project will have **No Effect** on this species.

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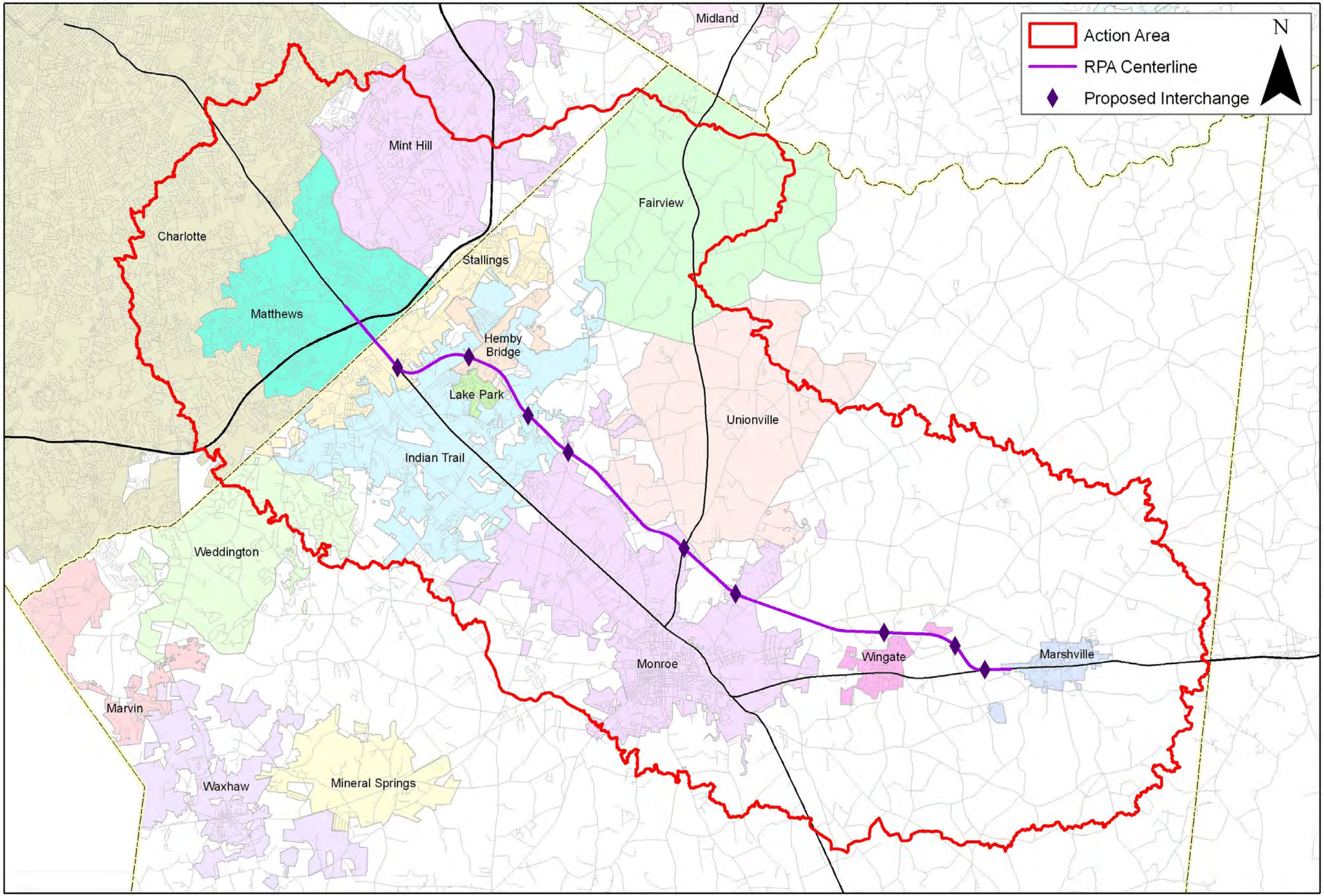


The Catena Group

Date: February 2010

Scale: 0 1 2 Miles

Job No.: 1125

Title:

Monroe Connector/Bypass (R-3329/R-2559)

Action Area

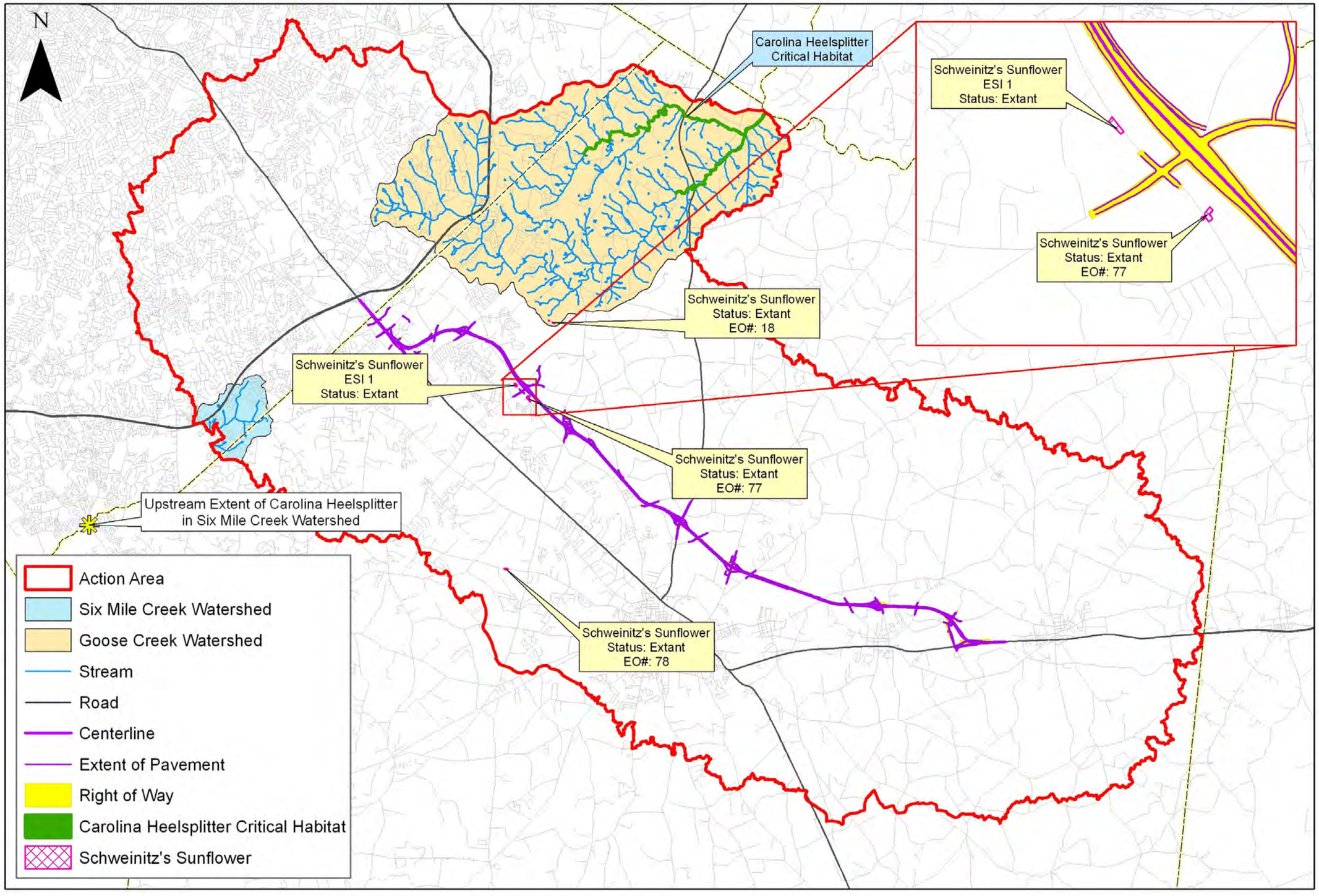
Mecklenburg and Union Counties, North Carolina

Client:

North Carolina Turnpike Authority

Figure

1



The Catena Group

Date: March 2010

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Job No.: 1125

Title:

Monroe Connector/Bypass (R-3329/R-2559)

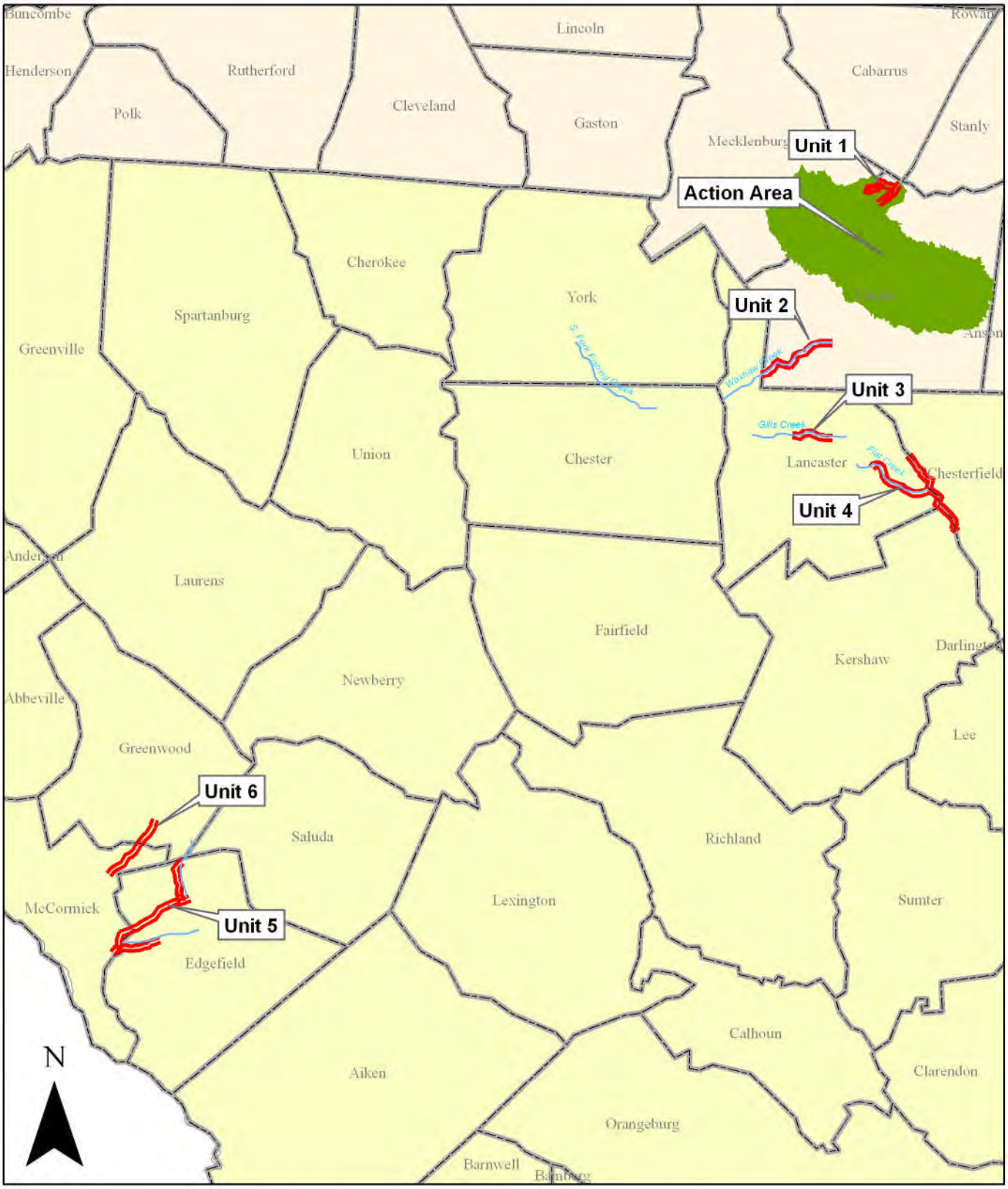
Project Proximity to Endangered Species and Critical Habitat

Mecklenburg and Union Counties, North Carolina

Client:

North Carolina Turnpike Authority

Figure 2



The Catena Group

Monroe Connector/Bypass
(R-2239/R-2559)
Carolina Heelsplitter
USFWS Critical Habitat Units
North and South Carolina

Date: March 2010

Scale: 0 5 10 Miles

Job No.: 1125

Figure 3

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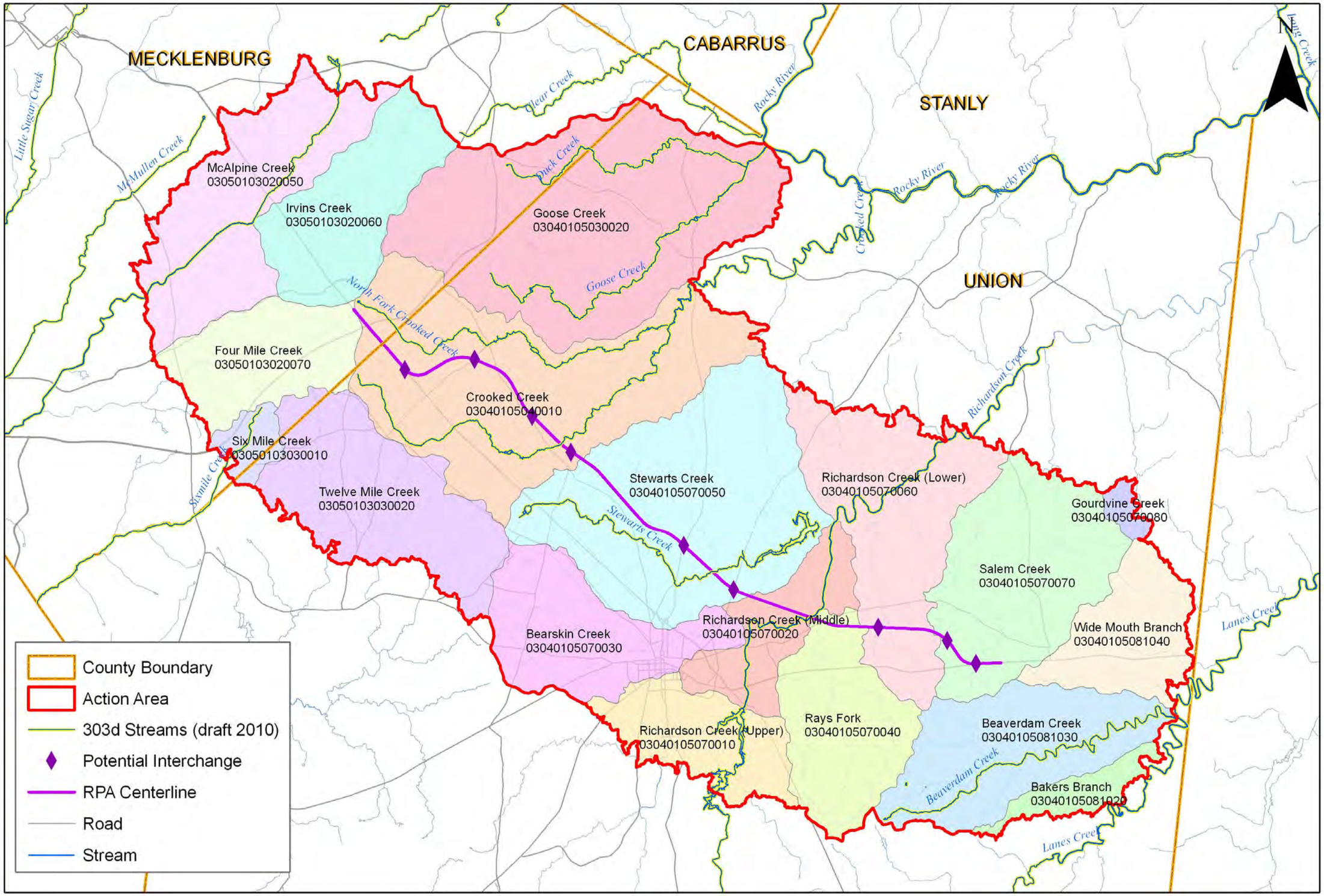

The Catena Group

Date: February 2010

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Job No.: 1125

Title:

Monroe Connector/Bypass (R-3329/R-2559)

Watersheds and 303(d) Streams

Mecklenburg and Union Counties, North Carolina

Client:

North Carolina Turnpike Authority

Figure 4

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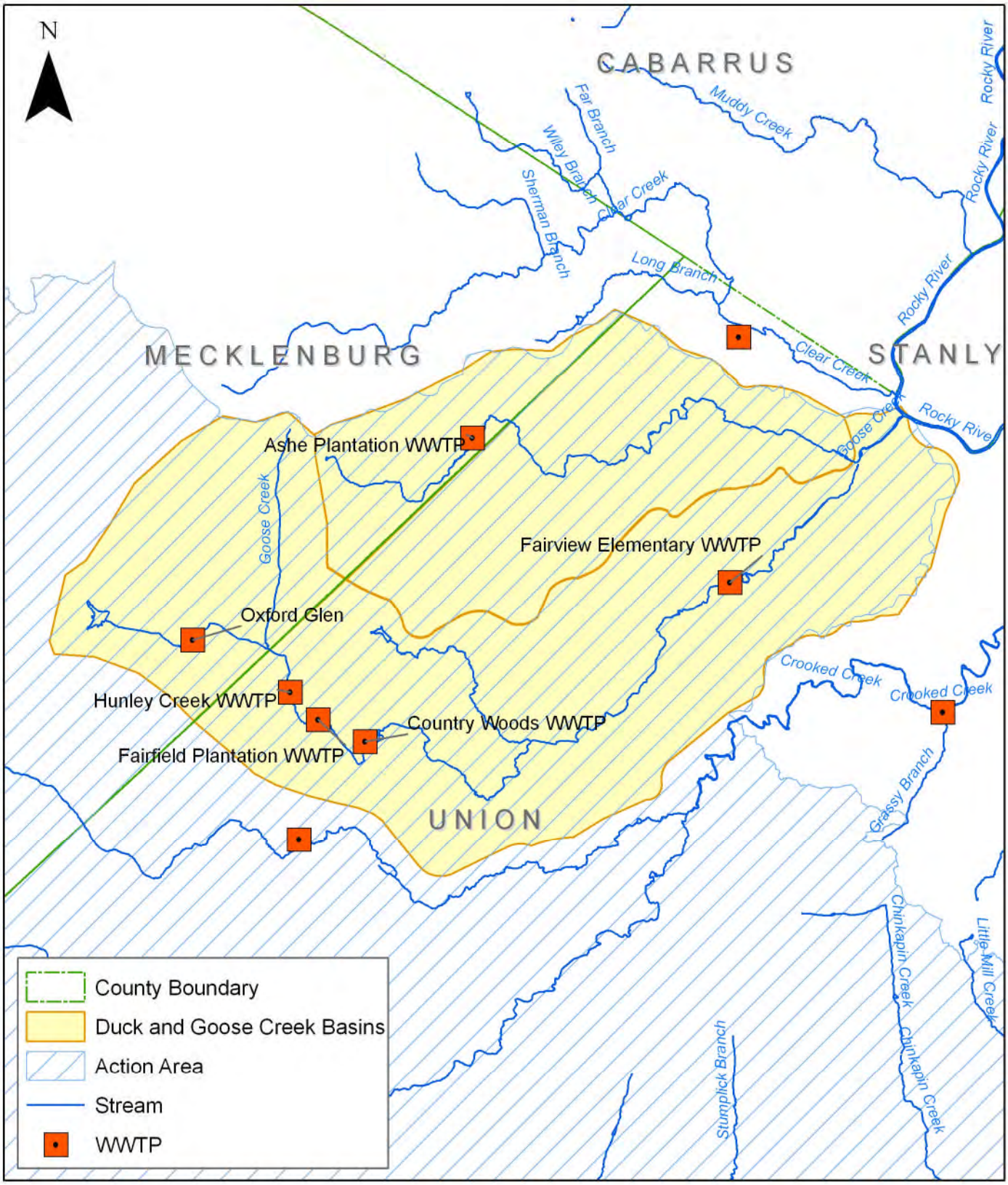

The Catena Group

Monroe Bypass/Connector
(R-3329/R-2559)
WWTP Locations
Goose and Duck Creek Basins
Union and Mecklenburg Counties, North Carolina

Date: March 2010

Scale: 0 0.5 1 Miles

Job No.: 1125

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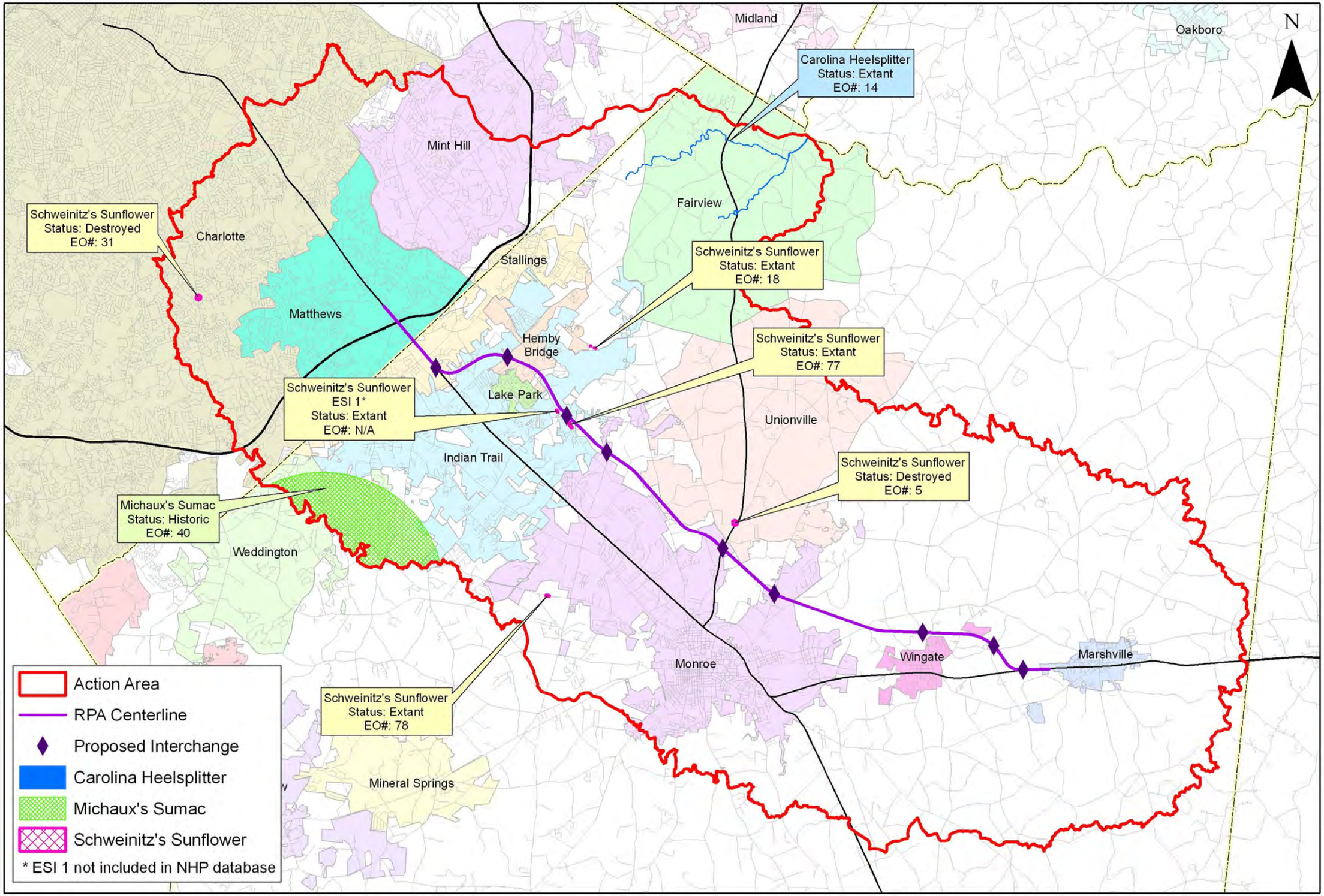


The Catena Group

Date: February 2010

Scale: 0 1 2 Miles

Job No.: 1125

Title:

Monroe Connector/Bypass (R-3329/R-2559)

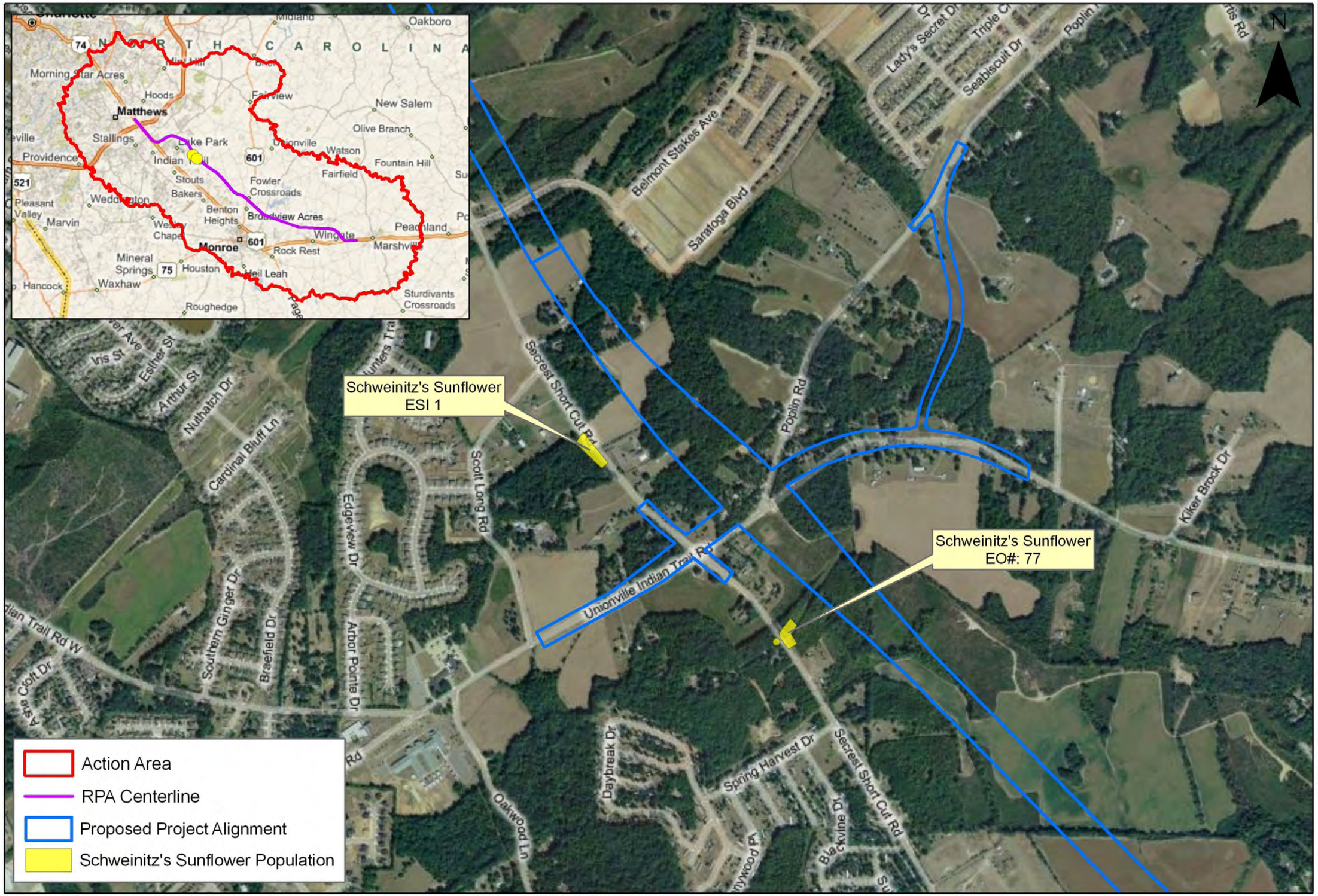
NCNHP Element Occurrences

Mecklenburg and Union Counties, North Carolina

Client:

North Carolina Turnpike Authority

Figure 6



The Catena Group

Date: February 2010

Scale: 0 550 1,100 Feet

Job No.: 1125

Title:

Monroe Connector/Bypass (R-3329/R-2559)

Potential Impact Schweinitz's Sunflower Populations

Mecklenburg and Union Counties, North Carolina

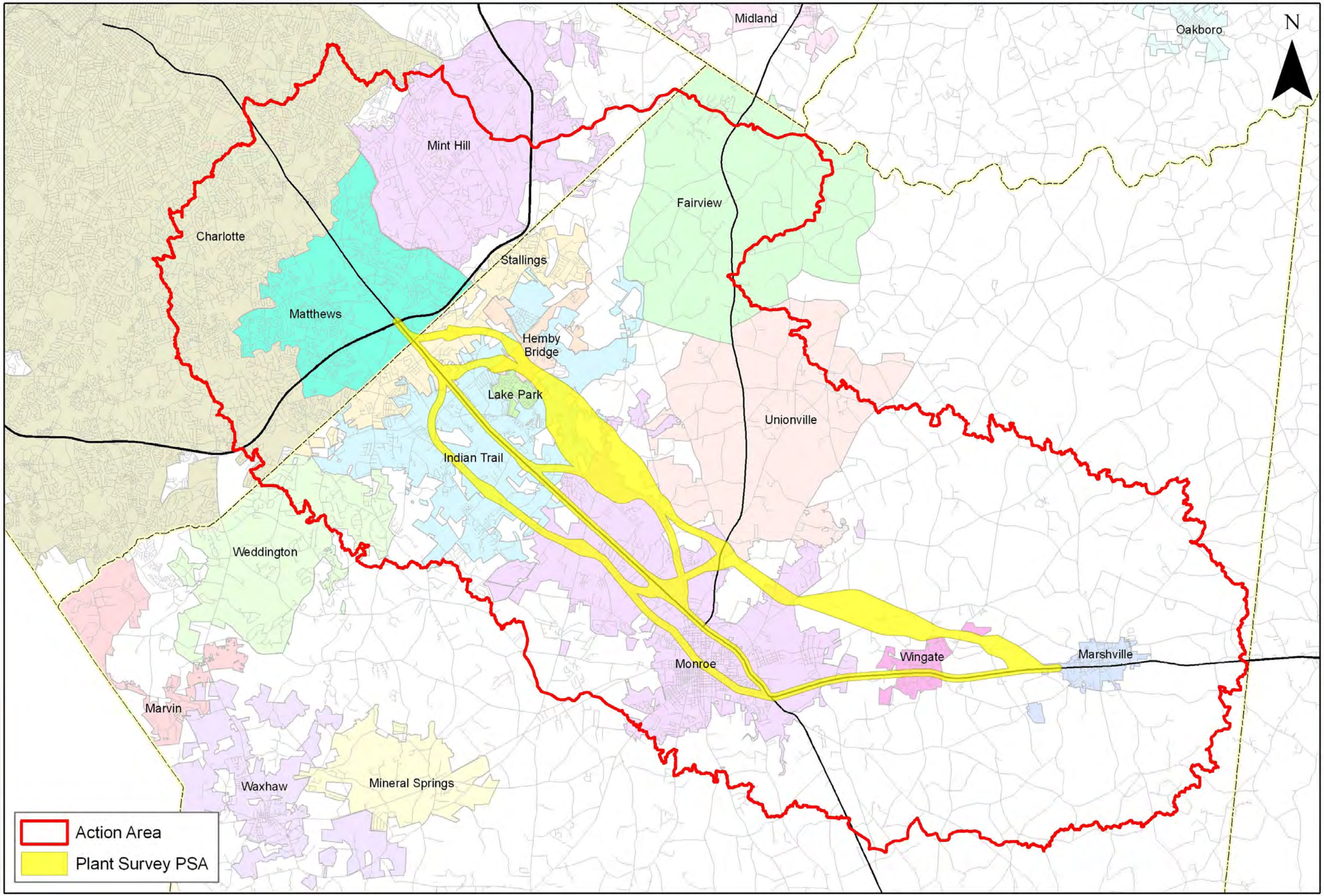
Aerial Photography: www.bingmaps.com

Client:

North Carolina Turnpike Authority

Figure

7



The Catena Group

Date: February 2010

Scale: 0 1 2 Miles

Job No.: 1125

Title:

Monroe Connector/Bypass (R-3329/R-2559)

Plant Survey Project Study Area

Mecklenburg and Union Counties, North Carolina

Client:

North Carolina Turnpike Authority

Figure

8

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Monroe Connector/Bypass (R-3329/R-2559)

Technical Report on Direct, Indirect and Cumulative Impacts to Federally Listed Species

Response to FWS Letter dated December 20, 2012

DRAFT

Prepared for the North Carolina Turnpike Authority

A Division of North Carolina Department of Transportation

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October 11, 2013

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TABLE OF CONTENTS

Table of Contents ..... **iii**
Table of Tables ..... **iv**
Table of Figures ..... **iv**
Table of Maps ..... **v**
Table of Appendices ..... **vi**
1.0 Introduction **1**
1.1 What Is the Proposed Project? 1
1.2 What is the Purpose of this Document? 1
1.3 Why Is this Update Needed? 1
2.0 Updates to Direct Impacts to protected species **2**
2.1 Updated Carolina Heelsplitter (Lasmigona decorata) Surveys 2
2.2 Updated Endangered Plant Surveys 3
3.0 Update to Indirect Impacts **4**
3.1 Why Is an Updated Quantitative Indirect and Cumulative Effects Analysis Needed? 4
3.2 How Is an ICE Analysis Done? 4
3.3 What Is the Study Area for the ICE Analysis? 5
3.4 What Are the Land Use Conditions and Trends in the Study Area? 6
3.5 Existing Land Use 17
4.0 Review of Socioeconomic Projections **20**
4.1 What Is an MPO? 20
4.2 How Did the MPO and CDOT Develop the Projections? 24
4.3 How Have Other Studies Used the MRM Socioeconomic Projections 44
4.4 How Do the MRM Socioeconomic Projections Compare to Other Projections? 51
4.5 How Accurate are the MPO Projections? 54
4.6 Conclusions 54
5.0 Induced Growth Assessment and Future Land Use Scenarios **57**
5.1 How Did the ICE Analysis Project Land Use without the Proposed Project? 57
5.2 How Was Project-Induced Growth Estimated? 59
6.0 Updated Land Use Results **67**
6.1 What Are the Land Use Results for the Entire Study Area? 67
6.2 What are the Land Use Results for Goose and Sixmile Creek Watersheds? 68
6.3 What Are the Indirect Land Use Impacts for Goose and Sixmile Creek Watersheds? 69
6.4 How Was Impervious Surface Estimated? 69
6.5 What Are the Indirect Impervious Surface and Cumulative Water Quality Impacts? 71
6.6 What are the Indirect and Cumulative Impacts to Plant Species? 72
6.7 Changes in Traffic Patterns 75
6.8 What Are the Indirect and Cumulative Impacts to the Carolina Heelsplitter 78
6.9 Conclusions 78
7.0 References **82**

TABLE OF TABLES

Table 1: Study Area Watersheds 6
Table 2: List of Interviews Completed in 2012[a] 7
Table 3: Zoning or Other Local Data Collected During Interviews* 9
Table 4: MRM Socioeconomic Projection Versions 25
Table 5: Roles, Factors and Accessibility Considerations of the MRM Socioeconomic Projection Process Components 33
Table 6: Capacity of Allocation Model to Capture Growth Influences 35
Table 7: Dr. Hammer's Population Projection for the Charlotte Region 36
Table 8: Union County Land Development Factors 39
Table 9: Household and Population Projections for the Corridor Study Area (132,436 acres) 47
Table 10: Change in Household and Population Projections within the Corridor Study Area 49
Table 11: Comparison of Population Projections 53
Table 12: Non-Residential Land Use by Employment 59
Table 13: Updated Land Use Scenario Results 67
Table 14: Updated Land Use Scenario Results, Sixmile Creek Watershed 68
Table 15: Updated Land Use Scenario Results, Goose Creek Watershed 69
Table 16: Percent Impervious Surface for Each Land Use Category 70
Table 17: Updated 2010 Baseline Imperviousness Compared to Previous 2007 Baseline Imperviousness 70
Table 18: Updated 2030 No-Build Imperviousness Compared to Previous No-Build Imperviousness 70
Table 19: Updated 2030 Build Imperviousness Compared to Previous 2030 Build Imperviousness 71
Table 20: Percent Impervious Surface by Watershed and Alternative 71
Table 21: Percent Impervious Cover Results from 2010 Report Compared to 2013 Report 71
Table 22: 2012 Clean Water Act §303(d) Impaired Streams by Watershed 72
Table 23: Total Conversion of Pasture/ Hay Natural Herbaceous and Barren Land Cover to Developed Land 73
Table 24: County and Regional Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) 76

TABLE OF FIGURES

Figure 1: Average Annualized Growth Rates Comparison 12
Figure 2: Lawyers Road and I-485 Small Area Plan, Land Use 15
Figure 3: Union County Future Land Use Plan 16
Figure 4: Land Use Categorization Process 19
Figure 5: Four-Step Travel Demand Model and Inputs 23
Figure 6: Timeline of MRM Projection Development 25
Figure 7: Visualization of LUSAM Workbook Process 28
Figure 8: LUSAM Example, Fairview, 2009 and 2008 Interim Projections, 2015 Horizon Year 32

TABLE OF MAPS

Map 1: Project Location
Map 2: Study Area Watersheds
Map 3: Updated Baseline 2010 Land Use Scenario
Map 4: Charlotte Region MPOs and RPOs
Map 5: Metrolina Model TAZs by Planning Organization
Map 6: Travel Time to Employment Center Analysis – Employment Center Locations and Travel Time Results
Map 7: Difference in Travel Time to Employment Centers Factor from Bottom Up Allocation
Map 8: Difference in Land Development Factor Composite Score from Bottom Up Allocation
Map 9: Household Density, 2030 Horizon Year, 2009 Projections
Map 10: Employee Density, 2030 Horizon Year, 2009 Projections
Map 11: Kenan Institute Study Zones and ICE FLUSAs
Map 12: Household Growth by TAZ, 2005 to 2030, 2009 Projections
Map 13: Employment Growth by TAZ, 2005 to 2030, 2009 Projections
Map 14: Comparison of Accessibility No-Build vs. Build
Map 15: Comparison of Accessibility No-Build vs. Build Goose and Sixmile Creek Watersheds
Map 16: Sanitary Sewer Availability
Map 17: Updated 2030 No-Build Land Use Scenario
Map 18: Land Use Change Baseline (Existing) to No-Build, Goose and Sixmile Creek Watersheds
Map 19: Updated 2030 Build Land Use Scenario
Map 20: Change in Land Use from No-Build to Build, Goose and Sixmile Creek Watersheds
Map 21: Land Use Change Baseline to No-Build Effects to Sunflower Populations
Map 22: Land Use Change No-Build to Build Effects to Sunflower Populations
Map 23: Raw Model Volumes for No-Build and Build Scenarios, US 601 from Monroe Bypass/Connector to Cabarrus County

TABLE OF APPENDICES

Appendix A Interview Summaries

Appendix B Growth Trends and Factors Analysis Memorandum

Appendix C Kenan Institute Report

Appendix D Hartgen Analysis

Appendix E MRM Raw Model Volume Traffic Comparison

1.0 INTRODUCTION

1.1 What Is the Proposed Project?

The North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), proposes to construct a project known as the Monroe Connector/Bypass. A project which would be a controlled-access toll road extending from US 74 near I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County, a distance of approximately 20 miles. Map 1 shows the proposed project and surrounding area. The proposed action is included in the NCDOT 2009–2015 State Transportation Improvement Program (STIP) as Project R-3329 (Monroe Connector) and Project R-2559 (Monroe Bypass) as a toll facility.

1.2 What is the Purpose of this Document?

NCTA, through this document, is responding to the USFWS December 20, 2012 Letter sent to NCTA which among other items, recommended a re-initiation of consultation under Section 7 of the Endangered Species Act (ESA). Previous coordination on this issue is summarized in the May 25, 2010 Biological Assessment (BA).

This document evaluates previous conclusions regarding direct as well as indirect and cumulative effects (ICE) to federally listed species (threatened and endangered species) associated with the Monroe Bypass/Connector. The following species are listed for Union and/or Mecklenburg Counties: Carolina heelsplitter, Schweinitz's sunflower, Michaux's sumac, and smooth coneflower. The report summarizes updated surveys for these species within the project area as well as the conclusions reached in the evaluation of ICE and describes the data collected, methodologies used and analyses conducted for the ICE for the project. The document also re-evaluates and considers data, analytical research relevant to the project area, and new information relevant to the analysis of the indirect and cumulative effect on land use, water quality, and federally designated threatened and endangered species and their critical habitat. Since the Carolina heelsplitter lives in two watersheds in the study area, water quality is a major focus area of this analysis. Thus, results for the watershed level are provided in this update. As the listed plant species are generally found in opened habitats, ICE analysis for these species focuses on potential land use changes associated with the project.

1.3 Why Is this Update Needed?

As stated previously, Section 7 consultation for the Monroe Connector/Bypass was summarized in the May 2010 Biological Assessment. NCTA previously analyzed indirect and cumulative effects of the Detailed Study Alternatives for the proposed action through a Qualitative Indirect and Cumulative Effects Assessment (Qualitative ICE) completed for the Draft Environmental Impact Statement (DEIS Chapter 7) and incorporated into the Final Environmental Impact Statement (FEIS Appendix G). This analysis was expanded and extended for the Preferred Alternative through a Quantitative Indirect and Cumulative Effects Analysis for Land Use (Quantitative ICE) and Quantitative Indirect and Cumulative Effects Water Quality Analysis (WQA) completed for the Final Environmental Impact Statement (FEIS Appendices H & I). These reports were summarized in Section 2.5.5 of the FEIS and together these reports comprise the FEIS ICE analysis and conclusions. In August 2010, FHWA issued a Record of Decision (ROD) selecting Detailed Study Alternative D (DSA D) as the Selected Alternative for the proposed action based on the

analysis of the DEIS and FEIS showing that this alternative had lower overall impacts to the natural environment and residential areas compared to other alternatives.

In November 2010, The North Carolina Wildlife Federation, Clean Air Carolina and Yadkin Riverkeepers (Plaintiffs) filed suit to overturn the ROD. The U.S. District Court for the Eastern District of North Carolina decided the case in October 2011, finding for FHWA and NCTA that the FEIS was sufficient. Plaintiffs appealed the decision to the U.S. Court of Appeals for the Fourth Circuit and the appellate court vacated the District Court decision on May 3, 2012. The FHWA rescinded its ROD for the project on July 3, 2012 in response to the appeals court decision.

The primary purpose of this report is to provide an update to the US Fish and Wildlife Service (USFWS) on the direct, indirect and cumulative impacts to federally listed species. This includes a substantial update to the FEIS summary of the quantitative ICE effects documented in the FEIS Appendix H. This document will:

1. Review the direct impacts to species and updates surveys of the corridor (Section 2.0)
2. Review the scope of the ICE analysis and conditions and trends in the study area, including the existing land use scenario (Section 3.0)
3. Review the Metrolina Regional Model socioeconomic projections, including how other studies have used the projections, and evaluate the most appropriate use of those projections within the framework of the ICE analysis (Section 4.0)
4. Explain the methods used to estimate induced growth and develop the future land use scenarios (Section 5.0)
5. Report revised induced growth results and conclusions based on the updated land use scenarios (Section 6.0)
6. Review measures that localities and others could adopt to minimize any impacts of future development, whether induced or not, on sensitive environmental resources (Section 7.0).

This report summarizes the conclusions reached in the evaluation of direct, indirect and cumulative effects to species and describes the data collected, methodologies used and analysis. This document also re-evaluates and considers data, analytical research relevant to the project area, and new information relevant to the analysis of the indirect and cumulative effect on land use, water quality, and federally designated threatened and endangered species and their critical habitat in the surrounding area.

2.0 UPDATES TO DIRECT IMPACTS TO PROTECTED SPECIES

2.1 Updated Carolina Heelsplitter (Lasmigona decorata) Surveys

Carolina heelsplitter surveys were conducted in 2012.[1] The locations for the 2012 mussel surveys were determined by overlaying the location of potential effects and/or impacts within the Future Land Use Study Area (FLUSA) with streams identified during the 2009 surveys that contain a robust freshwater mussel population that could potentially support the Carolina heelsplitter. Accordingly, South Fork Crooked Creek and Stewarts Creek in the vicinity of the project alignment, and portions of Crooked Creek and Richardson Creek within the FLUSA were surveyed.

[1] *Freshwater Mussel Survey Report Update* (October 26, 2012), prepared by The Catena Group.

Overall the results of the 2012 survey efforts are very similar to the 2009 surveys, and as was the case in 2009, the Carolina heelsplitter was not found in any of the surveyed streams. Differences between the two survey efforts are more likely a result of differences in time of year and survey conditions, rather than an indication of changes in mussel abundances. For example, while the Savannah lilliput was found in low numbers (3 individuals) in Richardson Creek in 2009, it was not located in 2012, but is likely still present. There was a large amount of leaf pack covering the substrate of Richardson Creek in 2012 generally making surveying difficult. This coupled with the very small size of the Savannah lilliput (< 2 inches) is likely the reason it was not detected. The fact that most of the other species occurring in Richardson Creek were found in similar numbers further supports this assumption. Furthermore, the difficulty of detecting a species that is present in low numbers during a one-time survey is highlighted by the fact that the Paper pondshell was found (one individual) in Richardson Creek in 2012, but not in 2009, although it was known from the stream prior to 2009 (North Carolina Wildlife Resources Commission [NCWRC] Unpublished Aquatic Species Database).

2.2 Updated Endangered Plant Surveys

Surveys were performed 2012 for Schweinitz's sunflower (*Helianthus schweinitzii*) and Michaux sumac (*Rhus michauxii*).[2] The survey area was the final proposed design footprint for the Monroe Connector/Bypass, including all utility relocations. No previously unknown populations of any of the species were found.

[2] *Updated T&E Plant Species Field Review* (October 9, 2012), prepared by Atkins

3.0 UPDATE TO INDIRECT IMPACTS

3.1 Why Is an Updated Quantitative Indirect and Cumulative Effects Analysis Needed?

This report summarizes the conclusions reached in the evaluation of ICE and describes the data collected, methodologies used and analysis conducted for the ICE for the project. This document also re-evaluates and considers data, analytical research relevant to the project area, and new information relevant to the analysis of the indirect and cumulative effect on land use, water quality, and federally designated threatened and endangered species and their critical habitat in the surrounding area.

3.2 How Is an ICE Analysis Done?

The National Environmental Policy Act of 1969, as amended (NEPA), the North Carolina State Environmental Policy Act (SEPA), and the United States Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508) identify assessment of indirect and cumulative effects as a necessary component of environmental impact assessment for major Federal actions. The ICE analysis to evaluate potential land use changes and environmental effects associated with the Monroe Connector/Bypass project followed a process contained in guidance released in 2001 by the North Carolina Department of Transportation (NCDOT), in consultation with the North Carolina Department of the Environment and Natural Resources (NCDENR), the North Carolina State Attorney General's Office and the Association of Municipalities entitled *Guidance for Assessing Indirect and Cumulative Impacts for Transportation Projects in North Carolina, Volume I: Guidance Policy Report and Volume II: Practitioners' Handbook*.[3] In this guidance document, the agencies agreed to the following steps that should be taken to thoroughly assess indirect and cumulative impacts.

Step 1: Definition of the Future Land Use Study Area
Step 2: Identification of the FLUSA's Direction and Goals
Step 3: Inventory of Notable Features
Step 4: Identification of Important Impact Causing Activities
Step 5: Identification and Analysis of Potential Indirect/Cumulative Effects
Step 6: Analyze Indirect/Cumulative Effects
Step 7: Evaluate Analysis Results
Step 8: Assess the Consequences and Develop Appropriate Mitigation and Enhancement Strategies.

The first five steps are undertaken for a qualitative ICE study. The last three steps are undertaken if a quantitative study is required. The ICE analysis previously conducted for the Monroe Connector/Bypass project included a qualitative analysis for inclusion and publication in the DEIS and a quantitative analysis for inclusion and publication in the FEIS.

FHWA and NCTA presented the results of the analysis of the first five steps in a Qualitative ICE, which was included in the DEIS and the FEIS as Appendix G. Based on a review of data and information available since that report was completed, the results and conclusions in the FEIS Appendix G would not

[3] NCDOT and NCDENR. *Guidance for Assessing Indirect and Cumulative Impacts for Transportation Projects in North Carolina, Volume I: Guidance Policy Report and Volume II: Practitioners' Handbook.* November 2001.

be significantly different or introduce new significant impacts or information, which were not previously considered.

Subsequently, a Quantitative ICE was developed following steps six through eight and was presented in FEIS Appendix H. Because of new data, information and the results of the Fourth Circuit of the United States Court of Appeals, FHWA and NCTA have reanalyzed steps six through eight in this updated Quantitative ICE. The scope of this Quantitative ICE includes analysis of the potential of increased indirect and cumulative effects on water resources, threatened and endangered species, and in response to agency and public comment on the DEIS. The decision to use watersheds as boundaries to quantitatively analyze effects, instead of the zones presented in the Qualitative ICE, was made due to the water quality concerns expressed by resource agencies. Watershed boundaries were also used for analysis for compliance with Section 7 of the ESA. Land use changes within watersheds were analyzed first and those results were used to estimate changes in water quality and impacts on the federally protected species. Because the Carolina heelsplitter mussel is an aquatic species, this report includes an evaluation of potential ICEs to water quality in Goose Creek and Sixmile Creek. Map 2 shows each watershed within the project study area.

The Quantitative ICE analysis addresses the potential land use changes associated with the proposed project by developing three land use scenarios associated with the following conditions:

- **Existing (or Baseline) Land Use Scenario**: A scenario that reflects the land use conditions as they existed in 2010 to provide a basis for comparison for cumulative impacts assessment.
- **No-Build Land Use Scenario**: A scenario that reflects the best estimate of land use development conditions in 2030 if the proposed project is not built based on the assumptions and methods used in this report.
- **Build Land Use Scenario**: A scenario that reflects the best estimate of land use development conditions in 2030 if the proposed project is built based on the assumptions and methods used in this report.

3.3 What Is the Study Area for the ICE Analysis?

The NCDOT ICE Guidance indicates that the development effects of a new or improved roadway facility are most often found within one mile of an interchange, and approximately two to five miles along major intersecting roadways to the interchange. Using the ICE Guidance, it was determined for the purposes of the Draft EIS that the potential for ICE exists within about five miles of the various project alignments, which for the purpose of the study were evaluated as a single Build Alternative. This approximate five-mile radius is depicted in the Draft EIS, Figure 7-1, and is referred to in the Draft EIS and the Qualitative ICE Assessment as the FLUSA.

Based on coordination with USFWS and other agencies, the DEIS FLUSA was expanded to include all of the Goose Creek watershed (14-digit Hydrologic Unit 03040105030020) as well as the headwaters of some of the area streams in the FLUSA. The Goose Creek watershed is located at its closest point approximately one mile north of the proposed project in northwestern Union County. Although some of the FLUSA watersheds overlap Anson County, the FLUSA was not expanded into Anson County because it lies outside the five-mile radius and does not contain special resources noted in comments on the Draft EIS. This expanded FLUSA is the area within which the Build Alternatives have the potential to affect the

resources that are the subject of this report (water quality, threatened and endangered species, and land use). The expanded FLUSA is depicted in Map 1. The watersheds within the Study Area that are the subjects of this report are shown in Map 2 and area of each watershed within the study area is listed in Table 1; the Goose Creek watershed is the relatively large watershed along the northern border.

Table 1: Study Area Watersheds

Watershed Name	Area (Square Miles)
Sixmile Creek	2.6
Goose Creek	42.3

3.4 What Are the Land Use Conditions and Trends in the Study Area?

To understand existing land use conditions and estimate future land use conditions, a review and assessment of land use conditions, land use regulations, growth trends, growth factors and other factors was completed. Much of this analysis was already completed in the original Quantitative ICE analysis. Additional background research for this Quantitative ICE updated included:

- Updated interviews with local planners
- The 2010 Census and growth trends and conditions in the study area
- Additional development activity
- New planning documents (such as new land use plans and new capital improvement plans).

Interviews

In 2008, the study team interviewed planners with local jurisdictions within the FLUSA, such as the Council of Governments (COG) and city, county and town planning department representatives, as part of the Qualitative ICE Assessment. In August 2009, the study team interviewed with the same organizations as part of the FEIS Quantitative ICE, with follow-up questions as necessary. In September 2012, the study team interviewed representatives of the same organizations again to determine if any new information was available to inform the update of the ICE analysis. Table 2 lists the organization that was the focus of these recent interviews, the individual respondents, and the dates of contact. Those contacts whose jurisdictions include portions of Goose Creek or Sixmile Creek are italicized. The study team was unable to schedule an interview with the mayor of Hemby Bridge. Additionally, the project team was unable to meet with staff from Lake Park, but their most recent Unified Development Ordinance for the Village of Lake Park was obtained.

Each interview began with an introduction of the study and its purpose. A map of the study area was provided to facilitate communication, as were past interview summaries as applicable. The purpose of the interviews was to identify changes to future land use scenarios since the 2009 interviews for the Quantitative ICE and gather any new or updated databases or GIS data that would be useful to the analysis. The following data was requested:

- Approved developments
- Updated zoning
- Information on current stream buffer or other environmental protection areas
- Water and sewer utility information
- Water and sewer priority areas
- Future land use projections

- Existing land use
- Approved population and employment projections and anticipated variations from projections with each land use scenario.

Table 2: List of Interviews Completed in 2012[a]

Organization	Respondent	Date of Interview
Town of Wingate	Patrick Niland – Town Manager	September 6, 2012
Centralina COG	*Diane Dil – Centralina Planner I*	*September 12, 2012*
Town of Matthews	*Kathi Ingrish – Planning Director*	*September 10, 2012*
Town of Unionville	*Sonya Gaddy – Land Use Administrator*	*September 11, 2012*
Union County Planning	*Amy Helms – Water and Land Resources Division Manager* *Scott Huneycutt – Engineering Division Manager* *Richard "Dick" Black – Planning Director*	*September 12 & 19, 2012*
Town of Marshville	Amanda Reid – Town Manager	September 12, 2012
Town of Indian Trail	*Shelley DeHart – Director of Planning and Neighborhood Services* *Adam McLamb, Civil Engineer*	*September 14, 2012*
Town of Mint Hill	*John Hoard - Planner*	*September 14, 2012*
Town of Weddington	*Jordan Cook - Town Planner and Zoning Administrator*	*September 25, 2012*
Town of Wesley Chapel	Josh Langen – Planning and Zoning Administrator	September 12, 2012
Charlotte – Mecklenburg Planning	*Debra Campbell – Director, Charlotte-Mecklenburg Planning Department*	*September 14, 2012*
City of Monroe	Doug Britt – Senior Planner	September 11, 2012
Town of Fairview	*Ed Humphries – Land Use Administrator*	*September 11, 2012*
Town of Stallings	*Brian Matthews – Town Manager* *Lynne Hair – Town Planner*	*September 14, 2012*
Union County Partnership for Progress*	Gretchen Carson – Planner Melanie O'Connell Underwood – Interim Director	September 27, 2012
Union County Planning*	Richard "Dick" Black – Planning Director	January 21, 2013
CSX Corporation*	Vance E. Bennett Jim Van Derzee	November 29-30, 2012

[a] - Italics indicates contacts representing portions of the Goose Creek or Sixmile Creek watersheds

* Contacted after the initial round of interviews to obtain information on the Proposed Legacy Park Development

Prior to the discussion, staff provided a list of the questions to the respondents. Appendix A contains complete minutes from all of the interviews. The following 11 questions were asked during interviews with local planners:

1. *The August 2009 interview covered land use and economic development trends, growth management and natural resource protection – in general, have any of these dynamics affecting future land use changed since the previous interview?*

2. *Have any changes to future land use plans, transportation plans or other plans, policies or projections been made that incorporate information from the 2010 Census?*
3. *Have new or amended land use regulations been developed since August of 2009? Please see the list we have provided of documents we collected and reviewed during the previous environmental documentation effort. Are there any updates to those plans or regulations? If there have been any changes, please provide specific web link or a copy of the document.*
4. *Has the local regulation of natural resources (including stream buffers) changed since August 2009? If so, how?*
5. *What can you tell us about any proposed or approved developments that have come to light since the August 2009 interviews? What information is available about any of these planned or approved developments that are not built yet? Can you provide any details and locations for these projects?*
6. *Have long-term growth expectations changed since the previous interview and if so how?*
7. *Has the city/town/county updated its Comprehensive Plan or Land Use plan since August 2009?*
    - *If so, does this updated plan reflect conditions in the future with or without the Monroe Connector/Bypass?*
8. *We are reviewing and considering the predictions of future growth (2030 forecast year) included in the previous EIS. Are there any other factors that have changed since August 2009 that might affect the level of future growth and the location of that growth in your community?*
    - *Do these changes reflect the future with the Monroe Connector/Bypass, without the Monroe Connector/Bypass, or is there no difference on that basis?*
9. *Have there been any changes in capacity of utility infrastructure or expectations about the future capacity since the last round of interviews? Do any of those changes affect growth expectations?*
10. *Are you or other planners or development review staff familiar with the North Carolina Wildlife Resources Commission "Green Growth Toolbox"? (http://216.27.39.101/greengrowth/)*
    - *Have you attempted to implement any of the practices, ordinances or other policies recommended by the toolbox?*
    - *Have you attempted to incorporate any other low-impact design type policies into zoning, subdivision or other land development ordinances?*
    - *How would you rate the likelihood of incorporating any low-impact design principles in future regulations or plans?*

Supplemental questions were asked pertaining to the specific interviewee's location or expertise. Face-to-face interviews were conducted to the extent practical. The interviews generally took between 30 and 60 minutes to complete. Notable information included:

- Often, zoning maps provided the best representation of current land use, while land use plans provided the best representation of future land use. Much of this information was available as geographic information systems (GIS) data.
- Some land use plans were in the process of being updated and were not yet available for this study. For example, Indian Trail was in the process of updating their Comprehensive Land Use Plan. Marshville indicated that the next update of their land use plan would include the Monroe Bypass/Connector. The City of Monroe was developing the US 74 Corridor revitalization Plan, which included the Monroe Bypass/Connector in its assumptions. Older land use plans tended not to include the Monroe Connector/Bypass, while the updated plans usually included the project.

- Based on the 2010 Census, the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) Urbanized Area is expanding to include Marshville.
- Mecklenburg County now administers the Goose Creek Management Plan[4]
- Goose Creek Water Quality Recovery Program Plan for the Fecal Coliform Total Maximum Daily Load TMDL was revised in 2010. This is a plan to reduce fecal coliform impairments based on the TMDL report completed in 2005.
- Areas in the eastern portion of the study area were more likely to indicate that their future plans included the Monroe Connector/Bypass and that the implementation of certain aspects of their plans was contingent on the development of the facility.
- Water and Sewer moratoria were rescinded in Union County in 2012.[5]

Plans and Ordinances

Specific documents or information obtained during the interview process are summarized in Table 3.

In addition, Charlotte Department of Transportation (CDOT) staff were interviewed on June 19, 2012 to discuss the Traffic Analysis Zone (TAZ) projections and any updates to their data since they were developed in 2008. Further communications were conducted with CDOT staff as this report was prepared. Summaries of that interview and follow up communications are provided in Appendix A along with the interviews listed in Table 3.

Table 3: Zoning or Other Local Data Collected During Interviews*

Jurisdiction/Area	Document	Year
Goose Creek Watershed	*Goose Creek Water Quality Recovery Program Plan for the Fecal Coliform TMDL*	*2010*
City of Monroe	Zoning Ordinance	Modified 2010
	List of Current Developments	Modified 2009
Village of Lake Park	Unified Development Ordinance	Draft 2012
Town of Unionville	*Zoning Map*	*Updated 2011*
	Future Land Use Map	*2005*
	Zoning Amendments	*Modified 2012*
Town of Fairview	*Future Land Use Map*	*Modified 2010*
	Land Use Ordinance	*Updated 2009*
Town of Stallings	***Unified Development Ordinance***	*Adopted 2012*
	Post Construction Ordinance	*Adopted 2010*

[4] This is a plan to guide restoration, retrofit and preservation efforts aimed at achieving specific goals for improving water quality conditions in the Goose Creek Watershed in Mecklenburg County such that these waters meet or exceed their State designated uses and are no longer rated as impaired on 303(d) lists. *Goose Creek Watershed Management Plan*. Charlotte-Mecklenburg Storm Water Services. October 31, 2009. http://charmeck.org/stormwater/Projects/Documents/GooseCreekWatershedManagementPlan.pdf

[5] Rescinding the moratorium may increase the short-term development activity within the study area, however, long-term growth is more dependent on long planned capital facilities expansions for water and sewer capacity, which have already been analyzed and considered in the Indirect and Cumulative Effects Analysis. Therefore, this change in policy does not affect long-term growth trends in the study area.

Jurisdiction/Area	Document	Year
Town of Mint Hill	*Unified Development Ordinance*	*Adopted 2011*
	Lawyers Road & I-485 Small Area Plan	*Adopted 2011*
	Pedestrian Master Plan	*Adopted 2011*
Town of Marshville	Urbanized Area Expansion	Updated 2010
	Comprehensive Pedestrian Plan	Adopted 2010
	Comprehensive Transportation Plan	Updated 2010
Town of Wingate	Land Use Ordinance	Updated 2010
	Wingate 2020 Plan (Comprehensive Plan and Concept Plan)	Adopted 2010
	Wingate Mixed Use Center Plan	Draft 2012
Town of Weddington	*Local Area Regional Transportation Plan*	*Updated 2009*
	Land Use Map	*Modified 2012*
	Zoning Map	*Modified 2011*
	Land Use Plan	*Modified 2011*
Village of Wesley Chapel	Flood Damage Prevention Ordinance	Updated 2009
	Subdivision Ordinance	Updated 2011
	Western Union County Local Area Regional Transportation Plan	Prepared 2009
	Zoning Ordinance	Updated 2012
Town of Matthews	*Zoning Code*	*Modified 2010*
	Unified Development Ordinance	*Draft 2012*
	Downtown Master Plan	*Draft 2012*
	Town of Matthews Land Use Plan	*Draft 2012*
	Demographic/Economic Update	*Prepared 2012*
Charlotte-Mecklenburg	*Growth Framework*	*Adopted 2010*
	FY 2013-2017 Capital Improvements, including 10-Year Needs for Water and Sewer Projects	*Updated 2012*
	Water Quality Buffer Implementation Guidelines	*Updated October 2011*
	Floodplain Ordinance	*Adopted 2012*
Union County	*Water Allocation Policy*	*Updated 2012*
	Sewer Policy	*Updated 2012*
	Union County Water and Sewer Extension Ordinance	*Updated 2012*
	Carolina Thread Trail Master Plan	*Adopted 2011*
	Union County Land Use Ordinance	*Adopted 2008*
	Union County Thoroughfare Plan	*Updated 2008*

Jurisdiction/Area	Document	Year
	Union County 2025 Comprehensive Plan	*Adopted October 2010*
	Comprehensive Water and Wastewater Master Plan	*December 2011*
	US 74 Corridor Revitalization Study	*Underway*

*Bolded documents include the Monroe Connector/Bypass

Growth Trends and Factors

A review of critical growth factors and trends indicates that Union County maintains a number of advantages relative to other suburban jurisdictions in the region. These growth trends and factors are discussed in detail in Appendix B. First, Union County has more land available for development than Mecklenburg, Gaston or Cabarrus counties. Union County has the highest median income of all surrounding counties, it has affordable housing relative to its median income level, and it has one of the best school districts in the region based on SAT scores and graduation rates. In terms of commute times, the interesting trend is that despite having one of the highest average commute times over the last decade, Union County has grown faster than any other county in the region. This finding suggests that factors other than accessibility to jobs are encouraging households to choose to locate in Union County. For the past decade, Union County has exhibited strong growth, and the factors driving those trends are poised to continue attracting growth to Union County regardless of whether the Monroe Connector/Bypass is constructed.

These findings are further supported by the analysis of the Operations Research and Education Laboratory of the Institute for Transportation Research and Education at North Carolina State University's February 28, 2007 *Land Use Study Final Report 2006-2007*. In its research on behalf of the Union County Public Schools, it described the leading factor of growth in Union County as its location within the Charlotte-Mecklenburg region. The Operations Research and Education Laboratory of the Institute for Transportation Research and Education determined the western area of Union County continues to experience a substantial population increase as a result of its desirable location. Marvin, Waxhaw, Weddington, Wesley Chapel and other western Union County suburbs continue to experience high demand for single-family homes. The report also listed the following other factors contributing to growth in Union County:

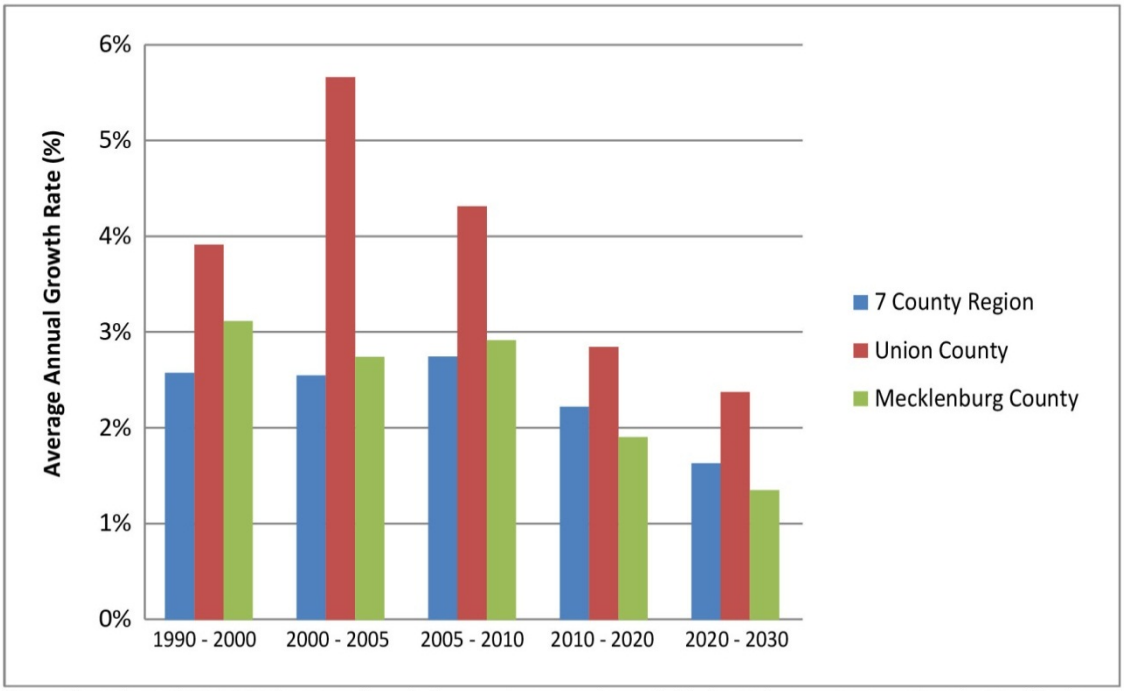
- Low taxes
- Good quality schools
- Comparatively reasonable land prices.

The report described the availability and cost of undeveloped land as a factor of future growth in the western part of the county. It concluded that a reduction in raw land would lead development in the eastern part of the county. The report described the eastern expansion of growth towards Monroe as constrained by a lack of easy access to Charlotte and Mecklenburg County.

Lastly, a review of current growth trends and projected growth trends suggests that while growth has slowed in Union County since 2005, it has still grown at a pace above the regional average. While the MPO projections still foresees a growth rate above the regional average into the future, the projected

growth rate is expected to decline dramatically. To reach the projected 337,317 estimate of population by 2030, growth in Union County would have to slow to an average annualized growth rate of 2.6 percent, based on the 2010 Census count. Figure 1[6] shows the differences in average annual growth rates across the five different periods (1990 to 2000, 2000 to 2005, 2005 to 2010, 2010 to projected 2020 and projected 2020 to projected 2030). The difference between 2000-2005, 2005-2010, 2010-2020 and 2020-2030 average annual growth rates reflects a typical "s-curve" of decreasing growth rates over time as a population base expands.

Figure 1: Average Annualized Growth Rates Comparison



Note: The adopted MUMPO forecasts for whole counties are only available for Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union and York Counties.
Sources: US Census 2000 and 2010, MUMPO 2009 Socioeconomic Forecasts

Specific Updates from Prior Quantitative ICE Analysis

Jurisdictions within Portions of Goose and Sixmile Creek Watersheds

Based on the interviews and review of documents provided by local jurisdictions, this section outlines the new information that prompted modifications to the future land use scenarios compared to the prior Quantitative ICE analysis.

Charlotte/Mecklenburg County: There were no major changes to growth expectations or land use plans. Local planners did note one subdivision and zoning update of a 24-acre parcel on land that previously was identified as Industrial or Undeveloped in the future scenarios of the last Quantitative ICE analysis. The area is now expected to develop as High Density Residential in the future under any scenario.

[6] Figure 1 compares growth rates to a 7 county region as the TAZ level forecasts for whole counties are only available for Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union and York Counties.

Matthews: There were no major changes in growth expectations or land use plans. Local planners did note one zoning change and one planned land use change affecting about 275 acres of land. These changes affected land that was previously identified as Low Density Residential Development or Undeveloped in the future scenarios of the last Quantitative ICE analysis. These areas were now expected to develop as Commercial, High Density Residential or Low Density Residential Development in the future under any scenario.

Mint Hill: There were no major changes in growth expectations but some changes to land use plans as a small area plan has been developed for the area around Lawyers Road and I-485 (see Figure 2).[7] The entire small area plan covers over 1,200 acres of land. In the prior Quantitative ICE analysis, most of this area was already designated as developed, as either Commercial or Low Density Residential. With the new information, some of the land previously identified as Low Density Residential is now identified as Medium Density Residential, Commercial, Institutional or Undeveloped (in the case of those areas identified as Open Space in the Small Area Plan). Mint Hill staff indicated in their interview that the developer will use best management practices to minimize stormwater impacts to Goose Creek.

Stallings: There were no major changes in growth expectations, land use plans or zoning that would necessitate adjustments to the ICE land use scenarios.

Indian Trail: There were no major changes in growth expectations or land use plans. One zoning change involves a 28-acre development. In the prior Quantitative ICE analysis, this area had been identified as a Low Density Residential Area. This area is now being zoned as Commercial and is expected to develop as Commercial under any scenario.

Fairview: The town has adopted a new land use plan with some important changes. Specifically the town has added some commercial nodes at major intersections and is working with the County on expanding water and sewer availability at the US 601 and NC 218 intersection. The new land use plan calls for a commercial district at this intersection as well as at NC 218 and Mill Grove Road (SR-1525) and at US 601 and Lawyers Road (SR-1612). The new land use plan also calls for a new Industrial node along Price Tucker Road (SR-1603) and at NC 218 and Old Dutch Road (SR-1542). All of these new nodes are expected to develop with or without the Monroe Connector/Bypass. In the prior Quantitative ICE analysis, these areas were expected to be Low Density Residential and Undeveloped areas. These areas are now expected to develop as Commercial and Industrial areas under any scenario.

Union County: The County has adopted a new land use plan that provides more detailed information on growth expectations in the eastern end of the county if the proposed project is built (see Figure 3)[8]. Growth expectations are not changing in the Goose and Sixmile Creek watersheds, thus there were no changes to the land use conditions in the watersheds due to this new information.

Jurisdictions outside of Goose Creek and Sixmile Creek Watersheds

Wesley Chapel: There were no major changes in growth expectations, land use plans or zoning that would necessitate adjustments to the ICE land use scenarios.

Stallings: There were no major changes in growth expectations, land use plans or zoning that would necessitate adjustments to the ICE land use scenarios.

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[7] *Lawyers Road & I-485 Small Area Plan*, Future Land Use Map
[8] *Union County 2025 Comprehensive Plan*, p 33

Monroe: There were no major changes in growth expectations or land use plans that would necessitate adjustments to the ICE. Local planners noted that there were zoning changes affecting parcels totaling about 80 acres that were previously identified as Low Density Residential in the previous Quantitative ICE analysis but that would now be expected to develop as Institutional and Commercial under any scenario.

Wingate: There were no major changes in expectations, land use or zoning requiring adjustments to the ICE. The previously Quantitative ICE analysis used the town zoning to determine the most appropriate allocation and density of development under a No-Build Scenario. For the Build Scenario in the prior Quantitative ICE analysis, the study team incorporated many of the proposed zoning changes noted in the Strategic Plan for Economic Development, Town of Marshville, Town of Wingate (2008) as this plan assumes construction of the Monroe Connector/Bypass. These assumptions appear to remain reasonable and valid based on discussions with local planners.

Marshville: There were no major changes in growth expectations, land use plans or zoning that would necessitate adjustments to the ICE land use scenarios (see Wingate discussion above).

Figure 2: Lawyers Road and I-485 Small Area Plan, Land Use

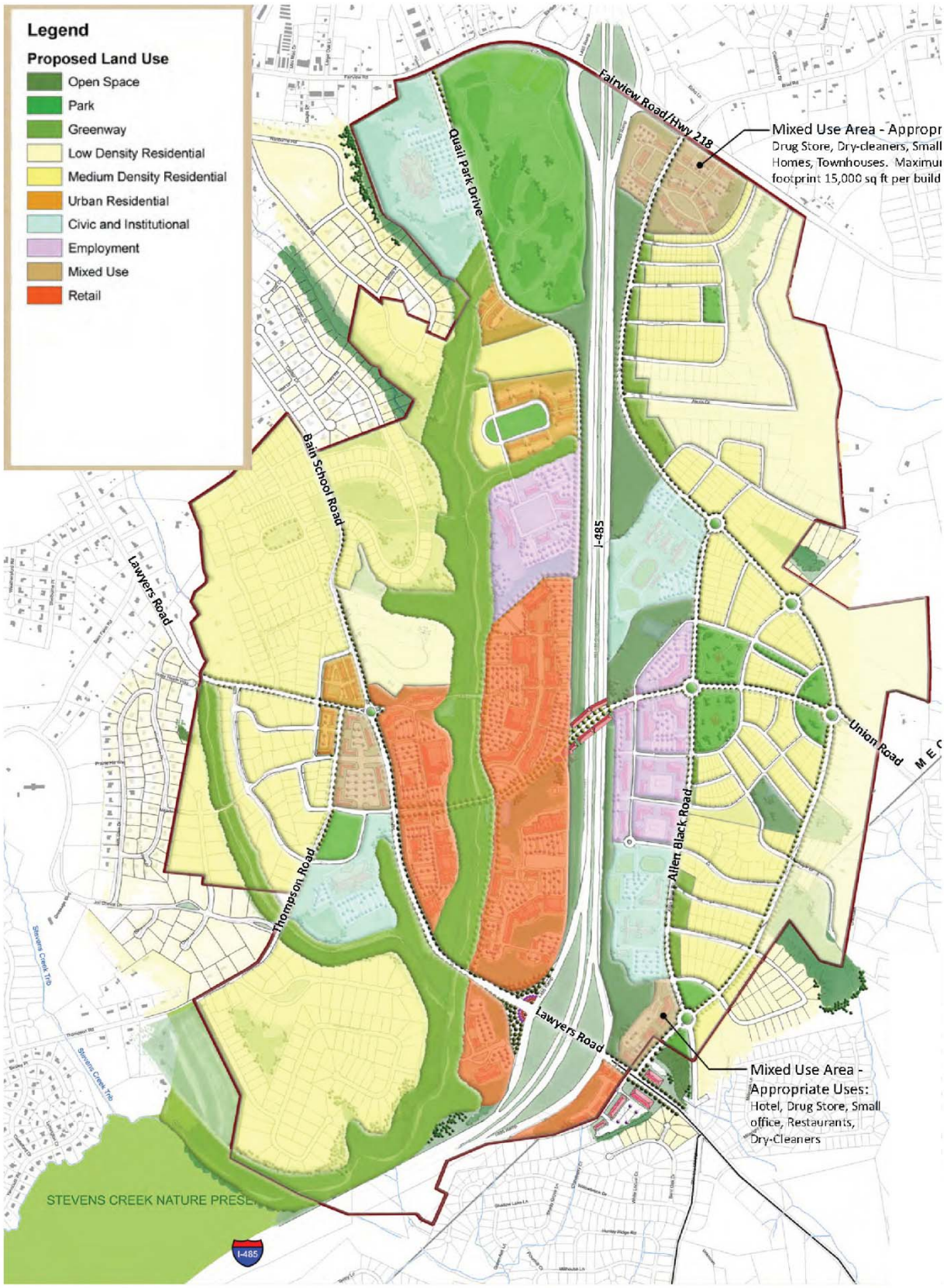
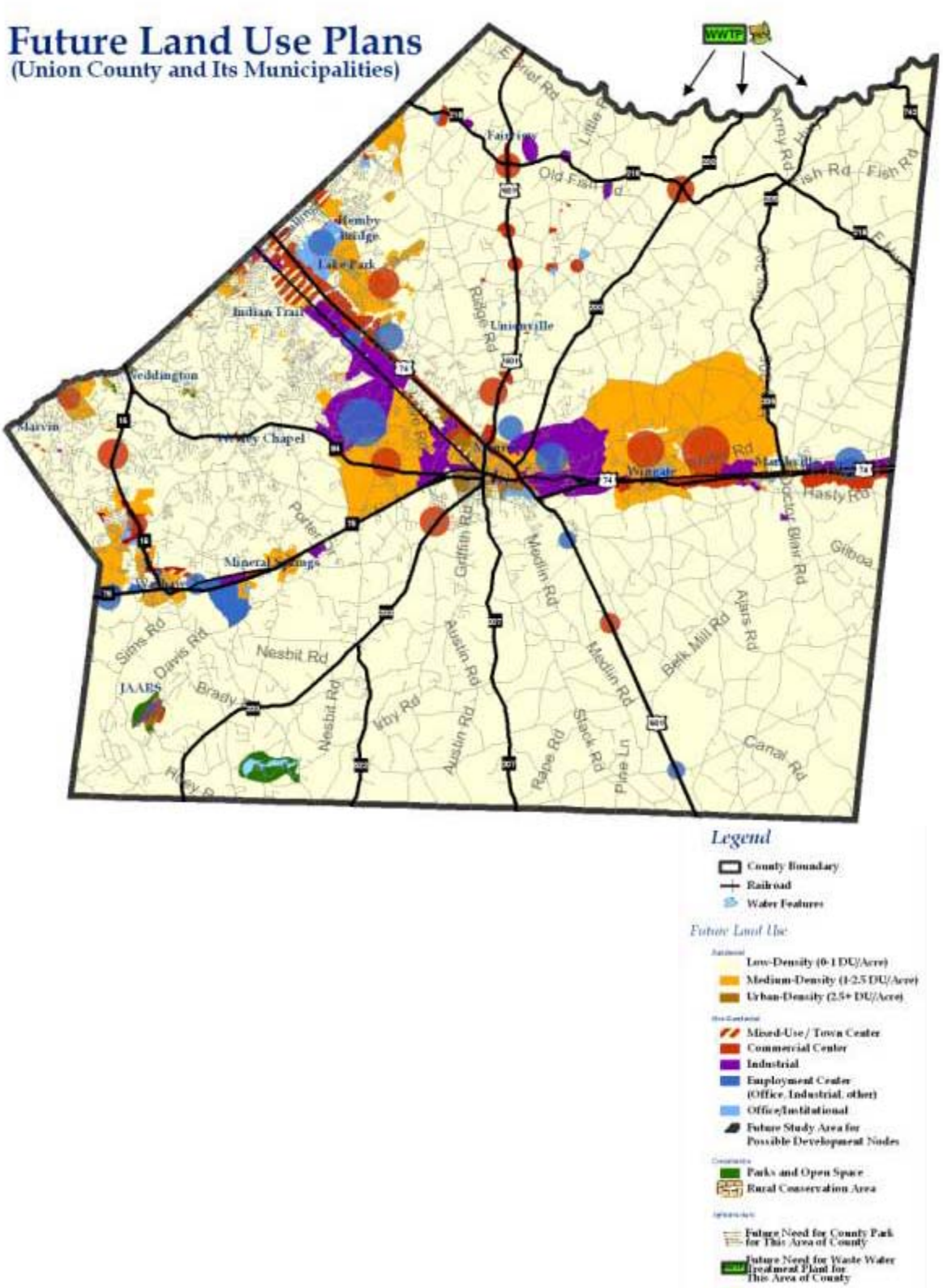


Figure 3: Union County Future Land Use Plan



3.5 Existing Land Use

How Was Existing Land Use Modeled?

Existing land use was developed using parcel-based data from both Mecklenburg and Union counties combined with zoning layers from all the local jurisdictions and the NCGAP[9] land cover dataset, which is based on 1992 aerial photography. The existing land cover is largely a combination of these three data sets, with developed land based on current parcel data and the North Carolina Gap Analysis Project (NC-GAP) data filling in the land cover types where parcels are undeveloped. Each parcel was classified as developed or undeveloped. Undeveloped properties included vacant land and farms. For parcels in the developed category, each was assigned one of five land use categories based on its zoning category and land use attributes from the parcel assessment records. The five categories were:

1. Low Density Residential
2. Medium Density Residential
3. High Density Residential
4. Commercial
5. Industrial/Office/Institutional.

Spot checks for the assessment were conducted by comparing recent aerial photography (2010) of the Study Area with the assessed land use. In addition to the zoning and parcel land use attributes, Union County provided a list of parcels that had applied for tax deferral based on agricultural use. This list was used to categorize farm properties as undeveloped. Aerial photography was used to identify farm properties in Mecklenburg County and also to check for other farms in Union County that were not included in the farm deferral list provided by the County.

Once each parcel was assigned to one of these five development categories or the undeveloped category, the parcel polygon feature class was converted to a raster image. A raster is a rectangular grid where each cell or pixel within the grid represents one unit of area and contains a value (which in this analysis represents land use). For this analysis, all rasters were formatted with a 30x30 meter cell size to match the NCGAP land cover dataset. Each raster cell is a 30x30 meter square, or about one quarter of an acre. For undeveloped properties, the NCGAP raster dataset was used to fill in the natural and farm land covers within those areas. Since parcels do not cover all land in the Study Area, a provision had to be made to account for areas outside parcel boundaries. Since nearly all land not included within a parcel boundary is a road right-of-way, these areas were categorized as transportation uses. Figure 4 illustrates how the existing land use raster was developed. It shows for an example area how the parcels were categorized and converted to a raster and then the undeveloped areas were filled in with the NC-GAP land cover.

The resulting land cover is a raster image consisting of over 900,000 individual cells, each cell categorized into one of 26 land use categories. The 26 land cover categories consist of: 5 developed

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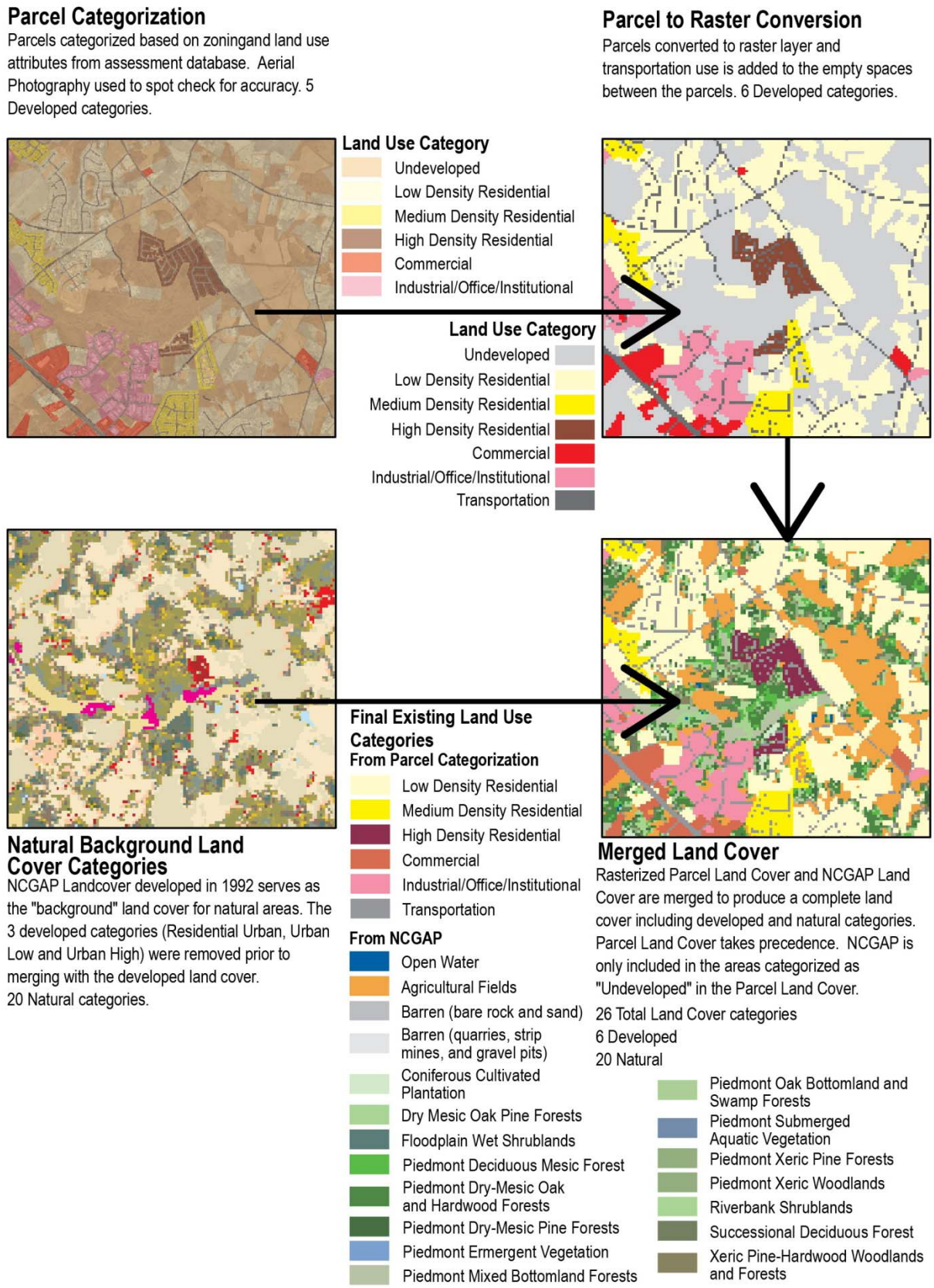
[9] The Gap Analysis Program is a national program with the mission of developing key datasets needed to assess biological diversity across the nation. The North Carolina Gap Analysis Project (NCGAP) was a state affiliate based at the North Carolina Cooperative Fish and Wildlife Research Unit and charged with developing those data for the state. A map of North Carolina's land cover was developed using Landsat TM satellite imagery acquired in 1991 and 1992.

categories, 1 transportation category, 2 farm categories, 16 vegetation categories from the NCGAP land cover, and 2 barren categories from the NC-GAP land cover. Existing land use, or Baseline condition, is presented in Map 3. To simplify the display of the land cover, many categories have been aggregated into larger categories in Maps 3, 17 and 19. These aggregated categories are:

- Agricultural Fields: includes both the Agricultural Fields and the Agricultural Pasture/Hay and Natural Herbaceous.
- Barren: includes both Barren (bare rock and sand) and Barren (quarries, strip mines, and gravel pits).
- Forested: includes Coniferous Cultivated Plantation (natural / planted), Successional Deciduous Forests, Piedmont Xeric Pine Forests, Piedmont Dry-Mesic Pine Forests, Piedmont Xeric Woodlands, Piedmont/ Mountains Dry-Mesic Oak and Hardwood Forests, Piedmont Mesic Forest, Xeric Pine-Hardwood Woodlands and Forests.
- Other Natural: includes Piedmont/Mountain Submerged Aquatic Vegetation, Piedmont/Mountain Emergent Vegetation, Riverbank Shrublands, Floodplain Wet Shrublands.

Figure 4: Land Use Categorization Process



4.0 REVIEW OF SOCIOECONOMIC PROJECTIONS

To assess potential impacts from induced development, two future land use scenarios are needed: a No-Build that reflects the future without the proposed project and a Build that reflects the future with the proposed project. Research on induced growth impacts of transportation investments indicates that typically induced development impacts fully arise within eight years of the opening of new roads or new capacity.[10] Therefore, if the proposed project is expected to be open to traffic before 2020, a 2030 horizon year would be an appropriate and reasonable analysis year. Since the prior Quantitative ICE analyzed 2030 conditions, it would also be appropriate to maintain that analysis year to make comparisons easier.

Since the Quantitative ICE analysis is looking at land use changes at the watershed level, the next question is how to estimate future growth under either scenario at that level of detail. Many entities, such as state level demographic agencies, private forecasters such as Woods and Poole, and even universities, produce projections of population and employment at the county, regional or state level, and these projections could be used to estimate growth in the study area. However, none of these sources provide detail on where that growth may occur below the level of individual counties. Metropolitan Planning Organizations (MPOs) develop similar projections of population and employment and, due to their federally mandated planning efforts, their projections typically include much smaller geographic divisions. MPO projections, therefore, represent the only best available resource for population and employment projections at the necessary geographic and temporal scales to reasonably estimate quantitative land use impacts of transportation projects.

4.1 What Is an MPO?

MPOs have been required under federal law since the early 1970s. Federal regulations requires any Census Bureau defined urbanized area (UZA) of at least 50,000 people to have an MPO to develop regional transportation plans and programs through a continuing, cooperative and comprehensive (3-C) transportation planning process. An MPO is required to develop a number of planning documents to guide the planning and funding of transportation improvements across the metropolitan region. To address the long-range transportation needs of a region, MPOs are required under federal regulations to estimate and accommodate the mobility needs for persons and goods in their Metropolitan Transportation Plans (MTP). This requirement, therefore, necessitates estimating the long-range travel needs of their respective regions. As such, most MPOs use some form of travel demand modeling to estimate the long-range travel needs for their regions and help in addressing other policy concerns such as transportation conformity (through emissions estimates), estimation of freight movement and of non-motorized trips. Most MPOs, including those in the Charlotte region, use a standard four-step travel demand model while a few MPOs have begun using more advanced modeling techniques such as activity-based models.

What Is the Metrolina Regional Travel Demand Model and How Does It Relate to the MPO Projections?

The main reason that MPOs prepare regional socioeconomic projections is to operate a regional travel demand model (TDM). The TDM is used to project future travel demand for use in transportation planning activities. In the Metrolina region, the TDM is called the Metrolina Regional Model (MRM).

[10] Cervero, Robert. "Road Expansion, Urban Growth and Induced Travel: A Path Analysis." *Journal of the American Planning Association*. Vol. 69, No. 2. Spring 2003, p 158.

This model is used for the four major tasks that MPOs must complete as part of their federally mandated planning responsibilities:

1. Identifying existing transportation conditions and deficiencies on the major segments of the transportation network within the region
2. Identifying future transportation conditions and deficiencies on the major segments of the transportation network within the region
3. Prioritizing projects for inclusion in LRTPs and a plan of implementation for inclusion in the Transportation Improvement Plan
4. Demonstrating conformity to the National Ambient Air Quality Standards established by the U.S. Environmental Protection Agency (EPA), under the Clean Air Act, for the EPA designated non-attainment area(s) within the region (also known as the air conformity process).

Based on the *Metrolina Regional Travel Demand Model Memorandum of Agreement*, CDOT is the custodian for the MRM and all its constituent parts (network files, socioeconomic data and projections, programming scripts, trip tables and any other files necessary to run the model). The MRM is the main tool used by state, regional and local planning agencies to assess regional travel patterns. The MRM covers the following areas, also shown in Map 4:

- Cabarrus-Rowan Metropolitan Planning Organization (CRMPO): Cabarrus and Rowan Counties
- Gaston Urban Area Metropolitan Planning Organization (GUAMPO): Most of Gaston County
- Mecklenburg-Union Metropolitan Planning Organization (MUMPO): All of Mecklenburg and most of Union County
- Part of the Lake Norman Rural Planning Organization (LNRPO): Iredell, Lincoln and Cleveland Counties and the remainder of Gaston County
- Part of the Rocky River Rural Planning Organization (RRRPO): Stanly and Anson Counties and the remainder of Union County
- All of York County and part of Lancaster County, South Carolina, including all areas within the Rock Hill-Fort Mill Area Transportation Study (RFATS, the MPO for eastern York County).

As custodian of the model, CDOT leads the model team and leads the model development and maintenance process, including all its constituent parts such as socioeconomic projections. Most CDOT staff members who oversee the model are also staff to MUMPO.

In addition to the above tasks, the MPO and others may use the travel demand model or its component parts to complete other planning or analytical tasks related to land use, transportation or environmental planning within the region. Often, in completing the necessary environmental studies, DOTs or others will use MPO socioeconomic projections and travel demand models for traffic forecasting or land use analysis as the MPO projections and travel demand models are often the only readily available source or tools available to complete the necessary analyses. As shown in Figure 5, the regional travel demand model is a "Four-Step Model" that uses the projections of population, households and employment as one key input file.

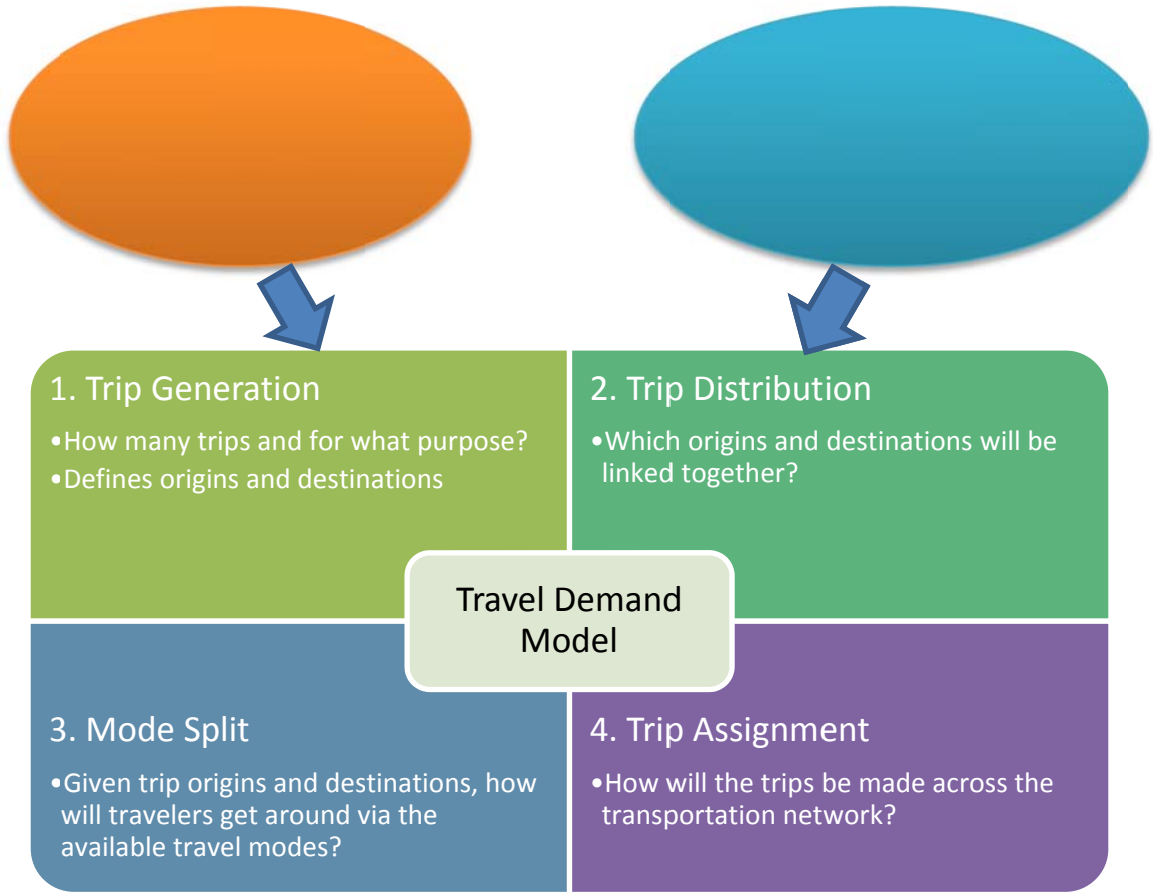
In most MPOs that use a Four-Step Model, the MPO develops the socioeconomic projections through some combination of projecting of historical trends, build-out capacity and other methods as appropriate for the specific region. To properly develop traffic forecasts, these socioeconomic projections must be provided at small geographic scales, thus the projections are allocated from a regional level, to a county

level and finally to smaller geographic areas called Traffic Analysis Zones (TAZs). The TAZ projections typically include data for a base year (with data based on Census counts and other survey resources) and future horizon years based on the MPO forecasting process. The data for each year typically includes, for each TAZ,

- the number of households
- number of persons within households
- number of persons within group quarters (i.e. dorms, prisons or other non-household living arrangements)
- median income for households
- the number of students (sometime divided into sub-categories by age group)
- number of employees (typically divided into multiple sub-categories by type of employment).

The regional travel model uses this data in Step 1 of 4 to predict how many trips and what type of trips are generated in each TAZ. The MRM TAZs for the Future Land Use Study Area (or FLUSA, the study area defined for the purposes of the ICE report) are shown in Map 5 to provide a sense of scale for these important geographic subdivisions. Also shown in Map 5 is the distinction between TAZs within the jurisdiction of MUMPO and those TAZs under the jurisdiction of another MPO or RPO. Of the 383 TAZs partially or fully within the FLUSA, 349 are within the jurisdiction of MUMPO, while the remaining 34 are under the jurisdiction of the RRRPO. Each planning organization is the final authority of the socioeconomic projections at the TAZ level for the TAZs under its jurisdictions. As discussed in Section 3.2, the socioeconomic projections developed for the Metrolina region have been developed through an extensive and highly cooperative regional projection process.

Figure 5: Four-Step Travel Demand Model and Inputs



TAZs are delineated by the MPO working from Census data on population and employment and criteria set by the FHWA. These criteria recommend minimum populations of 600 persons or workers but they generally recommend approximately 1,200 persons or workers per TAZ. Additionally, FHWA recommends or requires that TAZs meet the following criteria[11]:

- Compactness: TAZs should be compact in nature.
- Nesting and boundaries: TAZs must nest within a county and must not cross county or state boundaries. Where possible, TAZs should follow city or town boundaries.
- Maximize contiguity: TAZs should be contiguous across each county without any missing slivers.
- Include all water and land: TAZs must include all area within the territory of a county; water bodies must be part of a TAZ.
- Unique and identifiable: TAZs must have unique identifiers and each MPO must have a unique identifier.

A TDM generates trip "productions" based on household location and characteristics, and trip "attractions" based on the employment data, which represent not only job destinations but also shopping

[11] FHWA CTPP Data Products. March 2010. "TAZ Delineation Business Rules." http://www.fhwa.dot.gov/planning/census_issues/ctpp/data_products/tazddbrules.cfm

and other activities that attract household trips. The overall number of productions and attractions are balanced, providing a set of trip origins and destinations, which is then taken into Step 2 of the Travel Demand Model for Trip Distribution – the linking of the origins and destinations into trips. At this point, the model begins to use a separate input file that represents the network of available roadways in the region, including data about the capacity, speeds, and other characteristics of each road or highway.

Other modes of transportation such as public transit are also taken into account in Step 3 of the model, which estimates the division of all trips across the available travel modes. The final "loading" of trips onto the network happens in an iterative process in Step 4 of the model, in which trips are distributed across all of the roads in the network and the impacts of congestion on travel patterns are incorporated.

What is both important and relevant to the ICE analysis process is the fact that the socioeconomic projections (the projection of where population and employment will be in the future) are a distinct input to the travel demand model from the transportation network. Consequently, the extent to which the socioeconomic projections represent the land use impacts of any given project cannot be answered by solely looking at the transportation network used in the travel demand model or its outputs. Instead, it requires examining the process and data used by the MPO in developing the population and employment projections. The assumptions behind the MRM socioeconomic projections are discussed below.

4.2 How Did the MPO and CDOT Develop the Projections?

It is important to note that regional socioeconomic models and projections are somewhat fluid in their development. Factors and variables may be created in the development stage that are either applied narrowly or omitted due to data limitations or other aspects of the extremely complex process of creating future land use projections at regional, county, and TAZ levels. This is one factor that caused confusion in the past quantitative ICE analysis and which could persist in spite of the additional information provided here. As such, it is necessary not only to conduct a very careful review of how the models were designed, but more importantly, how they were ultimately used in developing socioeconomic projections. This is necessary in order to understand fundamental questions regarding the role of the Monroe Connector/Bypass in the ultimate socioeconomic projections. For this reason, the following discussion reviews not just the model processes, but also reviews the model results and includes information from CDOT, who created and applied the many of these models. These reviews are needed to understand the true meaning and bases of the regional projections and to develop a full understanding of the projections and their appropriate use in other analyses.

Review of Projection Versions

As custodian of the MRM, CDOT and MUMPO staff oversaw the various regional socioeconomic projection processes and updates that have occurred over the last decade. As the discussions below shows, the projection process is a continuous and evolving process, so it is important to document exactly which datasets are used for any different purposes and different planning efforts.

The current MRM 2011 v 1.1 uses projections finalized in 2009 and is used as the basis for air conformity approvals for the 2035 Long-Range Transportation Plan (LRTP) adopted May 3, 2010. These current projections (hereafter called the 2009 Projections) were the latest update to projections that were first developed beginning in 2003. Table 4 summarizes the various socioeconomic projections, the associated file naming conventions, the month and year the projections were completed, associated MRM versions and the base and horizon years for each socioeconomic projection dataset. Figure 6 shows the timeline of

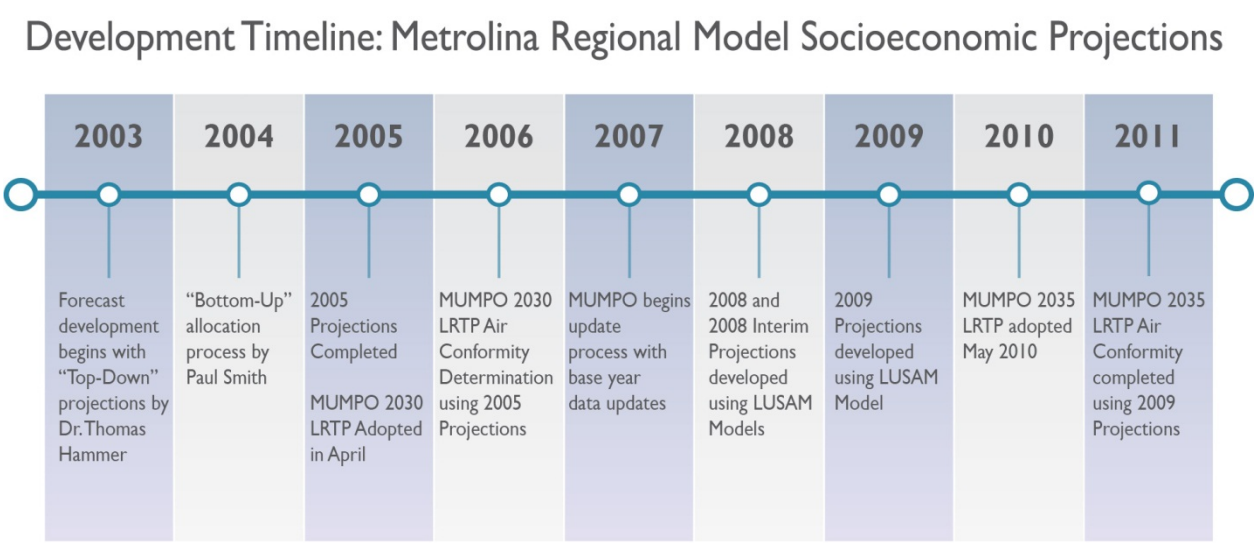
when the projections were developed relative to the adoption of each MUMPO LRTP. The Projection Names shown in the table and figure are not an official name but are used in this document for ease of reference. Each socioeconomic projection dataset includes projections for ten-year increments, with five-year increments interpolated between horizon years. Thus for the 2009 Projections (which were used in the 2035 LRTP), the horizon years were 2015, 2025 and 2035, but interpolated projections were also available for 2020 and 2030. Similarly, for the 2005 Projections (which were used in the 2030 LRTP), the horizon years were 2010, 2020 and 2030, but interpolated projections were also available for 2015 and 2025.

In the 2003-2004 timeframe, MUMPO and its regional partners at other MPOs and Rural Planning Organizations (RPOs) prepared the TAZ-level 2030 projections of population, households and employment in support of the development of the 2030 LRTP. The projections originally developed for this purpose were completed in 2005 and became the projections used in the official Metrolina Travel Demand Model 2005 version 1 (MRM05v1) and all versions of the model through MRM06v1.1.

Table 4: MRM Socioeconomic Projection Versions

Projection Name	TAZ File Name	Projections Completed	Use for LRTP Conformity Determination	Associated Model Version	Base and Horizon Years
2009 Projections	SE_*Year*_091028	October 2009	MUMPO 2035 LRTP	MRM 09 v1.0 MRM 11 v1.0 MRM 11 v1.1	Base: 2005 Horizon: 2015, 2025, 2035
2008 Interim Projections	SE_*Year*_081119_MUMPO_interim	November 2008	None	None	Base: 2005 Horizon: 2015, 2025, 2035
2008 Projections	SE_*Year*_081024	October 2008	RFATS 2035 LRTP	MRM 08 v1.0	Base: 2005 Horizon: 2015, 2025, 2035
2005 Projections	SE_*Year*_taz2934	May 2005	MUMPO 2030 LRTP	MRM 05 v1.0 MRM 06 v1.0 MRM 06 v1.1	Base: 2000 Horizon:2010, 2020, 2030

Figure 6: Timeline of MRM Projection Development



Subsequent to the adoption of the 2030 LRTP, MUMPO conducted an update process for their projections in 2008-2009 and extended their projections to 2035. These updates used the 2005 Projections as a critical input as described below. All of these updates used a spreadsheet model system called a Land Use Allocation Model (LUSAM) to develop the 2008 and 2009 Projections. The details of this process are described in later sections.

The first of these updates was completed and incorporated into MRM 08 v1.0, which was the official model used to support the 2035 LRTP for the Rock Hill-Fort Mill Transportation Study Area. CDOT continued to update the regional projections based on new information and developed interim projections in 2008 for use in the Northeast Transit Corridor planning process. These projections are known as the 2008 Interim Projections. These projections were further updated and finalized in 2009 and eventually incorporated into the 2035 LRTP adopted May 3, 2010 and modeled using Metrolina Travel Demand Model 2009 version 1 (MRM09v1). Subsequent Metrolina Travel Demand Model versions (MRM11v1, MRM11v1.1) also use these same projections.

The FEIS Quantitative ICE (developed in 2009 and completed in 2010) used the 2008 Interim Projections, as they were the most up-to-date projections available at the time of that analysis. Given that CDOT has updated its projections since that report, it would be most appropriate to use the 2009 Projections. The following sections describe the 2009 Projections and the various inputs and processes used to develop those projections, as well as describing the prior process for developing projections. The purpose of this review is to fully disclose and explain what, if any, impact the Monroe Connector/Bypass had on the 2009 Projections to determine the most appropriate way to use those projections in the update of the ICE analysis.

2008 and 2009 Projections (LUSAM Process)

In 2008, CDOT, MUMPO and other regional MPOs began development of their 2035 LRTPs and in doing so, needed to update population and employment projections for 2015 and 2025 and develop a TAZ level projection for 2035. The initial step was to develop the socioeconomic base year of 2005 by reviewing recent development activity and updating TAZ level data on households, population and employment estimates as of 2005. Next, CDOT staff developed a spreadsheet model system called a Land Use Allocation Model (LUSAM) to consider multiple factors as part of the projection process. CDOT documented how the model worked in an internal draft document titled *Metrolina Regional Travel Demand Model LUSAM: Land Use Allocation Model Technical Documentation* dated December 4, 2007.

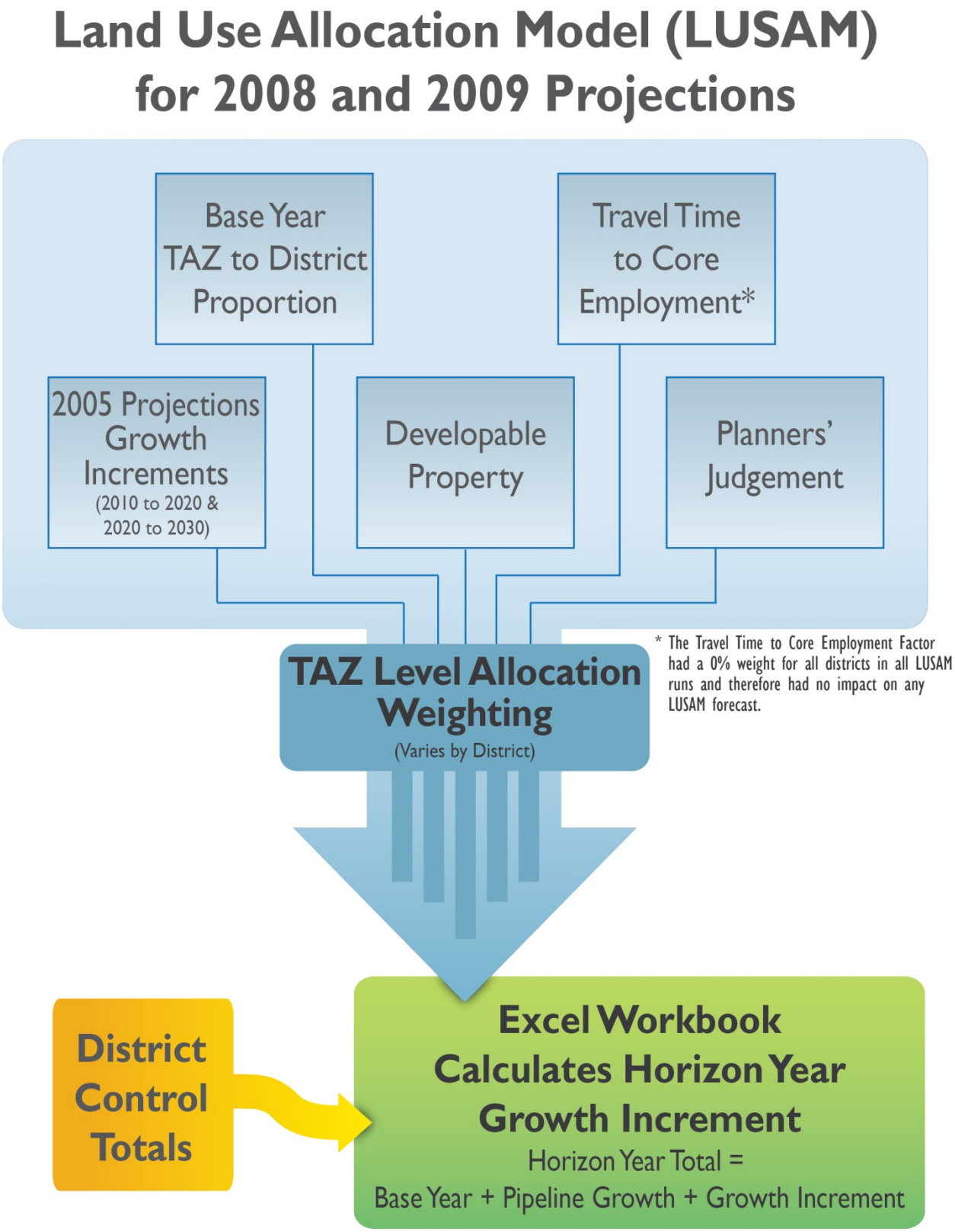
The LUSAM model uses a number of inputs to generate the future projections of households and employment for each TAZ and uses a district level approach to determining the factors considered in the distribution of the households and employment to each TAZ. The LUSAM model requires TAZs to be grouped into districts with up to 32 districts defined in the model. This simplifies the process of entering model weights, targets and factors. The model outputs its horizon year projections in an iterative process, such that each horizon year projection builds upon the next. Each iteration requires the input of base year values. For the first iteration, which produced the 2015 projections, the 2005 base year was used as the base year in all LUSAM model runs. For later LUSAM model iterations, the prior model output was used. Thus, for the 2025 horizon year, the 2015 output would be input as the base year and for the 2035 horizon year, the 2025 output would be input as the base year. The LUSAM model uses a district level targeting approach, where target household, population and employment values are set for each horizon year and the model attempts to adjust the projections such that the totals for the TAZs within each district would

equal the district target. LUSAM aggregates the base TAZ data into the same districts as the targets. The difference between the target and base is allocated by percentages to the TAZs within the district and a new TAZ land use dataset is created. These targets were developed independent of the LUSAM model and the inputs to those are discussed later.

Figure 7 provides a visual representation of the LUSAM model process. The model would use up to five weighted factors to determine how to allocate the district level target of growth to each TAZ within the district. The growth increment would then be added to the base year plus the pipeline growth (the number of households or jobs under construction or approved for construction) to yield to total for the horizon year. The five factors available in the LUSAM workbook are described below; however, as applied in the projection process, not all factors were used:

- **2005 Projections Growth Increment:** The change (growth) over time from an earlier projection (e.g. – projections for a new 2015 dataset would use the same growth allocation as an earlier projection between 2010 and 2020). In practice, the 2005 Projections growth increments for 2010 to 2020 and 2020 to 2030 were used as the input for this factor. Thus, the 2008 Interim and 2009 Projections relied on the growth increments in the 2005 Projections.
- **Base Year Proportion:** The same proportion of TAZ to District as in the base TAZ file (e.g. if TAZ "1" has 100 retail employees of the 1000 retail employees in the district – it would receive 10 percent of all new retail employees)
- **Developable Property:** This is based on an estimate of households or jobs per acre (and total acres). Relative development density is a primary input to this category. It differs across categories and across geographies, for example, employment density by acre is considerably higher in the center city than in suburbs.
- **Travel Time to Core Employment:** The estimated travel time to downtown Charlotte under peak highway congestion conditions. This factor was inverted as shorter travel times are preferred over longer. In the LUSAM Models for the 2008 Interim and 2009 Projections the weight applied to this factor was zero. Therefore, this factor was never used.
- **Planners' Judgment:** A direct 1-5 scale rating that could be applied to specific TAZs to reflect highly popular or unpopular TAZs for residential or non-residential development.

Figure 7: Visualization of LUSAM Workbook Process



The LUSAM model also incorporated "Pipeline" data by TAZ. The number of households or jobs under construction or planned could be added to a specific TAZ. Similarly, known decreases, such as that for a factory being closed, could be subtracted from a particular TAZ. Pipeline data would be added or subtracted to the base prior to allocation from districts.

The LUSAM model allowed for a weighting of the factors by each district. Thus, one district could have its entire weight based on the previous projections while another could have its entire allocation weight based on planners' judgment. The basic allocation equation is essentially the same for all categories and households are used in the example below.

$$
\begin{aligned}
& HH_future_{taz} \\
& = HH_base_{taz} + HH_pipeline_{taz} \\
& + (HH_target_{dist} - (HHbase_{dist}_HH_pipeline_{dist})* \\
& (Wgt1*(\Delta HH_y2-y1_{taz} / \sum \Delta HH_y2-y1) \\
& + Wgt2*(HH_base_{taz} / \sum HH_base) \\
& + Wgt3*(Vacant_res_{taz} / \sum Vacant_res) \\
& + Wgt4*(TravTime_{taz} / \sum TravTime) \\
& + Wgt5*(PlannersJudgment / \sum PlannersJudgment))
\end{aligned}
$$

Where:

HH_future_{taz}	Future (projection) year TAZ households
HH_base_{taz}	base year TAZ households
$HH_pipeline_{taz}$	Pipeline households added to TAZ between base year & future year
$\Delta HH_y2\text{-}y1_{taz}$	Change in no. of HH in TAZ between y1 and y2 in "old" projection set
$\sum\Delta HH_y2\text{-}y1$	Change in no. of HH in district (sum of all TAZ) between y1 and y2 in old projection set
HH_base_{taz}	No. of base households in district
$\sum HH_base$	Sum of base households for district
$Vacant_res_{taz}$	Vacant residential acres for TAZ
$\sum Vacant_res$	Sum of vacant residential acres for district
$TravTime_{taz}$	Reciprocal of travel time to core employment for TAZ
$\sum TravTime$	Sum of reciprocal of travel time to core employment for district
$PlannersJudgment_{taz}$	Planners Judgment value (1-5) for taz
$\sum PlannersJudgment$	Sum of Planners Judgment values for district
Wgt1 … Wgt5	Weights (0 – 1 for each factor, weights must sum to 1.0)

The 2008 Projections were the first projections developed using the LUSAM methodology. These projections were developed and used for the Rock Hill-Fort Mill Area Transportation Study 2035 LRTP air quality conformity analysis. The 2008 Projections were not used for any planning purposes within the MUMPO or RRRPO regions. Also, these projections were not used in development of the 2008 Interim or 2009 Projections, either. Therefore, they were not analyzed as part of this report.

The 2008 Interim Projections were the projections provided to NCTA for use in the FEIS Quantitative ICE analysis. The model inputs show that for the 2008 Interim Projections the major focus of adjustment was on Mecklenburg County, with the remainder of the region largely relying on the growth projections from the 2005 Projections to guide the LUSAM adjustments. Of the factors in the model, the Travel Time

to Core Employment is not used at all for any district for any horizon year. For all areas outside Mecklenburg County, the previous projections (2005 Projections, which were used in the 2030 LRTP) were the main factor in the household and population projections. For employment projections outside Mecklenburg County, the previous projections had the highest weighting but some weight (10-25 percent) was placed on the estimate of available land and densities. Within Mecklenburg County, projections of households and population were based on a mixture of the previous projections, available land and density and planners' judgment, with the exact weighting varying from district to district within the county.

The 2009 Projections are the most recently completed projections that have been fully adopted and used in regional air conformity analysis. These projections are very similar to the 2008 Interim Projections and, in fact, LUSAM runs were only used in Mecklenburg County to adjust between the 2008 Interim Projections and the 2009 Projections. Only minor adjustments were made in Union County and only to employment. Within Mecklenburg County, projections of households and population were based on a mixture of the previous projections, available land and density and planners' judgment, with the exact weighting varying from district to district within the county.

To illustrate how the LUSAM workbook produces the projections, Figure 8 shows the LUSAM process with district targets and changes for household projections for all TAZs in the Fairview District for the 2015 horizon year from the 2009 and 2008 Interim Projections LUSAM Model run. Fairview was chosen because it is partially located within the Goose Creek watershed and provides information on how population projections within the watershed were developed. The example is somewhat simplified as there are no pipeline household adjustments and 100 percent of the weight is on the Old Projection factor. Pipeline households would be any planned or under construction households in a TAZ. The process begins with the base year households, which are the number of households in each TAZ in 2005. The model then adds the pipeline households to the base year households. Next, the model works to distribute the households from the district level targets to the TAZ level using the weighted factors. In the example of Marshville, the full weight is placed on the distribution from the Old Projections (the 2005 Projections used in the 2030 LRTP). Thus, in the example shown below, TAZ 9032 captures 5.4 percent of the district household growth in the Old Projections. Thus, it receives that same percentage of the district household growth from the new, targeted growth (5.4% x 688 = 37 households). Thus, the household projection for 2015 for TAZ 9032 is 164 households.

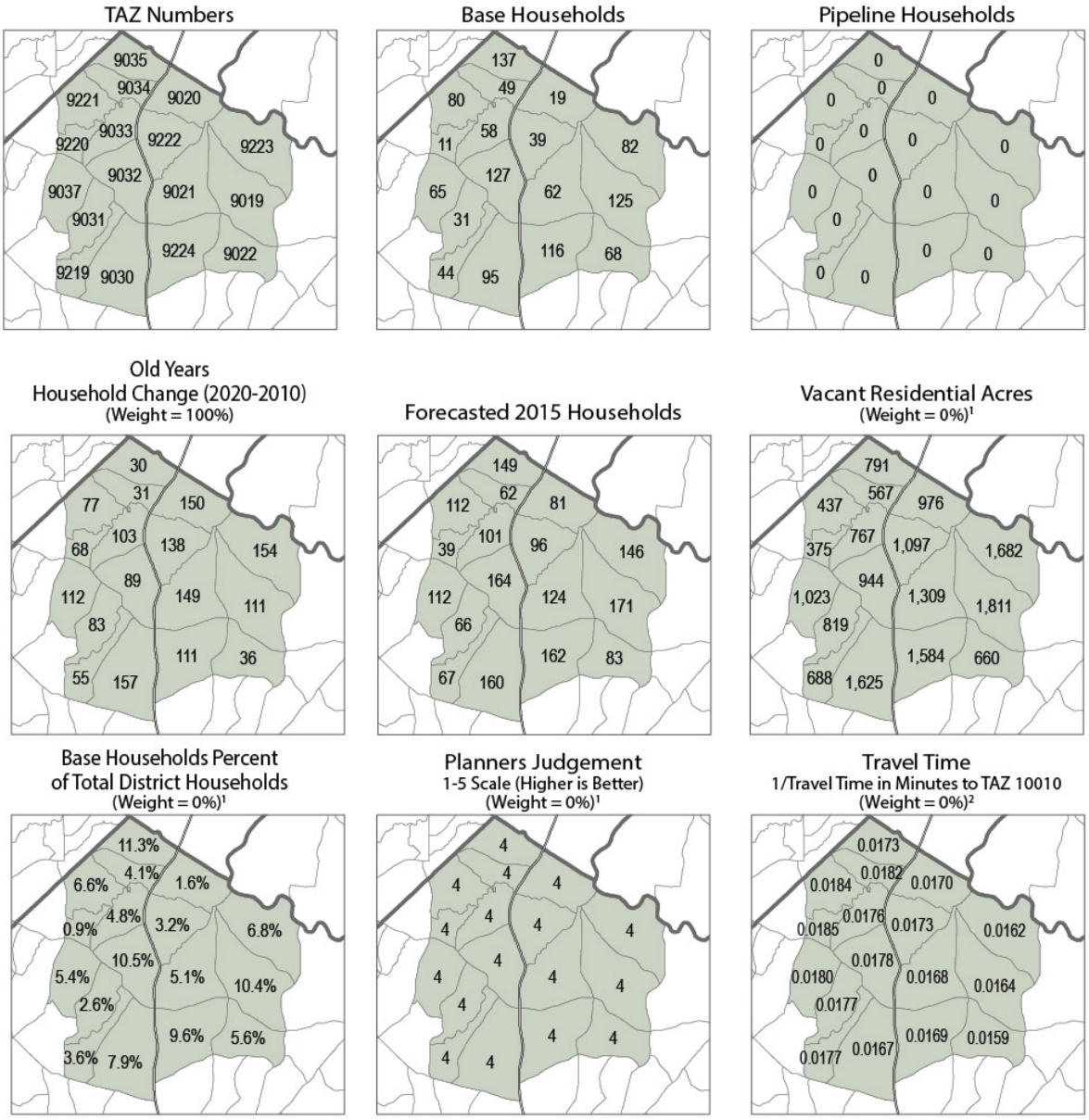
Based on these inputs and the LUSAM process, the Monroe Connector/Bypass could only have affected the LUSAM model through four possible inputs:

- The Planners' Judgment Factor
- The Travel Time to Core Employment Factor
- The Old Projections Growth Increments Factor (2005 Projections)
- District Level Targets.

As discussed above, however, the Travel Time to Core Employment Factor was not used (its weight was zero percent) for any LUSAM runs. Furthermore, the Planners' Judgment Factor was not used at all in Union County for any LUSAM run. Thus, based on the weighting of factors, the Monroe Connector/Bypass could not have influenced the projections through these two factors.

Thus, to fully assess whether the 2008 Interim or 2009 Projections were affected by the Monroe Connector/Bypass, one must fully understand the 2005 Projections (since the allocation of those projections guided the allocation of the newer projections) and the District Level Targets.

Figure 8: LUSAM Example, Fairview, 2009 and 2008 Interim Projections, 2015 Horizon Year



Fairview District		Fairview District Old Forecasts	
2005 Base HHs	1,208	2010 Forecasted HHs	1,845
2015 Target HHs	1,896	2020 Forecasted HHs	3,499
Difference	688	Difference	1,654

TAZ 9032 Example Calculation

2005 Base HHs + Pipline HHs + ((Old Years$_{TAZ}$/Old Years$_{Dist}$) x HH_Target$_{Dist}$) = 2015 HH Forecast

127 + 0 + ((89 / 1,654) x 688) = 164 HHs

[1] These factors were not used at all in Union County for the 2008 Interim or 2009 Forecasts. These variables were used in Mecklenburg County forecasts with the weights varied by district.

[2] While the LUSAM includes values for the Travel Time to Core Employment factor, the factor was not used for any forecast. The weight applied to it in all cases was 0%. It is shown here for the purposes of full transparceny.

Development of the 2005 Projections (Used in the 2030 LRTP)

The 2005 Projections (which were used in the 2030 LRTP) were developed through a process with three main components, a Top-Down projection, a Bottom-Up projection and input from an advisory group on the final projections. Each component in the process had a key role, as shown in Table 5. The development of the TAZ-level projections relied first on the Top-Down process to project future growth at the regional level and then allocate the regional growth to the county level. A subsequent Bottom-Up process allocated the county-level growth to the TAZ level within each county. Different parts of the Metrolina region used different approaches to the Bottom-Up process, but for the MUMPO area, which included most of Union County, a process prepared by Paul Smith of UNC-Charlotte provided the initial allocation. As was the case with the Top-Down projections, the Bottom-Up steps used input from local planners and jurisdictional representatives to review and refine the projections prior to adoption.

Table 5: Roles, Factors and Accessibility Considerations of the MRM Socioeconomic Projection Process Components

	Roles	Projection Factors	Accessibility Considerations
Macroeconomic (Top-Down) Projections **Completed by Dr. Thomas Hammer**	Projects regional household, population and employment totals and sets county level control totals	**Regional Projection** National population and employment trends linked by economic sector to regional trends	None
		County Level Allocation Past economic and demographic trends Economic and demographic conditions (as of 2003) Influence of income on growth Proximity Land availability Past land use and infrastructure policies	Explicitly includes two major road projects: • NC 16 Freeway to Lincoln County • Garden Parkway Only considers proximity in linear terms (county centroid to county centroid); no use of roadway networks
Household and Employment Allocation: (Bottom-Up) Process **Completed by Paul Smith, UNC-Charlotte**	Distributes growth from county-level to the Traffic Area Zones level	Developable Residential Land Redevelopable Residential Land Recent Population Change Travel Time to nearest Employment Center Water Availability Sewer Availability Expert Panel (High Growth Areas) Growth Policy Factor	Considers travel time from each TAZ to the NEAREST employment center, NOT regional employment centers Uses the TDM network, including the Monroe Connector/Bypass, but only in travel time to nearest employment calculations for final period (2020-2030).
Advisory/ Expert Input	County representatives agree on final county totals based on Top-Down process Local planners refine the Bottom-Up allocation based on adopted plans and local land use expertise; serves as a reality check on the allocation	Discretionary	Reflects local advisors' expectations (in 2003-2004) of whether new roads would be built Reflects the assumptions in adopted land use plans at the time regarding the anticipated road network

Regional Socioeconomic Projection and County Level Allocation (Top-Down Process)

The process to develop regional socioeconomic projections and allocate them to the county level (known as the Top-Down process) was a rigorous, research-based approach to developing a regional and county level projection of households and employment. Led by Dr. Thomas Hammer and documented in his report to the region titled *Demographic and Economic Forecasts for the Charlotte Region* (hereafter referred to as the "Hammer Report"), Dr. Hammer developed a long-range regional growth projection based on economic factors in the Charlotte region.

Dr. Hammer described his model as a demand-side model where the model determined economic employment (earnings) from a breakdown of different employment groups based on their link to national employment trends. The model also assumed by 2030, population demographic changes would constrain regional earnings. His report described large transportation projects and public policy land use or development controls as supply-side factors that do not necessarily contribute to the growth demand, but act as limits or constraints to where growth might occur at smaller scale projections.[12] Therefore, Dr. Hammer's projections were not sensitive to large transportation projects such as the construction of the Monroe Connector/Bypass.

Dr. Hammer's process started with descriptions of the national economy and regional economy to quantitatively link the economies based on worker earnings, referred to as employment. His modeling broke the regional economy into a 42-industry classification scheme to quantitatively link to the national economy. The procedure separated employment in each regional industry into a "basic" component and a "population-serving" component to quantitatively link the regional industry employment trends to national industry employment trends. Separate quantitative analysis was performed to create a linkage between the basic component of employment between the regional and national trends and the "population-serving" component of employment between the regional and national trends. The two separate quantitative linkages were combined to develop overall industry profiles for the region. Demographic projections were obtained by finding a regional population profile for each future year that yielded a labor force consistent with expected employment level.[13] The process yielded region-wide employment and demographic totals that became control totals to help determine where in the region the overall growth would occur.

The region-wide employment and household totals were allocated among the counties and districts with the aid of 35 equations to identify factors used in the determination of county level growth shares of the regional industry growth total. These equations included three for demographic variables of upper, middle and low-income housing, and 32 equations for employment by sector. These equations were calibrated on the experience of 227 counties in 29 separate U.S. metropolitan areas chosen for their comparability to the Charlotte region. The modeling allocation process also included factors such as available land in each county and location proximity between employment and households. The location proximity was incorporated by weighting an inverse function of distance to the county for which a variable was being measured to another county. However, the model omitted such supply side factors of large-scale transportation projects, new land use policies and provision of infrastructure, and natural land constraints

[12] Hammer Report, p 10
[13] Hammer Report, p 7

on development. Table 6 summarizes Dr. Hammer's description of the capacity of his projection and allocation model to capture growth influences.

Table 6: Capacity of Allocation Model to Capture Growth Influences

	Demand Side	Supply Side
Growth Factors Covered	• Past economic & demographic trends • Existing economic & demographic conditions • Economic-demographic linkages • Influence of income on growth patterns • Location	• Land area and land availability (as estimated on the basis of development magnitudes) • Past land use and infrastructure policies (to the extent they register in past growth)
Growth Factors Omitted	• Refinements o Some measures could be improved such as distance and area descriptors	• New or altered public policies governing land use and the provision of infrastructure • Large-scale transportation projects • Natural land constraints on development (if not strongly reflected in past growth)

Hammer Report, p 14

Dr. Hammer provided ranges of population and employment projections to account for variability and error in the model. He specifically noted, ". . . the upper and lower limits that express the ranges are specifically intended to express 90 percent or 95 percent confidence intervals. They cover only the year 2030, but could be extended to other years using the same proportions of past 2002 growth involved in their derivation"[14]. He obtained the upper and lower limits of growth by adding and subtracting amounts from the "most-likely" projection shown in Table 7.

> *The additions or subtractions at each geographic level equal a common percentage times the difference between the most likely values for 2030 and the actual values for 2002. Thus, the greater the expected growth, the wider the error margin, on the logic that unforeseen supply-side influences will operate mainly by reallocating growth rather than affecting urban development already present.*[15]

Dr. Hammer noted that different percentage margins are appropriate at different geographic levels, since the potential for error increases as area size decreases. He stated that "[s]mall margins are appropriate for the region as a whole because supply-side factors exert little influence at that scale." He calculated regional margins for population and employment by adding and subtracting 10 percent of the most likely 2002-2030 growth. He further noted that "[a]t the county level and district levels, the calculations involve larger downside margins than upside margins, on the argument that land use policies and environmental factors can have larger effect in diverting growth than in attracting development over and above location based demands." He obtained the county ranges from the 2030 most-likely projection, by applying a 25 percent deduction of the 2002-2030 most-likely growth and a 15 percent addition to the 2002-2030 most-likely growth.[16] Table 7 shows Dr. Hammer's 2030 population projection ranges.

[14] Hammer Report, p 66
[15] Hammer Report, p 66
[16] Hammer Report, p 66

Table 7: Dr. Hammer's Population Projection for the Charlotte Region

County	2030 Population		
	Lower	Most-Likely	Upper Limit
Anson County	36,967	40,847	43,175
Cabarrus County	247,142	283,115	304,699
Cleveland County	125,373	134,563	140,077
Gaston County	235,228	249,261	295,071
Iredell County	227,287	259,906	279,477
Lincoln County	113,206	128,857	138,247
Mecklenburg County	1,051,400	1,157,311	1,220,858
Rowan County	183,747	200,639	210,774
Stanly County	80,171	87,366	91,682
Union County	268,543	312,147	338,309
Cherokee County	83,228	93,168	99,132
Chester County, SC	52,278	58,306	61,923
Lancaster County, SC	91,781	101,680	107,619
Union County, SC	38,480	41,466	43,258
York County, SC	272,096	305,228	334,080

Hammer Report, p 67

Regional Projection and County Allocation (Top-Down Process) and the Monroe Connector/Bypass

Correspondence from interested parties suggests that Dr. Hammer's regional projections implicitly included the Monroe Connector/Bypass and therefore the regional projections should be used as the basis for a Build scenario or should be recalculated for the purposes of the Quantitative ICE.[17] Specifically, one comment suggests that Dr. Hammer's analysis assumed that there would be sufficient infrastructure available to accommodate any future growth and that this assumption implies that the Monroe Connector/Bypass is therefore assumed in the socioeconomic projections. As detailed above, supply side constraints were not a factor in Dr. Hammer's projections.[18] The following quotes from Dr. Hammer's report show that his process did not assume construction of the Monroe Bypass/Connector in projecting socioeconomic projections for the region or in allocation to the county level.

> *The strengths of the model approach include its objectivity and ability to capture a wide variety of relationships and spatial interactions. Its weaknesses derive from the severe limits on types of variables that can be feasibly collected for large sample model calibration. Because whole classes of variables must be omitted, the factors driving the model (other than regional totals) are limited to earlier values of the target variables themselves – i.e. to demographic and economic descriptors – plus functions of distance,*

[17] Letter from Southern Environmental Law Center to Jennifer Harris, NCTA, November 30, 2012, p 19.
[18] Hammer Report, p 11

> *land area and density. The most important omissions are factors that typically must be measured at a fine-grain level of detail (and often are hard to quantify in a relevant fashion) such as land use controls, natural land characteristics and availability of infrastructure. Since these factors mostly affect the supply of land suitable for development, and since the factors that allocation models do cover are most predictors of development demand, the limitations of such constructs can be summarized by calling them demand-side models*[19].
>
> *Two circumstances allow demand-side models to capture some supply-side influences. First such models can express the general role of land availability using crude measures that consider total land area (minus large-scale deductions like the military installations, wetlands and parks) and existing development density. Second because the model equations operate partly by extrapolation and are pegged to replicate past conditions in the subject areas, they implicitly cover all supply-side factors to the extent that future impacts of these factors equal past impacts.*[20]
>
> *But what models of the given type cannot do is capture the influence of exceptionally large infrastructure projects or shifts to more or less stringent development controls. They basically assume that the tendency of public actions to restrict or encourage growth will resemble the conditions prevailing in the calibration period (at the present meaning the 1990s).*[21]

Other comments from correspondence suggest that the "proximity factor" used by Dr. Hammer implicitly assumes an improved transportation network.[22] Dr. Hammer's proximity factor cannot include the transportation network. Since Dr. Hammer used the growth rates that occurred in the county between 1990 and 2000 to calibrate his model equations and there has been no controlled access freeway built in Union County in the last two decades, his projections, therefore, could not have assumed construction of a limited access roadway like the Monroe Connector/Bypass. Further, 2000-2010 growth that occurred in the region moved Union County's population rank among regional counties from sixth in 2000 to fourth in 2010. This growth occurred without a freeway. Thus, a freeway (even less so a toll-road), is not a factor contributing to the extremely high growth occurring in Union County. Rather Dr. Hammer describes major infrastructure projects as an influence that will operate by mainly reallocating growth rather than affecting the urban development that is already present.[23] As discussed in Section 3.3, this conclusion is not exclusive to the analytical work performed by Dr. Hammer.

Correspondence from interested parties also suggests that the county level population projections and employment projections should be re-calculated to exclude the Monroe Connector/Bypass.[24] Again, Dr. Hammer's model to allocate the region growth to County population and employment projections was not

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[19] Hammer Report, p 10
[20] Hammer Report, p 10-11
[21] Hammer Report, p 11
[22] Letter from Southern Environmental Law Center to Jennifer Harris, NCTA, November 30, 2012, p 19.
[23] Hammer Report, p 66
[24] Letter from Southern Environmental Law Center to Jennifer Harris, NCTA, November 30, 2012, p 19.

sensitive to a large-scale transportation project like the Monroe Connector/Bypass as he described in his report.[25]

> *In North Carolina, county-level forecasts from a calibrated allocation model should ordinarily be reliable – to the extent any forecast is reliable – with little or no adjustment for omitted supply-side influences. But supply-side factors gain potential importance at progressively smaller geographic scales, so the question is how far below the county level a model application should extend.*

Later in the report, Dr. Hammer notes how he adjusted outputs from the model to account for a particular major highway project that he believed would influence growth in a particular county.

> *The present approach is designed to avoid any need for ad hoc adjustment of results (other than systematic reconciliation with bottom-up, supply-side forecasts, if these are available). However, one after the fact adjustment has occurred here to improve the validity of the numbers in an area relevant for a particular planning project. The failure of the top-down forecasting procedure to acknowledge the impacts of special infrastructure development was judged a critical weakness in eastern Lincoln County, where the upgrading of Route 16 to a freeway will clearly yield growth increments over and above those predicted by demand-side model. This situation has been addressed by advancing the population forecast for one sub-district of Lincoln County from 2035 to 2025 and advancing the forecasts for two other Lincoln sub-districts from 2029 to 2025*[26].

Finally, explaining the ranges of population and employment projections shown in his tables, Dr. Hammer noted how he adjusted model results for the upper limit of the projections for East Gaston, Southwest Gaston, North York districts for the proposed toll road over the Catawba River.

> *The second factor is the possibility that a toll expressway will be constructed across the Catawba River to link southern Gaston County with western Mecklenburg. Such a facility would have substantial development impacts on East Gaston, Southwest Gaston, North York and the two counties in aggregate. These potential impacts are incorporated into the upper-limit population and employment values as explained in the footnotes to tables 11 and 12. Adjustments of this nature are not provided for the Route 16 freeway in Lincoln County because the impacts of this facility have already been incorporated into the forecasts, as discussed near the end of Section I. There are also not adjustments for completion of the I-485 beltway around Charlotte because it is not clear whether or how the beltway will alter district-level development patterns relative to what has already been predicted.*[27]

In summary, Dr. Hammer's analytical approach estimated regional and county growth within the Metrolina Regional Travel Demand model area. This projection was designed to establish regional and county level household, population and employment control totals and as such was not influenced by

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[25] Hammer Report, p 11
[26] Hammer Report, p 12-13
[27] Hammer Report, p 69

projects that primarily impact accessibility within one county such as the Monroe Connector/Bypass. This means Dr. Hammer's regional and county projections would not have changed with or without the construction of the project.

MUMPO 2030 LRTP Household, Population and Employment Allocation Process (Bottom-Up Process)

In 2004, CDOT hired Paul Smith and his team from the UNC-Charlotte Center for Applied GIS to create a model to allocate households, population and employment from the county level to the TAZ level. The methodology of the process is described in Mr. Smith's report *Mecklenburg-Union Metropolitan Planning Organization Population Projections and Employment Allocations, 2000-2030*. Mr. Smith's process focused on the household (and by default population) allocation and the allocation of population-chasing employment. Population-chasing employment is that employment associated with retail and services that tend to follow population growth. Non-population-chasing employment was distributed solely based on the input of staff and expert panel participants. Mr. Smith's allocation process started with the county-level control totals developed in the Top-Down process, existing baseline data (2000), and the influence of the of land development factors chosen and ranked by expert panels. Within Union County there were eight land development factors used to assess the attractiveness and capacity of each TAZ in the county to draw future growth. These variables are listed in Table 8.

Table 8: Union County Land Development Factors

Factor	Weight by Year of Allocation		
	2010	2020	2030
Developable Land	3	3	3
Travel Time to Employment	3	3	3
Water	2	2	2
Sewer	2	2	2
Redevelopable Land	2	3	3
Population Change	3	1	Not used
Expert Panel	2	2	2
Growth Policy	1	1	1

Mr. Smith used a raster cell based analysis system where Union County was split into a set of 500 feet by 500 feet grid cells and the value for each land development factor was calculated for each grid cell. Each land development factor would also be normalized to a 0 to 1 scale and weighted so that all scores could be combined into a composite score. The composite grid scores were calculated for each cell and then averaged across each TAZ to calculate land attractiveness scores for each TAZ. The TAZ land attractiveness scores were used to derive the available residential acreage to be consumed during each allocation period. The 2005 Projections (which were used in the 2030 LRTP) were developed for 2010, 2020 and 2030. Thus for each allocation period (2000-2010, 2010-2020, 2020-2030) land development factors were calculated and normalized then weighted and the composite score calculated for each cell. Finally, for each TAZ, an average of the composite scores for all cells within each TAZ was calculated. Higher scores reflected higher attractiveness and would result in higher acreage consumed, until a TAZ reached its calculated maximum capacity. Allowable development densities per TAZ multiplied by the derived residential acres to be consumed were used to calculate the number of households in each TAZ.

Historical household size was used to generate TAZ population at each allocation period. Existing development and available land acted as limits on further growth. Thus, while the available developable land served as a land development factor, it also served as a constraint in the model to ensure that growth in a TAZ was predicted within its capacity to accept development. Once the developable land within a TAZ was consumed, future development would be assigned to TAZs with lower composite scores in subsequent iterations. The land development factors and corresponding weights that were used in the Union County portion of the model are shown in Table 8.

The modeled predictions were subject to feedback and adjustment from the panel of experts. These experts reviewed and adjusted projections as documented in *Land Use and Socioeconomic Data and Projections for the Greater Charlotte* Region. No specific changes to household, population or employment projections are documented in the report but the overall process of expert panel input is reviewed. Expert panel review is a common and recommended method in long-range projection to improve the acceptance of projections by political entities and data users.[28] Within Union County, however, no changes were made to the household and population projections as developed by Paul Smith at the TAZ level for the horizon years of 2010, 2020 and 2030. These projections were included as the socioeconomic projections for the adopted MUMPO 2030 LRTP.

Consultation with CDOT staff indicates that there was no influence from the Monroe Connector/Bypass on growth expectations associated with these projections (Appendix A). The travel time to employment factor did include the Monroe Connector/Bypass in the road network used to calculate travel times for the final period, but the assessment of CDOT staff was that the methodology used to calculate that factor would have minimized any impact of the Monroe Connector/Bypass on the 2005 Projections (which were used in the 2030 LRTP). Furthermore, a review of Mr. Smith's results shows no indications of population or employment growth clusters along the project corridor. If the 2005 Projections had included growth expectations associated with the Monroe Connector/Bypass, one would expect to see higher than average population and employment growth and density in TAZs along the project corridor. There are no indications of such clusters of growth along the project corridor in Mr. Smith's results.

Review of the Travel Time to Employment Factor within the Bottom-Up Process

Since May 2012, NCTA has worked with CDOT staff and Paul Smith to reanalyze the travel time factor to determine if the factor affected the 2005 Projections (which were used in the 2030 LRTP) in a way that would indicate those projections include the induced growth effects of the proposed project. Specifically, NCTA engaged Paul Smith and CDOT staff in a reevaluation of the factor beginning in June 2012 and Paul Smith completed his analysis and reported his results to NCTA in September 2012.

The travel time to employment factor for Mr. Smith's model used an estimate of travel time to the nearest employment center. Mr. Smith defined an employment center as any location with 5,000 jobs within a ½-mile area. Travel time was calculated using a composite approach, combining travel speed information from the Metrolina Region Travel Demand Model (MRM), a GIS shapefile of existing roads and assumed walking speed of 2.5 miles per hour. [29] The MRM was used to estimate travel speeds for all roads within

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[28] Smith, Stanley K., Tayman, Jeff, Swanson, David A. *State and Local Population Projections: Methodology and Analysis.* Kluwere Academic/Plenum Publishers, New York, 2001. p 358

[29] FHWA guidance on signal design recommends using 3 to 5 feet per second (2 to 2.7 mph) walking speeds in developing pedestrian clearance times for signal timings. FHWA. Traffic Signal Timing Manual. Chapter 5, Section 5.3.3. http://ops.fhwa.dot.gov/publications/fhwahop08024/chapter5.htm

the MRM network. For the 2010 and 2020 horizon years, the 2010 model network was used and for the 2030 horizon year the 2025 model network was used. Using the speed assumptions above, travel times to the nearest employment center were then calculated for each horizon year (2010, 2020 and 2030). These travel times were then normalized to a 0 to 1 scale and averaged across each TAZ to determine the score for each TAZ.

The Monroe Connector/Bypass was included in the 2025 MRM network and thus the speed of that facility influenced the travel time to employment factor for the 2020 to 2030 period. Map 6 shows the original travel times calculated using this methodology. These travel times formed the basis of the original Travel Time to Employment Factor used in the Bottom-Up allocation process. As illustrated in the map and detailed in the discussion that follows, the Monroe Connector/Bypass does have a minor influence on the travel time used as an input to the Bottom-Up allocation process as indicated by the area of travel times of less than 10 minutes around the proposed project from Unionville-Indian Trail Road to Rocky River Road. The map also shows that many employment centers were used as destination points for the analysis in Mecklenburg and Union Counties. Notably, none of these employment centers are in the Goose or Sixmile Creek watersheds. The closest employment centers within the FLUSA are at the following locations:

- US 74 and Rama Road in Charlotte
- Monroe Road and Sardis Road in Matthews
- US 74 at NC 51 in Matthews
- US 74 just west of Seacrest Short Cut Road in Monroe
- Downtown Monroe
- US 74 at Sutherland Ave in Monroe
- Along Secrest Avenue, north of US 74 in Monroe.

The methodology to calculate the travel time to employment for the Bottom-Up allocation calculated travel times to the *nearest* employment center, not to major destinations such as downtown Charlotte. The average distance from an employment center for the MUMPO study area Mr. Smith analyzed was only 3.8 miles, while the greatest distance was 14 miles. Thus, the methodology was a relatively localized analysis of travel time. Freeway type facilities, such as the proposed 20-mile long Monroe Connector/Bypass, tend to serve longer trip lengths. As such, the travel time to employment center analysis methodology would largely miss the travel time savings that would accrue to longer trips like those most likely to occur on the Monroe Connector/Bypass. Lastly, the location of the employment centers Mr. Smith used relative to the Monroe Bypass/Connector would tend to minimize the travel time savings the project could provide. A number of employment centers are located in and around downtown Monroe, as seen in Map 6, and since the proposed project bypasses the downtown Monroe area, Mr. Smith's travel time analysis would largely not account for travel time savings associated with the project in central and eastern Union County.

Revising the Travel Time to Employment Factor without the Monroe Connector/Bypass

Since May 2012, NCTA worked with CDOT staff and Paul Smith to rerun the MRM model and the Bottom-Up allocation process with a revised MRM network that did not include the Monroe Connector/Bypass. NCTA requested the analysis to compare the results to the original 2005 Projections to determine whether removal of the proposed project would affect the results. CDOT staff obtained the 2025 MRM model used to calculate the travel speeds for the original travel time to employment factor analysis and revised the network by removing the Monroe Connector/Bypass. They subsequently reran

the travel demand model with the revised network to get new speed data for the transportation network that did not include the Monroe Connector/Bypass. Mr. Smith then incorporated this new speed data into his other speed assumptions and recalculated the travel times used to develop the travel time to employment factor score for each TAZ. He then recalculated the composite attractiveness scores and subsequently reapplied his allocation model with the new composite attractiveness scores to determine if there would be any differences in population or employment allocations with the new travel time results.

When Mr. Smith removed the Monroe Connector/Bypass from his analysis, it resulted in minor changes to the travel times and composite attractiveness index. Out of 256 TAZs in the MUMPO analysis area of Union County, most had little to no change in travel time to employment centers when the Monroe Connector/Bypass was removed from the network:

- 150 TAZs (59 percent) had no change in their travel time
- 85 TAZs (33 percent) had a travel time increase of less than 1 minute
- 21 TAZs (8 percent) experienced a travel time increase of 1 minute or more
- The maximum change for a TAZ was 5.7 minutes, and the average change throughout Union County was 16 seconds.

The areas with increased travel time are shown in Map 7. The areas with the greatest increase in travel time are in western Union County, centered around the proposed corridor between Stallings and Monroe. The impact of this travel time change is highly localized around the western end of the Monroe Connector/Bypass.

As seen in Map 7, there are no changes in the travel time factor for any TAZ in the Sixmile Creek watershed. For Goose Creek watershed, most TAZs see less than a 30-second increase in travel time, while three TAZs see between a 30-second and 3-minute increase in travel time.

As described above, the model uses travel time to employment as one of several weighted factors in the calculation of composite grid attractiveness scores, which are averaged across a TAZ to derive the percentage of available acreage to be consumed by TAZ for each period. Mr. Smith used the recalculated travel time to employment factor to recalculate the grid attractive scores and TAZ scores for the 2020 to 2030 period. When the composite attractiveness scores were recalculated to include the revised travel time results above and then further averaged for each TAZ, the results showed that most TAZs had little to no change in attractiveness score. Of those that did change, the result was a reduction in attractiveness scores, as increased travel time would result in lower attractiveness to development. Out of 256 TAZs in the MUMPO portion of the study area:

- 150 TAZs (59 percent) had no change in composite attractiveness score
- 92 TAZs (36 percent) had a reduction of less than 1 percent
- 14 TAZs (5 percent) had a reduction of 1 percent or more change in composite score
- The greatest Composite Score reduction is 3.9 percent, and the average Composite Score reduction is 0.21 percent.

Changes in composite attractiveness scores by TAZ, calculated by Mr. Smith, are shown in Map 8. The geographic distribution of the changes roughly parallels those in the travel time map.

As seen in Map 8, there are no changes in composite land development factor for any TAZ in the Sixmile Creek watershed. For Goose Creek watershed, most TAZs see less than a 0.5 percent decrease in their

composite factor, while three TAZs see between a 0.5 and 2 percent decrease in their composite land development factor.

Next, Mr. Smith reapplied the allocation model to determine specifically if the change in travel times and composite scores would result in a different allocation of households and employment. The allocation model uses the composite scores to determine the percentage of available land in each TAZ that would be consumed by growth. The higher the composite score the higher the percentage of available land that would be consumed. The model would then multiply the percentage consumed by the actual available land in each TAZ to determine the acreage of land consumed within each TAZ. Then the acreage would be multiplied by the development density for each TAZ (calculated from tax and zoning records) to determine the actual number of households to be added to each TAZ for each period. Thus any change in composite score could potentially change the percentage of land consumed and thus the number of households added to any given TAZ.

When Mr. Smith reran the allocation model with the new composite scores, the results showed that the land use projections were identical to those produced in his original report; in other words the results did not change. For the 106 TAZs where the change in travel time led to a reduction in their composite attractiveness index, the allocation model in the original allocation (i.e. before the Monroe Connector/Bypass was removed) had calculated that those TAZs would use 100 percent of available land by 2030. For those same TAZs, when the new allocation model was run (i.e. after the Monroe Connector/Bypass was removed) the lower attractiveness scores did not reduce their attractiveness in the allocation model enough to cause the allocation model to request less than 100 percent of the developable land within each of those TAZs by 2030. These 106 TAZs already had relatively high composite scores as they were in areas with sewer and water availability, where growth policy was favorable and where Expert Panel members expected growth already. The relatively small reduction in composite attractiveness that resulted from the changes in travel time did not reduce the score for these TAZs enough to reduce the percentage of land the model would consume. In addition, many of these TAZs had little available land to fill in the 2020 to 2030 period. This result is logical given that the areas where travel time and composite scores changed have experienced extensive growth since 1990 and thus are likely to reach build out sooner than most other areas of the County.

These results show clearly that removal of the Monroe Connector/Bypass from the travel time to employment factor had no effect on the results of the 2005 Projections. Therefore, it is clear that the Bottom-Up portion of the 2005 Projections was insensitive to the presence or absence of the proposed project. Since this factor was the only factor that explicitly included the project in either the Top Down or Bottom Up, it is clear that the 2005 Projections are insensitive to the presence or absence of the proposed project. As such, it is reasonable to conclude, that the proposed project had no influence on the "Old Projections" factor used in the LUSAM process for the 2008 and 2009 Projections.

Relevance to Goose and Sixmile Creek Watersheds

As noted above and seen in Maps 7 and 8, the re-evaluation of the Travel Time to Employment Center factor resulted in minimal changes to that factor for Goose Creek watershed and no changes to that factor for Sixmile Creek watershed. Similarly, the re-evaluation of that factor resulted in minimal changes to that the composite land development factor for Goose Creek watershed and no changes to the composite factor for Sixmile Creek watershed. Most important, though, is that the re-evaluation of the results of the 2005 Projections using the revised Travel Time to Employment Factor showed absolutely no change in

the final results for any TAZ in Goose Creek or Sixmile Creek watersheds. Since this factor was the only factor that explicitly included the project in either the Top Down or Bottom Up, it is clear that the 2005 Projections are insensitive to the presence or absence of the proposed project. As such, it is reasonable to conclude, that the proposed project had no influence on the "Old Projections" factor used in the LUSAM process for the 2008 and 2009 Projections for Goose and Sixmile Creek watersheds.

District Level Targets

The only remaining area that the Monroe Connector/Bypass could have influenced the LUSAM process would be through the district level targets. The household, population and employment targets used in the LUSAM models were developed based on the following inputs:

- Interpolation and extrapolation of the previous projections (2005 Projections, which were used in the 2030 LRTP)
- NC State Data Center Demographic Projections (Summer 2007)
- Hammer Report Five-Year Projections.

As previously documented, neither the Hammer Report nor the 2005 Projections (which were used in the 2030 LRTP) were influenced by the Monroe Connector/Bypass growth expectations. The NC State Data Center develops its projections based on trend growth over the previous two decades drawing from both Census counts and estimates. The projections are then developed using the most appropriate smoothing model that best fits the trend line data.[30] Since these projections rely entirely on trend data, there is no influence in these projections from proposed transportation improvements. Therefore, it is reasonable to conclude that the district level targets were unaffected by any influence from growth associated with the Monroe Connector/Bypass.

Review of Projection Results

An examination of density levels along the project corridor is illustrative regarding the relationship (or lack thereof) between the proposed project and the MPO projections of households, population and employment. Map 9 shows the household density by TAZ in 2030 from the 2009 Interim Projections. The household density levels in TAZs along the proposed project corridor in the 2030 projections are similar to the household densities of surrounding TAZs. If the projections were representative of a Build Scenario then one would expect to see higher household density levels along the project corridor, particularly at interchange locations. Map 10 shows the employment density by TAZ in 2030 from the 2009 Interim Projections. The employment density levels in TAZs along the proposed project corridor in the 2030 projections are similar to the densities of surrounding TAZs. If the projections were representative of a Build Scenario then one would expect to see higher employment density levels along the project corridor, particularly at interchange locations. Overall, the density pattern in the 2009 Projections shows no signs of influence from the Monroe Connector/Bypass. Furthermore, CDOT staff indicated that growth impacts of the proposed road were not a consideration in the projection process.

4.3 How Have Other Studies Used the MRM Socioeconomic Projections

The NCTA hired other consultants and researchers to perform work on traffic and revenue studies to obtain investment ratings for Toll Revenue Bonds. The work performed consisted of a Preliminary Traffic

[30] Smoothing models use historical data on past population or employment conditions and apply exponential functions that best fit those past trends to then forecast future conditions.

and Revenue Study, an Independent Economist Evaluation of the Socio-economic Estimates Underlying the Study of the Feasibility of the Proposed Monroe Connector/Bypass, and a Comprehensive Traffic and Revenue Study. This section will provide a summary of the work and the relevance to the research performed and used in the Quantitative ICE analyses.

WSA, Proposed Monroe Connector Preliminary Traffic and Revenue Study, Final Report, October 11, 2006

The NCTA hired Wilbur Smith Associates (WSA) to conduct a preliminary traffic and revenue study for the proposed Monroe Connector. The purpose of the study was to determine the feasibility of pursuing toll financing for construction of the Monroe Connector and/or Monroe Bypass. WSA assumed that the proposed project would provide significant time savings for travelers moving between I-485 south of Charlotte and Monroe or points south and east based on their analysis of travel conditions on US 74 in 2006 and travel demand model analysis of travel speeds in their study area. It should be noted that WSA completed this preliminary study in 2006 before analysis for the EIS had begun. WSA used the 2005 Projections socioeconomic data set (which were used in the 2030 LRTP) as it was the most recent projection available at the time of their study.

WSA collected traffic counts in the project corridor and used the information to re-calibrate the Metrolina Regional TDM model and provide traffic scenarios for No-Build, Build (Toll Free) and Build (Tolled) scenarios. They also updated the network within the model to account for proposed transportation improvements. WSA also collected information regarding regional and corridor income characteristics to aid in the development of estimated values of time for potential users of the toll facility. WSA stated that this is a critical parameter used to assess a motorist's willingness to pay for tolls and use the facility.

WSA concluded that the Monroe Connector/Bypass would help reduce congestion in the study area even with the planned widening of US 74. Its preliminary traffic and revenue study concluded that pursuing project financing with tolling was feasible and would be best served by combining the Monroe Connector and Bypass in a proposed toll financed project.

WSA's analysis relied upon the socioeconomic projections incorporated in the Metrolina Regional TDM. They concluded that the population projections contained in the Metrolina Regional TDM at that time were directly related to the growth rate of traffic predicated by the model. They indicated that the Monroe Connector/Bypass is included in the model and influences the growth projections therein. However, WSA did not perform a Build versus No-Build analysis for purposes of determining the project influence on the socioeconomic conditions in its study area. Furthermore, WSA provided no basis for the assumption that the Monroe Connector/Bypass influenced the growth projections in the model nor did they provide any documentation to justify the assumption. WSA's report clarified that its work was performed without the benefit of an independent economic review of the socioeconomic projections. WSA also acknowledged that such work would typically be required to support project financing.

In summary, this report was a preliminary traffic and revenue study and conducted prior to the DEIS Qualitative ICE and FEIS Quantitative ICE analyses. Furthermore, as shown through the analysis by Mr. Paul Smith discussed in section 4.4, the Monroe Connector/Bypass did not influence the 2005 Projections (which were used in the 2030 LRTP).

Kenan Institute of Private Enterprise, Technical Memorandum, Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, Initial Report of Independent Economist, September 28, 2009

In subsequent work on the traffic and revenue studies, the WSA team, in consultation with NCTA, hired the Kenan Institute of Private Enterprise at the University of North Carolina's Kenan-Flagler Business School (Kenan Institute) in 2009 to develop a set of TAZ projections specifically for the Monroe Connector/Bypass Traffic and Revenue Study. The Kenan Institute developed their projections based on Dr. Hammer's 2003 projections for regional and county growth, a review of the MUMPO Bottom-Up process to allocate county and district growth from Dr. Hammer's projections to TAZs; a review of recent economic, employment and population trends and estimates produced by other organizations; a regional scan of the project area; and, interviews with planners, developers and business/economic experts within the region. The Kenan Institute Report, entitled *Initial Report of Independent Economist* (Appendix C), was used in the development of WSA's *Comprehensive Traffic and Revenue Study*, October 22, 2010.

The main objective of the Kenan Institute Report was to determine the socioeconomic conditions that would be prevalent in its project study area with the construction of the Monroe Connector/Bypass toll road. As part of its work, the Kenan Institute conducted an independent economic review of the 2008 Interim Projections, which were the most up to date TAZ level projections available at the time of their study. The Kenan Institute's corridor study area for evaluation and analysis is shown in Map 11.

Map 11 also includes the Qualitative and Quantitative ICE analysis areas. One key observation is the Kenan Institute's study area is much smaller than the either the Qualitative or Quantitative ICE study areas. The Quantitative ICE study boundary was established to evaluate effects on the natural environment in consultation with resource agencies and is focused on impacts to watersheds and protected species. The Kenan Institute's study area appears to have been established based on the project's travel time savings during peak travel times. The Kenan Institute study area is 132,436 acres compared to the Quantitative ICE study area of 202,000 acres or 66 percent of the Quantitative ICE study area. This observation also highlights that the area of influence of change in socioeconomic projections is much less than the project area, the county and the region as a whole. In other words, the Kenan Institute analysis and resulting study area provide further evidence that the Monroe Connector/Bypass would have little to no effect on regional or county level growth. As seen in Map 11, the Kenan Institute study area included only very small portions of either Sixmile or Goose Creek watersheds. The report notes that the corridor was "an analyst's construct approximating the area where travel behavior is most likely to be influenced by the new roadway."[31] This would suggest that their conclusion was that there would be little to no effect on travel behavior or growth in the Goose Creek or Sixmile Creek watersheds.

The Kenan Institute reviewed the 2008 Interim Projections and determined that for the purposes of forecasting traffic for Toll Revenue Bond issuance, adjustments would be required to develop socioeconomic projections that were reasonable but did not overestimate traffic forecasts. The Kenan Institute made two adjustments to the socioeconomic estimates. "The first was to make region-wide adjustments consistent with the national growth expectations. The second was to reallocate growth in Union County in line with development factors and constraints."[32]

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[31] Appendix C, p 2, Footnote 3
[32] Appendix C, p 29

The Kenan Institute's analysis determined that the growth in the 2008 Interim Projections needed to be adjusted to account for the extended recession, which it determined was not accounted for in the projections. Based on its research, the Kenan Institute lowered the TAZ level projections by 8.7 percent to account for the national economic correction, which suggests that as growth resumes, the gross domestic product is expected to be 91.3 percent as high as it would have been at the same time in the absence of the national crisis.[33]. Table 9 shows the original 2008 Interim Projections of household and population, the Kenan Institute adjustments for the national economic correction, and their project specific adjustments.

Table 9: Household and Population Projections for the Corridor Study Area (132,436 acres)

Year	MRM 2008 Interim Projections		Kenan Adjustments for "National Correction"		Kenan Adjustments due to Project	
	Households	Population	Households	Population	Households	Population
2005	42,595	120,054	42,595	120,054	42,595	120,054
2010	49,393	140,267	45,164	128,258	45,346	128,732
2015	56,454	161,371	51,556	147,364	51,968	148,486
2020	62,479	178,152	57,056	162,689	57,974	165,207
2025	68,407	194,812	62,469	177,902	63,869	181,775
2030	74,497	211,973	68,029	193,573	69,843	198,613

Looking within the project corridor, the Kenan Institute accepted the allocation of growth by the MPO in Mecklenburg County. However, it reallocated the projected population growth within Union County away from the line of high growth in the southwest quadrant of the county to the Connector/Bypass corridor because of the project. A portion of the expansion in several high growth TAZs in the northeastern quadrant of the county was also reallocated towards the corridor. The Kenan Institute made these adjustments based on results of interviews with local planners, analysis of growth trends in the area, and analysis of water and sewer demand and capacity in the area. The Kenan Institute report notes that many of the regional planners could not recall critical details of the regional and TAZ level socioeconomic projection and allocation modeling and reasoning behind specific projections. They also concluded from the interviews that a few biases may have entered into the Union County small area projections. Dr. Appold specifically noted the line of growth in southwest Union County along and south of NC 75 that did not appear to be appropriate given limitations on growth in that area.[34]. However, that the Kenan Institute found it necessary to reallocate growth to account for the influence of the Monroe Connector/Bypass is consistent with the contention that the existing projections did not represent a Build Condition for the Monroe Connector/Bypass.

Table 10 provides a comparison between the MRM 2008 Interim Projections in the corridor to the overall adjustments made by the Kenan Institute.

The set of projections in the second column of Table 10, shown under the heading Kenan National Correction Adjusted, was calculated by multiplying the MPO projection for 2030 by 8.68 percent (the same reduction that the Kenan Institute used to adjust the projection for all TAZs). This calculation allowed a comparison of the Kenan Institute adjustments within the corridor due to the project (third

[33] Appendix C, p 24
[34] Appendix C, p 24-25

column set of projections) with projections adjusted due to the national correction. Thus, the last column set in the table shows how the project would increase growth by zones in the corridor of the Kenan Institute study area. It is important to note that the Kenan Institute did not conduct a "Build versus No-Build" analysis, but only created a scenario of a 2030 projections of population and households with the project.

Although the growth rate difference in the entire corridor is rather small (3 percent), the tables show the substantial difference in the allocation of growth between the western corridor zones to the eastern corridor zones. This re-allocation of growth by zone is very similar to the growth patterns in the DEIS Qualitative ICE and FEIS Quantitative ICE. Therefore, the Kenan Institute reallocation of adjusted regional growth in Union County supports the Quantitative ICE conclusions regarding the project's influence on accelerated growth in central and eastern Union County.

For the Sixmile Creek watershed, only a small portion falls within Zone 1 of the Kenan study area. As noted in Table 10, this zone saw limited adjustment from the Kenan analysis, suggesting that this zone would have little to no change associated with the proposed project. A small portion of Zones 1 and 2 fall within the Goose Creek watershed. As noted in Table 10, these zones saw limited adjustment from the Kenan analysis, suggesting that these zones would have little to no change associated with the proposed project. Thus, the Kenan Institute adjustments and choice of study area, strongly suggest that there would be little to no indirect land use changes in either Goose or Sixmile Creek watersheds associated with the proposed project.

Table 10: Change in Household and Population Projections within the Corridor Study Area

Year	MRM 2008 Interim Projections[1]		Kenan "National Correction" Adjusted		Kenan Project Adjusted[1]		Change in Kenan Projection due to project in 2030 (%)	
	Households	Population	Households	Population	Households	Population	Households	Population
Corridor								
2005	42,595	120,054	42,595	120,054	42,595	120,054		
2030	74,497	211,973	68,029	193,573	69,843	198,613	3%	3%
Zone 1								
2005	14,118	38,774	14,118	38,774	14,118	38,774		
2030	19,307	55,413	17,631	50,603	17,730	50,871	1%	1%
Zone 2								
2005	11,017	30,859	11,017	30,859	11,017	30,859		
2030	16,676	47,280	15,228	43,176	15,474	43,842	2%	2%
Zone 3								
2005	7,617	20,404	7,617	20,404	7,617	20,404		
2030	11,369	30,980	10,382	28,291	11,074	30,225	7%	7%
Zone 4								
2005	6,164	19,084	6,164	19,084	6,164	19,084		
2030	17,827	51,435	16,279	46,970	16,455	47,580	1%	1%
Zone 5								
2005	3,679	10,933	3,679	10,933	3,679	10,933		
2030	9,318	26,865	8,509	24,533	9,110	26,095	7%	6%

[1] Appendix C Table 11

One may argue that the Kenan Institute concluded that the growth in the corridor area would reallocate outside Union County without the project. However, the Kenan Institute acknowledged that it did not conduct a no-build versus build analysis. It also acknowledged that its analysis relied upon the regional growth allocation to the counties, which did not consider supply-side factors such as large infrastructure projects. Lastly, the Kenan Institute's study area of 132,436 acres is much smaller than the area of Union County. Therefore, any conclusion the Kenan Institute report made regarding a No-Build Scenario was not reached with the same degree of analytical work performed in developing the adjusted projections.

A final point regarding the reports prepared by the Kenan Institute for the project is the complimentary narratives regarding Dr. Hammer's methodologies, models and projections of region and county

population and employment described in his report, *Demographic and Economic Forecasts for the Charlotte Region*, 2003.

> *Our basic assessment of the MPO socio-economic projections is twofold. First, although the region-wide projections were prepared with an unusual degree of competency and care, they may have been over-adapted to new information during the boom years which followed.*[35]
>
> *The large area projections performed by Thomas Hammer and summarized above appear to be thoughtfully and carefully constructed.*[36]
>
> *Recognizing that no projection is completely accurate (error bounds are discussed in the full report), our judgment is that Thomas Hammer, the consultant hired by MUMPO to estimate county and sub-county population and employment for selected years, has the most credible methodology of any known population and employment projection. His estimation process relies on Census data, the quantified detailed experiences of similar metropolitan regions, and extensive feedback from knowledgeable regional (Charlotte) informants. We feel that his estimates, modified with the best available information about development subsequent to his work, form the best possible basis for NCTA decision-making.*[37]

WSAs, Final Report, Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, October 22, 2010

WSA's Comprehensive Traffic and Revenue Study (T&R Study), begun in 2009, was a follow up to the preliminary study performed in 2006. This research was conducted parallel to but separate from the NEPA analyses conducted for the FEIS and ROD. The report was not completed until after issuance of the ROD. The T&R Study used the Kenan Institute's socioeconomic projections of population, household and employment described above as inputs to the Metrolina Regional TDM. WSA also conducted an Origin-Destination Study in the project study area to identify current travel patterns and trip characteristics. They also supplemented NCDOT traffic counts with further counts during March 2009. WSA also updated the proposed transportation projects into the transportation network. Finally, based on traffic counts, WSA adjusted the model during a calibration process to achieve model predictions better aligned with current traffic observations.

WSA's T&R Study Report also compared population projections from the 2005 Projections (which were used in the 2030 LRTP), the 2008 Interim Projections, and the projections developed by the Kenan Institute in 2009 within the corridor. WSA found that the three different population projections for the corridor in the year 2030 closely correlate. For example, in 2009, the Kenan Institute estimated the 2030 population in their study area to be 198,613. This projection clearly included the effects of the project. However, the information WSA extracted from the 2005 Projections estimated the 2030 population in their study area to be 210,900. The information WSA extracted from the 2008 Interim Projections estimated the 2030 population in their study area to be 211,973. As previously discussed, none of the

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[35] Appendix C, p 4
[36] Appendix C, p 23
[37] Appendix C, p 3

MRM socioeconomic projection versions included growth effects from the project. All of these projection results are within seven percent and suggest a strong correlation between different projection versions. Since the Kenan Institute's charge in developing their projections was to err on the side of not overestimating traffic so as to provide a conservative estimate for financing purposes, it would not necessarily be appropriate to use those adjusted projections as a basis for environmental impacts analysis. Finally, WSA's T&R Study did not construct a No-Build versus Build scenario to analyze the effects of the project on the study area. However, they did break down the project zones to more precisely describe where increased growth was likely to occur. This work is similar to the work conducted in the FEIS Quantitative ICE analysis and the implications from their analyses regarding the areas most likely to see additional growth due to the project are similar to the conclusions of the DEIS Qualitative ICE and FEIS Quantitative ICE.

4.4 How Do the MRM Socioeconomic Projections Compare to Other Projections?

The ICE Guidance recommends using adopted regional projections authored by MPOs where available.[38] Yet it would be best to compare those projections to others before using them. Therefore, it is instructive to compare the MPO projections to other population projections for the area. Projections from other sources show a wide range of future growth trends for Union County. Two of the most commonly cited privately developed projections are from Woods & Poole and Global Insights. Both firms use cohort-component projections, a demographic projection method that focuses on fertility, mortality and net migration to estimate total population by year. The Global Insight model incorporates the predictions of a regional macroeconomic model, thereby incorporating some economically driven assumptions of jobs growth into the process. The North Carolina State Data Center also generates population projections using a time series trends projection process. Table 11 summarizes five different projections of population to 2030 from four different sources:

1. MRM 2009 Projections (developed between 2004 and 2009)
2. Global Insights Projections (developed in 2009)
3. Woods & Poole Projections (developed in 2009)
4. NC State Data Center Projections (developed in 2009)
5. NC State Data Center Projections (developed May 2011).

As all of the projections operate from either demographic trend projection or economic modeling projections; they do not incorporate expectations of transportation infrastructure development except to the extent that past infrastructure development has affected past trends. One key to understanding the differences in these projections is to compare the actual change in each five-year increment. The demographically driven approaches used by Woods & Poole and the NC State Data Center produce very similar changes in each five-year increment of their projections, whereas the Global Insights and MPO projections, which are more economically driven models, show significant differences in each five-year increment of changes.

As to the actual projection of future population in Union County, the highest projection is from the NC Data Center in 2009, which projected a 2030 population of 400,683. The NC Data Center's projection

[38] NCDOT & NCDENR, 2001a, p III-16

from 2011, however, predicts a 2030 population of 271,289, the lowest of all the projections. The Global Insights projection from 2009 predicts a 2030 population of 393,407, while Woods & Poole from 2009 predicts a 2030 population of 283,433. The MRM 2009 Projections fall generally in the middle of all these projections, predicting a 2030 population of 337,314 for Union County. Most interesting is how closely the MPO projections predicted the 2010 populations (based on actual 2010 Census counts) of Mecklenburg and Union Counties. In the case of Mecklenburg County, the MPO projection for 2010 population of 931,666 (Table 11) is only 1.3 percent higher than the actual 2010 Census count of 919,628. In the case of Union County, the projected population in 2010 of 200,450 is only 0.4 percent lower than the actual 2010 Census count of 201,292. This compares favorably to other projections completed prior to 2010. The Global Insights projections from 2009 overestimated population in Mecklenburg and Union Counties by four percent and nine percent respectively. The Woods & Poole projection from 2009 underestimated population for Mecklenburg and Union Counties by 0.3 percent and two percent respectively. The NC State Data Center projections from 2009 underestimated Mecklenburg County population by one percent and overestimated Union County population by four percent. Given that these other projections were all completed about one year prior to the horizon year in question (the 2010 Census counts) whereas the MRM Socioeconomic projections were largely completed two years prior (and the underlying work dates back to 2004), the MRM socioeconomic projections for Mecklenburg and Union Counties compare favorably.

Table 11: Comparison of Population Projections

Global Insights (2009)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	806,834			161,765			1,314,553		
2010	956,823	149,989	3.5%	219,690	57,925	6.3%	1,570,976	256,423	3.6%
2015	1,065,308	108,485	2.2%	263,298	43,608	3.7%	1,749,656	178,680	2.2%
2020	1,171,442	106,134	1.9%	303,978	40,680	2.9%	1,920,865	171,209	1.9%
2025	1,275,768	104,326	1.7%	349,186	45,208	2.8%	2,097,412	176,547	1.8%
2030	1,382,406	106,638	1.6%	393,407	44,221	2.4%	2,280,808	183,396	1.7%
Woods & Poole (2009)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	802,400			160,876			1,307,329		
2010	916,747	114,347	2.7%	197,554	36,678	4.2%	1,497,063	189,734	2.8%
2015	1,000,055	83,308	1.8%	218,988	21,434	2.1%	1,630,535	133,472	1.7%
2020	1,084,264	84,209	1.6%	240,490	21,502	1.9%	1,765,570	135,035	1.6%
2025	1,168,900	84,636	1.5%	261,995	21,505	1.7%	1,901,371	135,801	1.5%
2030	1,253,544	84,644	1.4%	283,433	21,438	1.6%	2,037,236	135,865	1.4%
MRM 2009 Projections									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	837,862			168,728			1,369,445		
2010	931,666	93,804	2.15%	200,450	31,722	3.51%	1,544,779	175,334	2.44%
2015	1,025,004	93,338	1.93%	231,986	31,536	2.97%	1,719,218	174,439	2.16%
2020	1,111,254	86,250	1.63%	266,612	34,626	2.82%	1,891,996	172,778	1.93%
2025	1,196,999	85,745	1.50%	301,053	34,441	2.46%	2,063,849	171,853	1.75%
2030	1,271,300	74,301	1.21%	337,314	36,261	2.30%	2,221,345	157,496	1.48%
NC State Data Center (2009)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	796,529			159,726			1,298,879		
2010	911,252	114,723	2.7%	210,069	50,343	5.6%	1,518,920	220,041	3.2%
2015	996,414	85,162	1.8%	257,378	47,309	4.2%	1,706,871	187,951	2.4%
2020	1,081,577	85,163	1.7%	304,688	47,310	3.4%	1,894,854	187,983	2.1%
2025	1,166,740	85,163	1.5%	351,996	47,308	2.9%	2,082,842	187,988	1.9%
2030	1,253,198	86,458	1.4%	400,683	48,687	2.6%	2,274,700	191,858	1.8%

NC State Data Center (2011)									
	Mecklenburg	Change	Annualized % Change	Union	Change	Annualized % Change	Region*	Change	Annualized % Change
2005	802,998			160,260			1,305,092		
2010	923,144	120,146	2.8%	202,200	41,940	4.8%	1,510,094	205,002	3.0%
2015	1,009,658	86,514	1.8%	219,522	17,322	1.7%	1,634,793	124,699	1.6%
2020	1,095,857	86,199	1.7%	236,778	17,256	1.5%	1,758,306	123,513	1.5%
2025	1,182,056	86,199	1.5%	254,034	17,256	1.4%	1,881,818	123,512	1.4%
2030	1,268,257	86,201	1.4%	271,289	17,255	1.3%	2,005,336	123,518	1.3%

* The Regional projections here are for a four county region of Cabarrus, Gaston, Mecklenburg and Union Counties. This is due to data limitations from the various sources.

4.5 How Accurate are the MPO Projections?

Projecting socioeconomic conditions, and any projection of the future, is an uncertain process fraught with the potential for error. Available evidence on socioeconomic projection indicates that "forecast errors are generally larger for small places [such as an individual TAZ] than for large places; are generally larger for places that have very high [such as Union County] or negative growth rates than they are for places that have moderate, positive growth rates; generally increase with the length of the projection horizon; and vary from one launch year to another."[39] Errors for long-range socioeconomic projection can also be quite high, especially for smaller geographies. For county level projections of 25 years, the typical mean algebraic percentage errors are about 30 percent while for census tracts (which are typically larger than TAZs) errors are typically 45 percent for the same period.[40] Thus, despite the best efforts of researchers and forecasters, the error rates for long-range projections are still quite high and thus any projection or estimate of induced and cumulative effects must be considered the best estimate within a wide range of error. The accuracy of projected growth under any future scenario could be affected by many variables. These include individual owner or developer actions, the timing of or changes in utility provision, changes in local or state regulations on land use and, most importantly, changes in national or regional economic conditions. While the potential for error is high, the techniques used by the MPO are the best available and provide the best available data for projecting population and employment conditions in the future.

4.6 Conclusions

What Influence Did the Monroe Connector/Bypass Have on the MPO Projections?

As discussed above, an assessment of the MRM socioeconomic projections reveals the following regarding the influence of the Monroe Connector/Bypass on the projections:

- The proposed project did not affect the Travel Time to Core Employment factor in the LUSAM process as this factor had zero weight for all districts for all LUSAM runs.

[39] Smith, Stanely K., Tayman, Jeff, Swanson, David A. *State and Local Population Projections: Methodology and Analysis.* Kluwere Academic/Plenum Publishers, New York, 2001. p 292
[40] Smith, Tayman, Swanson, p 340

- The proposed project did not affect the Planners' Judgment factor in the LUSAM process as this factor had zero weight for all districts in Union County for all LUSAM runs.
- The proposed project was included in the Travel Time to Employment factor used by Paul Smith in developing the 2005 Projections, but a reassessment of that factor without the proposed project shows that the project had no influence on the projection results.
- The proposed project did not affect Dr. Hammer's projections of households and employment that were used in the 2005 Projections for county level control totals and were used in the 2008 Interim and 2009 Projections for developing the district level targets.
- There is no evidence or indication that any other factor in the LUSAM process or the other projection processes was influenced by the proposed project and communications with CDOT staff indicate that the proposed project was not a consideration in development of the projections.
- A review of the results of the projections shows no signs that the proposed project influenced the projections.

Based on this review, the overall evidence suggests that the MRM socioeconomic projections are insensitive to the presence or absence of the proposed project in the land use models used to develop the projections. The methodology used by CDOT and MUMPO to develop the projections is effectively insensitive to the Monroe Bypass/Connector and other large transportation projects. In the methodology used by Dr. Hammer, specific adjustment had to be made to account for the expected growth-induced by large roadway projects in the Top-Down process. As the sensitivity analysis of Paul Smith's Travel Time to Employment Factor showed, the proposed project made no difference in the Bottom-Up allocation process. Thus, the methodology used does not incorporate the full accessibility impacts of major roadway projects. Consequently, if the ICE analysis were to follow the exact same methodology as the MRM socioeconomic projections to calculate induced growth impacts of the Monroe Connector/Bypass, then the result would be to find no induced growth. However, the qualitative ICE analysis and all other studies point to localized land use impacts occurring with the Build Alternative, particularly in eastern Union County. Therefore, it would be inappropriate to use the MPO socioeconomic projection and allocation methods to attempt to estimate induced growth or induced land use changes associated with the Monroe Bypass/Connector. As described in Section 5, the study team has chosen other methodologies to estimate induced growth and induced land use changes associated with the proposed project.

How Did the Quantitative ICE Use the MPO Projections?

Based on the above review of the assumptions and variables used in the Top-Down and Bottom-Up processes, the inputs and variables used in the LUSAM models, a review of the actual results of the various projection versions, and a re-evaluation of the 2005 Projections without the project, we concluded that the MUMPO models did not incorporate the induced land use effects of the Monroe Connector/Bypass. Furthermore, in comparison to other projections for Union County, the MPO projections appear to be reasonable and in the middle of the range of available projections. Since the MPO projections are also the only source that provides growth projections at a small geographic scale, which is critical to a Quantitative ICE analysis, the MPO projections appear to be the best resource to developing a starting point for future land use conditions in the study area.

A review of the actual distribution of growth in the projections indicates that there is no pattern of development along the proposed project corridor that would suggest that the proposed project was considered in the projection development. Furthermore, a review of how other entities have used the MRM Projections for Traffic and Revenue analyses shows that minor adjustments were made to the MRM socioeconomic projections to account for the presence of the Monroe Connector/Bypass. These adjustments generally consisted of increases in household and employment in eastern portions of the study area. These conclusions suggest that additional analysis is needed to estimate the induced land use effects of the project. As described in Section 4, this Quantitative ICE analysis used the MPO projections as control totals, along with various other information, to develop a scenario without the project or its growth inducing impacts (i.e., the No-Build Scenario). The study team then estimated the induced growth potential of the project and added that estimated induced growth to the No-Build land use scenario to create a new scenario that represents future conditions with the project and its growth inducing impacts (i.e. the Build Scenario).

5.0 INDUCED GROWTH ASSESSMENT AND FUTURE LAND USE SCENARIOS

To assess the induced growth potential of the proposed project and compare, quantitatively, the land use conditions with and without the proposed project, two land use scenarios were developed. The Build Scenario would represent the best estimate of land development conditions with the proposed project and its growth inducing impacts. The No-Build Scenario would represent the best estimate of land use conditions without the proposed project or its growth inducing impacts. As noted above, a reference point for the future growth of the study area was needed from which to base the two scenarios and that reference point was the MPO socioeconomic projections. The sections below describe specifically how each scenario was created and how the projections were used in the development of those scenarios.

5.1 How Did the ICE Analysis Project Land Use without the Proposed Project?

To estimate the land use conditions in 2030 without the proposed project or its growth-inducing impacts, the study team used three main inputs:

- Stream buffer regulations
- Land use plans or zoning ordinances (as appropriate per the research phase)
- MPO socioeconomic projections of growth.

All undeveloped parcels were isolated from the process to develop the Existing Land Use Scenario and these parcels were considered available for development unless specifically excluded by regulations. These parcels were then compared to the areas designated for stream buffers and the zoning and land use plans for the various communities to determine the potential use and density for each parcel. Then, based on the growth estimates in the TAZ level projection, the total amount of development was estimated for 2030. The specific steps and methods are detailed below.

Lands Excluded from Development

Prior to allocating growth, stream buffers were excluded from the subset of developable parcels because development within these areas is prohibited by local and/or state regulations. Buffers were developed based on the Post Construction Ordinance regulations and NCDENR's *Site Specific Water Quality Management Plan for the Goose Creek Watershed* (NCDENR, 2009). These regulations vary somewhat between jurisdictions but generally require the following buffers: 30 feet on streams draining areas less than 50 acres; 35 feet on streams draining more than 50 acres and less than 300 acres; 50 feet on streams draining areas more than 300 acres less than 640 acres; and 100 feet plus the floodplain on streams draining more than 640 acres. Special rules apply in the Goose Creek watershed where undisturbed riparian buffers within 200 feet of waterbodies within the 100-year floodplain and within 100 feet of waterbodies that are not within the 100-year floodplain are now required.[41] Buffers were developed on all streams in the National Hydrographic Dataset available for the area.[42] While it is possible to obtain an exemption to these restrictions, it is assumed that mitigation requirements would offset any impacts.

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[41] North Carolina Department of Environment and Natural Resources (NCDENR). 2009. Site Specific Water Quality Management Plan for the Goose Creek Watershed.

[42] U.S. Geological Survey Water Resources Division and U.S. Department of Agricultural Natural Resources Conservation Service (USGS & USDA). 1999. National Hydrography Dataset, Watershed Boundaries Dataset.

Residential Development Allocation

Once the total land available for development was determined, the next step was to estimate the level of development needed to accommodate future household growth. The study team used the projected household growth from the MPO 2009 Projections. For each TAZ, the total undeveloped (vacant or agricultural) area was determined based on the parcel categorization completed for the Existing Land Use Scenario (see Section 2.1). For the future scenario, each undeveloped parcel was re-categorized into one of the five development categories (low density residential, medium density residential, high density residential, commercial, or industrial/office/institutional) based on the future land use plans and zoning of the local jurisdictions. For residential properties, the land use categories equated to the following densities:

- Low Density Residential – two dwelling units (DU) per acre or fewer
- Medium Density Residential – greater than two DU per acre but fewer than five
- High Density Residential – five or more DU per acre.

Household growth by TAZ based on the MUMPO's projections is depicted in Map 12. The allocation for residential growth followed a four-step process, as detailed below.

Step 1 - Identification of TAZ Build-Out Capacity: The total acreage of currently undeveloped land that is zoned or planned for future residential development based on local land use plans was calculated for each TAZ to determine the total build-out capacity of that TAZ. Based on local future land use plans, each parcel was assigned a residential land use category, and the total number of possible dwelling units was determined.

Step 2: - Identification of Projections by TAZ: The build-out capacity values calculated in Step 1 were then compared to the household growth in the MUMPO TAZ projections.

Step 3 - Density Adjustments for Over-Capacity TAZs: Where projected growth based on MUMPO's TAZ projection exceeded capacity (determined in Step 1 above), spot checking was done to determine where infill development could be expected to increase density, and parcels were reclassified to a higher residential density appropriately to allow the projected growth to "fit" within the TAZ area.

Step 4 - Distribution of Growth for Under-Capacity TAZs: Where projected growth was equal to or less than capacity, a "percentage of capacity factor" was calculated by dividing the projected growth by the capacity. This factor was used to determine the reduction of the potential build-out area necessary to represent the projected level of growth.

Rather than selecting some parcels to build-out and others to remain undeveloped, the methodology spreads the growth across a proportionate amount of every potential parcel. This provides a more fragmented land use projection than that which might actually occur; therefore, it is a conservative estimate (i.e., overestimate), in terms of coverage, of the areas that may have future development. Given that TAZ boundaries are smaller than watershed boundaries, distributing growth to control totals within the TAZs does not appear to potentially skew the indirect or cumulative effects results for watersheds.

It should be noted that only a portion of each developable parcel was converted to development for the future land use scenario, as described below, so that the total acres of development in each TAZ was maintained according to the projections. For example, if a TAZ had 1,000 acres of currently undeveloped parcels categorized for low density residential growth in the future (two DU per acre), the TAZ would have capacity for 2,000 households. If the TAZ was expected, based on the MPO projections, to add

1,000 households in the future, the TAZ would be filling only 50 percent of its capacity. Thus, a 50 percent reduction factor would be applied to all currently undeveloped parcels in that TAZ categorized for future low density residential development. Therefore, each of those parcels in that TAZ would be reduced in size by 50 percent to reflect the expectation that growth under the 2030 No-Build scenario will only fill 50 percent of the total capacity of low density residential development in that TAZ, and the remaining 50 percent was classified as undeveloped. These undeveloped areas retained the previously assigned NCGAP land cover category (as listed in Section 2.1).

Non-Residential Development Allocation

A similar process was completed for future non-residential development. All currently undeveloped parcels with non-residential zoning or future land use designations were summarized at the TAZ level to calculate the difference between projected growth and capacity.

The MPO TAZ projections include projections for the number of new employees by economic sector for each TAZ. Those sectors were aggregated into Office, Retail or Industrial/Warehouse/Distribution employment growth. Total employment growth by TAZ is depicted in Map 13. Projected new employees were used to calculate new acres of employment-related development using the Social Cost of Alternative Land Development Scenarios (SCALDS) model values provided in the NCDOT's ICE Guidance for assessing future land use (NCDOT & NCDENR, 2001b, p. A-14). These model values are presented in Table 12.

Table 12: Non-Residential Land Use by Employment

Employment Type	Employees/Acre
Office	52.32
Retail	21.78
Industrial/Warehousing/ Distribution	16.33

As with the residential land use analysis, the resulting values from the conversion of employees to acres of land developed were compared to the total capacity for each land use in each TAZ. Reduction factors were calculated in similar fashion to the residential process. These reduction factors were then applied to the non-residential parcels. As with residential development, the growth was spread across a portion of all developable parcels rather than selecting which parcels would develop and which would not within each TAZ.

Once both residential and non-residential development had been accounted for in the parcel and TAZ analysis, the "reduced" parcels categorized by land use were converted to 30x30-meter raster and overlaid on the existing land cover raster to create a new 2030 No-Build scenario raster image.

5.2 How Was Project-Induced Growth Estimated?

As National Cooperative Highway Research Program (NCHRP) Report 423A notes:

> *When a transportation project or policy makes it easier to access certain locations, these places can become attractive to more or different types of development. However, improving accessibility does not guarantee that land use changes will follow. The type, amount, and timing of land use changes will also depend upon the state of the regional economy, the current levels of accessibility, the types of development permitted by land*

> *use regulations, the availability of services such as sewer and water, the desirability of the area for development, and other factors.*[43]

This statement suggests that induced growth impacts of major road projects will be dependent upon five major factors:

- The state of the regional economy
- Current levels of accessibility
- The types of development permitted by land use regulation
- The availability of sewer and water
- The desirability of an area for development.

Thus, in some cases, induced growth impacts of specific projects may be negligible. The Monroe Connector/Bypass would certainly improve travel times to eastern Union County; however, most of the county is already highly accessible with a well-connected roadway network and no major barriers limiting access from Union County to the major employment centers in Mecklenburg County. Various studies have shown that accessibility improvements of highway projects have had diminishing impacts on land values since the 1950s. This is logical—as the national and regional highway systems have been more fully built out, the addition of any single additional link in the network provides a diminishing return to the overall accessibility of any given area. Boarnet and Haughwout note that:

> *As more highways are built, and the metropolitan highway network matures, the incremental effect on accessibility from new or improved highways decreases, thus accounting for a smaller change in land prices due to any access premium.*
>
> *New evidence suggests that metropolitan highway projects still influence land use in the way that theory predicts. The important difference between the new evidence and earlier studies is that the geographic scale of the land use effect appears to be somewhat smaller. A new highway or improvement might importantly reduce travel times in the immediate vicinity of a project, even if the resulting changes in metropolitan-wide transportation accessibility are small. Hence the land use effects of modern highway projects likely operate over a very fine geographic scale, rather close to the project.*[44]

Therefore, other factors that might affect land use change, such as utility availability and planned and zoned land uses were also analyzed to estimate the potential induced impacts of the project. The methods used to estimate the induced growth potential of the proposed project can be summarized as a combination of the following analytical techniques:

- a scenario writing approach to identify areas most likely to see induced growth based on planning information and interviews
- a build-out analysis to see which areas had the most capacity for induced growth

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[43] NCHRP Report 423A. *Land Use Impacts of Transportation: A Guidebook.* Washington DC: National Academy Press, 1999.

[44] Boarnet, Marlon G. and Haughwout, Andrew F. *Do Highways Matter? Evidence and Policy Implications of Highways' Influence on Metropolitan* Development. The University of California Transportation Center, Berkley, CA. August 2000. http://escholarship.org/uc/item/5rn9w6bz. p. 9

- an accessibility analysis to see which areas would most benefit from the proposed project and thus most likely to see induced growth
- a Hartgen Analysis to estimate potential commercial growth at interchange areas.

This combination of approaches was deemed most appropriate as the local land use regulatory restrictions varied dramatically across the FLUSA and a more direct gravity model approach would likely overstate growth in some areas and understate it in others by missing the regulatory restrictions. The accessibility analysis did not consider that the cost of a toll would offset the value of the time saved using the road and therefore that portion of the analysis may actually overstate the potential for induced growth.

Build Land Use Scenario

This Quantitative ICE examines potential effects of the alternative DSA D, which was the Recommended, Preferred Alternative (RPA) for the Monroe Connector/Bypass in the Final Environmental Impact Statement (FEIS). NCTA found no reason to change the conclusions previously reached by NCTA and its agency partners as to the RPA when evaluating changes in the study area since the publication of the ROD and therefore this ICE report analyzes only the RPA in the Build Land Use Scenario.

Improvements in Accessibility/Travel Time

An analysis of accessibility was completed to determine the areas most likely to see development increases attributable to the Monroe Connector/Bypass. The main areas of employment in the region are in Mecklenburg County; therefore, improving accessibility (as measured by travel time) to I-485 and the major employment centers in Mecklenburg County would be the main reason for changes in development patterns. This assertion is supported by the Qualitative ICE Assessment and the ICE discussion in the Draft EIS. To identify the areas with substantially improved accessibility, an estimate of the improvement in travel time to the US 74/I-485 interchange attributable to the proposed project was calculated for the FLUSA.

Map 14 shows the changes in driving time under the Build scenario compared to the No-Build scenario. This analysis was completed using the Network Analyst extension of ArcGIS and a general roadway network with posted speed limit attributes. The travel time from all intersections within the Study Area to the I-485/US 74 interchange was calculated in both the No-Build and Build scenarios. The scenarios are compared on the basis of traffic operating at posted speed limits. The difference in travel time to each intersection was calculated, and the result was converted to a raster surface using the Inverse Distance Weighted method. The resulting map shows the estimated travel time improvement that the Monroe Connector/Bypass will provide to the study area, given the assumptions noted above. The results are not intended to represent the exact travel time savings that the project would provide to the study area. It is mostly an illustrative tool for determining which areas will see the greatest and least accessibility improvements because of the proposed project. The analysis shows improvement in accessibility, especially east of Monroe and around Wingate due to the proposed project. There are also improvements for some sections of Unionville along NC 200 (Morgan Mill Road). Notably, neither Goose Creek nor Sixmile Creek watersheds see sizeable travel time savings from the proposed project, which would strongly suggest that these watersheds would be highly unlikely to see project-induced growth.

Map 15 shows the changes in driving time for the Goose and Sixmile Creek watersheds in more details. As seen in the map, Sixmile Creek sees little to no travel time benefit from the proposed project. The southern portions of Goose Creek appear to reap some travel time benefits based on this drive time analysis. The southern portions of the watershed show potential improvements in travel time of between

one and three minutes. The methodology used in this analysis may overestimate the benefits to these portions of the study area. The analysis estimated travel time benefits to the I-485/US 74 Interchange since access to I-485 was regularly noted as a key benefit of the proposed project. These portions of the Goose Creek watershed have more direct access to I-485 via Idlewild Road, Lawyers Road and NC 218 and drivers originating from the southern portions of the Goose Creek watershed would likely find shorter travel times to I-485 via these roads than via the proposed project.

Scenario Writing and Build Out Analyses

Other factors considered in the allocation of growth in the project area with the Monroe Connector/Bypass included the availability of water and sewer, and the inclination of local jurisdictions to new development. Availability of sewer service in the future was determined by using Future Public Sewer System coverage from the NC Center for Geographic Analysis. Map 16 shows the estimates of existing and future availability of sewer service in the FLUSA. Existing sewer service is relatively limited north of the proposed project, particularly east of Rocky River Road. In the future, sewer service is expected to be extended into Fairview and northern parts of Unionville, but these areas are relatively far from the proposed project and do not coincide with areas that see travel time savings from the proposed project. East of Morgan Mill Road, sewer service exists around each interchange and in the future sewer service is expected to be expanded especially north and south of Wingate. These areas coincide with areas that would benefit substantially from the travel time savings of the proposed project. These areas would logically be the most likely to see some induced land use changes associated with the proposed project.

The inclination of local jurisdictions toward new development is also critical to the likelihood of induced land use changes and induced growth. Based on the interviews and review of planning documents, the localities in the western portions of the study area, particularly Indian Trail and Stallings, are less interested in fostering significant growth within their jurisdictions. Unionville, while not opposed to new development, is not interested in increasing densities and would prefer to maintain its rural character, though they are planning for a commercial node at the US 601 interchange with the proposed project.

Other jurisdictions, however, are more interested in fostering growth and development associated with the proposed project. Union County, as noted above, has a new land use plan that specifically recommends residential development north of Wingate and east of Monroe that is expected to occur with the proposed project. Additionally, Wingate and Marshville have plans to encourage development around the interchange areas within their jurisdictions. These observations were suggested in the Qualitative ICE Assessment and Draft EIS, and are supported by the GIS analysis and interviews conducted for the quantitative ICE analysis. Based on this improved accessibility, as well as the availability of sewer service, the areas east of Monroe and north of Wingate, in the eastern portions of the Study Area, are most likely to see increased growth as a result of the project.

As for the Sixmile Creek watershed, most of the watershed is already served by sewer and water service it is nearly built out already. Furthermore, the watershed is already well served by I-485, so the addition of a new freeway far from the watershed would be unlikely to spur additional development.

For Goose Creek, about half of the watershed has sewer and water service currently. The remainder of the watershed is expected to get sewer and water service in the future, which would be expected to spur additional development. The town of Fairview, which covers the majority of the undeveloped property in the watershed currently, does not plan to encourage moderate to high density residential development nor does it plan to encourage substantial commercial or industrial development. As the watershed is already

served by a well-connected roadway system that connects it easily to I-485, the addition of a freeway that is largely farther from the watershed than I-485 would be unlikely to spur additional development.

Hartgen Analysis of Interchanges

In addition to the accessibility analysis described above, a "Hartgen analysis" was completed for each interchange area to gauge potential for development, using methods researched by Dr. David Hartgen.[45] A Hartgen analysis reviews the traffic volumes, distance to nearest towns, and access to sewer and water services to gauge the potential for induced development at interchanges in rural areas. The results of that analysis indicated that all interchanges except the Forest Hills School Road interchange have at least moderate potential for commercial development. Thus, the Build scenario analysis indicates that more dense growth would be expected where accessibility will improve and other needed infrastructure will be available in the future. Results of this analysis are shown in Appendix D.

As none of the interchange areas are within the Sixmile Creek or Goose Creek watersheds, the Hartgen Analysis is not applicable to the analysis of project-induced development in those watersheds.

Project-Induced Growth Allocation

The preceding analysis identified the general locations and types of development that the proposed project would induce in a Build Scenario. The amount of additional development was determined based on the availability of land in the vicinity of proposed interchanges, the density allowed by zoning and land use plans for the jurisdictions and the capacity for additional development. Capacity for additional development is limited primarily by the access to sewer services. Thus, those areas around the interchanges that are not expected to receive sewer service in the future were not considered for higher density uses. Most new commercial development was allocated in the immediate vicinity of interchanges or at major crossroads nearby. Additional residential development or increases in residential density were allocated in areas near (within roughly two to three miles) but not immediately adjacent to interchanges. The resulting adjustments in parcel level land use from the 2030 No-Build scenario was then converted to a 30x30 meter raster land cover and overlaid on the 2030 No-Build raster.

Finally, one method often considered in induced growth analysis is the possible reallocation of growth within a study area. As accessibility improves in the eastern parts of Union County, the expanded opportunities for development may result in less development in the western portions of the FLUSA in a Build Scenario, relative to a No-Build Scenario, as new development may prefer less costly land and more growth friendly jurisdictions. Other ICE analyses have sometimes taken a reallocation approach to the issue of induced growth. In this case, the study team has specifically chosen not to reallocate growth, but instead to add the estimated induced growth over and above that growth expected under a No-Build Scenario. With this assumption, the ICE analysis is taking a more conservative approach to assuming higher possible cumulative effects across the entire study area.

Induced land use changes in the area of US 74 at the western terminus of the project were expected to be limited. Under the No-Build Scenario, 84 percent of the land within one mile of the interchange is already developed and many of the remaining undeveloped areas are within or near regulated riparian buffers and would therefore be more difficult to develop. Thus, most of the land in the vicinity of this interchange is already developed or planned for development and there would be little opportunity for additional

[45] NCDOT & NCDENR, 2001a, p. IV-27

development under the Build Scenario. Additionally, the proposed project does not provide substantial time savings to major regional employment centers from this area and would therefore be unlikely to spur development in this area.

At Indian Trail-Fairview Road, approximately 50 acres of additional industrial development was expected with the Build scenario. This is consistent with the Indian Trail's zoning and land use plans for the interchange area to become a major industrial park.

At Unionville-Indian Trail Road, Indian Trail land use plans projected a village center as the focal point of the interchange area. Land use plans called for additional commercial space to take advantage of the interchange and medium density residential using Traditional Neighborhood Design (TND) principles. TND principles include building developments with a range of housing types, a well-connected street system, integrated public spaces and some mix of uses. Land use changes under the Build scenario were a shift from residential to commercial for about 50 acres and increases in residential density affecting about 100 acres.

At Rocky River Road, an addition of approximately 50 acres of commercial land use was expected, with about half being converted from a different use compared to the No-Build, consistent with City of Monroe's Rocky River Land Use Corridor Plans (November 2008) for additional commercial development in this area should the proposed project be built.

At US 601, an additional 100 acres of commercial development, with about half being converted from residential use compared to the No-Build, was expected and was consistent with the City of Monroe zoning and plans for areas near this interchange. About 100 acres of residential land use were expected to increase in density. While this was not consistent with existing zoning for the area, it was projected that additional residential density would follow commercial development in the vicinity of this interchange.

At Morgan Mill Road, additional commercial development of less than 50 acres was expected just south of the interchange, mostly converted from residential compared to the No-Build scenario. In addition, about 50 acres of increased residential density was expected in the Build scenario. Also, less than 50 acres of industrial land use, converted from residential as compared to the No-Build, was expected, which was consistent with existing land use and zoning.

At Austin Chaney Road, additional industrial/office development of about 100 acres, plus additional commercial development of about 50 acres was expected. Most of these additions would replace residential development as compared to the No-Build scenario. Additional or increased residential density of about 150 acres was also expected. These were generally consistent with the *Strategic Plan for Economic Development, Town of Marshville, Town of Wingate* (2008) indicating that this interchange area should be a focal point for non-residential development in eastern Union County. In addition, approximately 1,000 additional acres of Low Density Residential development is expected in the areas north of Wingate and east of Monroe. This is generally consistent with the expected land use changes identified in the updated Union County Comprehensive Plan.

At Forest Hills School Road, only new residential development was expected as the results of Hartgen Analysis indicated poor conditions for commercial development. About 100 acres of additional or higher density residential development was expected around this interchange.

Project-Induced Growth Estimates for Goose and Sixmile Creek

Using the analytical tools above, project-induced growth was estimated for the entire study area and allocated to different parts of the study area. The results of that analysis indicated that there would not be any project-induced growth within the Goose or Sixmile Creek watersheds. These results are due to the fact that these two watersheds are in the western portion of the study area and travel times from those watersheds to major regional employment centers see little to no change from the proposed project. Therefore, there are no project-induced growth estimated to occur within these two watersheds.

Legacy Park Proposal

The resource agencies and others have questioned whether the Quantitative ICE should consider the effects associated with the proposed Legacy Park development in eastern Union County and include them in one or both of the future land use scenarios. The proposed Legacy Park is a potential industrial park and intermodal shipment terminal advocated by the former economic development agency for Union County (Union County Partnership for Progress) and mentioned in several regional reports, including the NCDOT Seven Portals Study. The potential development was proposed to be sited north and east of Marshville, along and north of the CSX railroad. Estimates from the Union County Partnership for Progress of the full build-out of the proposed industrial park and rail terminal included up to 5,000 acres of development and up to 20,000 jobs on site.

The Qualitative ICE and the previous Quantitative ICE addressed this development as not being reasonably foreseeable as there were no definite project plans or financing behind the project. Research by the Kenan Institute at the same time as the Quantitative ICE indicated that the proposal did not have any funding commitment and needed to surmount a significant number of hurdles before becoming a reality.[46]

Further research by the study team since the FEIS has reinforced the conclusion that Legacy Park is currently not a reasonably foreseeable development, particularly in the timeframe of the ICE analysis (see interview summaries in Appendix A). There are a few factors that do indicate planning for the project is continuing. For example, the most recent Union County Water and Wastewater Master Plan (2011) does include provisions for ensuring sufficient capacity to provide service if Legacy Park is built, but the plan includes no actions items or financing recommendations for providing the specific water or sewer lines to directly serve the site. Three localities (Anson County, Marshville and Wingate) have adopted resolutions supporting the proposal, but these localities do not have jurisdiction over most of the proposed site.

The vast majority of evidence at this time suggests the proposal is highly speculative and unlikely to develop in a foreseeable timeframe, if ever. In an interview with the project's main sponsor, staff from the Union County Partnership for Progress indicated that planning for the project is "dead" and that they felt the project was highly speculative and unlikely to develop. Their most optimistic estimate was that if the Monroe Connector/Bypass were built there might be a 25 percent chance of some industrial development at the proposed site.

In an interview with Richard Black, the Planning Director for Union County, it was noted that the site of the proposed development was marked for rural residential development in the most recent Union County Land Use Plan. The first draft of that plan did include industrial planned land use at the site of the

[46] Appendix C, p 34-35

proposal, but the planned land use was changed as Planning Commissioners and others felt the Legacy Park proposal was too speculative and highly unlikely to occur. Furthermore, the current zoning for most of the site is rural residential. Mr. Black also noted that his impression was that the proposal hinged on the participation of CSX Transportation and, in particular, the development of an intermodal (rail-truck) terminal at the site to spur connected industrial development.

The project team corresponded with CSX staff who noted that the site was topographically well suited to development and situated in a manner that would make it easy to develop rail-served industrial development or an intermodal terminal. They noted that they have previously marketed the site to a number of customers but that none had showed interest. As to the development of an intermodal terminal, CSX staff noted that they did not see the level of market demand necessary to proceed with a feasibility study at this time.

Finally, the project team communicated with Dr. Stephen J. Appold, Assistant Professor at the Kenan Institute at UNC-Chapel Hill. Dr. Appold has been involved with CDOT and the Metrolina Region on new Top-Down projections and has worked on logistics studies for the State Logistics Task Force. Dr. Appold noted that the anchor tenant for Legacy Park has expressed interest but made no commitment. He noted that the location of Legacy Park is distant from the main traffic flows in the region and that even if the Monroe Connector/Bypass were constructed as a non-toll facility, it would not be clear that Legacy Park would develop as a logistics node. Additionally, Dr. Appold noted that while many proposed developments may cite large potential "build out" projections, such projections are often inflated and that many proposals never reach their build out and some may never attract any tenants or users at all.[47]

In August 2013, officials with the Monroe-Union County Economic Development Department indicated they were revamping the Legacy Park proposal to pursue a smaller development in the range of 200-300 acres. NCTA will contact Chris Platé of Monroe-Union County Economic Development to discuss this issue and to assess the level of planning that has occurred.

The totality of information points toward the likelihood that Legacy Park is a highly speculative proposal that is unlikely to see development within the time horizon of the ICE analysis (2030) with or without the Monroe Connector/Bypass. Therefore, no development associated with Legacy Park has been incorporated into any future land use scenarios for this analysis. However, NCDOT and FHWA will continue to monitor the Legacy Park proposal and other proposed development projects throughout the NEPA process.

US 74 Revitalization Study

Beginning in 2011, Union County, and the Towns of Stallings, Indian Trail and Monroe worked together to begin development of the US 74 Revitalization Study. The study completed a draft plan in 2013 and those draft recommendations are currently under review and consideration. The study team reviewed the draft US 74 Revitalization Study and its recommendations for their potential impact to future land use scenarios. Since the study is still draft and has not been adopted and since the land use and other recommendations would result in minimal changes to the land use scenario results, the study team determined it was not reasonably foreseeable to incorporate the draft plan recommendations into any future land use scenario.

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[47] Letter from Dr. Stephen J. Appold to Jamal Alavi, NCDOT, May 29, 2013, p 3-4.

6.0 UPDATED LAND USE RESULTS

6.1 What Are the Land Use Results for the Entire Study Area?

The following section outlines the updated results from the three updated scenarios, the 2010 Existing (Baseline), the 2030 No-Build, and the 2030 Build scenario.

Table 13: Updated Land Use Scenario Results

	Updated Baseline (2010)		Updated 2030 No-Build			Updated 2030 Build		
Land Use	**Total Area (acres)**	**% of Total Area**	**Total Area (acres)**	**% of Total Area**	**Change in % from Baseline**	**Total Area (acres)**	**% of Total Area**	**Change in % from No-Build**
Total Residential	71,500	35%	97,900	48%	13%	99,700	49%	1%
Low Density	*55,600*	*28%*	*79,500*	*40%*	*12%*	*80,600*	*40%*	*0%*
Medium Density	*12,900*	*6%*	*14,900*	*7%*	*1%*	*15,600*	*8%*	*1%*
High Density	*3,100*	*2%*	*3,500*	*2%*	*0%*	*3,500*	*2%*	*0%*
Commercial	3,900	2%	5,600	3%	1%	5,900	3%	0%
Industrial/Office/Institutional	7,100	4%	8,700	4%	1%	8,800	4%	0%
Transportation	12,700	6%	12,800	6%	0%	13,900	7%	1%
Total Developed	**95,200**	**47%**	**125,000**	**62%**	15%	**128,200**	**63%**	**2%**
Total Agricultural	**52,900**	**26%**	**37,500**	**19%**	-8%	**35,500**	**18%**	**-1%**
Total Forested	**51,900**	**26%**	**37,700**	**19%**	-7%	**36,500**	**18%**	**-1%**
Total Other	**1,900**	**1%**	**1,800**	**1%**	0%	1,800	1%	**0%**
TOTAL	**202,000**	**100%**	**202,000**	**100%**	0%	**202,000**	**100%**	**0%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

6.2 What are the Land Use Results for Goose and Sixmile Creek Watersheds?

The results of all three scenarios for the Sixmile Creek watershed are shown in Table 14.

Table 14: Updated Land Use Scenario Results, Sixmile Creek Watershed

Land Use	Updated Baseline (2010)		Updated 2030 No-Build			Updated 2030 Build		
	Total Area (acres)	% of Total Area	Total Area (acres)	% of Total Area	Change in % from Baseline	Total Area (acres)	% of Total Area	Change in % from No-Build
Total Residential	900	52%	1,100	69%	17%	1,100	69%	0%
Low Density	*200*	*13%*	*300*	*16%*	*3%*	*300*	*16%*	*0%*
Medium Density	*600*	*37%*	*700*	*44%*	*8%*	*700*	*44%*	*0%*
High Density	*0*	*3%*	*100*	*9%*	*6%*	*100*	*9%*	*0%*
Commercial	0	0%	0	1%	1%	0	1%	0%
Industrial/Office/Institutional	0	2%	0	2%	0%	0	2%	0%
Transportation	200	12%	200	12%	0%	200	12%	0%
Total Developed	**1,100**	**66%**	**1,400**	**83%**	**17%**	**1,400**	**83%**	**0%**
Total Agricultural	**100**	**7%**	**100**	**4%**	**-3%**	**100**	**4%**	**0%**
Total Forested	**400**	**27%**	**200**	**13%**	**-14%**	**200**	**13%**	**0%**
Total Other	**0**	**0%**	**0**	**0%**	**0%**	**0**	**0%**	**0%**
TOTAL	**1,600**	**100%**	**1,600**	**100%**	**0%**	**1,600**	**100%**	**0%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

The results of all three scenarios for the Goose Creek watershed are shown in Table 15. The Update 2010 Baseline Land Use is illustrated in Map 3. Map 17 illustrates the No-Build Scenario land use conditions and Map 18 shows the raw land use changes in the Goose and Sixmile Creek watersheds and surrounding areas.

Map 19 shows the Build Scenario land use conditions and Map 20 shows the raw land use change in the Goose and Sixmile Creek watersheds and surrounding areas. These results are analyzed in the indirect and cumulative impacts review below.

Table 15: Updated Land Use Scenario Results, Goose Creek Watershed

Land Use	Updated Baseline (2010)		Updated 2030 No-Build			Updated 2030 Build		
	Total Area (acres)	% of Total Area	Total Area (acres)	% of Total Area	Change in % from Baseline	Total Area (acres)	% of Total Area	Change in % from No-Build
Total Residential	10,600	39%	13,900	51%	12%	13,900	51%	0%
Low Density	*10,400*	*39%*	*13,100*	*48%*	*10%*	*13,100*	*48%*	*0%*
Medium Density	*100*	*1%*	*800*	*3%*	*2%*	*800*	*3%*	*0%*
High Density	*0*	*0%*	*0*	*0%*	*0%*	*0*	*0%*	*0%*
Commercial	0	0%	600	2%	2%	600	2%	0%
Industrial/Office/Institutional	100	0%	100	1%	0%	100	1%	0%
Transportation	1,400	5%	1,400	5%	0%	1,400	5%	0%
Total Developed	**12,100**	**45%**	**16,100**	**59%**	**15%**	**16,100**	**59%**	**0%**
Total Agricultural	**5,800**	**21%**	**4,400**	**16%**	**-5%**	**4,400**	**16%**	**0%**
Total Forested	**9,100**	**34%**	**6,500**	**24%**	**-9%**	**6,500**	**24%**	**0%**
Total Other	**100**	**0%**	**100**	**0%**	**0%**	**100**	**0%**	**0%**
TOTAL	**27,000**	**100%**	**27,000**	**100%**	**0%**	**27,000**	**100%**	**0%**

Notes: Results have been rounded to the nearest 100 acres and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

6.3 What Are the Indirect Land Use Impacts for Goose and Sixmile Creek Watersheds?

Table 14 shows the indirect land use differences between the Updated No-Build and Updated Build scenarios for Sixmile Creek watershed. Table 15 shows the indirect land use differences between the Updated No-Build and Updated Build scenarios for Goose Creek watershed. The Build Scenario has no measurable difference in effect on the amount of developed land in the Goose Creek or Sixmile Creek watersheds, which are known to support the endangered Carolina heelsplitter. The comparisons between the 2030 No-Build and Build finds no difference for Goose Creek and Sixmile Creek for any land use.

6.4 How Was Impervious Surface Estimated?

In order to determine the amount of impervious surface in the FLUSA and by watershed under all the land use scenarios, each land use category was assigned an assumed level of impervious surface. This step of the analysis followed guidance in the Soil Conservation Service (SCS) TR-55 Manual. The SCS TR-55 Manual is widely used for drainage studies and runoff calculations. Land use categories with their associated percentage of impervious coverage applied in this quantitative ICE analysis are presented in Table 16.

Table 16: Percent Impervious Surface for Each Land Use Category

Land Use Category	% Impervious using SCS TR-55 Manual
Commercial	85%
Industrial/Office/Institutional	70%
High Density Residential	38%
Medium Density Residential	25%
Low Density Residential	20%
Transportation	100%
Agricultural and Natural	0%

Source: SCS, 1986

These percentages were applied to the land use acreages, and results are summarized here. The 2010 Quantitative ICE analyses included a Water Quality Analysis based on the results of the 2010 Quantitative ICE for Land Use. To determine the need for additional water quality modeling, the results of the impervious surface analysis from the 2013 Quantitative ICE are compared to the results from the 2010 Quantitative ICE to determine if the changes are substantial enough to necessitate rerunning the water quality modeling. Table 17 shows the changes in impervious surface between the original 2007 Baseline (from the 2010 report) and the updated 2010 Baseline results (from the 2013 report). The updated Existing 2010 Land Use shows that Goose and Sixmile Creek watersheds have seen little to no change in impervious surface percentage since 2007.

Table 17: Updated 2010 Baseline Imperviousness Compared to Previous 2007 Baseline Imperviousness

Watershed Name	Original Impervious Cover	Updated Impervious Cover	Difference in Percentages
Sixmile Creek	25%	26%	1%↑
Goose Creek	13%	13%	No Change

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Table 18 shows the changes in impervious surface between the original No-Build (from the 2010 report) and the updated No-Build results (from the 2013 report). Sixmile Creek and Goose Creek show an increase of one full percentage point. These shifts are due to factors noted in Section 1.7, such as the changes in expected development at the Lawyers Road interchange with I-485. Overall, the updated results are similar to the previous results.

Table 18: Updated 2030 No-Build Imperviousness Compared to Previous No-Build Imperviousness

Watershed Name	Original Impervious Cover	Updated Impervious Cover	Difference in Percentages
Sixmile Creek	30%	31%	1%↑
Goose Creek	17%	18%	1%↑

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

Table 19 shows the changes in impervious surface between the original Build (from the 2010 report) and the Updated Build results (from the 2013 report). Both Sixmile Creek and Goose Creek show an increase of one percent over the previous results. Therefore, the results are similar to the previous results. This suggests that additional water quality modeling would find the same results as the prior water quality modeling, given the standard errors associated with both land use projections and water quality modeling. The indirect and cumulative effects of these impervious surface results are discussed further in Section 6.6.

Table 19: Updated 2030 Build Imperviousness Compared to Previous 2030 Build Imperviousness

Watershed Name	Original Impervious Cover	Updated Impervious Cover	Difference in Percentages
Sixmile Creek	30%	31%	1%↑
Goose Creek	17%	18%	1%↑

Notes: Results have been rounded to the nearest whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

6.5 What Are the Indirect Impervious Surface and Cumulative Water Quality Impacts?

Indirect Impervious Surface Impacts

Impervious surface was calculated as described above. The changes in impervious surface from Baseline to No-Build and No-Build to Build in the updated analysis are show in Table 20. In all cases, the total impervious area was calculated from the raw land use results and then rounded to the nearest percent.

Table 20: Percent Impervious Surface by Watershed and Alternative

Watershed Name	2010 Baseline Impervious Cover	2030 No-Build Impervious Cover	Change from Baseline to 2030 No-Build[1]	2030 Build Impervious Cover	Change from 2030 No-Build to 2030 Build[1]
Sixmile Creek	26%	31%	5%	31%	No Change
Goose Creek	13%	18%	5%	18%	No Change

[1] Changes were calculated prior to rounding and therefore do not match exactly the difference shown in the table results.

Table 21: Percent Impervious Cover Results from 2010 Report Compared to 2013 Report

Watershed Name	Impervious Cover Results from 2010 Report				Impervious Cover Results from 2013 Report				Difference in Change in Build from No-Build between 2010 Report and 2013 Report
	2007 Baseline	2030 No-Build	2030 Build	Change in Build from No-Build	2010 Baseline Updated	2030 No-Build Updated	2030 Build Updated	Change in Build from No-Build	
Sixmile Creek	25%	30%	30%	0%	26%	31%	31%	0%	0%
Goose Creek	13%	17%	17%	0%	13%	18%	18%	0%	0%

Notes: Results have been rounded to the nearest one whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

As shown in Table 21, the change in percent impervious surface has no change from 2030 No-Build to 2030 Build. In addition, the percent impervious cover results from the 2010 Report to the 2013 Report also shows no change.

Cumulative Water Quality Impacts

Sixmile Creek and Goose Creek watersheds include three streams that are impaired in some capacity according to water quality ratings established by the NCDENR, Division of Water Quality (DWQ). These watersheds and their impaired waters are documented in Table 22. The impervious surface level for these watersheds is not expected to change from the Build to the No-Build condition. Given that there is no difference in induced impact, no induced water quality impacts are expected in these watersheds.

Table 22: 2012 Clean Water Act §303(d) Impaired Streams by Watershed

Watershed Name	Impaired Stream or Water Body	Impaired Reasons (Year)
Sixmile Creek	Sixmile Creek (Source to NC/SC Line)	Category 5 Fair Bioclassification (2006)
Goose Creek	Duck Creek (Source to Goose Creek)	Category 4b Fair Bioclassification (2008)
	Goose Creek (Source to SR 1524)	Category 4b Turbidity
	Goose Creek (SR 1524 to Rocky River)	Category 4b Fair Bioclassification (1998)
		Category 4t Fecal Coliform Violation

Source: 2012 NCDENR 2012 North Carolina 303(d) Integrated Report

These results are the same as the results of the original Quantitative ICE. The model calibration completed for the Quantitative ICE Water Quality Analysis (FEIS Appendix I) used the Nash-Sutcliffe coefficient, as recommended by the American Society of Civil Engineers, to estimate how well the hydrological model fit observed stream flows. The analysis at the calibration stage and at the validation stage both returned a 0.78, which indicated a very good fit. Since the land use results have changed very little, and are well within the typical variability of hydrological modeling, then new water quality modeling would be highly unlikely to show any differences from the prior results.

6.6 What are the Indirect and Cumulative Impacts to Plant Species?

Michaux's sumac, Schweinitz's sunflower, and the smooth coneflower are federally listed as endangered plant species. The sumac and sunflower are listed for both Mecklenburg and Union counties, but the coneflower is listed only for Mecklenburg County.[48] There are known populations of Schweinitz's sunflower in the FLUSA, and populations of the species have been found in the vicinity of the proposed alignment for the Monroe Connector/Bypass. An evaluation of potential indirect and cumulative effects to the species is summarized below.

Michaux's sumac grows in sandy or rocky open woods on sandy or sandy loam soils with low cation-exchange capacities and appears to depend upon some form of disturbance to maintain the open quality of

[48] NC Natural Heritage Program. "Data Services." Updated January 9, 2009.

its habitat.[49][50] Most extant populations can be found on open disturbed areas, such as railroad, road, and utility rights-of-way that are periodically maintained and/or managed for the species. The only known occurrence of Michaux's sumac in the FLUSA was last observed in 1794 and no populations were found in surveys of suitable habitat in the FLUSA. The survey methodology is discussed in the Biological Assessment. [51] As no populations of the species have been found in the FLUSA, it is not anticipated that the Monroe Connector/Bypass project will have any indirect or cumulative effects on the species.

There are no know populations of smooth coneflower in the FLUSA. Based on the ICE analysis, indirect effects are not anticipated in the Mecklenburg County portion of the FLUSA, therefore no ICEs are anticipated for this species.

Historically, it is believed that Schweinitz's sunflower occupied open prairie and Post Oak-Blackjack Oak Savannas that were maintained by relatively frequent fire.[52] FLUSA-wide, physical investigation of all suitable habitat within forest gaps was beyond the scope of this ICE analysis. In addition, the sunflower is an opportunistic species that can colonize even disturbed areas. Therefore, indirect effects to Schweinitz's sunflower are addressed through examining the conversion of land exhibiting habitat characteristics that would support the species. The NCGAP land cover categories included in the analysis were:

- Agricultural Pasture/Hay and Natural Herbaceous
- Barren (subcategory quarries, strip mines, and gravel pits)
- and Barren (subcategory bare rock and sand).

Utilizing these entire categories as potential habitat is a conservative assessment (overestimates potential impacts), since only the ecotonal edges of these land covers could provide potential habitat for the species. Although this species could eventually inhabit some of the lands converted to developed land use[53], such land use categories were not included in the analysis to present a more conservative estimate of the amount of suitable habitat loss. Table 23 presents the results of this analysis.

Table 23: Total Conversion of Pasture/ Hay Natural Herbaceous and Barren Land Cover to Developed Land

	Baseline (acres)	2030 No-Build (acres)	2030 Build (acres)	Change in 2030 with No-Build (acres)	Change in 2030 with Build (acres)
Acres	33,000	23,000	21,700	-10,000	-11,300
% of Baseline	-	-	-	-30%	-34%

Notes: Results have been rounded to the nearest 100 and whole percent. Differences were calculated prior to rounding. Totals may appear not to equal the sum of the parts because of rounding.

With the 2030 No-Build, there is an estimated 30 percent decrease in land cover types presumed to

[49] USFWS. *Michaux's Sumac Recovery Plan*. 1993. Atlanta, GA: p 30.
[50] Suiter, D. Endangered Species Biologist, USFWS. Raleigh, NC. Personal Communication regarding Draft 5-year status review of Michaux's sumac. Telephone: Feb. 2 and 18, 2010.
[51] The Catena Group for NCTA, *Biological Assessment of Carolina Heelsplitter (Lasmigona decorata) and Designated Critical Habitat, Schweinitz's Sunflower (Helianthus schweinitzii), Michaux's Sumac (Rhus michauxii), and Smooth Coneflower (Echinacea laevigata)*, Monroe Connector/Bypass, May 25, 2010.
[52] USFWS. *Schweinitz's Sunflower Recovery Plan*. 1994. Atlanta, GA: p 28.
[53] For example, utility rights of way, which are periodically maintained could provide habitat for the Schweinitz's sunflower, whereas frequently maintained lawns and landscape areas would not provide suitable habitat.

provide potential suitable habitat for the Schweinitz's sunflower. The incremental effect with the 2030 Build scenario is approximately a four percent decrease in potential suitable habitat (34 percent versus 30 percent). This decrease in habitat combined with changes in land use resulting from reasonably foreseeable infrastructure projects may potentially result in effects to Schweinitz's Sunflower.

The land use analysis indicates a significant increase in development and residential growth throughout the FLUSA regardless of construction of the proposed project. Figure 21 depicts changes in land use projected to occur under the No-Build scenario as compared to the current Baseline condition in relationship to known Sunflower populations. Figure 22 illustrates changes in land use from the No-Build to Build scenarios, such as from Residential to Non-Residential (commercial, industrial, etc.) relative to known populations of the Sunflower. Land use around EO# 31, EO# 78, and EO# 18 is not anticipated to change as a result of the project. Land use near EO# 5 is expected to change generally from Undeveloped and Residential to Non-Residential, but since this population is believed to be extirpated, no indirect impacts are anticipated.

There are also several categories of land use change near EO# 77 and EO# 230. While the specific locations of these EO are not anticipated to incur changes in land use, due to their proximity to areas that are projected to experience induced changes in land use, EO# 230 and EO# 77 could potentially be indirectly affected, as they have an increased risk of degradation due to the projected increase in density of nearby development. However, water and sewer service is currently available throughout this area (Cockerhan 2010, Union County Engineering, pers. comm.); therefore, installation of potential additional infrastructure for these services is not expected. In addition, Union Power does not plan to relocate their utility lines near these populations for the Monroe Connector/Bypass. Power line relocation is not typically necessary in response to residential, commercial, or light industrial / office development. NCDOT Division 10 also recently resurfaced and widened the shoulders of Secrest Shortcut Road and does not foresee a need for further road widening to accommodate future development (Thompson 2010a, pers. comm.). Furthermore, these populations are within NCDOT and Union Power ROW and both agencies have agreed to preserve these populations in place. As such, no indirect effects are anticipated to the known populations.

The Build scenario is anticipated to result of in a maximum loss of four percent of potentially suitable habitat within the FLUSA compared to the No Build. A large portion of the four percent estimate includes fringe ecotones, primarily along the edges of agricultural fields that are generally maintained. Such areas are typically not where Schweinitz's Sunflower is found in the FLUSA; they are typically found within NCDOT ROW and utility easements. As such, the 4 percent loss of habitat is not "high-quality" habitat per se. Further, overall there is, and will continue to be, sufficient suitable habitat in the form of NCDOT ROW and utility easements throughout the FLUSA for Schweinitz's Sunflower to colonize. Therefore, it is not anticipated that the project will have indirect effects on the species.

6.7 Changes in Traffic Patterns

The ICE shows that some limited growth would take place (mostly in the eastern part of the FLUSA) if the Monroe Connector/Bypass is built. For this reason, it was necessary to evaluate how growth caused by the project would influence traffic patterns in the FLUSA.

The evaluation used the Metrolina Regional Model (MRM). The model was used to calculate raw traffic volumes under three scenarios:

- The No-Build Scenario
- A Build Scenario using MUMPO's 2009 projected traffic (original socioeconomic data)
- A Build Scenario that adds the effects of the growth projected in the ICE (additions made to the original socioeconomic data based on results of the ICE analysis).

The details of the evaluation are summarized below. The basic conclusions reached were that the added traffic caused by induced growth in the project area had little effect on the overall function of the area road network (on average, traffic increased by about 1,400 vehicles per day on roads intersecting the proposed Monroe Connector/Bypass (Y-line roads).

The volumes reported are raw model volumes that have not been fully calibrated or adjusted per standard traffic engineering principles. These volumes therefore do not represent a fully calibrated forecast of No-Build and Build traffic conditions, but because they were developed the same way from the same MRM version, the difference between them can help reveal the induced traffic impacts of the project. For the No-Build Scenario, the MRM 11 v1.1 was revised to remove the Monroe Connector/Bypass from the model network and the model was run using the 2009 Projections for the socioeconomic input. As documented in Section 4, the 2009 Projections were used to develop the No-Build scenario and therefore were used in this analysis to represent the No-Build Scenario.

For the Build Scenario, two scenarios were run to compare the differences with and without the estimated growth impacts of the proposed project. In the first scenario, the MRM 11 v1.1 was used with the Monroe Connector/Bypass in the model network and the model was run using the 2009 Projections for the socioeconomic input. For the second Build Scenario the MRM 11 v1.1 was used with the Connector/Bypass in the model network and the model was run using an adjusted version of the 2009 Projections for the socioeconomic input. The land use differences identified in the Build Scenario ICE analysis were reviewed at the TAZ level and, based on the localized density assumptions, estimates of the additional household and employment attributable to the additional development anticipated under a Build Scenario were developed at the TAZ level. These estimates of additional households and employment were then added to the 2009 Projections to create a 2009 ICE Projections version. These adjustments added, on net, approximately 4,900 households and 3,800 employees to TAZs within the FLUSA. The raw model volumes from the MRM are shown in Appendix E. Table 24 shows a comparison of the regional vehicle miles traveled (VMT) and vehicle hours traveled (VHT) under the same three scenarios.

The segment level volumes in Appendix E show that when comparing the two Build scenarios run in the model, the project's induced growth does add to the volume level on the Monroe Connector/Bypass, US 74 and intersecting roadways. The highest percent change is along the Y-Line corridors, where there would be some road segments that would see sizeable percentage increase relative to a Build Scenario without the project-induced growth. Yet, the volume increase for any given road segment is less than

3,500 AADT. On average, each roadway segment only sees an additional 1,400 vehicles per day. Along the US 74 and Monroe Connector/Bypass corridors, the percent increase is much lower, less than five percent in most cases. The eastern end of US 74 sees the greatest percentage increases, but again, most of these segments see relatively modest AADT increases of less than 5,000 vehicles per day. Also of note, is the comparison between the Build (2009 Projections) and the Build (Adjusted Projections) volume along the US 74 corridor. Under both scenarios, volume on the US 74 corridor drops by between 8 and 36 percent, depending on the segment, meaning that under the Build Scenario, with or without project-induced growth, US 74 would see substantially less traffic than under a No-Build Scenario.

With respect to total vehicle miles traveled within Union County, the Build Scenario with project-induced growth shows total VMT three percent higher than the Build Scenario without project-induced growth and eight percent higher than the No-Build Scenario. At the regional level, however, the difference is only one percent relative to the No-Build. For vehicle hours traveled, within Union County, the Build Scenario with project-induced growth is three percent higher than the No-Build and four percent higher than the Build without project-induced growth.

Table 24: County and Regional Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT)

County		Union	Mecklenburg	All Others	Regional Total
No-Build	VMT	9,253,669	44,616,030	51,580,950	105,450,650
	VHT	307,176	1,659,686	1,533,217	
Build (2009 Projections)	VMT	9,612,887	44,747,461	51,525,166	105,885,514
	VHT	302,260	1,664,994	1,529,494	
Build (Adj. Projections)	VMT	9,948,279	44,745,210	51,543,589	106,237,079
	VHT	315,582	1,665,283	1,529,690	
No-Build vs Build (2009 Projections)	% Change VMT	4%	0%	0%	0%
	% Change VHT	-2%	0%	0%	
No-Build vs Build (Adj. Projections)	% Change VMT	8%	0%	0%	1%
	% Change VHT	3%	0%	0%	
Build (2009 Projections) vs Build (Adj. Projections)	% Change VMT	3%	0%	0%	0%
	% Change VHT	4%	0%	0%	

With respect to total vehicle miles traveled within Union County, the Build Scenario with project-induced growth shows total VMT three percent higher than the Build Scenario without project-induced growth and eight percent higher than the No-Build Scenario. At the regional level, however, the difference is only one percent relative to the No-Build. For VHT, within Union County, the Build Scenario with project-induced growth is three percent higher than the No-Build and four percent higher than the Build without project-induced growth.

Overall, these forecasted traffic levels indicate that the induced growth impacts of the proposed project will add to the total volume of traffic in Union County and to the total vehicle miles traveled and vehicle hours traveled. Roads that connect to the Monroe Connector/Bypass will likely see some increases in traffic. Overall, however, the increases in traffic are modest and would not likely create substantial congestion issues within the design year of the project, particularly given that the impacts will be spread across the many miles of transportation facilities throughout Union County. Since most of the additional

development in a Build Scenario is expected in the eastern portions of the study area, the additional volumes mostly fall on roadways east of US 601. Therefore, there are little to no increases in traffic volumes associated with induced development in the Goose Creek and Sixmile Creek watersheds.

US 601 North of Monroe Connector/Bypass

Questions had been raised on how the Monroe Connector/Bypass would affect traffic on US 601 north of the project area. This is of special concern as US 601 passes through portions of the Goose Creek Watershed.

There are plans to widen US-601 south of the Monroe Connector/Bypass. While traffic throughout Union County is projected to increase through the design year of the project, widening of the sections of US 601 north of Ridge Road are not included in the constrained long-range transportation plan for MUMPO. The proposal to widen the section between Ridge Road and Lawyers Road was considered in the 2035 MUMPO Long Range Transportation Plan, but the project is ranked 261 out of 307projects considered and was left unfunded The widening south of the bypass has been incorporated into the ICE analysis. US 601 north of the Monroe Bypass to the Union/Cabarrus Line includes the area that crosses Stewarts Creek, Crooked Creek and Goose Creek watersheds. Since the indirect and cumulative land use results show no increase in development along US 601 north of Stewarts Creek, one would not expect to see any substantial increase in traffic volume along the US 601 corridor north of Stewarts Creek. It is more likely that for the segments of US 601 north of Stewarts Creek, traffic volumes would probably decrease in a Build Scenario relative to a No-Build Scenario due to through trips diverting off of NC 218 and US 601 to the Monroe Connector/Bypass for longer distance travel between counties or across the region.

To evaluate any potential traffic impacts to US 601, raw traffic model data was analyzed under No-Build and Build Scenarios to determine whether the proposed project might affect the likelihood that US 601 might require widening in the future. Map 23 shows a comparison of the traffic volumes on US 601 north of the Ridge Road, with and without the proposed project. In the Build Scenario with the induced development included, traffic volumes are expected to mostly decrease to between 5,300 and 13,000 vehicles per day (VPD). The only segment that increases compared to the No-Build Scenario north of Ridge Road is the segment between Ridge Road and Sykes Mill road, where volumes would increase by approximately 2 percent or 300 VPD. All other segments decrease in volume between 3 to 13 percent (300 to 1,200 VPD). Since the Build Scenario is likely to see a reduction, overall, in volumes north or Ridge Road, the proposed project would be unlikely to increase the need to widen US 601 north of Ridge Road. Furthermore, for a rural two-lane road, the projected traffic volumes are below the Annual Average Daily Traffic (AADT) threshold of 15,000 (+/- 5,000) at which widening might be recommended. Therefore, there is no expectation that the traffic impacts associated with induced development from the Monroe Connector/Bypass would necessitate any improvements to US-601 north of Ridge Road.

Do the Indirect and Cumulative Impacts to Traffic Affect Endangered Species

Based on the analysis above, there are no indications that any increases in traffic associated with the project would cause indirect or cumulative effects to federally listed species. Since traffic increases are expected to be limited to the eastern portions of the study area, away from Goose and Sixmile Creek watersheds, it is unlikely that any increases in traffic would affect the Carolina heelsplitter Critical Habitat. Traffic increases noted above would be unlikely to affect federally listed plant species as there is no clear channel through which those increases would impact the plant species in the study area.

6.8 What Are the Indirect and Cumulative Impacts to the Carolina Heelsplitter

Within the FLUSA, the Carolina heelsplitter is found only in the Goose Creek and Sixmile Creek watersheds. As shown in previous sections of direct and indirect effects, no measureable differences in impervious surface were found between the 2030 No-Build and 2030 Build within the Goose Creek or Sixmile Creek watersheds. Therefore, there are no indirect effects on the species associated with the Monroe Connector/Bypass project. As there are no indirect effects, the project does not contribute an incremental effect that would yield potential cumulative effects. Therefore, there would be no cumulative effect to the Carolina heelsplitter or Critical Habitat Unit 1 associated with project-induced changes to land use or impervious surface because of the proposed project.

6.9 Conclusions

As with any attempt to project future growth or development, there are limitations to the accuracy and certainty of the results of these analyses. Most of these analyses rely on the land use projections developed using recommended methods as described in the NCDOT ICE Guidance[54]. Specifically, the land use projections rely on the socioeconomic projections developed by CDOT, and therefore the results are only as accurate as those projections. Projection of socioeconomic conditions, and any projection of the future, is an uncertain process fraught with the potential for error. Despite the best efforts of researchers and forecasters, the error rates for long-range projections are still quite high and thus any projection or estimate of induced and cumulative effects must be considered the best estimate within a wide range of error. The accuracy of growth projections under any future scenario could be affected by many variables. These include individual owner or developer actions, the timing of or changes in utility provision, changes in local or state regulations on land use and, most importantly, changes in national or regional economic conditions. While the potential for error is high, the techniques used by the MPO are the best available and provide the best available data for trying to project population and employment conditions in the future.

As discussed above, the MRM socioeconomic projections appear to be robust in light of their basis in empirical research and the accuracy of the 2009 Projections in comparison to 2010 Census data, and while the potential for error is still large, these projections are the best resource available to estimate future growth in the study area. The methods used to distribute land use effects are based on reasonable assumptions to produce a valid comparative analysis, but these methods also result in high, conservative estimates of effects.

Carolina Heelsplitter

Direct Impacts

- Updated field surveys within the project area found no new populations, thus there is no change in the anticipated direct effects of the project, which were minimal based on the analysis of the BA.

[54] NCDOT & NCDENR, 2001a

Indirect Impacts

- There are no changes in land use within the Sixmile Creek and Goose Creek watersheds from the No-Build to the Build scenarios, thus there are no indirect land use impacts attributable specifically to the projects.
- Since there are no differences in land use between the No-Build and Build scenarios, there are also no differences in the impervious surface levels between the No-Build and Build scenarios in both watersheds.
- With regard to percent impervious cover as an indicator for water quality effects and effects to aquatic species, findings show no difference in percent impervious cover between the 2030 Build and 2030 No-Build for the two watersheds. Thus there are no changes in the indirect water quality impacts.

Cumulative Impacts

- There are substantial increases in development from the Baseline condition to both the No-Build and Build conditions, but these changes would occur with or without the proposed project. Therefore, there are no indirect impacts from the proposed project in the two watersheds and thus there are no cumulative land use impacts from the proposed projects in the two watersheds.
- There are substantial increases in development from the Baseline condition to both the No-Build and Build conditions leading to substantial increases in impervious surface levels, but these changes would occur with or without the proposed project. Therefore, there are no indirect impacts from the proposed project in the two watersheds and thus there are no cumulative impervious surface impacts from the proposed projects in the two watersheds.
- There are substantial increases in development from the Baseline condition to both the No-Build and Build conditions leading to substantial increases in impervious surface levels and possibly reductions in water quality, but these changes would occur with or without the proposed project. Therefore, there are no indirect impacts from the proposed project in the two watersheds and thus there are no cumulative water quality impacts from the proposed projects in the two watersheds.
- Mecklenburg and Union Counties, and communities in the Goose Creek and Sixmile Creek watershed, have developed regulations to reduce the cumulative effect of development on water quality in these sensitive watersheds. These regulations include the Site Specific Water Quality Management Plan for the Goose Creek Watershed, the Goose Creek Water Quality Recovery Program Plan for the Fecal Coliform TMDL, and Charlotte-Mecklenburg Water Quality Buffer Implementation Guidelines.
- Overall, as the land use and impervious surface results are only slightly different from the results of the original Quantitative ICE, additional water quality modeling is not necessary, as these differences are not large enough to see substantial differences compared to the prior water quality results.

Carolina Heelsplitter Critical Habitat

Direct Impacts

- Since the project footprint has not changed and the Critical Habitat definition has not changed, there are no changes in the anticipated direct effects of the project to Critical Habitat Area 1, which were minimal based on the analysis of the BA.

Indirect Impacts

- There are no changes in land use within the Sixmile Creek and Goose Creek watersheds from the No-Build to the Build scenarios, thus there are no indirect land use impacts attributable specifically to the projects.
- Since there are no differences in land use between the No-Build and Build scenarios, there are also no differences in the impervious surface levels between the No-Build and Build scenarios in both watersheds.
- With regard to percent impervious cover as an indicator for water quality effects and effects to aquatic species, findings show no difference in percent impervious cover between the 2030 Build and 2030 No-Build for the two watersheds. Thus, there are no changes in the indirect water quality impacts.

Cumulative Impacts

- There are substantial increases in development from the Baseline condition to both the No-Build and Build conditions, but these changes would occur with or without the proposed project. Therefore, there are no indirect impacts from the proposed project in the Goose Creek watershed and thus there are no cumulative land use impacts from the proposed projects in the watershed.
- There are substantial increases in development from the Baseline condition to both the No-Build and Build conditions leading to substantial increases in impervious surface levels, but these changes would occur with or without the proposed project. Therefore, there are no indirect impacts from the proposed project in the Goose Creek watershed and thus there are no cumulative impervious surface impacts from the proposed projects in the watershed.
- There are substantial increases in development from the Baseline condition to both the No-Build and Build conditions leading to substantial increases in impervious surface levels and possibly reductions in water quality, but these changes would occur with or without the proposed project. Therefore, there are no indirect impacts from the proposed project in the Goose Creek watershed and thus there are no cumulative water quality impacts from the proposed projects in the watershed.
- Mecklenburg and Union Counties, and communities in the Goose Creek watershed, have developed regulations to reduce the cumulative effect of development on water quality in these sensitive watersheds. These regulations include the Site Specific Water Quality Management Plan for the Goose Creek Watershed, the Goose Creek Water Quality Recovery Program Plan for the Fecal Coliform TMDL, and Charlotte-Mecklenburg Water Quality Buffer Implementation Guidelines.
- Overall, as the land use and impervious surface results are only slightly different from the results of the original Quantitative ICE, additional water quality modeling is not necessary, as these differences are not large enough to see substantial differences compared to the prior water quality results.

Schwinetzer's Sunflower

Direct Impacts

- Updated field surveys within the project area found no new populations, thus there is no change in the anticipated direct effects of the project.

Indirect Impacts

- For the 2030 Build, findings indicate a four percent greater decrease of land exhibiting habitat characteristics that might support the Schweinitz's sunflower as compared to the change predicted for the 2030 No-Build based on results of this study.
- These indirect effects are the same as previously reported in the BA.
- Therefore there are no changes in the previously conclusions regarding indirect impacts to the sunflower.

Cumulative Impacts

- Since the direct and indirect effects are the same as previously reported in the BA, there are no changes in the previously conclusions regarding cumulative impacts to the sunflower.

Michaux's Sumac

Direct Impacts

- Updated field surveys within the project area found no new populations, thus there is no change in the anticipated direct effects of the project.

Indirect Impacts

- Since no populations of this species have been found in the FLUSA, no indirect impacts are expected to occur as a result of the proposed project.

Cumulative Impacts

- Since no populations of this species have been found in the FLUSA, no cumulative impacts are expected to occur as a result of the proposed project.

Smooth Coneflower

Direct Impacts

- Field surveys within the project area found no new populations, thus there is no change in the anticipated direct effects of the project.

Indirect Impacts

- Since no populations of this species have been found in the FLUSA, no indirect impacts are expected to occur as a result of the proposed project.

Cumulative Impacts

- Since no populations of this species have been found in the FLUSA, no cumulative impacts are expected to occur as a result of the proposed project.

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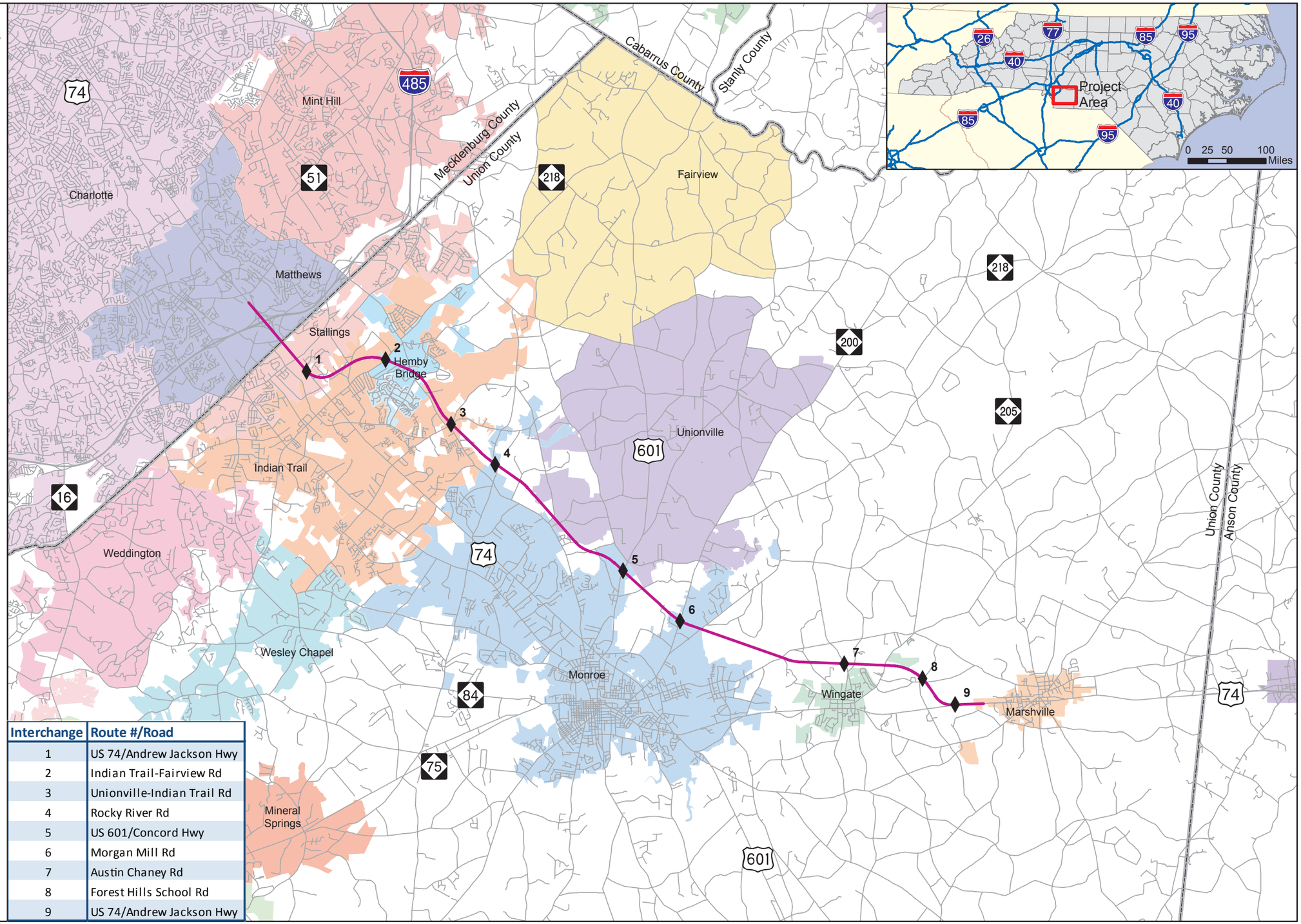
Maps

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 1: Project Location

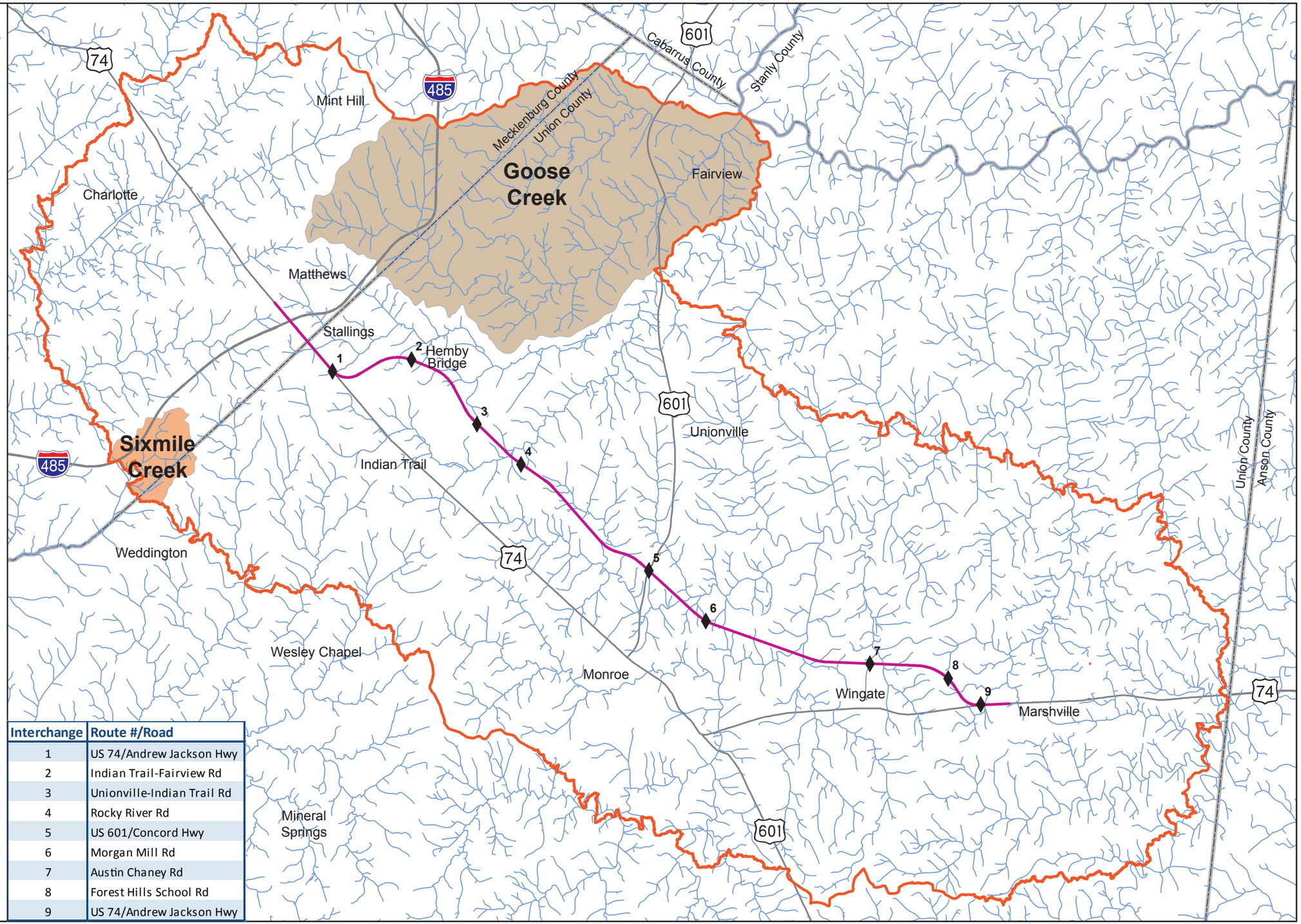


Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
2	Indian Trail-Fairview Rd
3	Unionville-Indian Trail Rd
4	Rocky River Rd
5	US 601/Concord Hwy
6	Morgan Mill Rd
7	Austin Chaney Rd
8	Forest Hills School Rd
9	US 74/Andrew Jackson Hwy

NORTH CAROLINA Turnpike Authority

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 2: Study Area Watersheds



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NORTH CAROLINA Turnpike Authority

Monroe Connector/Bypass
Technical Report on Impacts
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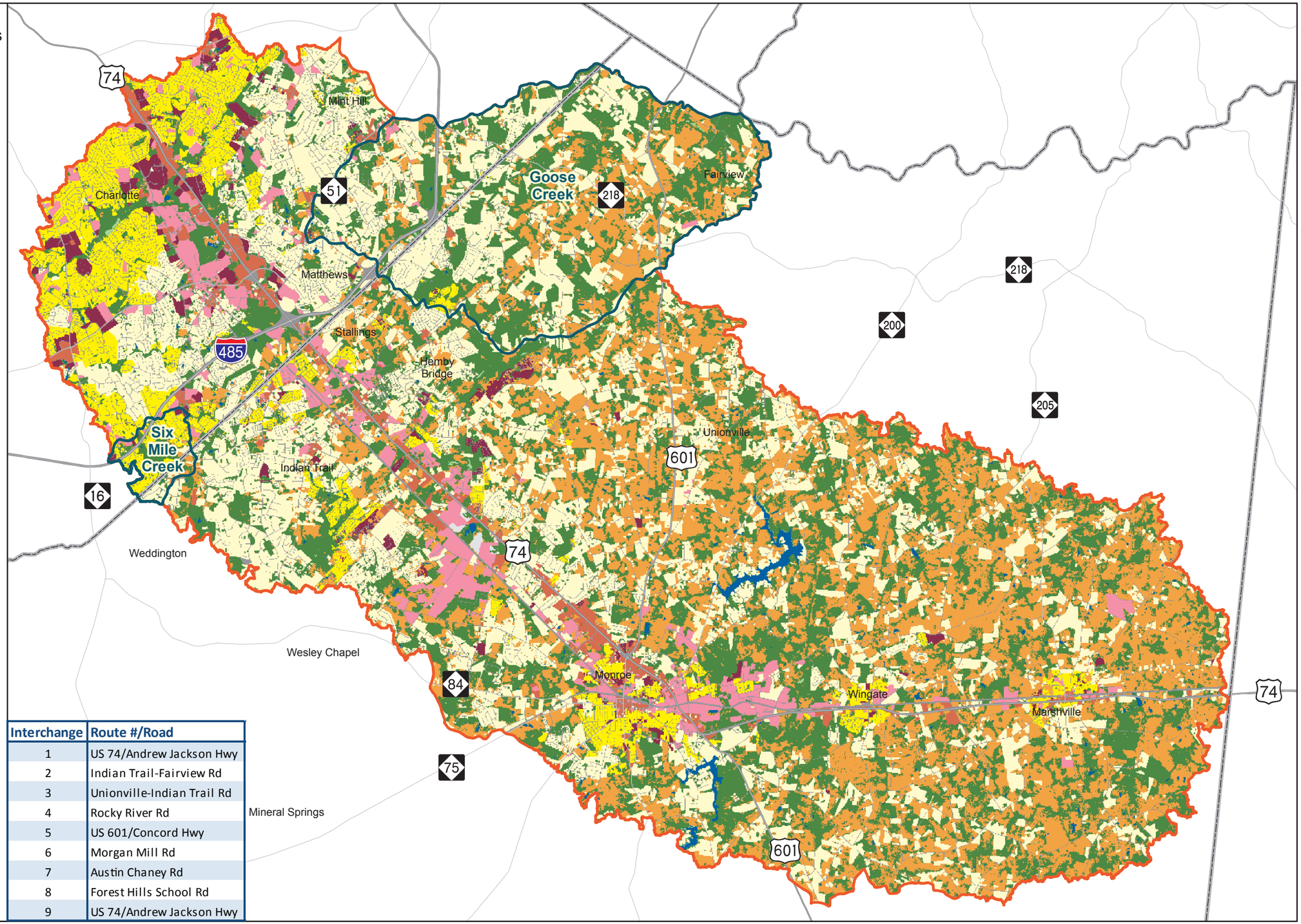
Map 3: Updated 2010 Baseline Land Use Scenario



Existing Land Use

- Agricultural Fields
- Barren
- Commercial
- Forested
- Other Natural
- High Density Residential
- Industrial/Office/Institutional
- Low Density Residential
- Medium Density Residential
- Open Water
- Transportation
- **FLUSA Boundary**
- **Watersheds**

NORTH CAROLINA Turnpike Authority

N W E S

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Miles

Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
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Monroe Connector/Bypass
Technical Report on Impacts
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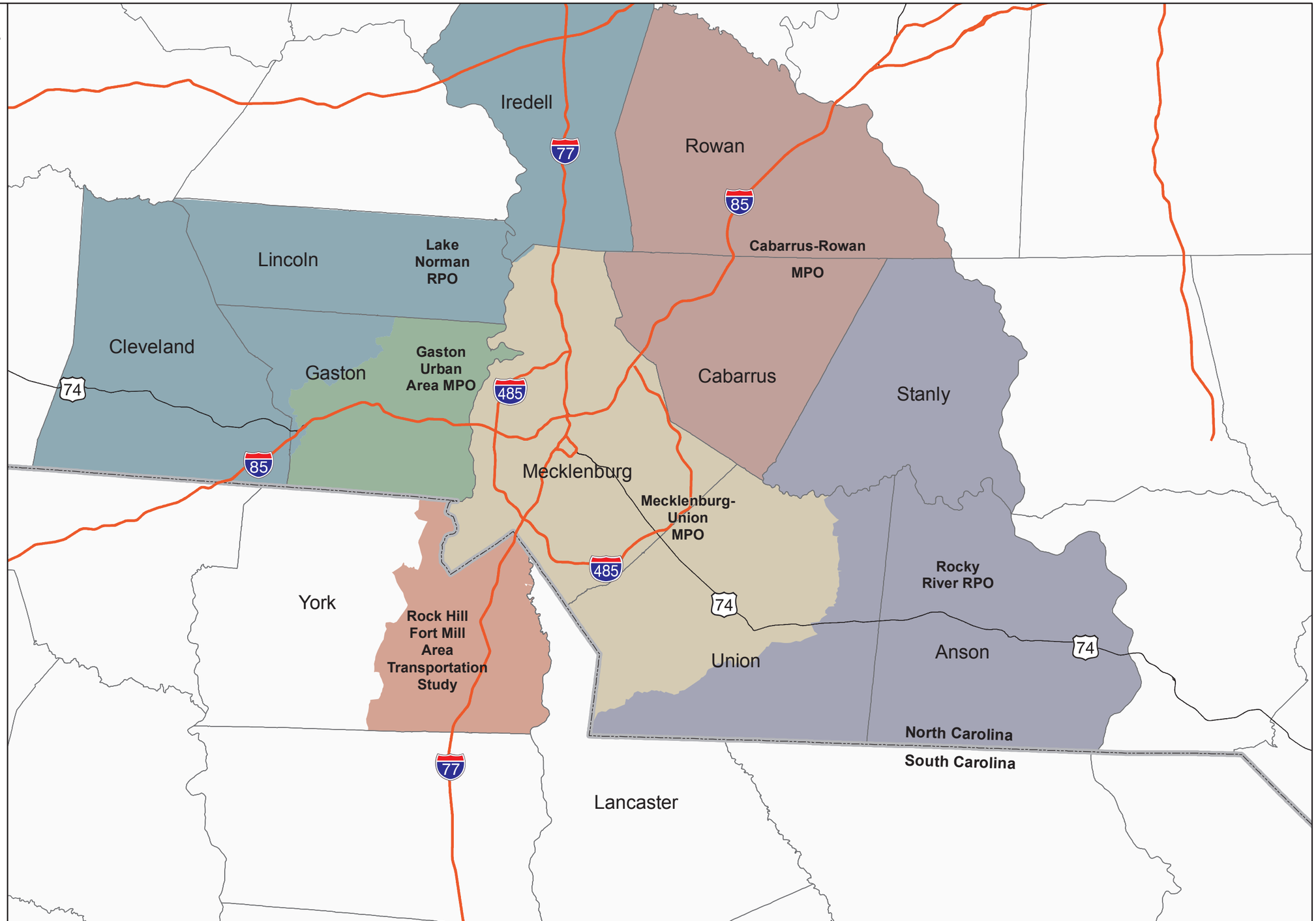
Map 4
Charlotte Region MPOs and RPOs



Interstates
MajorRoads
Counties

NORTH CAROLINA Turnpike Authority

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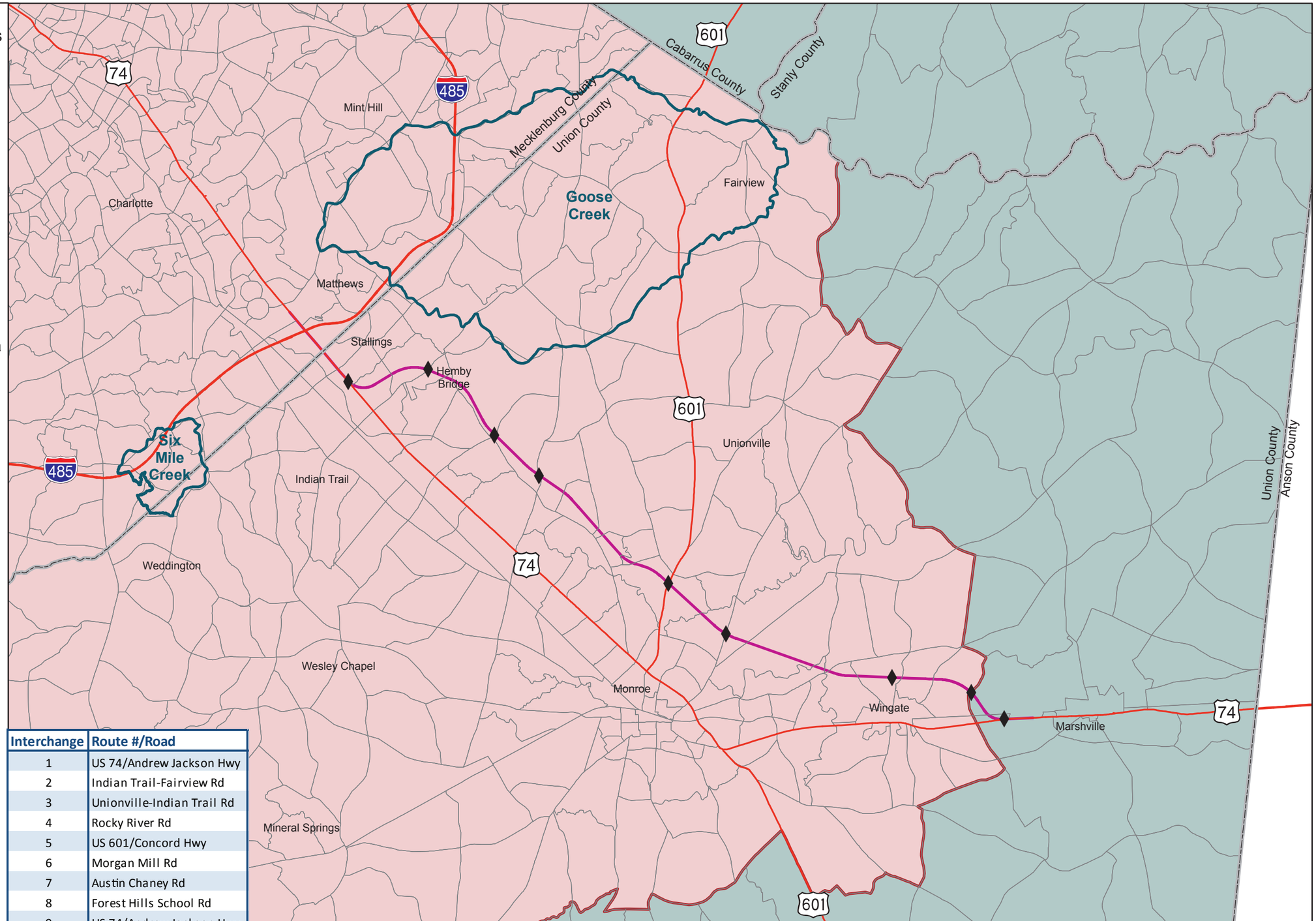
Miles

Monroe Connector/Bypass Technical Report on Impacts to Federally Listed Species

Map 5: Metrolina Model TAZs by Planning Organization



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Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 6:
Travel Time to Employment Center Analysis - Employment Center Location and Travel Time Results

RPA Centerline
Interchanges
Watersheds
MUMPO Analysis Area
Employment Centers

Travel Time to Employment Center

<10
10-20
20-30
30-40
>40
Minutes

NORTH CAROLINA
Turnpike Authority

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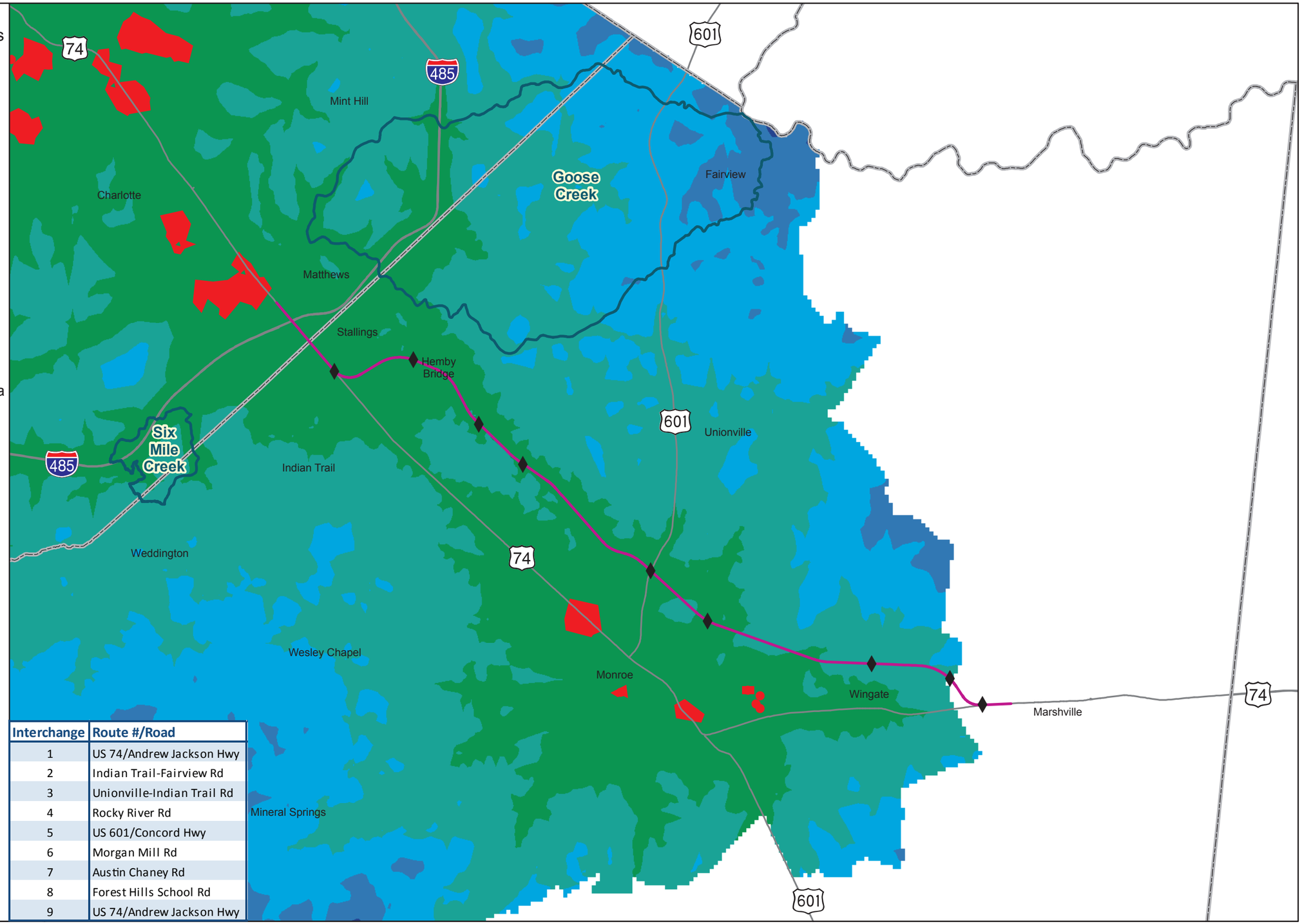

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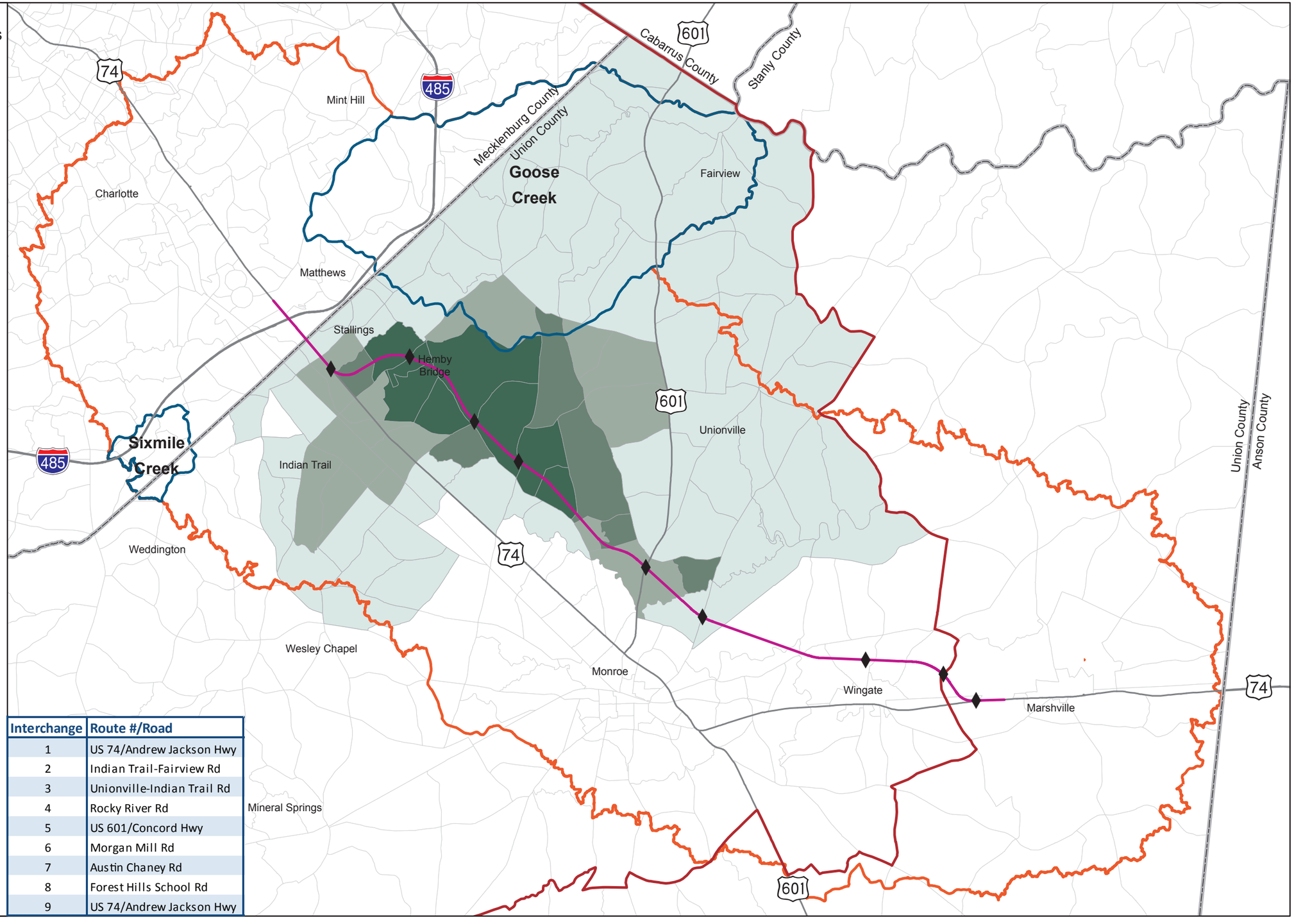
Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 7: Difference in Travel Time to Employment Centers Factor from Bottom Up Allocation



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Monroe Connector/Bypass
Technical Report on Impacts to Federally Listed Species

Map 8: Difference in Land Development Factor Composite Score from Bottom Up Allocation

- Interchanges
- RPA Centerline
- Watersheds
- FLUSA Boundary
- MUMPO Analysis Area
- Watersheds

Land Development Factor Composite Score

Percent Difference

- -2% to -3.86%
- -1% to -1.99%
- -0.5% to -0.99%
- -0.01% to -0.49%
- 0%

NORTH CAROLINA Turnpike Authority

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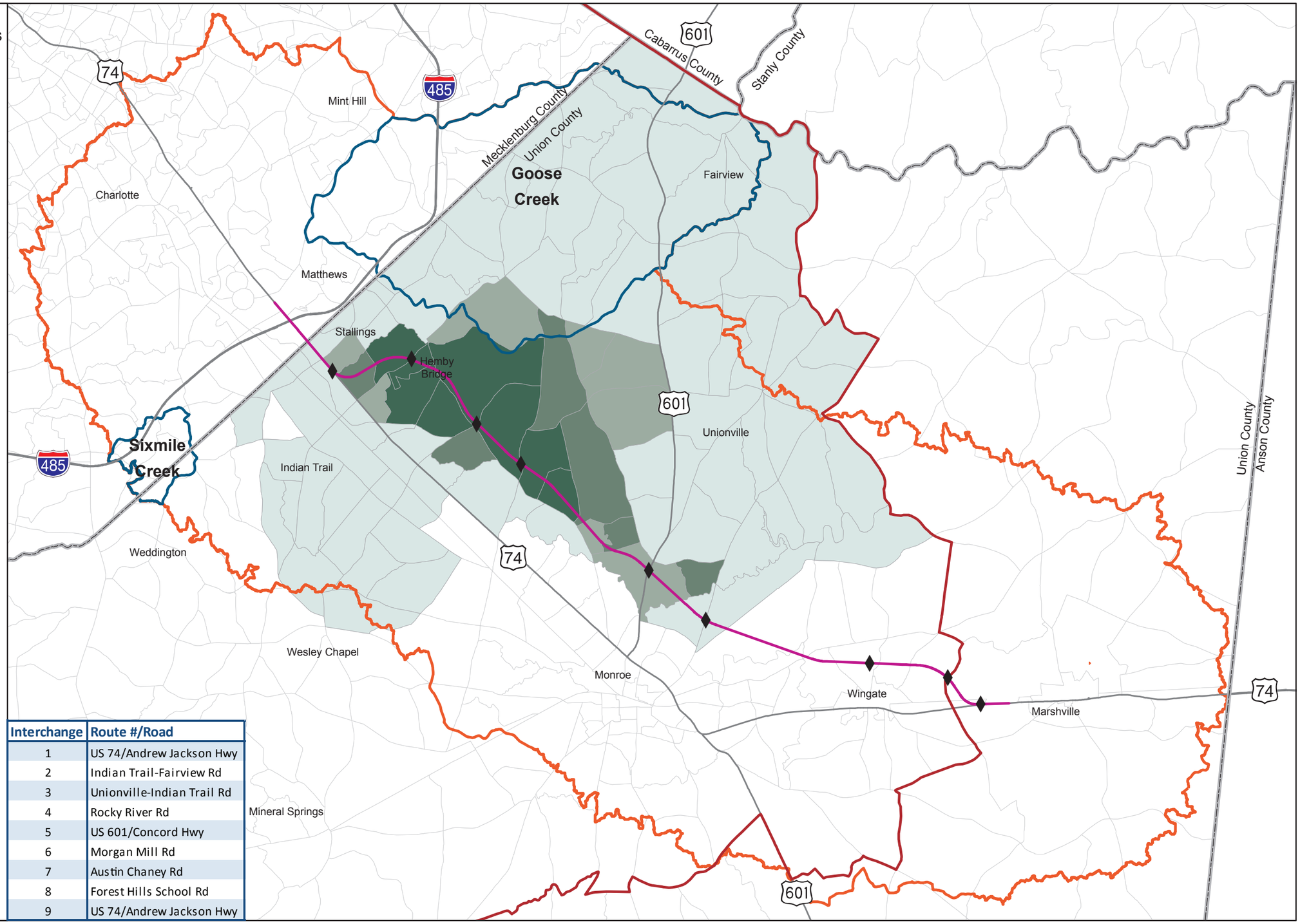

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Monroe Connector/Bypass
Technical Report on Impacts
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Map 9: Household Density 2030 Horizon Year

2009 Projections

Watersheds
FLUSA Boundary
Interchanges
RPA Centerline

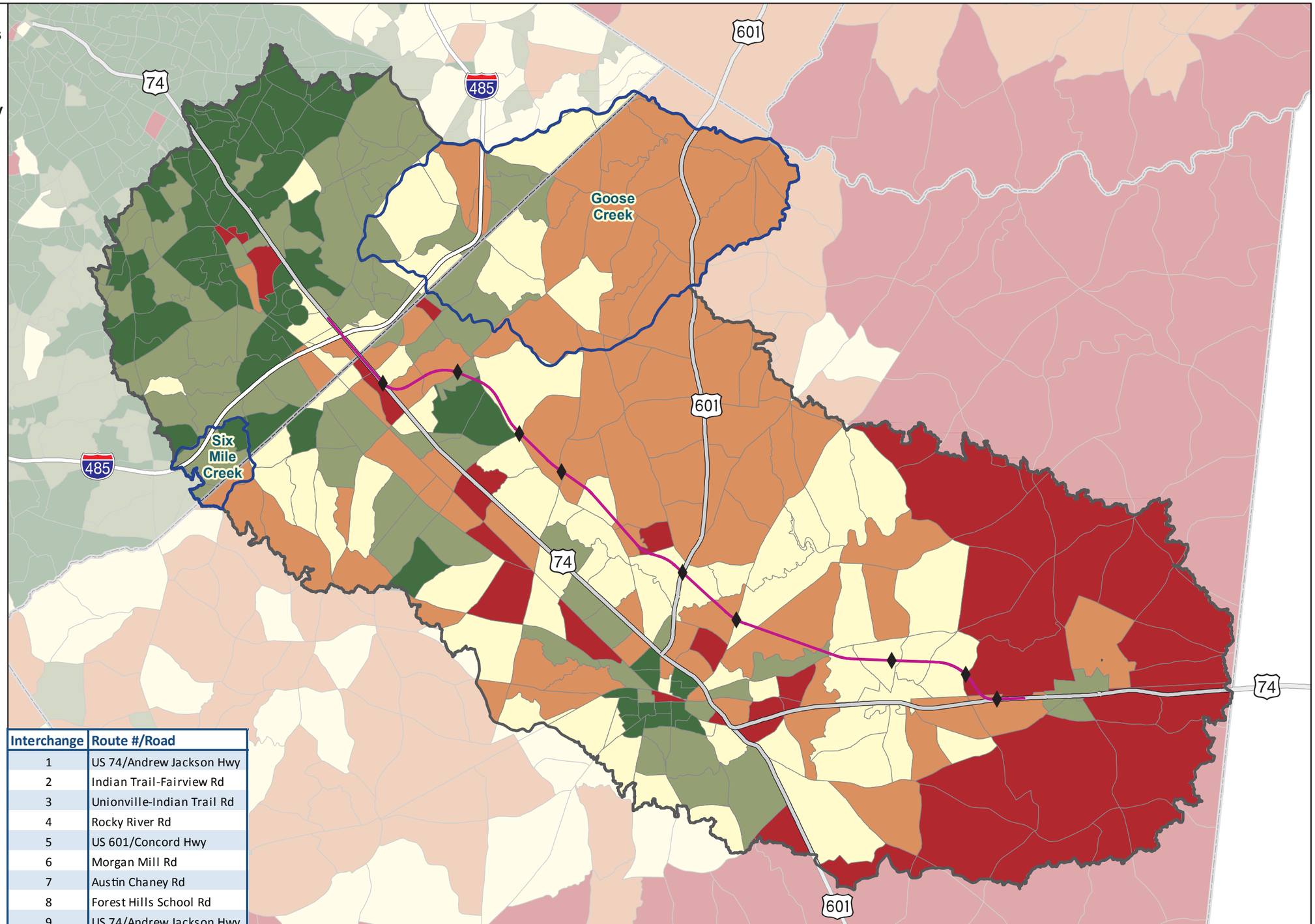
Household Density per Sq. Mile

- > 1000
- 501 - 1000
- 301 - 500
- 101 - 300
- < 100

NORTH CAROLINA Turnpike Authority

N W E S

0 1 2 4
Miles



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Monroe Connector/Bypass
Technical Report on Impacts
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Map 10: Employee Density 2030 Horizon Year

2009 Projections

Watersheds
FLUSA Boundary
Interchanges
RPA Centerline

Employee Density per Sq. Mile

- > 1500
- 601 - 1500
- 301 - 600
- 101 - 300
- < 100

NORTH CAROLINA Turnpike Authority

N W E S

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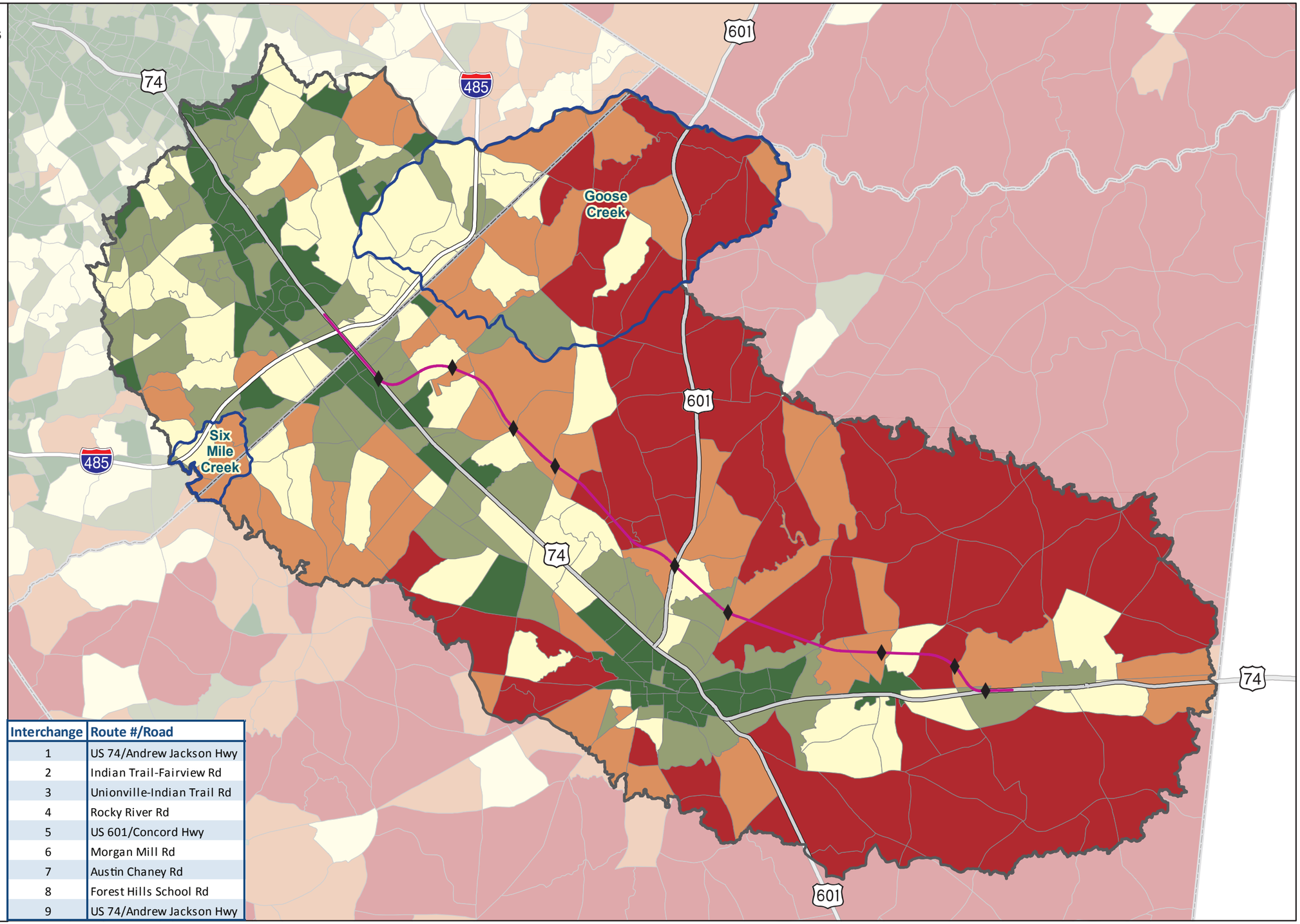
Miles



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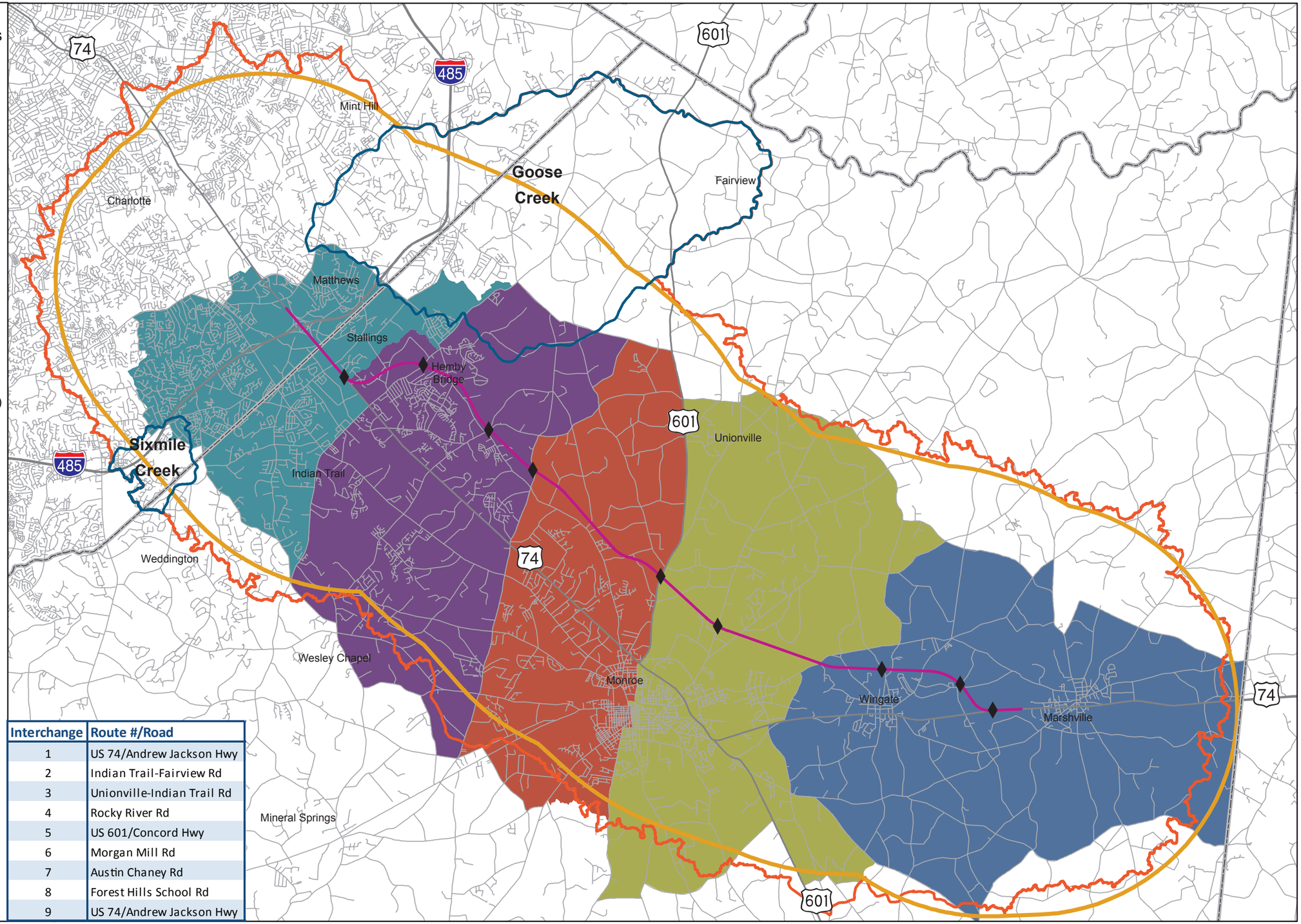
Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 11: Kenan Institute Study Zones and ICE FLUSAs



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9	US 74/Andrew Jackson Hwy

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 12: Household Growth by TAZ

2009 Projections

Watersheds
FLUSA Boundary
Interchanges
RPA Centerline

Household Growth
2005-2030

< 0
1 - 50
51 - 100
101 - 200
201 - 500
>500

NORTH CAROLINA
Turnpike Authority

N
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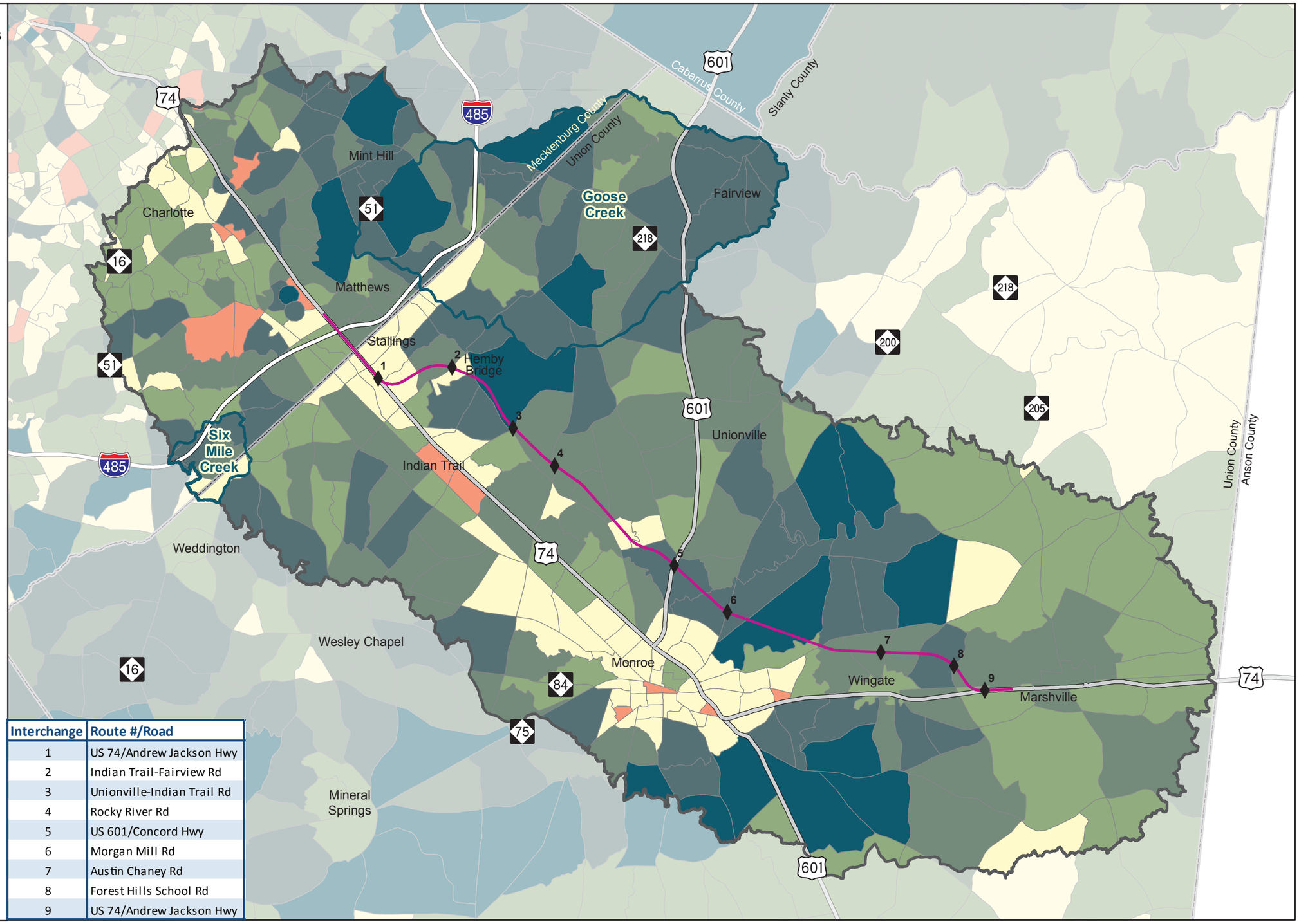
0 1 2 4
Miles



Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
2	Indian Trail-Fairview Rd
3	Unionville-Indian Trail Rd
4	Rocky River Rd
5	US 601/Concord Hwy
6	Morgan Mill Rd
7	Austin Chaney Rd
8	Forest Hills School Rd
9	US 74/Andrew Jackson Hwy

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 13: Employment Growth by TAZ

2009 Projections

Watersheds
Study Area
Interchanges
RPA Centerline

Employment Growth 2005-2030

- < 0
- 1 - 150
- 151 - 350
- 351 - 700
- 701 - 1200
- > 1200

NORTH CAROLINA Turnpike Authority

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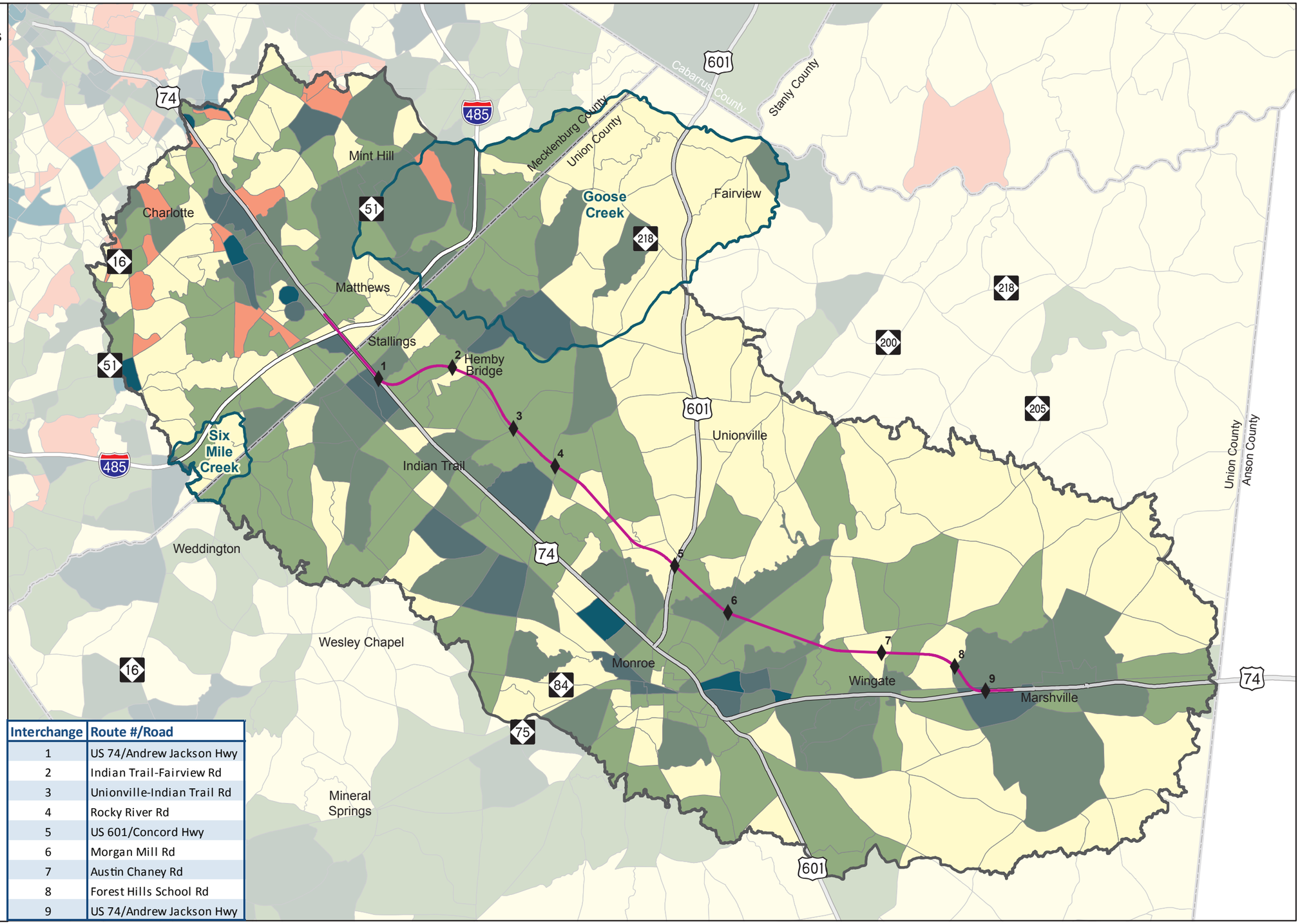
Miles



Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
2	Indian Trail-Fairview Rd
3	Unionville-Indian Trail Rd
4	Rocky River Rd
5	US 601/Concord Hwy
6	Morgan Mill Rd
7	Austin Chaney Rd
8	Forest Hills School Rd
9	US 74/Andrew Jackson Hwy

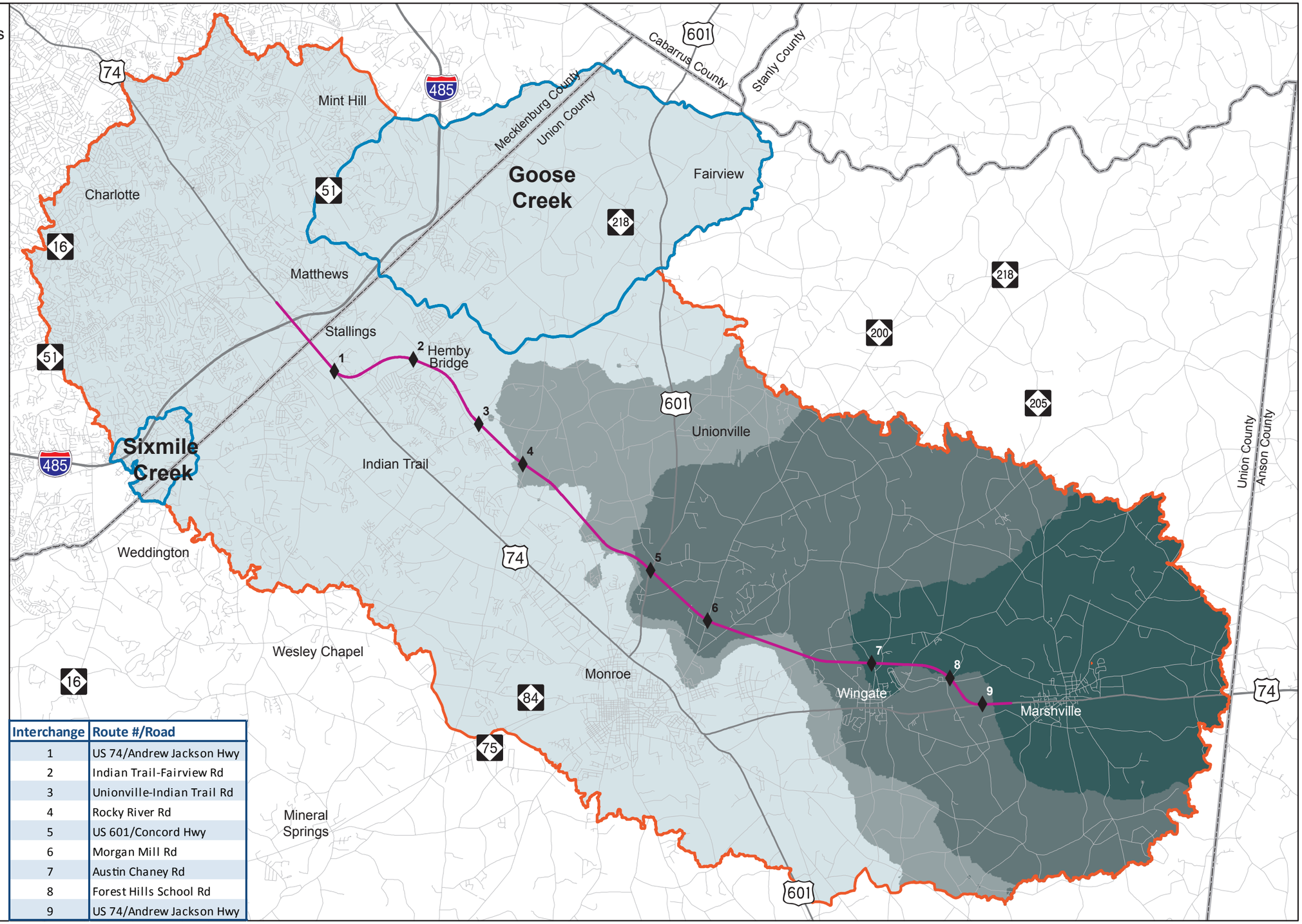
Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 14: Comparison of Accessibility No-Build vs Build

Interchanges
Recommended Preferred Alternative Centerline
FLUSA Boundary
Watershed Boundary

Change in Travel Time Decrease from No Build to Build (Min)
0 to 2.9
3 to 4.9
5 to 7.9
8 to 10

NORTH CAROLINA Turnpike Authority



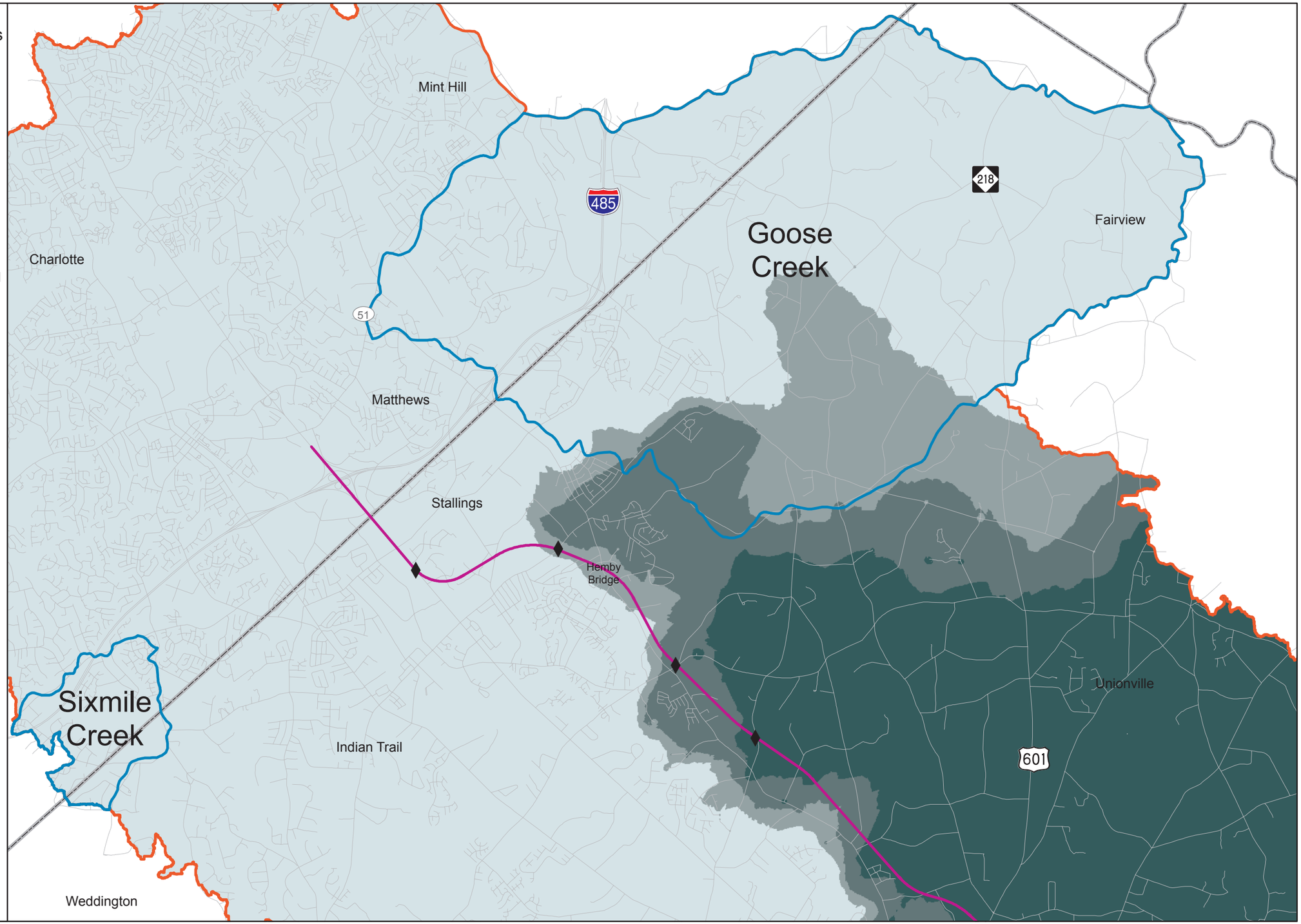
Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
2	Indian Trail-Fairview Rd
3	Unionville-Indian Trail Rd
4	Rocky River Rd
5	US 601/Concord Hwy
6	Morgan Mill Rd
7	Austin Chaney Rd
8	Forest Hills School Rd
9	US 74/Andrew Jackson Hwy

N W E S

0 1 2 4
Miles

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 15: Comparison of Accessibility No Build vs Build



Interchanges
Reccommended Preferred Alternative Centerline
FLUSA Boundary
Watersheds

Change in Travel Time
Decrease from
No Build to Build

- 0 to 0.9
- 1 to 1.9
- 2 to 2.9
- 3 to 10

NORTH CAROLINA Turnpike Authority

N W E S

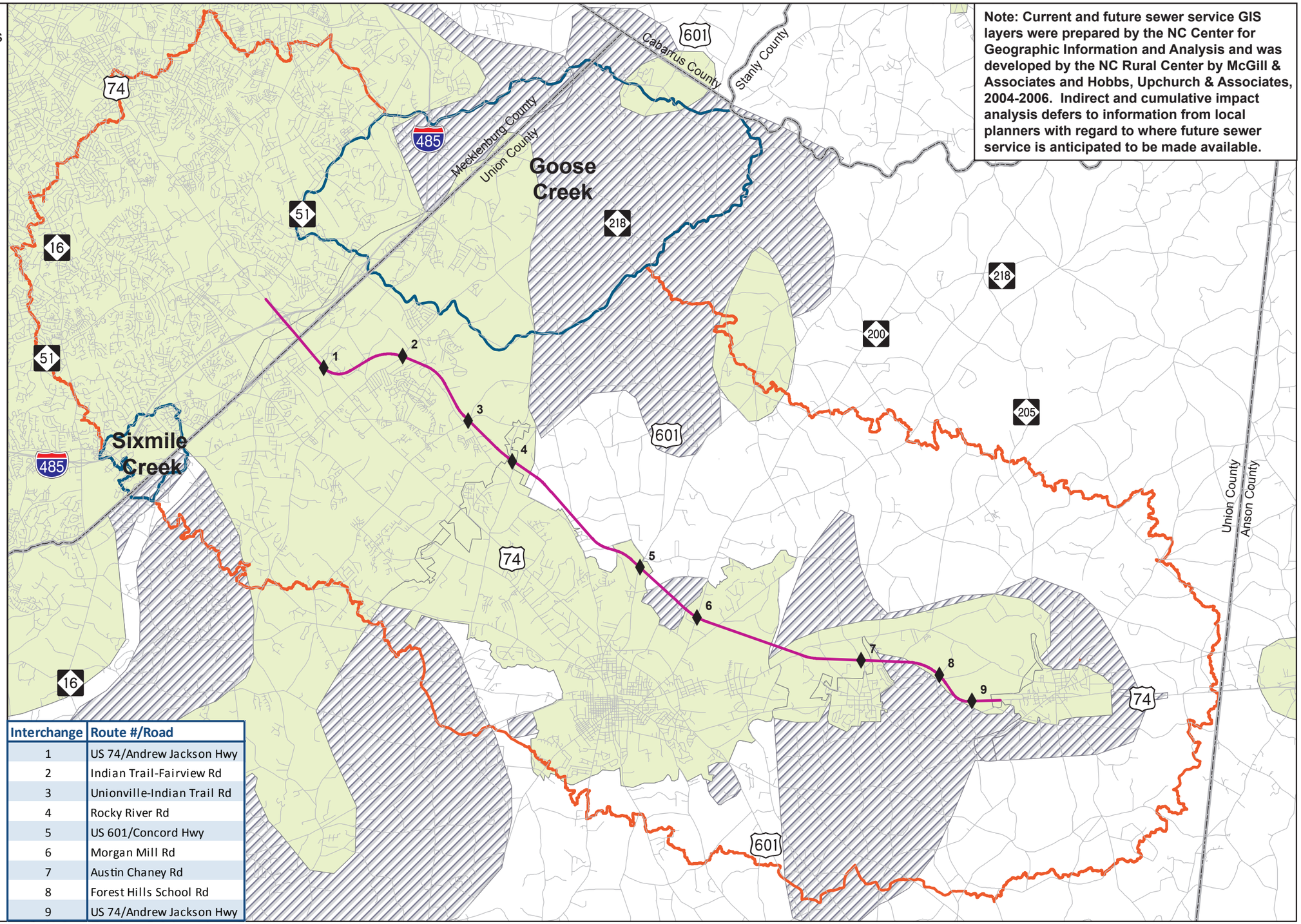
0 0.5 1 2
Miles

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 16: Sanitary Sewer Availability

Interchanges
Recommended Preferred Alternative Centerline
Existing Roads
Watersheds
Future Land Use Study Area Boundary
Current Sewer Service
Future Sewer Service

NORTH CAROLINA Turnpike Authority



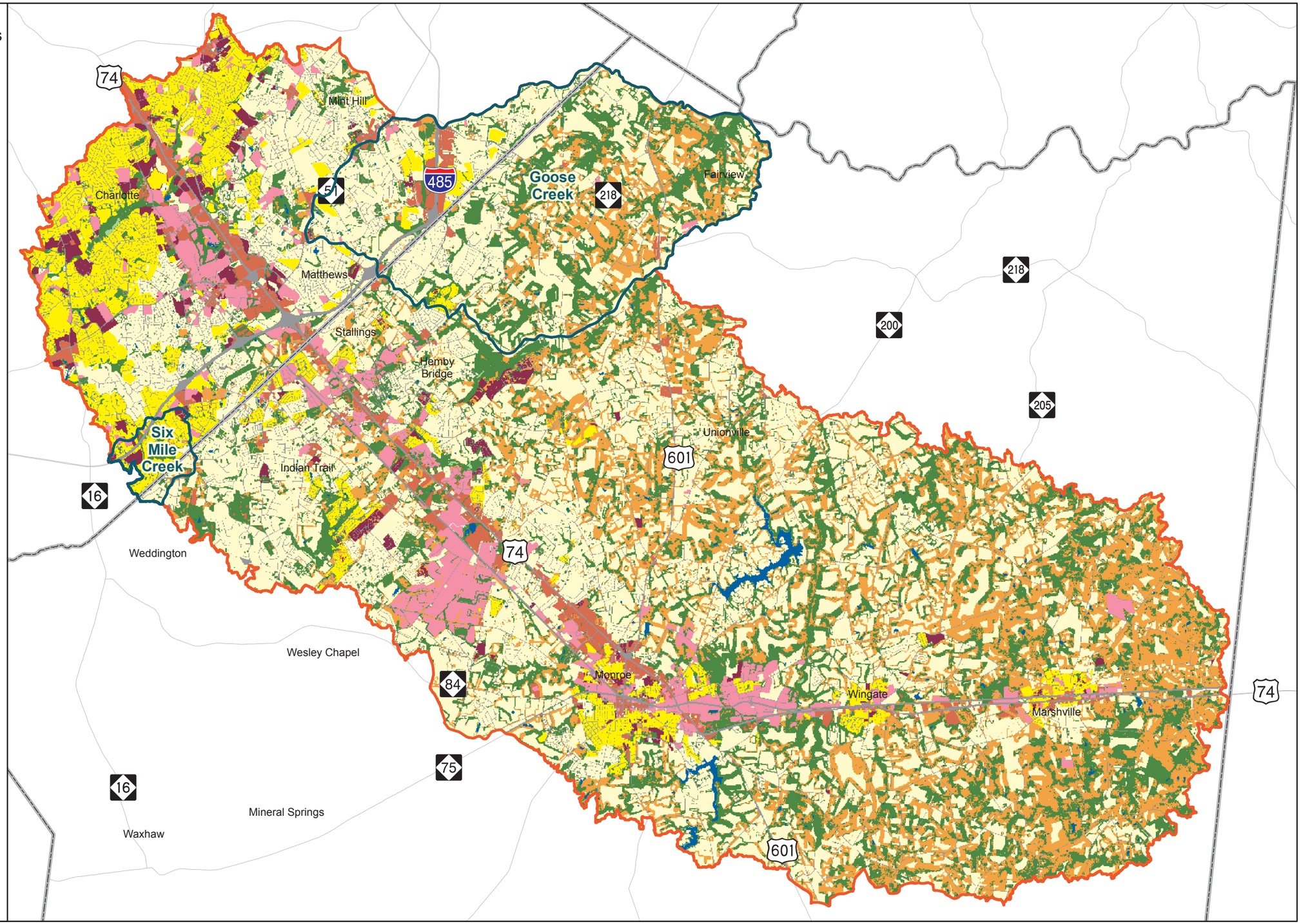
Interchange	Route #/Road
1	US 74/Andrew Jackson Hwy
2	Indian Trail-Fairview Rd
3	Unionville-Indian Trail Rd
4	Rocky River Rd
5	US 601/Concord Hwy
6	Morgan Mill Rd
7	Austin Chaney Rd
8	Forest Hills School Rd
9	US 74/Andrew Jackson Hwy

N W E S

0 1 2 4
Miles

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 17: Updated 2030 No-Build Land Use Scenario



No Build Land Use

- Agricultural Fields
- Barren
- Commercial
- Forested
- Other Natural
- High Density Residential
- Industrial/Office/Institutional
- Low Density Residential
- Medium Density Residential
- Open Water
- Transportation
- **FLUSA Boundary**
- **Watersheds**

NORTH CAROLINA Turnpike Authority

N W E S

0 1 2 4
Miles

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 18: Land Use Change

Baseline (Existing) to No-Build

Change in Land Use

- From Undeveloped to Residential
- From Lower to Higher Density Residential
- From Non-Residential to Residential
- From Residential to Non-Residential
- From Undeveloped to Non-Residential
- Other Change between Developed Land Uses

- RPA Centerline
- FLUSA Boundary
- Watersheds

NORTH CAROLINA Turnpike Authority

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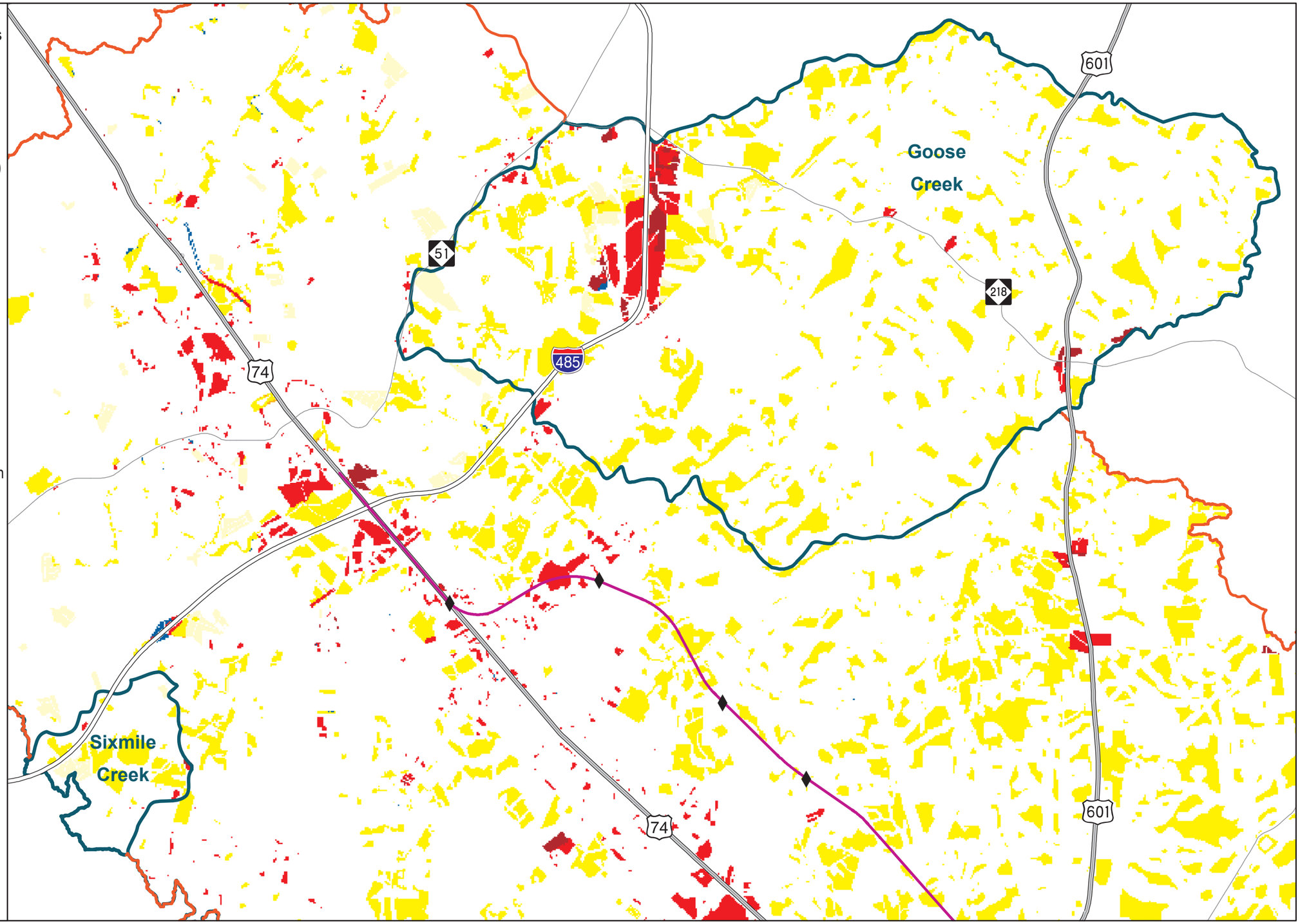
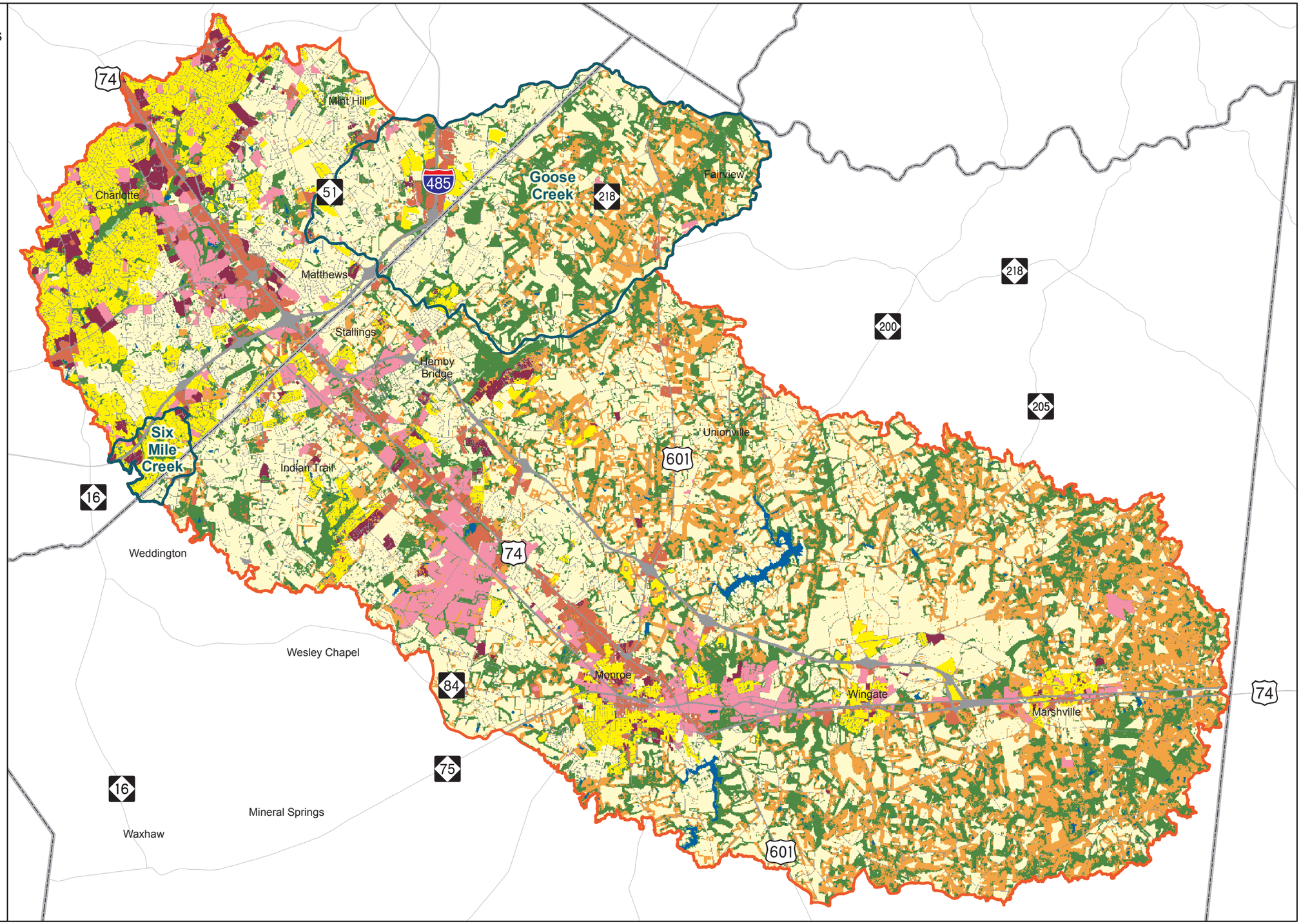


Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 19: Updated 2030 Build Land Use Scenario



Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 20:
Land Use Change

No-Build
to Build

Change in Land Use

- From Undeveloped to Residential
- From Lower to Higher Density Residential
- From Non-Residential to Residential
- From Residential to Non-Residential
- From Undeveloped to Non-Residential
- Other Change between Developed Land Uses

- FLUSA Boundary
- Watersheds

NORTH CAROLINA
Turnpike Authority

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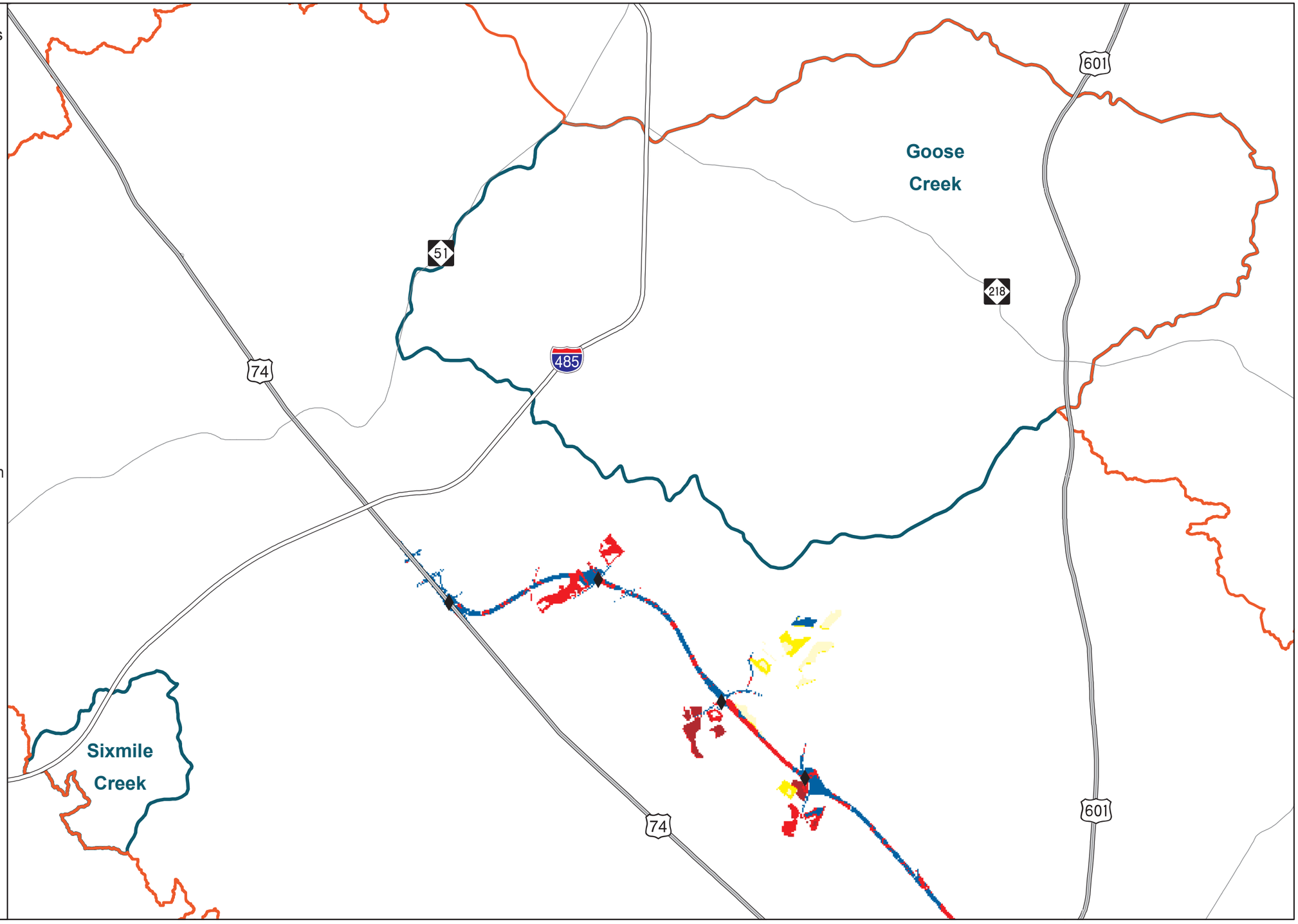

Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 21: Land Use Change

Baseline (Existing) to No-Build Effects to Sunflower Populations

Schweinitz's Sunflower Population

Change in Land Use

- From Undeveloped to Residential
- From Lower to Higher Density Residential
- From Non-Residential to Residential
- From Residential to Non-Residential
- From Undeveloped to Non-Residential
- Other Change between Developed Land Uses

FLUSA Boundary

NORTH CAROLINA Turnpike Authority

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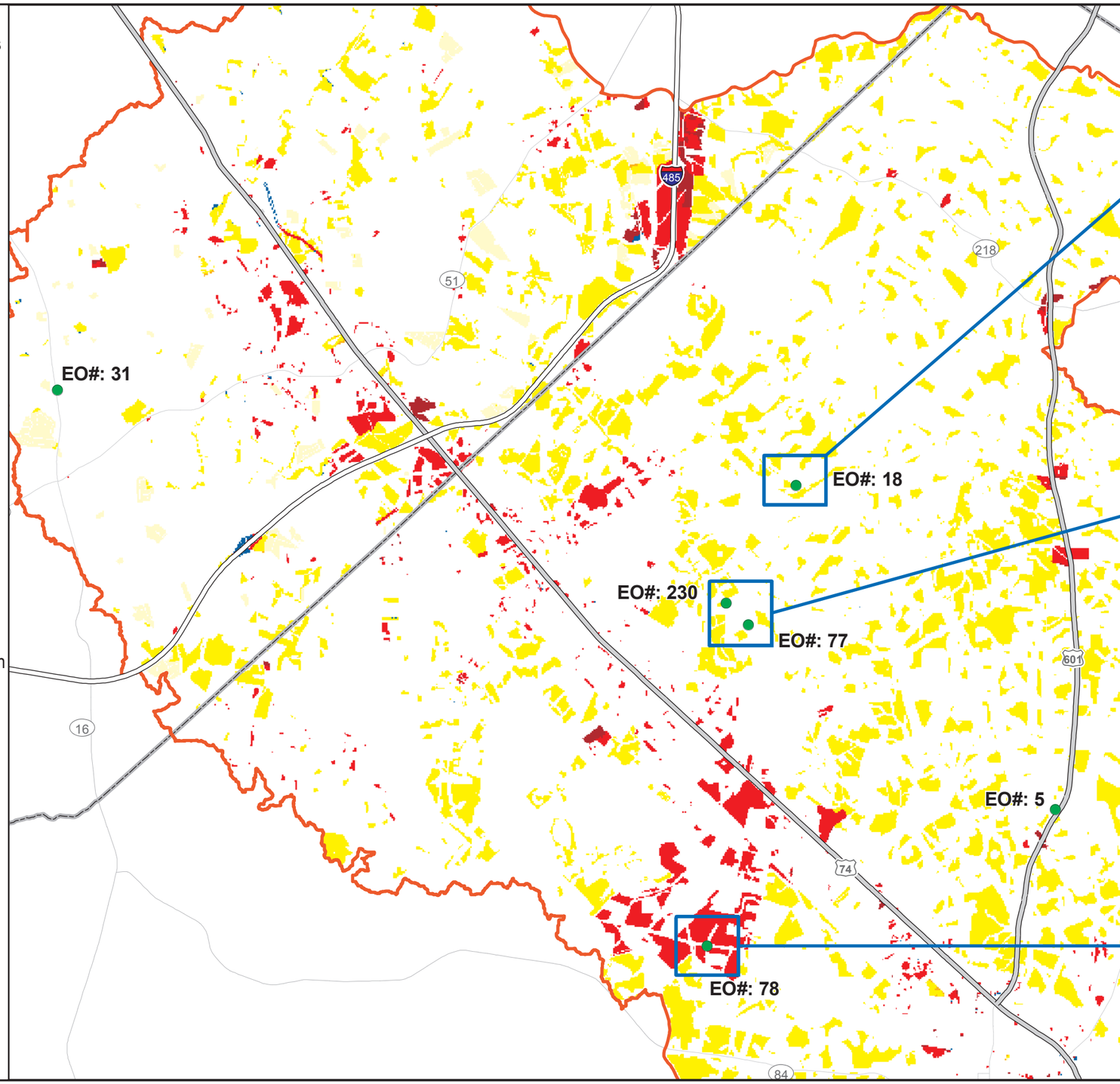
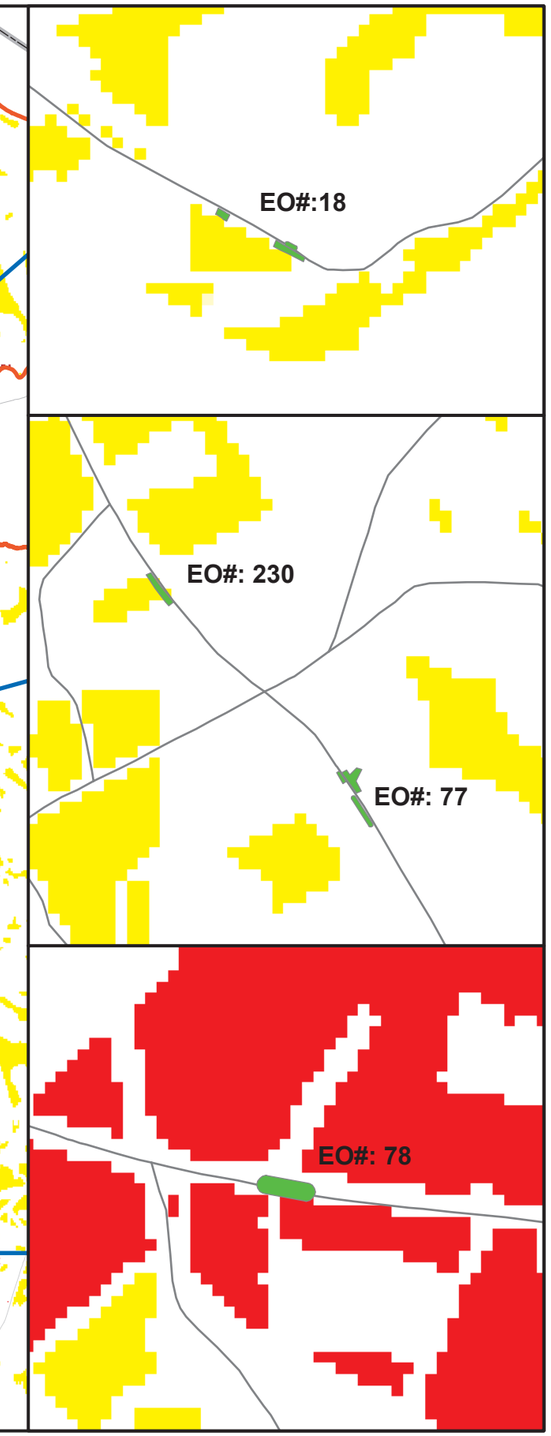
0 0.5 1 2
Miles





Monroe Connector/Bypass
Technical Report on Impacts
to Federally Listed Species

Map 22: Land Use Change

No-Build to Build Effects to Sunflower Populations

Schweinitz's Sunflower Population

Change in Land Use

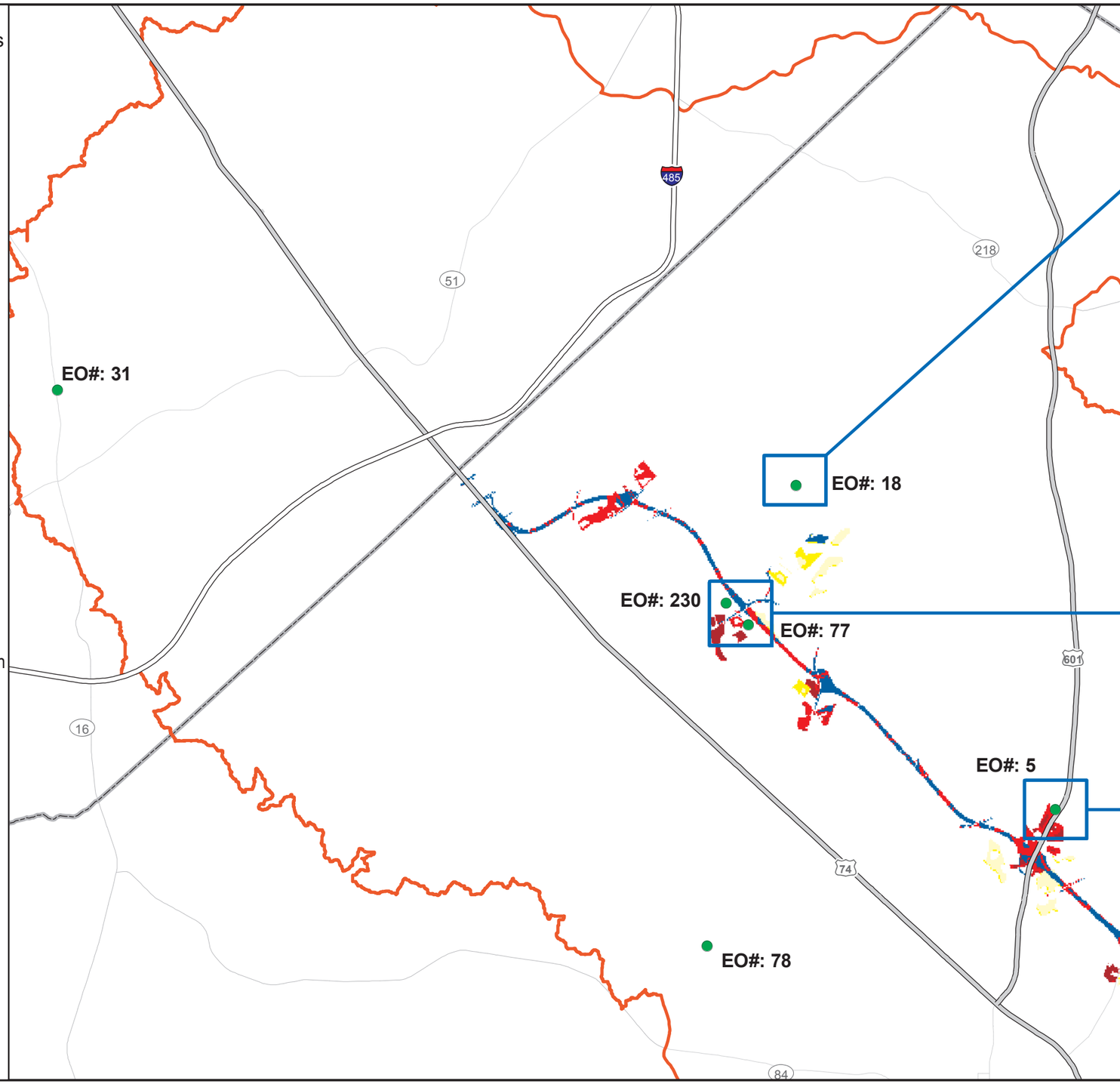
- From Undeveloped to Residential
- From Lower to Higher Density Residential
- From Non-Residential to Residential
- From Residential to Non-Residential
- From Undeveloped to Non-Residential
- Other Change between Developed Land Uses

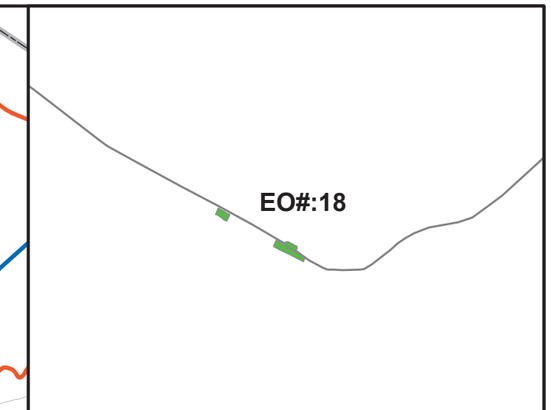
FLUSA Boundary

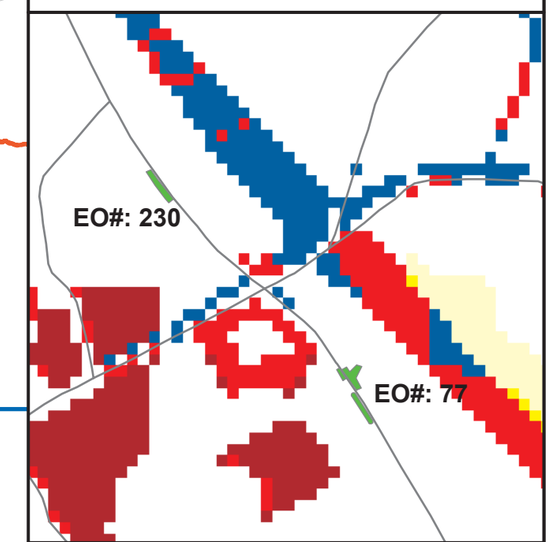
NORTH CAROLINA Turnpike Authority

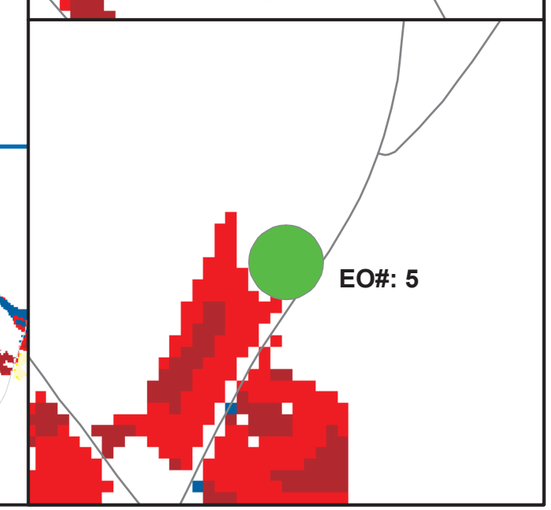
N W E S

0 0.5 1 2
Miles









Monroe Connector/Bypass
Supplement to the
Biological Assessment

Map 23: Raw Model Volumes No-Build and Build Scenarios

US 601 from
Monroe Connector/Bypass
to Cabarrus County

Volume **decrease** from No-Build to Build

Volume **increase** from No-Build to Build

Raw Model Volumes

No-Build	1,000
Build	(1,000)

RPA Centerline

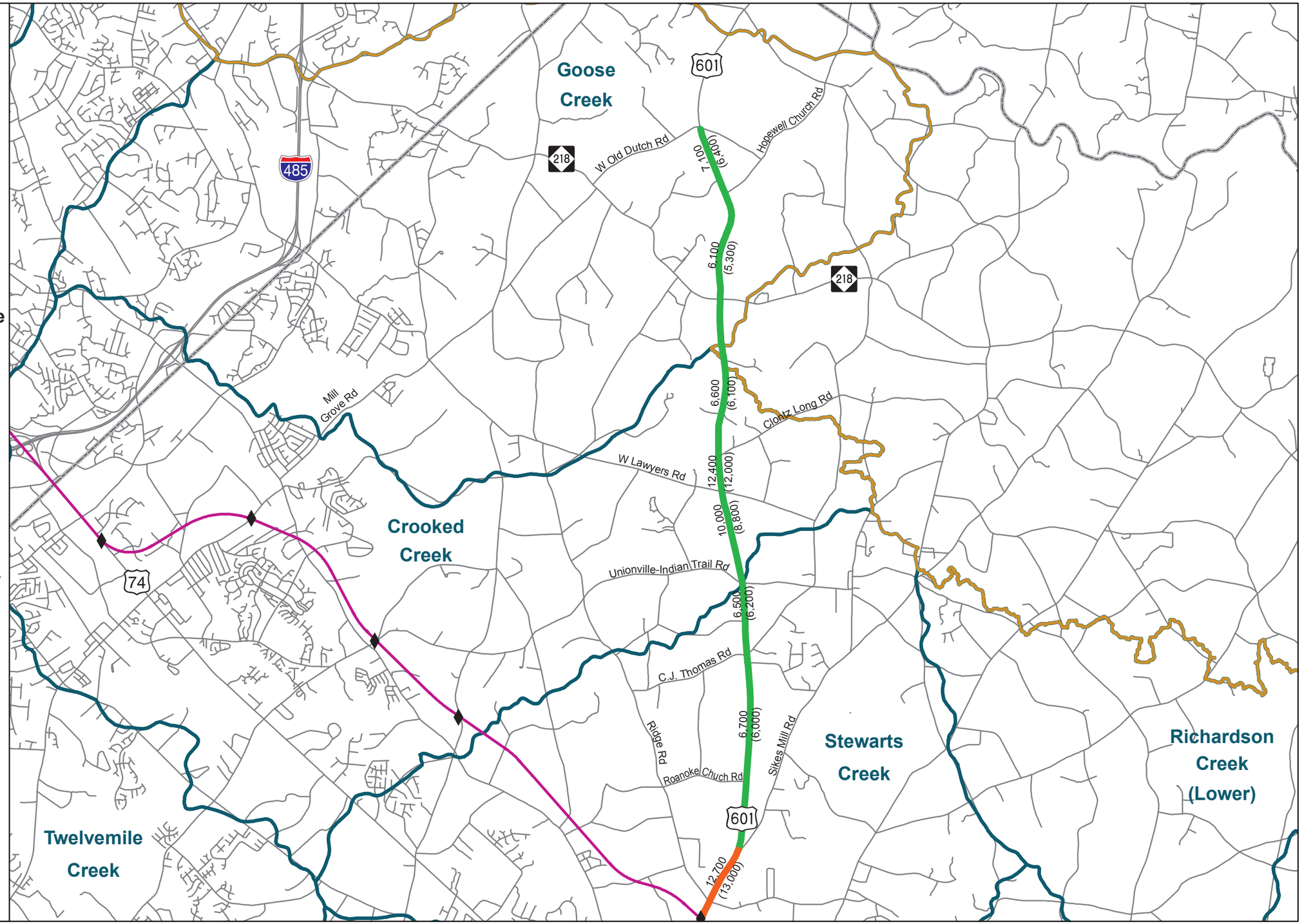
FLUSA Boundary

Watersheds

NORTH CAROLINA Turnpike Authority

N W E S

0 0.5 1 2
Miles



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Document: USFWS Letter dated September 30, 2013

Response To Comments

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
1	Reference to Prior Report	For ease of review and clarification, we recommend removing discussion of previous results and focusing this document on the updated/revised no build and build alternative comparison.	The DTR is provided to be a stand-alone document. The DTR refers back to the results of the 2010 Quantitative ICE in a few instances to note the updates that have occurred and the limited changes that resulted from those updates. In particular the report refers back to the 2010 Quantitative ICE results for Impervious Surface to indicate the limited changes in results which strongly indicates that no further water quality modeling is needed.
2	Access to ICE Report	The document reportedly summarizes the conclusions reached in the evaluation of indirect and cumulative impacts (ICI). Can the larger ICI report be made available for review as well? It is helpful to have all the original data when reviewing a document of this nature.	The DTR includes nearly all the same methodology and results information as is included in the updated Quantitative ICE report, but then performs a more detailed and focused assessment of potential impacts to species. The draft Quantitative ICE report was provided via email on October 2, 2013.
3	Re-initiation of Section 7 Consultation	The updated information regarding these impacts represents a changed condition, and therefore, requires re-initiation of the section 7 consultation.	Re-initiation will be requested along with a stand-alone BA.
4	Sewer and Water Utility Availability	On page 9, the Technical Report notes that water and sewer moratoria were rescinded in Union County in 2012; however, there is no further discussion of this. What is the impact or potential impact of Union county rescinding the water and sewer moratorium? We recommend adding a discussion of the potential impacts of this rescission.	We have revised the DTR to include a footnote indicating the impacts of the change in sewer and water utility connection policies in Union County.
5	Update of Progress on Goose Creek Management Plan	Section 3.4 The Technical Report notes that Mecklenburg County now administers the Goose Creek Management Plan. The Management plan was completed in 2009. We recommend adding an update of any progress that has been made on the Goose Creek management plan under the Mecklenburg County administrator	An update of the Goose Creek Management Plan within Mecklenburg County since Mecklenburg County assumed administration of the Plan is provided in the BA.
6	Land Use Changes in Goose Creek Watershed	The Technical Report notes that both Unionville and Fairview are concentrating plans for development along the US 601corridor. In particular, Unionville expects to grow because of the new interchange with the project and US 601. We recommend including a cumulative impact analysis of the towns of Fairview and Unionville plans for development in the Goose Creek watershed?	The discussion of Unionville should not have been included in the Technical Report as it is not within the Goose Creek Watershed. The commercial and industrial nodes anticipated to develop in Fairview are expected to develop with or without the construction of the proposed project, as noted in Section 3.4. Since there is no indirect impact anticipated, these nodes would not constitute a cumulative impact to the watershed.

Document: USFWS Letter dated September 30, 2013

Response To Comments

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
7	Data Assumptions	Section 5.0 This section is critical to an accurate assessment of indirect and cumulative impacts. However, the Technical Report does not identify whether this section has been updated or not. The first reference to the data is on page 58 and that reference is to the 2009 MPO projections. Are those the projections that include the project in the no build analysis? Please clarify.	Section 5 details the methodology used in the long range land use analysis. The methodology for the updated Quantitative ICE is the same as the 2010 Quantitative ICE. Changes since the 2010 Quantitative ICE include new information about future development as documented in Section 3 of the report and updated socioeconomic projections, as documented in Section 4. As the analysis in Section 4 shows, none of the socioeconomic projections developed by MUMPO have been influenced by the project.
8	Land Use Change in Goose Creek	On pages 62-63, the Technical Report notes that there is travel time savings and new water and sewer potential in the southeastern section of the Goose Creek basin, yet concludes that additional development is unlikely to be spurred by the addition of a freeway. Please provide further justification for this conclusion given that it would be logical to conclude that proximity plus time savings plus water and sewer expansion would result in a greater potential for development?	Map 15 indicates that some portions of Goose Creek watershed appear to see travel time savings from the Monroe Connector/Bypass. However, as documented in Section 5.2, the travel time analysis methodology "may overestimate the benefits to these portions of the study area. The analysis estimated travel time benefits to the I-485/US 74 Interchange since access to I-485 was regularly noted as a key benefit of the proposed project. These portions of the Goose Creek watershed have more direct access to I-485 via Idlewild Road, Lawyers Road and NC 218 and drivers originating from the southern portions of the Goose Creek watershed would likely find shorter travel times to I-485 via these roads than via the proposed project."
9	Michaux's sumac reference	Section 6.2 On the bottom of page 68, the reference to the last observation of Michaux's sumac in the FLUSA identified 1794. This must be a typographical error as the species was not identified until 1875. Please correct this information.	Based upon the cited reference (Barden, L.S. and J.F. Matthews (2004). André Michaux's Sumac – Rhus michauxii Sargent: Why Did Sargent Rename It and Where Did Michaux Find It? Castanea 69(2): 109-115. June 2004), we assumed the following is accurate: "In 1794 André Michaux discovered dwarf sumac Rhus michauxii in Mecklenburg County, North Carolina, and in 1803 published a species description under the name Rhus pumila. In 1895 C.S. Sargent assigned the name R. michauxii to correct Michaux's use of a homonym and to honor its discoverer. The type location is now in Union County, North Carolina, which was formed from part of Mecklenburg County in 1842".
10	Schweinitz's sunflower protection	Section 6.2 At the bottom of page 69, the Technical Report notes that according to the Biological Assessment the NCTA will commit to on-site conservation of two extant populations of Schweinitz's sunflower. Please provide additional information as to what type of protection will be provided. Will it be in perpetuity?	The on site conservation measures are detailed in the BA. The commitments from both NCDOT and Union Power will be adhered to for as long as the respective conservation areas are under their ownership. While this can't necessarily be considered "in perpetuity", ownership of such areas are very rarely relinquished. As such, there is no reason to assume these sites will not continue to be managed for Schweinitz's sunflowers for the foreseeable future.

Document: USFWS Letter dated September 30, 2013

Response To Comments

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
11	Substantial Cumulative Effects	Section 6.2 At the top of page 70, the Technical Report notes that "It is not anticipated that future development will cause substantial cumulative effects. This terminology is vague and, while possibly suitable in a National Environmental Policy document, has no relevance as an assessment of possible affects to a federally listed species during the consultation process. Please provide clarification as to the specific definition of "substantial". Are adverse effects likely to occur, and if so, in what form will they occur and how will they be avoided, minimized and mitigated?	The discussion has been expanded to clarify the specific impacts and address effects.
12	Species Status Updates	Additionally, the reference on page 69 to the 2010 Biological Assessment raises the question of whether this assessment will be updated. The Federal Highway Administration is required to provide the best available scientific and commercial information during the consultation process and the existing biological assessment is now over three years old. Is the species status information still accurate? Is there any new information that should be updated? We recommend that this be addressed in the request for re-initiation of consultation.	The noted information is updated as appropriate and provided in the BA.
13	Reference to Previous ICE	In the discussion of impervious surface on page 72, the first paragraph refers to the previous ICE for land use. Is this the data that includes the project? It is difficult to follow which data sets are being used in this section. Please clarify.	As the analysis in Section 4 shows, none of the socioeconomic projections developed by MUMPO have been influenced by the project. We have revised the wording in Section 6.6 to clarify when results from the 2010 Quantitative ICE are being discussed and compared to results of the most recent ICE analysis.
14	Internal Document Reference	On page 73, there is reference to Section 5.3 but the Technical Report does not contain a Section 5.3. Please correct this reference.	This reference has been corrected.
15	Changes in Impervious Surface	On page 73, it appears that there is a 1% increase in imperviousness from the previous data presented. Please provide a more detailed explanation of the reason for this increase. For example, has the baseline changed and if so, how and where was it changed relative to the location of the listed species?	As noted in Section 6.5, the level of impervious surface for Sixmile Creek increased approximately 1% for all scenarios when compared to the 2010 Quantitative ICE. This change, as noted in Sections 1.7 and 6.5, is related to the update of the Baseline Land Use which was updated from a base year of 2007 to 2010. As noted in Section 6.5, the level of impervious surface for Goose Creek increased approximately 1% for all future year scenarios when compared to the 2010 Quantitative ICE. As noted in Sections 1.7 and 6.5, these changes are a result of changes in planned land use, particularly at the Lawyers Road interchange with I-485.

Document: USFWS Letter dated September 30, 2013

Response To Comments

COMMENT NO.	PRIMARY TOPIC	COMMENT	RESPONSE
16	Traffic Impacts Analysis	This section is rather confusing, referencing a no build as well as two build scenarios on page 74, whereas other Sections of the Technical Report only reference one build scenario. Please provide clarification as to which data were used for this discussion and what this section is concluding regarding traffic pattern changes.	This section has been revised to better clarify the various traffic modeling scenarios.
17	Traffic Impacts Analysis	On page 76 there is a discussion of the changes to US 601 north of the project. The Technical Report notes that there is not a project to improve US 601 north of the project in the long range plan for MUMPO. Given the discussion of the planned development in Unionville and Fairview on US 601 north of the Monroe Connector Bypass, it would seem that such improvements would be being considered at least at the comprehensive transportation plan level.	This section has been revised to add more detail to the discussion of US 601 traffic impacts. As noted in that analysis, the induced growth impacts of the proposed project do not substantially affect traffic volumes on US 601. Furthermore, the predicted 2030 traffic levels on US 601 through the Goose Creek watershed are well below typical thresholds for widening and the modest development proposals for Unionville and Fairview would be unlikely to substantially change those predicted traffic volumes.
18	Biological Conclusions	This Section of the Technical Report does not provide a definitive conclusion as to the impacts to federally listed species; rather it assesses the difference between any conclusions drawn from the 2010 Biological Assessment and those based on the new modeling. We recommend that in any re-initiation letter to the Service, specific determination be spelled out for each federally listed species that may occur within the action area.	A BA and accompanying cover letter requesting re-initiation and concurrence with the stated Biological Conclusions are being provided.
19	Local Governments Efforts	The purpose of this section is unclear. Efforts for local governments to voluntarily protect sensitive resources could be discussed if they are implementing any protective measures. The FHWA/NC Turnpike Authority/NCDOT could discuss any measures that are being taken to further conservation of listed species.	This section has been removed.

APPENDIX C-3
OTHER CORRESPONDENCE

- Email from Mayor Paxton to NCDOT 10/03/12
- NCDOT Response to Mayor Paxton regarding US 74 Corridor 10/24/12

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Gibilaro, Carl

From: Harris, Jennifer <jhharris1@ncdot.gov>
Sent: Wednesday, October 03, 2012 3:12 PM
To: Shumate, Christy; Gibilaro, Carl; Franklin, Spencer T
Cc: Slusser, Scott (SSLUSSER@ncdoj.gov); Cole, Scott; Mitchell, Louis L; Alavi, J S
Subject: FW: Clarification

From: Lynda Paxton [mailto:LPaxton@mayor.stallingsnc.org]
Sent: Wednesday, October 03, 2012 3:10 PM
To: Harris, Jennifer
Subject: Clarification

Jennifer,
I've been out of town but still pondering some of the information from our meeting on 9/24. You and Scott Cole both indicated that the comments from the meeting notes for the 74 corridor study were dealing with "safety" and not intended to address congestion per se. I understand that the notes were intended to capture the ideation and concepts from the discussion and were not direct quotes, but the message seemed clear that congestion would not improve significantly. You indicated there is data regarding the origin and destination for trips within the corridor. Can you please provide me with information relevant to the following questions?

1. What is the net reduction anticipated for traffic on Highway 74 in 2015 and 2035 after the bypass is constructed?
2. What is the anticipated reduction in commercial truck traffic on highway 74 in those years?
3. Conversely, what is the anticipated volume of traffic on the bypass for passenger vehicles and trucks in the early years and by 2035?
4. What is the anticipated volume for Highway 74?
4. What percentage of the current traffic on 74 has a destination within the 74 corridor and would be expected to continue to use that route?
5. What percentage of the current traffic on 74 originates outside the general Monroe/Union County area?
6. Is it possible to retain the SHC designation for Highway 74 after the bypass is constructed?

Thanks so much for your help.
Lynda Paxton

PRIVACY WARNING: For auditing purposes, a copy of this message has been saved in a permanent database.

Email correspondence to and from this sender is subject to the N.C. Public Records Law and may be disclosed to third parties.

This message has been checked for threats by Atkins IS

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
TURNPIKE AUTHORITY

BEVERLY E. PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

October 24, 2012

Memorandum To: Mayor Lynda Paxton

From: Jennifer Harris, P.E.

Subject: STIP R-3329/R-2559 Monroe Bypass
Questions regarding US 74 Corridor

Purpose. The purpose of this memo is to respond to questions submitted by Stallings' Mayor Lynda Paxton in an email dated October 3, 2012, regarding traffic patterns and projections for existing US 74 and the Monroe Bypass. Mayor Paxton asked the following seven questions, which are responded to below. In addition, references to where the information can be obtained are included. All referenced documents are available on the NCDOT web site at www.ncdot.gov/projects/monroeconnector.

1. What is the net reduction anticipated for traffic on Highway 74 in 2015 and 2035 after the bypass is constructed?
2. What is the anticipated reduction in commercial truck traffic on highway 74 in those years?
3. Conversely, what is the anticipated volume of traffic on the bypass for passenger vehicles and trucks in the early years and by 2035?
4. What is the anticipated volume for Highway 74?
5. What percentage of the current traffic on 74 has a destination within the 74 corridor and would be expected to continue to use that route?
6. What percentage of the current traffic on 74 originates outside the general Monroe/Union County area?
7. Is it possible to retain the SHC designation for Highway 74 after the bypass is constructed?

Responses.

1. What is the net reduction anticipated for traffic on Highway 74 in 2015 and 2035 after the bypass is constructed?

Table 1. US 74 AADT Comparisons – 2015 and 2035 No-Build and Build

US 74 Segment	2015 No-Build AADT	2015 Build AADT	2015 AADT Change	2035 No-Build AADT	2035 Build AADT	2035 AADT Change
I-485 to Stallings Rd	69,700	79,200*	+9,500^	89,100	95,600*	+6,500^
Stallings Rd to Indian Trail-Fairview Rd	67,500	70,700	+3,200	86,300	67,400	-18,900
Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	58,100	44,600**	-13,500	69,400	52,400**	-17,000
Unionville-Indian Trail Rd to Rocky River Rd	59,000**	33,800**	-25,200	72,300**	38,200**	-34,100
Rocky River Rd to US 601	64,600**	43,300**	-21,300	72,100**	48,100**	-24,000
US 601 to Morgan Mill Rd	62,900**	46,400**	-16,500	74,800**	57,200**	-17,600
Morgan Mill Rd to Austin Chaney Rd	54,500**	45,200**	-9,300	66,900**	60,000**	-6,900
Austin Chaney Rd to Forest Hills School Rd	27,700**	21,400**	-6,300	35,900**	26,100**	-9,800
Forest Hills School Rd to US 74	22,900	15,500	-7,400	31,600	20,700	-10,900

* Build volumes include a combination of US 74 frontage roads and Monroe Bypass traffic.

** Highest segmental traffic forecast volume is listed. Intermediate roadways within segments cause traffic forecast volumes to vary.

^ Build volumes increase due to the combination of US 74 and Monroe Bypass traffic.

Notes:

- 2015 No-Build and Build volumes calculated by straight-line interpolation between 2008 and 2035 No-Build and Build volumes from the following sources. Year 2015 was not specifically forecasted and, therefore, these volumes should only be used for general purposes.
    - 2008 and 2035 No-Build volumes from HNTB's *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector Bypass No-Build Traffic Forecast Memorandum* (dated March 2010).
    - 2008 and 2035 Build volumes from Wilbur Smith Associates' *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (dated September 19, 2008) – Exhibit 9 (2008 Build Toll Traffic Figures – Alternate 3A) and Exhibit 12 (2035 Build Toll Traffic Forecast Figures – Alternate 3A).

2. What is the anticipated reduction in commercial truck traffic on highway 74 in those years?

Table 2. US 74 Daily Truck Percentage Comparisons – 2015 and 2035 No-Build and Build

US 74 Segment	2015 and 2035 No-Build (Duals / TTST's)	2015 and 2035 Build (Duals / TTST's)
I-485 to Stallings Rd	8% / 5%	7% / 11%^
Stallings Rd to Indian Trail-Fairview Rd	8% / 5%	4% / 6%
Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	8% / 5%	4% / 6%
Unionville-Indian Trail Rd to Rocky River Rd	8% / 5%	4% / 6%
Rocky River Rd to US 601	8% / 5%	4% / 6%
US 601 to Morgan Mill Rd	8% / 5%	4% / 6%
Morgan Mill Rd to Austin Chaney Rd	8% / 5%	4% / 6% - 3% / 4%
Austin Chaney Rd to Forest Hills School Rd	8% / 5%	3% / 4%
Forest Hills School Rd to US 74	8% / 5%	3% / 4%

^ Truck percentages increase due to the combination of US 74 frontage roads and Monroe Bypass traffic for this segment.

Notes:

- (Duals / TTST's) – Duals (single-unit trucks with at least one dual-axled tire) and TTSTs (multi-unit trucks with single and twin trailers)
- 2015 No-Build and Build truck percentages were calculated using 2008 and 2035 volumes from the following sources. Year 2015 was not specifically forecasted and, therefore, these truck percentages should only be used for general purposes.
    - Truck percentages from Wilbur Smith Associates' *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (dated September 2008) – Exhibit 9 (2008 Build Toll Traffic Figures – Alternative 3A) and Exhibit 12 (2035 Build Toll Traffic Forecast Figures – Alternative 3A), and HNTB's *NCDOT STIP Project R-3329 & R-2559 Revised Monroe Connector Bypass No-Build Traffic Forecast Memorandum* (dated March 2010) (2008 and 2035 No-Build Traffic Forecast figures).

3. Conversely, what is the anticipated volume of traffic on the bypass for passenger vehicles and trucks in the early years and by 2035?

Table 3. Monroe Bypass AADT and Daily Truck Percentage Comparisons – 2015 and 2035 Build

Segment	2015 Build AADT	2035 Build AADT	2015 and 2035 Build Truck %'s (Duals / TTST's)
I-485 to Stallings Rd *	79,200	95,600	7% / 11%
Stallings Rd to Monroe Bypass *	78,000	95,600	7% / 11%
US 74 to Indian Trail-Fairview Rd	25,500	48,200	8% / 15%
Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	26,800	51,200	8% / 15%
Unionville-Indian Trail Rd to Rocky River Rd	27,300	52,300	8% / 15%
Rocky River Rd to US 601	23,900	46,600	8% / 15%
US 601 to Morgan Mill Rd	18,200	35,200	8% / 15%
Morgan Mill Rd to Austin Chaney Rd	12,800	24,800	8% / 16%
Austin Chaney Rd to Forest Hills School Rd	11,300	19,600	8% / 16%
Forest Hills School Rd to US 74	10,500	16,400	8% / 16%

* Build volumes include a combination of US 74 frontage roads and Monroe Bypass traffic.

Notes:

- (Duals / TTST's) – Duals (single-unit trucks with at least one dual-axled tire) and TTSTs (multi-unit trucks with single and twin trailers)
- 2015 volumes calculated by straight-line interpolation using 2008 and 2035 volumes from the following sources. Year 2015 was not specifically forecasted and, therefore, these volumes should only be used for general purposes.
    - <u>2008 and 2035 Build volumes and truck percentages</u> from Wilbur Smith Associates' *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (dated September 2008) – Exhibit 9 (2008 Build Toll Traffic Figures – Alternate 3A) and Exhibit 12 (2035 Build Toll Traffic Forecast Figures – Alternate 3A).

4. What is the anticipated volume for Highway 74?

Table 4. US 74 AADT Volumes – 2015 and 2035 Build

Segment	2015 Build AADT	2035 Build AADT
I-485 to Stallings Rd *	79,200	95,600
Stallings Rd to Indian Trail-Fairview Rd	70,700	67,400
Indian Trail-Fairview Rd to Unionville-Indian Trail Rd	44,600	51,300-52,400^
Unionville-Indian Trail Rd to Rocky River Rd	33,800	34,500-38,200^
Rocky River Rd to US 601	43,300	28,800-48,100^
US 601 to Morgan Mill Rd	46,400	56,000-57,200^
Morgan Mill Rd to Austin Chaney Rd	45,200	33,100-60,000^
Austin Chaney Rd to Forest Hills School Rd	21,400	25,200-26,100^
Forest Hills School Rd to US 74	15,500	20,700

* Build volumes include a combination of US 74 and Monroe Bypass traffic.
^ Highest segmental traffic forecast volume was used to interpolate the 2015 Build AADT. Intermediate roadways within segments cause traffic forecast volumes to vary.

Notes:

- 2015 Build volumes calculated by straight-line interpolation between 2008 and 2035 Build volumes from the following sources. Year 2015 was not specifically forecasted and, therefore, these volumes should only be used for general purposes.
    - 2008 and 2035 Build volumes from Wilbur Smith Associates' *Traffic Forecast for TIP Projects R-3329 & R-2559 Monroe Connector/Bypass* (dated September 2008) – Exhibit 9 (2008 Build Toll Traffic Figures – Alternate 3A) and Exhibit 12 (2035 Build Toll Traffic Forecast Figures – Alternate 3A)

5. What percentage of the current traffic on 74 has a destination within the 74 corridor and would be expected to continue to use that route?

Based on travel pattern surveys conducted as part of the *Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study* (Wilbur Smith Associates, dated October 22, 2010):

- Over 62 percent of respondents reported that they used US 74 during peak periods.
- Other roads with reported usage included Old Charlotte Highway, I-485, US 601, NC 200, NC 218, Lawyers Road, and NC 84.
- A majority of survey respondents (about 78 percent) indicated that their trip began in the communities of Monroe, Indian Trail, Marshville, Wingate or Charlotte.
- Almost 75 percent of trips were destined for Monroe, Charlotte, or Matthews.
- Of the total trips, 57 percent had a destination outside of the US 74 corridor in the project area (Matthews, Charlotte, or other[1]). The remaining 43 percent of respondents had a destination within the project study area (Indian Trail, Monroe, Wingate, Marshville).

[1] "Other" destinations include Richbury, Cheraw (SC), and Hamlet (NC).

6. What percentage of the current traffic on 74 originates outside the general Monroe/Union County area?

Generally, the "origin-destination survey" results show approximately 14.5% to 27.7% of traffic originates outside the general Monroe/Union County area (Charlotte 5.6%, Wadesboro 3.2%, Matthews 3.1% and Other 15.8%) per Table 3-2, page 3-5 of the *Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study* (Wilbur Smith Associates, dated October 22, 2010). The percent distribution of trips by origin city is based on travel pattern survey locations, per Figure 3-1. The survey locations were not exclusive to US 74 traffic and included additional roadways in the Monroe/Union County area.

Table 5. Trips by Origin City

Origin City	Percent
Monroe	42.9%
Indian Trail	17.3%
Marshville	6.4%
Wingate	5.7%
Charlotte	5.6%
Wadesboro	3.2%
Matthews	3.1%
Other	15.8%
Total	**100.0%**

7. Is it possible to retain the SHC designation for Highway 74 after the bypass is constructed?

The current Strategic Highway Corridor (SHC) map for NCDOT Division 10 (http://www.ncdot.gov/doh/preconstruct/tpb/shc/PDF/SHC_Vision_Plan_Division10.pdf) does not show existing US 74 as a SHC, rather it includes the Monroe Bypass as the designated SHC (Freeway). If there is a desire to change the designation to existing US 74, then there would be a process through the NCDOT Board of Transportation for approval.