

EAST END CONNECTOR

**From NC 147 (Durham Freeway) to North of NC 98 (Holloway Street)
Durham, Durham County**

PROJECT NUMBERS:

**Federal Aid Project No. NHF-76-1(2)
State Project No. 8.1351501
TIP Project No. U-0071**

**ADMINISTRATIVE ACTION
ENVIRONMENTAL ASSESSMENT**

**Submitted Pursuant to 42 USC 4332(2)(c) and 49 USC 303
U.S. Department of Transportation
Federal Highway Administration
and
North Carolina Department of Transportation**

**Cooperating Agencies:
Department of the Army, Corps of Engineers**

12/11/09
Date of Approval

Gregory J. Thorpe
FOR Gregory J. Thorpe, Ph.D., Director
Project Development and
Environmental Analysis Branch,
North Carolina Department of Transportation
John F. Sullivan, III
for John F. Sullivan, III, PE, Division Administrator
Federal Highway Administration

12/16/09
Date of Approval

The following persons may be contacted for additional information concerning this document:

John F. Sullivan, III, PE
Division Administrator
Federal Highway Administration
310 New Bern Avenue, Suite 410
Raleigh, NC 27601-1418
(919) 856-4346

Gregory J. Thorpe, Ph.D., Director
Project Development & Environmental Analysis Branch
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, NC 27699-1548
(919) 733-3141

This Environmental Assessment evaluates the adequacy of the FEIS for the East-West Freeway Project dated July 23, 1982. This previous study evaluated four build alternatives with respect to social and economic impacts, environmental impacts, and cost of a proposed facility east of the City of Durham.

EAST END CONNECTOR

**From NC 147 (Durham Freeway) to North of NC 98 (Holloway Street)
Durham, Durham County**

PROJECT NUMBERS:

**Federal Aid Project No. NHF-76-1(2)
State Project No. 8.1351501
TIP Project No. U-0071**

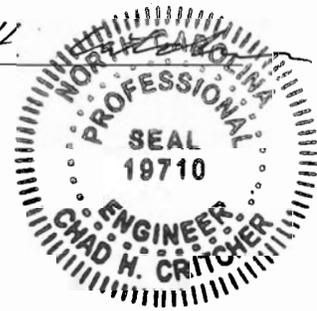
**ADMINISTRATIVE ACTION
ENVIRONMENTAL ASSESSMENT**

Documentation Prepared By:

RS&H Architects-Engineers-Planners, Inc.
Charlotte, North Carolina

12-4-09
Date

Chad H.
Chad H. Critcher, PE
Project Engineer



For the:

**North Carolina Department of Transportation
Project Development and Environmental Analysis Branch**

12-10-09
Date

Leza Wright Mundt
Leza Wright Mundt, AICP
Consultant Engineer

12/10/09
Date

Derrick G. Weaver
Derrick G. Weaver, PE
Consultant Engineering Unit Head

PROJECT COMMITMENTS

East End Connector
From NC 147 (Durham Freeway) to North of NC 98 (Holloway Street)
Durham, Durham County
Federal Aid Project No. NHF-76-1(2)
State Project No. 8.1351501
TIP Project No. U-0071

The following special commitments have been agreed to by NCDOT:

PDEA / Roadway Design

A design noise study and subsequent sound barrier design will be performed during the final roadway design phase of this project. A preliminary traffic noise analysis was performed as part of this document preparation and locations of noise sensitive areas were documented. No new noise sensitive areas will be identified or barrier locations added after the date of public knowledge, which corresponds with the approval of the project's final environmental document.

The NCDOT and the City of Durham are reviewing locations within the project limits where sidewalks and bicycle lanes would be beneficial and are developing an appropriate cost sharing agreement for these improvements.

PDEA/Division 5

The NCDOT will mitigate the use of parkland from C. R. Wood Park by paving the C. R. Wood parking lot and/or tennis courts, in coordination with the City of Durham Parks and Recreation Department.

TABLE OF CONTENTS

PAGE

1.0 Purpose of and Need for the Project	1-1
1.1 Introduction	1-1
1.2 Proposed Action.....	1-2
1.3 Project Description	1-2
1.4 System Linkage.....	1-4
1.4.1 Existing Roadway Network	1-4
1.4.2 Proposed Roadway Improvements.....	1-4
1.4.3 Modal Interrelationship.....	1-6
1.4.3.1 Railroads	1-6
1.4.3.2 Airports.....	1-7
1.4.3.3 Transit	1-7
1.5 Summary of Need for Proposed Action.....	1-7
1.6 Purpose of Need for Proposed Action.....	1-10
1.7 Conclusion	1-12
2.0 Description of Alternatives Considered	2-1
2.1 No-Build Alternative	2-1
2.2 Improve Existing Roadways Alternative.....	2-1
2.3 Transportation Management Alternative	2-1
2.4 Alternative Transportation Modes	2-2
2.5 Build Alternatives	2-2
2.5.1 Design Features	2-2
2.5.1.1 Roadway Design Criteria.....	2-2
2.5.1.2 Typical Section	2-3
2.5.1.3 Access Control.....	2-3
2.5.2 Preliminary Corridors.....	2-6
2.5.2.1 Description of Preliminary Corridors.....	2-6
2.5.2.2 Alternative Impacts	2-7
2.6 Traffic Operations Analyses	2-13
2.6.1 Year 2035 Traffic Projections	2-13
2.6.2 Freeway Mainline Capacity Analysis.....	2-15
2.6.3 Freeway Merge/Diverge Capacity Analysis.....	2-15
2.6.4 Freeway Weaving Capacity Analysis	2-20
2.6.5 Freeway Ramp Capacity Analysis.....	2-21
2.6.6 Intersection Capacity Analysis.....	2-22
2.6.7 Traffic Demand on local Roadways.....	2-23
2.6.8 Conclusions.....	2-25
2.7 Detailed Study Alternative(s).....	2-25
3.0 Existing Environments	3-1
3.1 Human and Physical Environment Characteristics	3-1
3.1.1 Population Characteristics.....	3-1
3.1.1.1 Population Profile	3-1
3.1.1.2 Racial/Ethnic Composition	3-3
3.1.2 Economic Characteristics	3-4
3.1.2.1 Employment	3-5
3.1.2.2 Income	3-6
3.1.2.3 Commuting Patterns.....	3-6
3.1.3 Neighborhoods	3-8

TABLE OF CONTENTS, (continued...)**PAGE**

3.1.4	Community Facilities and Services.....	3-8
3.1.4.1	Educational Facilities.....	3-11
3.1.4.2	Religious Institutions	3-11
3.1.4.3	Health Care Facilities	3-11
3.1.4.4	Government and Public Safety Facilities.....	3-11
3.1.4.5	Cultural Facilities	3-11
3.1.4.6	Parks/Recreational and Community Facilities.....	3-11
3.1.5	Noise	3-12
3.1.5.1	Characteristics of Noise	3-13
3.1.5.2	Traffic Noise Measurement and Modeling.....	3-13
3.1.6	Air Quality	3-16
3.1.7	Farmlands	3-17
3.1.8	Utilities	3-17
3.1.9	Visual Environment	3-17
3.1.10	Hazardous Materials	3-17
3.1.11	Floodplains/ Floodways.....	3-21
3.1.12	Parks, Recreational lands, and Wildlife Refuges.....	3-21
3.2	Cultural Resources.....	3-21
3.2.1	Historic Architectural Resources	3-21
3.2.2	Archaeological Resources.....	3-23
3.3	Land Use and Transportation Planning.....	3-23
3.3.1	Land Use Plans	3-23
3.3.1.1	Existing Land Use and Zoning Characteristics.....	3-24
3.3.1.2	Future Land Use	3-24
3.3.2	Transportation Plans	3-25
3.3.2.1	Highway Plans	3-28
3.3.2.2	Transit Service	3-29
3.3.2.3	Bicycle and Pedestrian Plans.....	3-31
3.4	Natural Environment Characteristics.....	3-31
3.4.1	Geology/ Topography/Soils	3-31
3.4.1.1	Geology	3-31
3.4.1.2	Topography	3-31
3.4.1.3	Soils	3-32
3.4.2	Biotic Communities and Wildlife	3-32
3.4.2.1	Methodology.....	3-32
3.4.2.2	Terrestrial Communities	3-34
3.4.2.3	Terrestrial Wildlife.....	3-35
3.4.2.4	Aquatic Communities and Wildlife.....	3-36
3.4.3	Water Resources.....	3-37
3.4.3.1	Surface Water Characteristics.....	3-37
3.4.3.2	Best Usage Classification.....	3-37
3.4.3.3	Listed Waters in Section 303(d) of the Clean Water Act.....	3-41
3.4.4	Jurisdictional Issues	3-41
3.4.4.1	Waters of the United States	3-41
3.4.4.2	Wetlands and Surface Waters.....	3-41
3.4.4.3	Riparian Buffers	3-42
3.4.4.4	Protected Species	3-47

TABLE OF CONTENTS, (continued...)

PAGE

4.0 Preferred Alternative Environmental Consequences	4-1
4.1 Human and Physical Environment	4-1
4.1.1 Community	4-1
4.1.1.1 Local Access and Travel Patterns.....	4-1
4.1.2 Relocations and Neighborhood Cohesion.....	4-3
4.1.3 Community Facilities and Services.....	4-4
4.1.3.1 Impacts to Churches	4-5
4.1.3.2 Impacts to Parks – Section 4(f) De Minimis Impact Analysis	4-5
4.1.4 Impacts to Environmental Justice Populations	4-9
4.1.4.1 Federal Regulations and Policies.....	4-9
4.1.4.2 Public Involvement Activities	4-10
4.1.4.3 Community Cohesion.....	4-11
4.1.4.4 Avoid, Minimize, and Mitigate Impacts to Minority and Low-Income Populations	4-12
4.1.5 Accessibility and Economic Development.....	4-14
4.1.6 Potential Community Impact Mitigation Measures	4-15
4.1.7 Noise	4-15
4.1.7.1 Traffic Noise Abatement Measures	4-16
4.1.8 Air Quality.....	4-19
4.1.8.1 CO Microscale Analysis.....	4-19
4.1.8.2 Attainment Status	4-19
4.1.8.3 Mobile Source Air Toxics.....	4-20
4.1.9 Farmlands	4-25
4.1.10 Utilities	4-26
4.1.11 Visual Impacts	4-26
4.1.12 Hazardous Materials	4-27
4.2 Land Use and Transportation Planning.....	4-27
4.3 Cultural Resources.....	4-27
4.3.1 Historic Architecture Resources	4-27
4.3.2 Archaeological Resources.....	4-27
4.4 Natural Environment	4-27
4.4.1 Biotic Community and Wildlife.....	4-28
4.4.1.1 Terrestrial Community and Wildlife.....	4-28
4.4.1.2 Aquatic Community and Wildlife	4-28
4.4.2 Water Resources.....	4-28
4.4.2.1 Major Drainage Structures.....	4-28
4.4.2.2 Stream/Pond Impacts	4-29
4.4.2.3 Floodplain/Floodways	4-31
4.4.3 Jurisdictional Issues	4-31
4.4.3.1 Impacts to Jurisdictional Wetlands and Surface Waters.....	4-31
4.4.3.2 Permits.....	4-32
4.4.3.3 Mitigation Evaluation.....	4-33
4.5 Construction	4-35
4.5.1 Air Quality.....	4-36
4.5.2 Noise	4-36
4.5.3 Water Quality.....	4-37
4.5.4 Biotic Communities.....	4-37
4.5.5 Construction Waste	4-37
4.5.6 Utility Service.....	4-37
4.5.7 Maintenance of Traffic.....	4-37

TABLE OF CONTENTS, (continued...)	PAGE
4.6 Indirect and Cumulative Effects	4-37
4.6.1 Market Conditions and Development Potential	4-38
4.6.2 Forecasted Growth	4-39
4.6.3 Land Supply and Infrastructure	4-39
4.6.4 Local Accessibility Changes	4-39
4.6.5 Property Values	4-39
4.6.6 Potential for Land Use Changes and Development	4-39
4.6.7 Mitigation of Growth Impacts	4-40
5.0 Agency Coordination and Public Involvement.....	5-1
5.1 Agency Coordination	5-1
5.1.1 Project Scoping	5-1
5.1.2 Merger 01 Meetings	5-1
5.1.2.1 Concurrence Point 1	5-1
5.1.2.2 Concurrence Point 2	5-2
5.1.2.3 Concurrence Point 2A and 3.....	5-2
5.1.2.4 Concurrence Point 4A.....	5-2
5.2 Public Involvement	5-2
5.2.1 Mailing List, Email, Newsletters, Hotline, Website and Other Repositories.....	5-3
5.2.2 Citizens Information Workshops and Neighborhood Meetings.....	5-5
5.2.3 AD HOC Advisory Committee Meeting.....	5-6
5.2.4 Elected Officials Presentations.....	5-6
5.2.5 Neighborhood and Small Group Meetings	5-6
5.2.6 Public Involvement Summary	5-6
6.0 Environmental Assessment Conclusion	6-1
7.0 References.....	7-1
8.0 Technical Appendices (Separate Documents).....	8-1

APPENDIX

Appendix A	Agency Comments & Coordination
Appendix B	Relocation Reports
Appendix C	Air Quality Analysis
Appendix D	Noise Analysis
Appendix E	Public Involvement
Appendix F	Public Hearing Transcript

LIST OF TABLES**PAGE**

Table 1-1	Projects in Vicinity of EEC Study Area	1-6
Table 1-2	Traffic Demand On Local Roadways	1-9
Table 1-3	Accident Analysis	1-10
Table 2-1	Proposed Roadway Design Criteria	2-4
Table 2-2	Alternatives Analysis Summary	2-12
Table 2-3	Freeway Mainline Capacity Analysis 2035 Build Conditions	2-18
Table 2-4	Freeway Merge/Diverge Capacity Analysis 2035 Build Conditions	2-19
Table 2-5	Freeway Weaving Capacity Analysis 2035 Build Conditions	2-21
Table 2-6	Freeway Ramp Capacity Analysis 2035 Build Conditions	2-22
Table 2-7	Intersection Capacity Analysis 2035 Build Conditions	2-24
Table 2-8	Traffic Demand on Local Roadways	2-25
Table 3-1	Population Profile of Durham and North Carolina	3-3
Table 3-2	EEC Study Area Racial/Ethnic Composition	3-4
Table 3-3	EEC Study Area Employment by Sector	3-5
Table 3-4	EEC Study Area Annual Household Income	3-6
Table 3-5	EEC Study Area Community Facilities	3-10
Table 3-6	Noise Abatement Criteria	3-12
Table 3-7	Criteria for Substantial Noise Increase	3-13
Table 3-8	Ambient Noise Levels (Leq)	3-15
Table 3-9	National Ambient Air Quality Standards	3-16
Table 3-10	USTs Hazardous Waste & Other Potentially Contaminated Sites	3-19
Table 3-11	Projects in Vicinity of EEC Study Area	3-28
Table 3-12	Soil Mapping Units	3-33
Table 3-13	Jurisdictional Streams within the Project Area	3-38
Table 3-14	Jurisdictional Streams within the Project Area	3-39
Table 3-15	Verified Wetlands and Ponds within the Project Study Area	3-43
Table 3-16	Verified Wetlands and Ponds within the Project Study Area	3-45
Table 3-17	Federally Protected Species for Durham County	3-47
Table 3-18	Federal Species of Concern for Durham County	3-49
Table 4-1	Estimated Minority and Low Income Relocations for the EEC Facility	4-13
Table 4-2	Predicted Traffic Noise Impacts	4-16
Table 4-3	Utility Relocation Cost Estimates	4-26
Table 4-4	Coverage Area of Terrestrial Communities	4-28
Table 4-5	Major Drainage Structures	4-29
Table 4-6	Estimated Stream Impacts	4-30
Table 4-7	Estimated Pond Impacts	4-30
Table 4-8	Estimated Wetland Impacts	4-32
Table 4-9	Avoidance and Minimization Summary	4-34
Table 4-10	Potential On-Site Mitigation	4-34
Table 4-11	Potential for Land Use Changes Related to Indirect and Cumulative Effects	4-40
Table 5-1	Community Meetings	5-4
Table 5-2	Newsletters	5-5

LIST OF FIGURES**PAGE**

Figure 1-1	Project Study Area	1-3
Figure 1-2	Existing Transportation System.....	1-5
Figure 2-1	Typical Section	2-5
Figure 2-2	Preliminary Alternative 1	2-8
Figure 2-3	Preliminary Alternative 2	2-9
Figure 2-4	Preliminary Alternative 3	2-10
Figure 2-5	Preliminary Alternative 4	2-11
Figure 2-6	Lane Configuration, 2035 Build Conditions	2-14
Figure 2-7	Daily Traffic Volumes, 2006 and 2035 Conditions	2-16
Figure 3-1	Minority/Ethnic Population.....	3-2
Figure 3-2	Low-income Population	3-7
Figure 3-3	Community Facilities and Neighborhoods.....	3-9
Figure 3-4	Ambient Noise Measurement Sites	3-14
Figure 3-5	Floodplains	3-22
Figure 3-6	Existing Land Use	3-26
Figure 3-7	Future Land Use	3-27
Figure 3-8	2030 Long Range Transportation Plan Projects	3-30
Figure 3-9	Streams and Wetlands	3-46
Figure 4-1	De Minimis Acquisition, C. R. Wood Park	4-7
Figure 4-2	Vehicle Miles Traveled (VMT) Vs. Emissions, 2000 - 2020	4-21

1.0 Purpose of and Need for the Project

1.1 Introduction

The proposed East End Connector has a long history, dating from 1959 when it was introduced as part of the City of Durham Thoroughfare Plan. This project has been incorporated in City plans and transportation studies since the 1970's and was established as the City's top priority transportation project in the year 2000. The history of the proposed East End Connector is directly linked to the East-West Freeway (NC 147 between interstate I-40 and interstate I-85). The two projects were planned simultaneously during the preparation of a 1982 Final Environmental Impact Statement (FEIS). This 1982 FEIS and subsequent Record of Decision allowed the East-West Freeway, now known as the Durham Freeway or NC147¹, to be completed in 1992; however, the proposed East End Connector did not receive funding and was not constructed.

Interest in the proposed East End Connector re-surfaced in the late 1990's; and in 1998 the North Carolina Department of Transportation initiated further study of the 1982 Final Environmental Impact Statement as it relates to the proposed East End Connector; however, funding was not allocated. In 2003 the proposed East End Connector project was added to the list of projects eligible for the North Carolina Highway Trust Fund program and in 2005, a new study was initiated to again re-evaluate the 1982 FEIS. This Environmental Assessment (EA) is the resulting planning document of the 2005 – 2008 re-evaluation and includes updating the roadway design alternatives and associated traffic impact analysis, socioeconomic analysis, natural resources, biological resources, historical and cultural resources and right-of-way/relocation impacts for the proposed project.

Federal regulations, specifically 23 CFR 771.129(b) and (c), require that the Federal Highway Administration conduct re-evaluations of Final Environmental Impact Statements (FEIS) before further approvals are granted to advance a project toward construction when no major steps to advance the project have occurred within three years of approval of the FEIS. According to 23 CFR 771.130(c) and the Federal Highway Administration's Technical Advisory T6640.8A, an Environmental Assessment may be prepared as the written re-evaluation for a proposed action. Federal regulations, specifically 23 CFR 771.130(c) states, "where the Administration is uncertain of the significance of the new impacts, the applicant will develop appropriate environmental studies or, if the Administration deems appropriate, an EA to assess the impacts of the changes, new information, or new circumstances." Due to the amount of time that has passed since the FEIS was first approved, the similarity in scope and study area to the 1982 FEIS, and the possibility of new or significant impacts, the Federal Highway Administration has determined that an Environmental Assessment is the most appropriate tool for evaluating and clearly documenting any new or significant impacts identified during the re-evaluation process. If no significant impacts are identified during preparation of the EA, a Finding of No Significant Impact (FONSI) will be issued for the proposed project and compliance with the National Environmental Policy Act will be complete.

This EA is prepared in accordance with Title 23 CFR (Highways) Part 771.129 and the Federal Highway Administration (FHWA) Technical Advisory T6640.8A and has followed the North Carolina Department of Transportation Merger 01 Environmental Planning Process.

¹ NC 147 is also known as the I. L. "Buck" Dean Freeway – NCDOT Transportation Improvement Program 2006 – 2012.

Merger 01 is a process to streamline the project development and permitting processes, agreed to by the US Army Corps of Engineers (USACE), North Carolina Department of Environment and Natural Resources (NCDENR), Federal Highway Administration (FHWA) and North Carolina Department of Transportation (NCDOT) and supported by other stakeholder agencies and local units of government. The Merger 01 process provides a forum for appropriate agency representatives to discuss and reach consensus on ways to facilitate meeting the regulatory requirements of Section 404 of the Clean Water Act during the NEPA/SEPA decision-making phase of transportation projects.

Results from this EA confirm the build alternatives previously studied during the 1982 FEIS, with minor alignment adjustments, and also finds that the Purpose and Need Statement from the 1982 FEIS (citing capacity deficiencies, better freeway connectivity, and consistency with state and local land use and transportation plans) continues to be valid. The Merger 01 team approved this Purpose & Need and study area boundaries during the Concurrence Point 1 meeting held on December 12, 2006. Team members consisted of representatives from the FHWA, NCDOT, USACE, US Fish and Wildlife Service (USFWS), US Environmental Protection Agency (USEPA), North Carolina Division of Water Quality (NCDWQ), North Carolina Wildlife Resource Commission (NCWRC), and the North Carolina State Historic Preservation Office (SHPO).

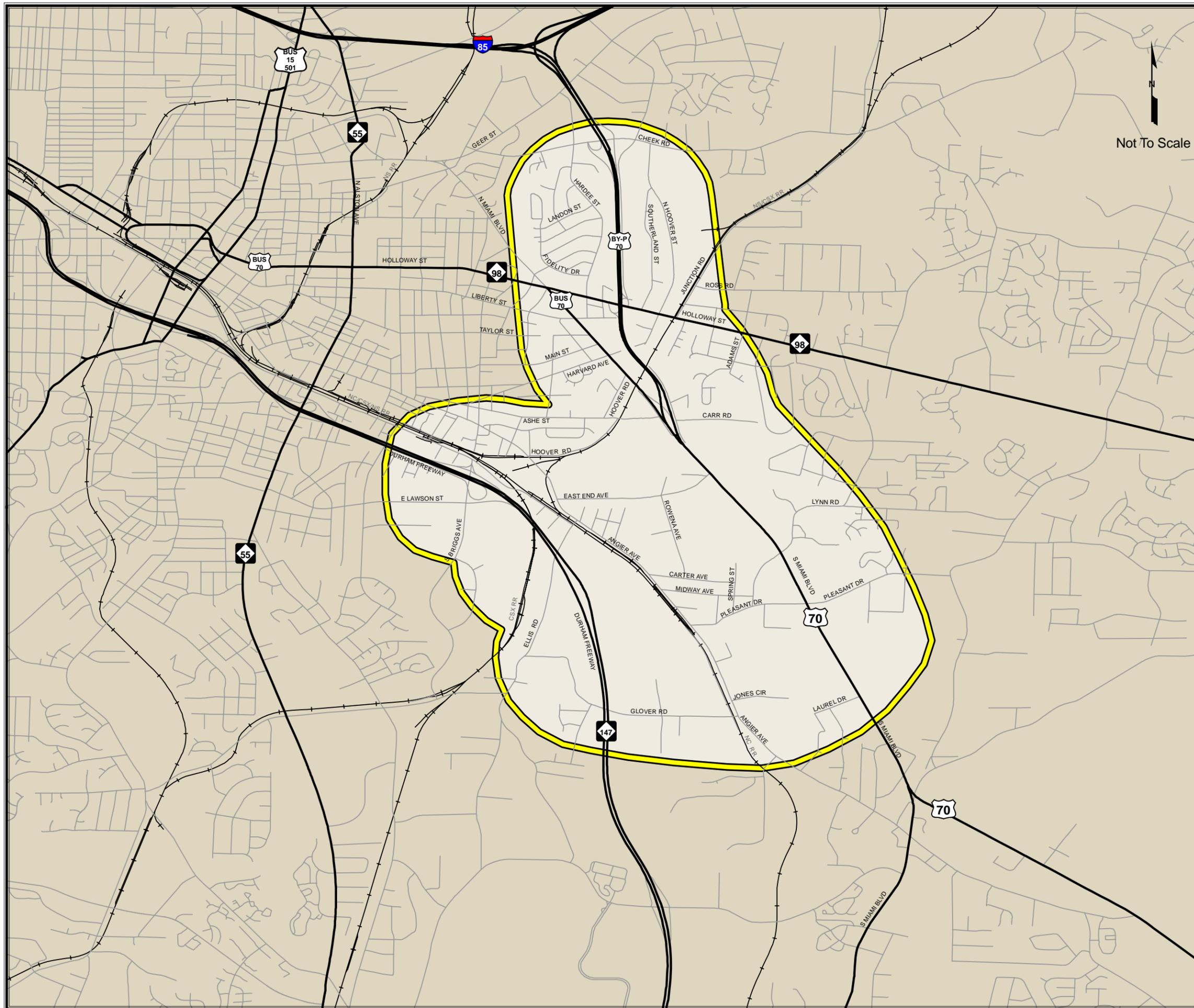
1.2 Proposed Action

The North Carolina Department of Transportation (NCDOT) 2009–2015 Transportation Improvement Program (TIP) proposes the East End Connector (EEC) project to provide a direct freeway connection between the Durham Freeway (NC 147) and US 70 in Durham County. The EEC project begins on NC 147 in the vicinity of Glover Road and ends on US 70 just south of Cheek Road. The proposed project will also upgrade US 70 to a freeway from NC 98 (Holloway Street) to Pleasant Drive. US 70 has already been upgraded to a freeway north of NC 98.

1.3 Project Description

The proposed project is located within the City of Durham in Durham County, North Carolina. Durham County is located in the northern Piedmont region of the state and shares boundaries with Orange, Person, Granville, Wake, and Chatham counties. The general study area is bounded by Cheek Road to the north, Glover Road to the south, US 70 to the east, and NC 147 to the west. Figure 1-1 shows the project location and study area.

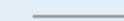
The East End Connector will be designed to interstate standards. Freeway-to-freeway junctions will be provided between US 70 and the East End Connector and between the East End Connector and NC 147. The proposed facility is approximately 3.6 miles long and will ultimately include three continuous through lanes in each direction plus auxiliary lanes as needed. Corresponding design elements include a median 26 feet wide, 12 feet wide inside shoulders, and 14 feet wide outside shoulders. This roadway geometry will provide a free-flow traffic movement at high speeds connecting the area's freeway and interstate facilities. Right-of-way costs for the ultimate section are estimated at \$44 million with a construction cost of \$137.3 million.

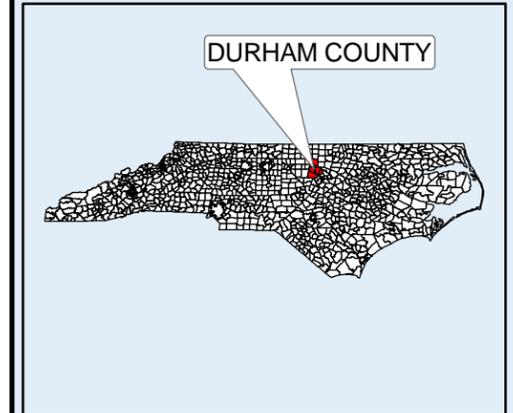


PROJECT STUDY AREA

EAST END CONNECTOR

LEGEND

-  Major Highway
-  Local Streets
-  Railroad



 General Study Area Boundary

Due to project budget constraints, project construction phasing studies were performed resulting in an alternative build section. This section will include four lanes for the East End Connector (two continuous lanes in each direction) with a median 50 feet wide.

The 2009-2015 TIP indicates a right-of-way acquisition schedule of 2010 with construction beginning in 2013.

Project construction phasing studies resulted in a 2013 build section which will be two continuous lanes in each direction. As traffic volumes increase on the East End Connector, the need for the ultimate six-lane section with an additional continuous lane in each direction may be required. As traffic volumes dictate, the additional third lane will be constructed inside the median. This will reduce the median width from 50 feet to 26 feet, but will not increase the outside shoulder roadway footprint. The build section will match the ultimate section's right-of-way cost of \$44 million; however, the initial construction costs will be lowered to \$130 million. The ultimate and build sections are further described and shown in section 2.5 of this document.

During the planning process the ultimate section was analyzed in order to clarify final roadway conditions. The build section was studied only for purposes of reducing initial project construction costs. Environmental impacts identified in the EA are based on the ultimate six-lane typical section.

1.4 System Linkage

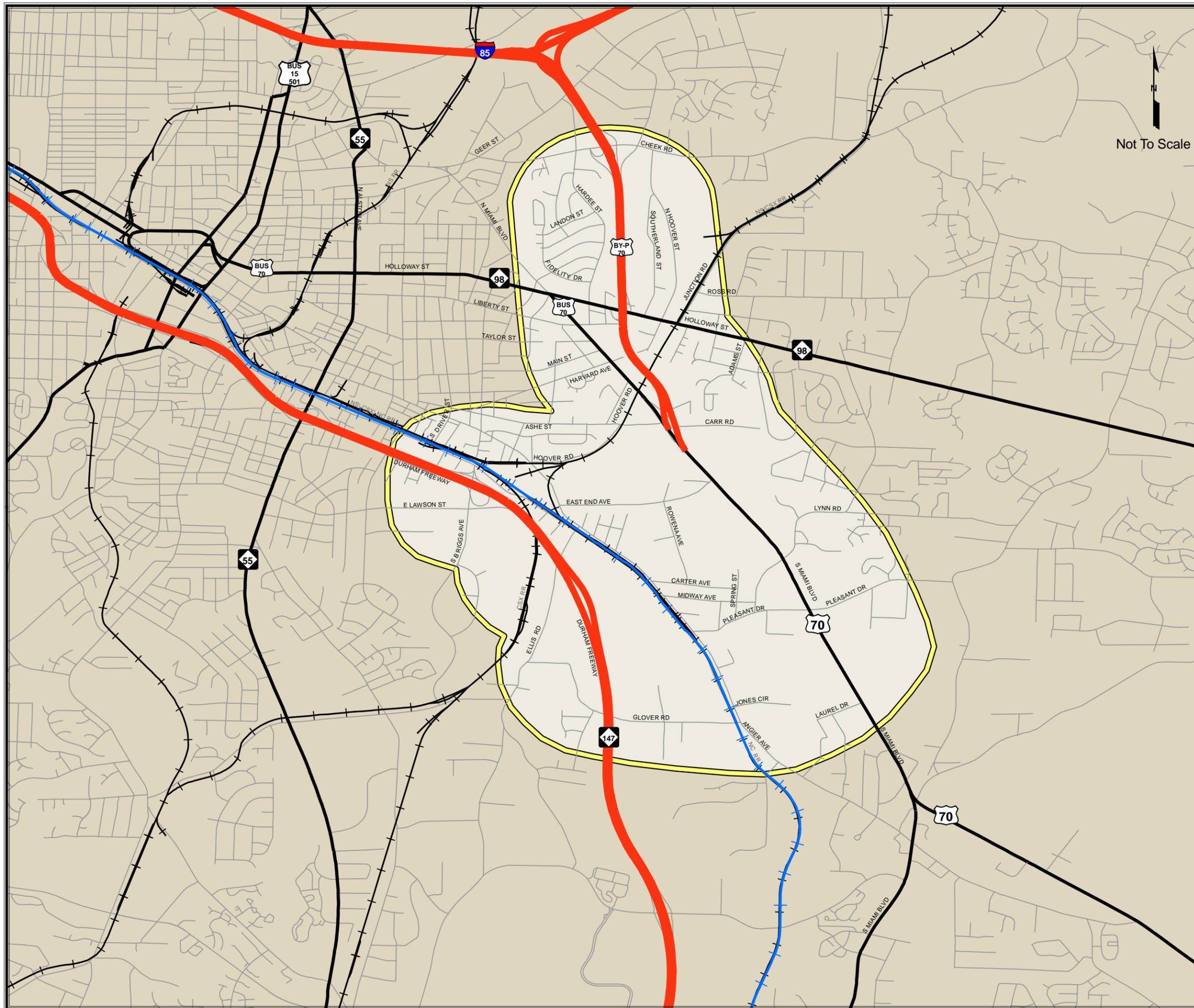
Population and economic growth in Durham continue to place greater demands on the transportation system. These demands require greater interaction between the various transportation modes. This section provides an overview of the relationship between the proposed East End Connector project and the overall roadway network and describes other modes of transportation operating in the study area.

1.4.1 Existing Roadway Network

The Durham County transportation system is dominated by major east/west interstate transportation corridors: I-85 to the north of Durham's central business district and I-40 to the south. The two freeways merge in Orange County, the county immediately west of Durham County. Connections between the Durham Freeway and US 70 are currently accommodated by a series of local arterial streets such as Holloway Street, Avondale Drive/Alston Avenue, Roxboro Street/Mangum Street (one-way pair), and Duke Street/Gregson Street (one-way pair). Figure 1-2 provides an overview of major transportation facilities within the study area.

1.4.2 Proposed Roadway Improvements

Table 1-1 lists the other roadway-related improvement projects that have programmed funding by NCDOT and are in, or near, the EEC study area. Additional details on these roadway improvements are shown in Figure 3-8 and discussed in section 3 of this document.



EXISTING TRANSPORTATION SYSTEM

EAST END CONNECTOR

LEGEND

- MAIN ROADWAYS**
- Freeways
-  I-85
 -  NC 147
 -  US 70 Bypass
- Highways
-  NC 98
 -  NC 55
 -  US 15/501
 -  US 70 Business
 -  US 70
- RAILROAD**
- Passenger
-  Amtrak Rail Service
- Freight
-  All Freight Rail

 General Study Area Boundary

**Table 1-1
Projects in Vicinity of EEC Study Area**

TIP No.	Route	Length (miles)	Description	Construction Year 2009-2015 TIP
U-2831B	Briggs Ave Extension	1.6	Riddle Rd to So-Hi Dr - Two lanes on multi-lane right-of-way.	Unfunded - Future Years
U-4010	NC 98	0.3	Widening of NC 98 (Holloway St) center turn lane from east of US 70 to east of Junction Rd.	Under Construction
U-4446	NC 147	N/A	NC 147, I-40 to I-85 - Install ITS infrastructure improvements.	Under Construction
U-4720	US 70	7.8	US 70 - Lynn Rd to the proposed Northern Durham Pkwy. Upgrade to limited access control freeway.	Unfunded - Future Years
U-3308	NC 55	1.0	NC 55 (Alston Avenue), NC 147 (I.L. "Buck" Dean Freeway) to US 70 Bus.-NC 98 (Holloway Street). Widen to four lane divided facility and replace Norfolk-Southern Railroad bridges.	FY 2011

1.4.3 Modal Interrelationships

Multi-modal transportation is becoming critical to the efficient movement of people and goods. Listed below is an overview of the other modes of transportation that exist within the proposed East End Connector study area.

1.4.3.1 Railroads

Freight Rail

Freight rail service is provided to businesses within the study area by three railroad lines. The North Carolina Railroad (NCR) parallels Angier Avenue from the northwest to the southeast. The CSX Railroad enters the study area from the southwest parallel to Ellis Road. The Norfolk and Southern Railroad parallels Junction Road entering the study area from the north. All of the railroads come into the East Durham Rail Yard, located between Pettigrew Street and NC 147. The East Durham Rail Yard is a switching facility for the movement of rail traffic from north to south within the county.

Passenger Rail

Amtrak operates daily passenger rail service on the NCRR in the Durham area; the rail station is located in downtown Durham and the Amtrak route passes through the East End Connector study area. There are also two separate rail transit services proposed within the EEC study area, the North Carolina Railroad shared corridor commuter rail, and the Southeast High Speed Rail Corridor.

1.4.3.2 Airports

The Raleigh-Durham International (RDU) Airport provides a full complement of aviation services to the region. The airport is located in Wake County approximately 12-miles southeast of the study area. Airport total passenger activity for 2005 was 9,409,992. Freight shipped by air through the airport in 2005 totaled 9,154,020 pounds. Traffic traveling from downtown Durham on the Durham Freeway can access the airport via I-40 in the southern part of Durham County. Travelers using US 70 can gain access to the airport via I-540.

1.4.3.3 Transit

Bus and paratransit service is available in Durham through the Durham Area Transit Authority (DATA). Within the EEC study area, bus service is provided on DATA Routes 2, 3, 13, 15, and 16.

Triangle Transit also operates regional bus service in the Triangle region. The Triangle Transit regional bus system travels through the EEC study area via NC 147 connecting downtown Durham, the Research Triangle Park (RTP), I-40 and other cities in the Triangle region. Future expansions of the regional bus service are planned for areas south of the EEC study area within the RTP.

1.5 Summary of Need for Proposed Action

The Durham Freeway (NC 147) starts at I-85 north and west of downtown; it runs on the south side of downtown and connects to I-40 in the Research Triangle Park. In Durham, US 70 intersects with I-85 on the northeast side of downtown and runs south and east into Wake County. On the east side of downtown these two roadways parallel each other and come as close as one mile apart within the study area, yet do not connect. Traffic projections indicate that without the proposed East End Connector, local and regional traffic cannot efficiently gain access to the freeway system. This will affect traffic flow conditions on NC 147, US 70 and on local streets. This compromises the ability to maintain an efficient transportation system and reduces residents' ability to access employment and retail centers. These issues are demonstrated by the following summary of existing and projected travel conditions.

- **Capacity Deficiencies** – Capacity analyses were performed on six freeway segments, 19 merge/diverge junctions and fifteen ramp capacities along NC 147 and US 70. Seventeen intersections on local streets were also included in the analysis. Traffic data from the Triangle Travel Demand model were used in the analysis.

By the year 2035, the proposed project's design year, traffic demand will approach or exceed roadway capacity on NC 147, US 70, and at nine of the seventeen intersections analyzed:

- NC 147 between Ellis Road and Briggs Avenue and US 70 between US 70 Business (Miami Boulevard.) and NC 98 (Holloway Street) will fail in serving the traffic demand (Level of Service F) during at least one peak hour of the day.
 - Traffic demand at all NC 147 and US 70 ramp junctions analyzed will exceed capacity (Level of Service F) during at least one peak hour of the day.
 - Traffic at nine intersections will either approach or exceed capacity during at least one peak hour of the day.
- **Poor Connectivity between the Durham Freeway (NC 147) and US 70** – Over the last 25 years Durham County has had an average population growth rate of two percent per year.¹ This steady growth requires the community to maintain an efficient transportation system that will meet the growing demand for the movement of people and goods. The lack of a high speed limited access connector between the Durham Freeway and US 70 reduces the efficiency of the regional transportation system. Travel demand modeling indicates that without this connector the number of through trips using local arterial streets will increase through the year 2035. This will cause greater delay at signalized intersections, increased travel time on local roadways and reduced quality of life in neighborhoods bordering these roadways. These affected areas are described below:
 - North of the Project Study Area – Through traffic that is generated north of the study area must travel on local roadways such as Roxboro Street/Mangum Street (US 15/501 one-way pair), Alston Avenue/Avondale Drive (NC 55), and Gregson Street/Duke Street (one-way pair) to travel between US 70 and the Durham Freeway. These roadways are major arterials that pass through residential neighborhoods such as the Duke Park, Old North Durham, Old Five Points, Trinity Park, and the Albright Community.
 - East of the Project Study Area – Residents and businesses east of the study area have two major arterials, in the form of one-way pairs, (Holloway Street/NC 98 and Cheek Road/Geer Street) that provide access to downtown Durham; these roadways do not connect directly to the Durham Freeway. Vehicles traveling west on Cheek Road will use Geer Street to connect to Alston Avenue or Roxboro Street to access the Durham Freeway. Widening these roadways and/or improving the intersections will increase capacity, but will cause substantial impacts to the neighborhoods adjacent to the roadways.
 - **Through Traffic on Local Streets** – Traffic volumes on local roadways are forecast to increase over the next 25 years for roadways such as Gregson Street/Duke Street (one-way pair), Roxboro Street/Mangum Street (US 15/501 one-way pair), and Alston Avenue/Avondale Drive (NC 55). Table 1-2 provides a comparison of the current and projected traffic volumes for these roadways without the proposed East End Connector.

¹ U.S. Census Bureau - Durham County Census of Population 1980, 1990, 2000, and Durham County Census of Population Estimates for the year 2005.

**Table 1-2
Traffic Demand on Local Roadways**

Street Name	Location	2006 Volume	2035 Volume	
			No-Build	
			Volume	Percent Change
S. Alston Avenue ¹	At NCRR ²	21,600	42,000	+94%
S. Mangum Street	At NCRR	9,700	12,300	+27%
S. Roxboro Street	At NCRR	11,800	15,700	+33%
S. Duke Street	At NCRR	13,300	16,500	+24%
S. Gregson Street	At NCRR	13,000	18,400	+42%

¹ Alston Avenue is currently a 2-lane roadway with plans to be upgraded to a 4-lane facility (2 lanes in each direction) in 2011. NCDOT STIP Division 5 Durham County – U 3308.

² North Carolina Railroad

Source: *Traffic Forecast for Project U-0071 (East End Connector) Durham County, North Carolina Department of Transportation; July 6, 2006.*

Based on the traffic forecast, the proposed East End Connector is crucial for the efficient movement of traffic. Without the proposed project, local roadways will continue to have traffic growth, but with little or no viable solution to reduce delay. The following examples demonstrate these impacts:

- **Alston Avenue/Avondale Drive** – This road is scheduled to be widened to a four-lane thoroughfare in 2007. Traffic demand on this roadway is projected to almost double to 42,000 over the next 30 years. Even with the added capacity, traffic demand on the four-lane version of Alston Avenue will exceed its capacity by 2035. Additional widening of Alston Avenue will increase capacity, but cause adverse impacts on neighborhoods adjacent to the roadway.
 - **Mangum Street/Roxboro Street** – Average daily traffic on this one-way pair will increase up to 33 percent without the EEC. This one-way pair travels through local neighborhoods. Widening to create additional capacity on this one-way pair will have adverse impacts on neighborhoods around it.
 - **Duke Street/Gregson Street** – Average daily traffic on this one-way pair will approach capacity, increasing by 24 percent and 42 percent respectively by the year 2035. This one-way pair travels through local neighborhoods; adding capacity will adversely affect the neighborhoods around the pair.
- **State/Local Land Use and Transportation Plans** – The proposed East End Connector is consistent with state, regional, and local planning programs. These plans have been adopted through local government action to establish policy to guide growth and infrastructure improvements. The proposed East End Connector project has been included in the following planning documents:
 - The North Carolina Strategic Highway Corridor System, adopted in 2004.
 - The NCDOT Long Range Transportation Plan, adopted in 2004.
 - The 2030 Long Range Transportation Plan, adopted by the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) in 2004.
 - The City of Durham and Durham County incorporated the proposed East End Connector into the 2030 Long Range Transportation Plan adopted in 2005.
 - **Above-Average Accident Rates on Area Roadways** – The local roadways that are currently used to connect US 70 to the Durham Freeway—including Alston

Avenue/Avondale Drive, Mangum Street/Roxboro Street (one-way pair), and Duke Street/Gregson Street (one-way pair)—have crash rates that are five to seven times higher than the statewide average for similarly classified roadways. Table 1-3 shows that traffic using these roadways has a greater chance of being involved in an accident than if they were traveling on a freeway facility. Without the proposed East End Connector, traffic is projected to increase on each of these roadways (see Table 1-2 Traffic Demand on Local Roadways). As traffic increases on these roadways over the next 30 years, the probability of more frequent crashes increases due to more high speed vehicles traveling within closer proximity of one another.

**Table 1-3
Accident Analysis**

Street Name	Crash Rate (Accidents per 100 Million Miles of Travel)	Statewide Crash Rate (Accidents per 100 Million Miles of Travel)	Crash Rate Statewide Rate
Local Streets			
S. Alston Avenue	1,700	300	5.7
S. Mangum Street	1,900	300	6.3
S. Roxboro Street	2,000	300	6.7
S. Duke Street	1,700	300	5.7
S. Gregson Street	1,600	300	5.3
US 70- Mineral Springs Rd to US 70 Bus.	300	250	1.2
Freeways			
NC 147	60	140	0.4
US 70- US 70 Bus. To Cheek Rd.	132	150	0.9

Source: Traffic Safety Systems Management Unit of the Traffic Engineering and Safety Systems Branch – North Carolina Department of Transportation, 2002-2005

1.6 Purpose of Proposed Action

The purpose of the proposed East End Connector is to improve capacity on the Durham Freeway (NC 147) and US 70 and improve connectivity between these high speed routes which provide direct access to I-40 to the south, and I-85 to the north. The proposed improvement will offer a number of secondary benefits to travelers and residents in East Durham, including improved access to major employment centers, particularly the Research Triangle park; enhance connectivity between suburban areas to the north and east of downtown Durham; and divert through traffic away from local surface streets, such as Magnum Street and Roxboro Street.

- **Improves Roadway Capacity for Major Freeway** – The proposed East End Connector will help relieve future congestion on the Durham Freeway through downtown Durham.
 - By providing an alternative route between northern suburbs and the Research Triangle Park, the proposed East End Connector will divert traffic away from NC 147 through downtown, a route that will exceed capacity in the future.

- **Improves Freeway Connectivity between Durham Freeway (NC 147) and US 70** – The proposed East End Connector will improve the movement of people and goods within the City of Durham, Durham County, and the region.
 - The proposed East End Connector provides a direct freeway connection between the Durham Freeway and US 70. This connector provides residents and businesses traveling between locations to the north and east of the study area to areas south and west of the study area with a travel route that does not require the use of local arterial streets.
 - Traffic forecasts for the proposed East End Connector indicates that 24,000 trips will be diverted from the local roadway network [Gregson Street/Duke Street (one-way pair), Roxboro Street/Mangum Street (US 15/501 one-way pair), and Alston Avenue (NC 55)] in 2035. Diverting traffic away from local arterials will reduce by half the growth rate of traffic (through the year 2035) on local arterials, stabilizing traffic volumes at current levels.

- **Consistent with the State, Local Land Use and Transportation Plans** –The proposed East End Connector has been included in the following plans:
 - The proposed East End Connector is a part of North Carolina’s Strategic Highway Corridor system. The primary purpose of this system is to provide a network of high-speed, safe, reliable highways throughout North Carolina. The proposed project met the following Strategic Highway Corridor criteria:
 - The proposed project provides mobility to the region. It is forecast to carry an estimated average annual daily traffic volume of 100,000 vehicles per day in the year 2035.
 - The proposed project connects major employment centers, including downtown Durham and the Research Triangle Park.
 - The proposed project provides a link between interstate roadways. The proposed East End Connector project provides a link between I-85 and I-40. This project also provides relief to the interstate system by creating an alternative corridor between I-85 and I-40 via the Durham Freeway (NC 147) and US 70.
 - The proposed East End Connector project is included in Sections 136-180 of the North Carolina Highway Trust Fund Act (enacted in 1989 and amended in 2003). This legislation establishes and describes specific urban loops within the state that are eligible to receive North Carolina Highway Trust Funds.
 - The Proposed East End Connector project was originally identified in the 1959 Durham Thoroughfare Plan and was included in the 1982 FEIS for the East West Freeway. This project is in the current Durham-Chapel Hill-Carrboro Metropolitan Planning Organization 2030 Long Range Transportation Plan. This Long Range Transportation Plan lists the proposed East End Connector project as the number one priority of the seven regional projects to be funded from the North Carolina Highway Trust Fund. In addition, the City Council and County Commission of Durham have designated the proposed East End Connector as the number one transportation priority for the community.

- **Potentially Enhances Transportation Safety** – Diverting traffic from local arterial streets such as Roxboro Street/Mangum Street and Gregson Street/Duke Street will potentially enhance safety within the study area. Freeway-class roadways have a significantly lower accident rate than do local arterial streets.

- The proposed East End Connector will most likely provide a safer alternative corridor. Within the study area, local arterial streets have an average crash rate that is 5 to 7 times greater than the state average for similar roadways. The proposed East End Connector is expected to have a crash rate similar to NC 147, 57 accidents per 100 million vehicle miles of travel. This is one-tenth the rate of local arterials. The EEC will divert through traffic away from local streets, helping to reduce the rate of traffic growth for these roads.

1.7 Conclusion

As mentioned above, the findings of this EA verify the traffic capacity related Purpose and Need for the EEC previously documented in the 1982 FEIS. A need for better freeway connectivity as identified in state and local land use and transportation plans, further support the project need. This Purpose and Need, along with the project study boundaries, were approved at the Merger 01, Concurrence Point 1 meeting held on December 12, 2006.

As previously described, this EA provides a re-evaluation of the 1982 FEIS by updating the roadway design alternatives with associated traffic impact analysis, socioeconomic analysis, natural resources, biological resources, historical and cultural resources, and right-of-way/relocation impacts for the proposed project. As a result of these updates, the following sections of this document will describe an updated analysis of the East End Connector project study area and the potential impacts of the preferred build alternative. Results of this EA indicate that no new significant impacts exist beyond those previously identified, and that the purpose and need for this project remains valid and has become more imperative.

2.0 Description of Alternatives Considered

The 1982 FEIS evaluated the impacts of four alternatives for the East End Connector but did not include a No-Build or other alternatives for consideration. For this EA, a new range of reasonable alternatives were considered. Alternatives chosen for evaluation included the No-Build Alternative, the Improve Existing Roadways Alternative, the Transportation Management Alternative, the utilization of Alternative Transportation Modes, as well as modifications to the four Build Alternatives from the 1982 study described above.

2.1 No-Build Alternative

The No-Build Alternative analysis investigated future conditions if no transportation improvements are realized. Findings indicate that this alternative will not meet any of the purposes identified for the project, nor will it address any of the needs described in the Purpose and Need Statement. It could have the potential to adversely impact social and economic conditions in downtown Durham and the area east of downtown, given the increased congestion on NC 147 and increased delay at local intersections.

The No-Build Alternative will incur neither right-of-way nor construction costs. There will be no short-term disruptions along existing roadways during construction. There will be no impacts to streams, wetlands or other natural and cultural resources, nor any residential or business relocations. Persons traveling between NC 147 and US 70 will continue to use local arterial streets.

2.2 Improve Existing Roadways Alternative

The Improve Existing Roadways Alternative will involve roadway widening and intersection improvements along Duke Street/Gregson Street and Mangum Street/Roxboro Street (one-way pairs), Alston Avenue/Avondale Drive, Ellis Avenue, Glover Road, Lynn Road, Pleasant Drive and East End Avenue. Improvements to these local roadways will consist of adding lanes and/or improving intersections to increase capacity between US 70 and NC 147.

A qualitative analysis of this alternative indicates that additional right-of-way acquisition will be required in a highly urbanized portion of Durham and could require significant relocation of residences and businesses. Also, proposed improvements will cause congestion and traffic disruption during construction. Proposed improvements will not be sufficient to meet 2035 traffic demand and potential impacts to the natural resources, cultural and physical impacts will require further environmental review. This alternative will not satisfy the capacity, connectivity, and consistency needs described in the project's Purpose and Need Statement.

2.3 Transportation Management Alternative

Transportation Management Alternatives include Transportation Demand Management and Transportation System Management strategies as alternatives to the proposed project. Transportation Demand Management (TDM) improvements focus on reducing the peak travel demand and Transportation System Management (TSM) improvements focus on operational and physical improvements to roadways and intersections. Transportation Demand Management programs do not typically require right-of-way or construction costs. Some Transportation System Management projects will require right-of-way acquisition and will incur construction costs. These projects will have the potential to disrupt existing roadways during

construction. Some actions may have impacts on the natural, human and physical environment. Actions related to the Transportation Management Alternative are an important component of efficient transportation; however, the effect of these actions as related to the proposed project will not meet the purposes identified for the project nor will it address any of the needs described in the Purpose and Need Statement.

2.4 Alternative Transportation Modes

The Durham Area Transit Authority (DATA) provides local bus, paratransit, park-and-ride, and vanpool service within the City of Durham and Durham County. The Triangle Transit complements the local DATA service by providing regional bus and car-/vanpool services. The Triangle Transit will also be the operator for the proposed commuter rail system that will link Durham to Raleigh (through the project study area). The Alternative Transportation Mode Alternative will not meet the purposes identified for the project, nor will it address the needs described in the Purpose and Need Statement. Alternative transportation modes do not provide connectivity between NC 147 and US 70, but rather serve local trips between neighborhoods and employment centers in downtown Durham. Planned transit system improvements in the region will not provide the capacity or frequency of service to satisfy the demand for travel between NC 147 and US 70.

2.5 Build Alternatives

Four Build Alternative corridors similar to the alternatives reviewed in the 1982 study were evaluated as part of this EA. In this EA, additional environmental studies were performed including focused jurisdictional water investigations and inventories. As a result, corridor adjustments and alignment modifications to the 1982 alternatives were performed in order to reduce impacts where possible. Also, these updated alternatives were designed for a higher classification of interstate roadway, allowing the East End Connector to potentially be signed as a connecting interstate route. These interstate standards further modified the original 1982 alternatives.

2.5.1 Design Features

Unlike the 1982 study, each of the four Build Alternatives has been designed to interstate standards.

2.5.1.1 *Roadway Design Criteria*

The roadway design criteria establish the parameters for the project. The East End Connector is designed to interstate standards with freeway-to-freeway junctions between US 70 (both directions) and the East End Connector; and between the East End Connector and NC 147 to the south. It should be noted that the section of NC 147 north of the proposed East End Connector does not meet interstate standards, permitting lower-speed ramp design. The design criteria information shown also includes design criteria for ramps, flyover structures, and local cross streets. Each of the four build alternatives share the roadway design criteria listed in Table 2-1.

2.5.1.2 *Typical Section*

The ultimate typical section (Figure 2-1) for the East End Connector includes three continuous through lanes in each direction plus auxiliary lanes as needed. The typical cross-section includes a median 26 feet wide, 12 feet wide inside shoulders, and 14 feet wide outside shoulders.

In an effort to reduce project costs, value engineering was performed resulting in an initial alternative build section that includes only two continuous through lanes in each direction with a median 50 feet wide. This alternative build section is also shown in Figure 2-1. Right-of-way acquisition under this initial build section will be sufficient to accommodate the ultimate six-lane typical section.

The third typical provided in Figure 2-1 shows the US 70 Bypass section which extends from the project beginning point on US 70 north of Holloway Street to the US70/ East End Connector split. As shown, this US 70 Bypass 50 foot median section corresponds to the 50 foot median section shown for the EEC initial build section.

2.5.1.3 *Access Control*

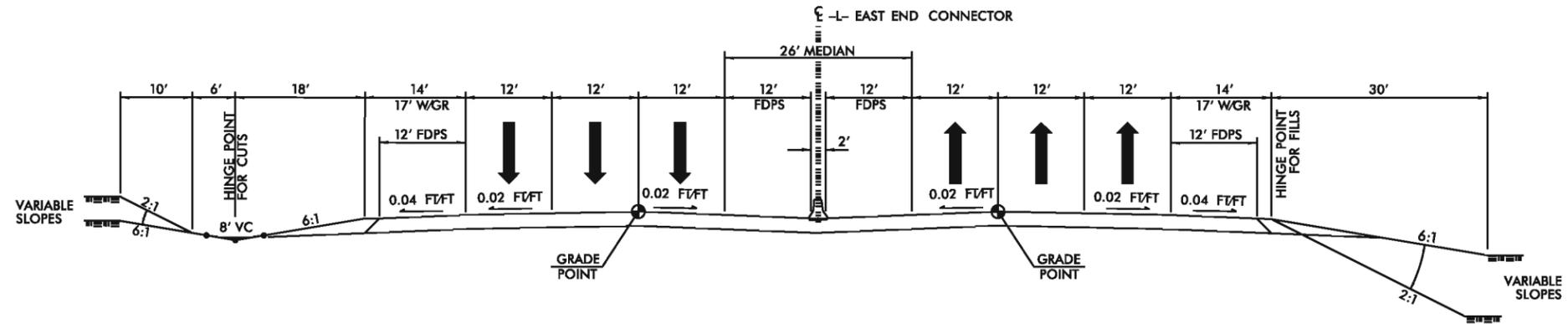
The East End Connector project will be designed to interstate standards with full control of access from NC 147 on the west to US 70 on the east. Access to the facility will be limited to the interchanges at US 70 and the Durham Freeway. Improvements to US 70 between Check Road and the East End Connector will be designed and constructed to interstate standards with full control of access. US 70 between the East End Connector and the nearest intersection to the south will have full control of access as well. NC 147 already is a freeway facility with full access control.

**Table 2-1
Proposed Roadway Design Criteria**

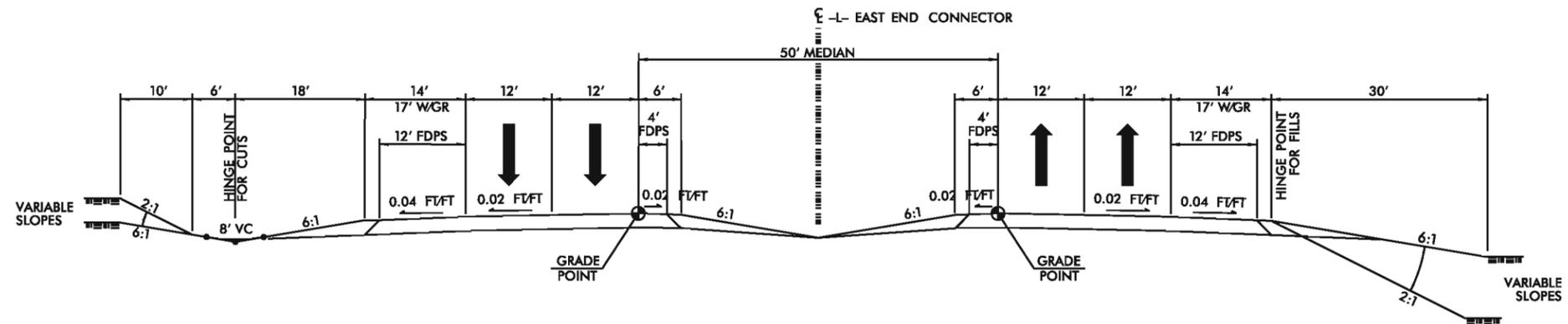
	EEC	EEC Ramps	EEC Flyovers/Freeway Connectors	EEC Flyovers/Freeway North of EEC	EEC Flyovers/Freeway South of EEC	US 70	Arterial Cross Street (Holloway St.)	Collector Cross Street	Local Cross Street
Type of Terrain	Rolling	Rolling	Rolling	Rolling	Rolling	Rolling	Rolling	Rolling	Rolling
Lane Width in feet	12'	12'	12'	12'	12'	12'	12/14' OL	12'	11' - 12'
Horizontal Alignment									
Maximum Superelevation (ft/ft)	0.10	0.08	0.06	0.10	0.10	0.08	0.06	0.06 to 0.08	0.06 to 0.08
Minimum Radius in feet	1630'	758'-1200'	833'	1090'	1630'	1200'	485'	231' to 485'	214 to 444'
Spiral Curve (Y/N)	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Grade									
Maximum	4%	3-5%	5%	4%	4%	6%	8%	0	15%
Minimum	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0	0.3%
Traffic Data									
Average Daily Traffic 2015 (let)	65,600	26,800	40,400	86,700	86,300	54,300	20,900	3,780	2992
Average Daily Traffic 2035	106,300	40,100	60,400	129,400	127,500	116,100	16,950	5,540	4425
Total Semi Trucks	8%	8%	8%	3%	3%	8%	5%	1 to 2%	1 to 8%
Dual Axle Trucks	6%	6%	6%	5%	5%	5%	3%	1 to 5%	2 to 10%
Design Hour Volume	10%	10%	10%	10%	10%	10%	10%	10%	9 to 11%
Directional Distribution	55%	55%	55%	60%	60%	55%	55%	55 to 65%	55 to 70%
Classification	Interstate	Interstate	Interstate	Interstate	Interstate	Arterial	Arterial	Collector	Local
Design Speed mph	70	50-60	50	60	70	60	40	30 to 40	30 to 40
Posted Speed mph	65	45-55	45	55	65	55	35	35	25 to 35
Right-of-Way width in feet	350' min.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control of Access	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Typical Section Type	Shoulder	Shoulder	Shoulder	Shoulder	Shoulder	Shoulder	C & G	C&G or Shoulder	Shoulder (Lawson has C&G)
Median Width in feet	26'	N/A	N/A	Variable	Variable	N/A	N/A	N/A	N/A
Shoulder Width in feet									
Median ft.	12'	N/A	N/A	12'	12'	N/A	N/A	N/A	N/A
Outside w/o GR ft	14'	12'	12'	12'	12'	12'	N/A	8'	N/A
Outside w/ GR ft	17'	15'	15'	15'	15'	15'	N/A	11'	N/A
Paved Shoulder									
Outside Total/FDPS ft	14'/12' FDPS	4'/4' FDPS	4'/4' FDPS	10'/4' FDPS	10'/4' FDPS	10'/4'	N/A	2' to 4'	2' to 4'
Median Total/FDPS ft	12'/12' FDPS	N/A	N/A	4'/4' FDPS	10'/4' FDPS	4'/4'	N/A	N/A	N/A

Notes:

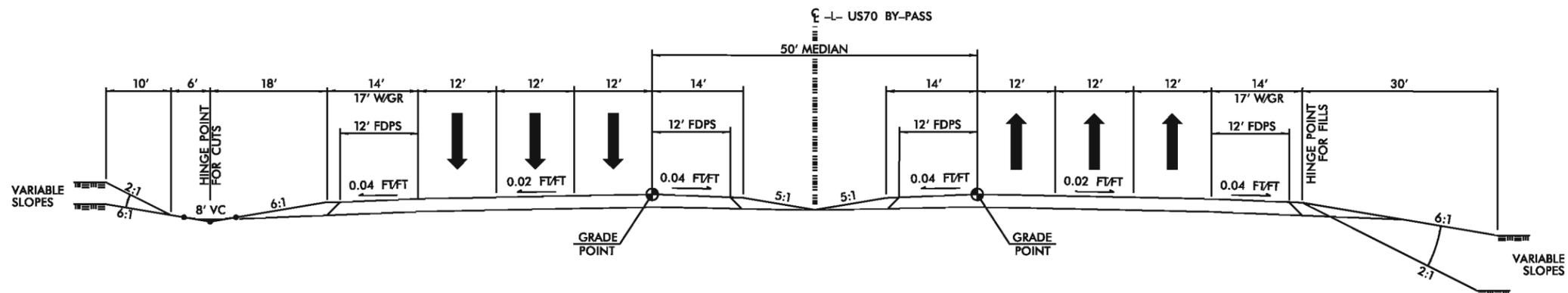
- Design criteria based on ultimate EEC section with three continuous lanes in each direction.
- FDPS – Full Depth Paved Shoulder
- C&G – Curb and Gutter
- Let – Construction Year Bid Letting
- GR – Guardrail
- OL – Outside Lane



**EAST END CONNECTOR TYPICAL SECTION
(ULTIMATE SECTION)**



**EAST END CONNECTOR TYPICAL SECTION
(BUILD SECTION)**



**US70 BY-PASS TYPICAL SECTION
(BUILD SECTION)**

NOT TO SCALE

2.5.2 Preliminary Corridors

Functional design plans were developed for the four Build Alternative corridors for use in evaluating the impacts related to the natural, human and physical environment. Under this EA, three continuous lanes in each direction are planned for the EEC, instead of the two lanes previously shown in the 1982 document.

2.5.2.1 Description of Preliminary Corridors

Alternative 1 – This alternative is closest to downtown Durham and is similar to the 1982 FEIS Alternative 1. Alternative 1 begins on US 70 south of its interchange with Cheek Road, continues traveling west to east between East End Avenue and Hoover Road, joining NC 147 south of Briggs Avenue. The project terminates south of Glover Road. See Figure 2-2.

Alternative 2 – This alternative is located just south of Alternative 1 and is similar to the 1982 FEIS Alternative 2; however this most recent Alternative 2 has been shifted slightly west to minimize jurisdictional surface water impacts. Alternative 2 begins on US 70 south of its interchange with Cheek Road, continues traveling west to east crossing East End Avenue and joining NC 147 south of Briggs Avenue. The project terminates south of Glover Road. See Figure 2-3.

Alternative 3 – Alternative 3 is located south of East End Avenue. It begins on US 70 south of its interchange with Cheek Road, continues traveling west to east crossing Rowena Avenue and joining NC 147 south of Briggs Avenue. The project terminates south of Glover Road. See Figure 2-4.

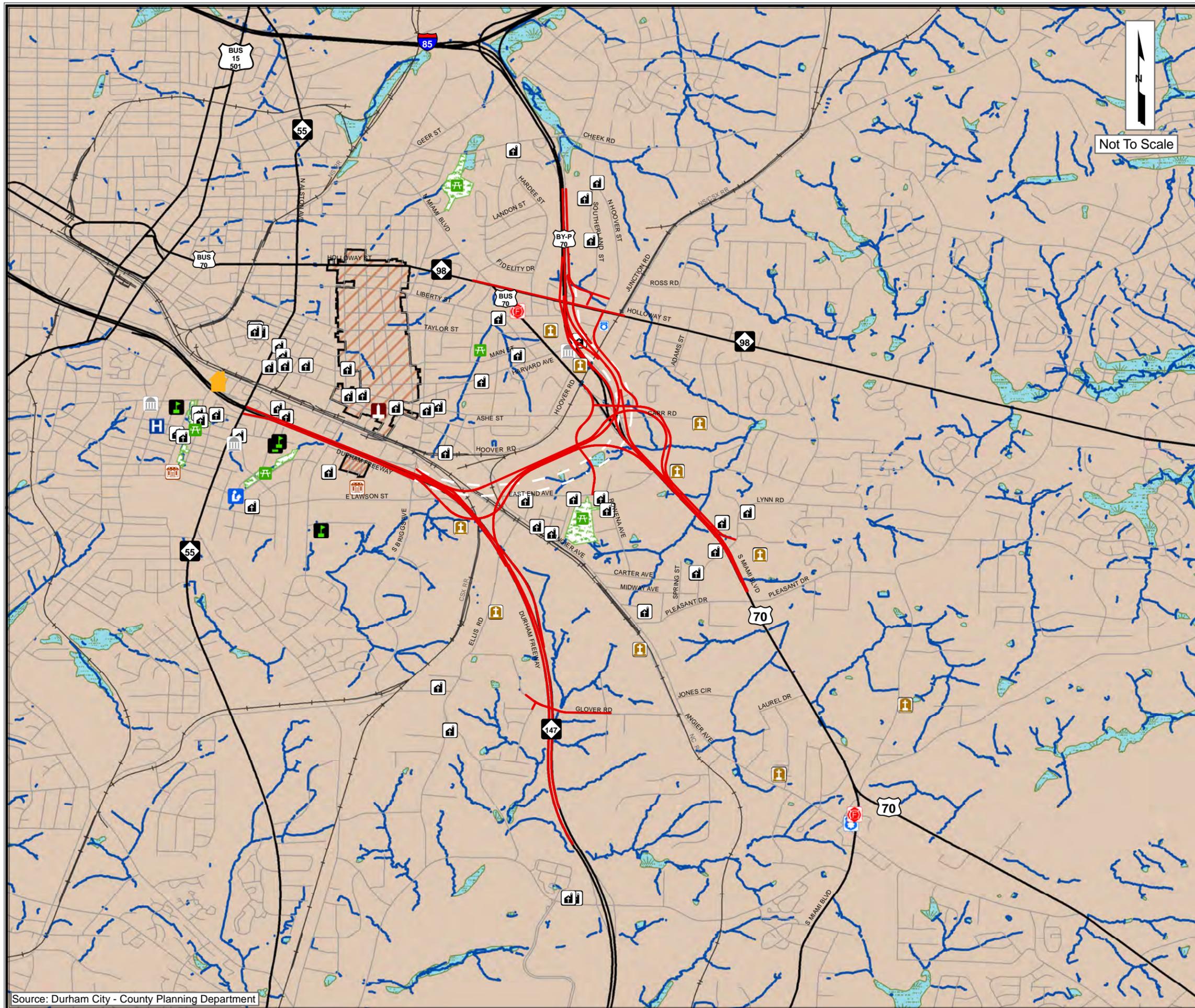
Alternative 3 is similar to the 1982 FEIS recommended design; however, more extensive public involvement and natural system studies were performed during this EA study, resulting in new design considerations. Design differences between the 1982 FEIS and this EA study are listed below:

- The most recent EEC alignment has been designed to interstate standards.
- Previously a single point urban interchange was shown for NC 98. This study provides a compressed diamond design at this location.
- Rowena Avenue has not been extended to Miami Boulevard. Instead, East End Avenue and Rowena Avenue will have access to US 70 via connection to a service road.
- In the 1982 FEIS a proposed service road connecting Lynn Road and Pleasant Road was mentioned; however, no design was provided. As part of this EA, a service road design is provided between the two roadways.
- A service road between Rowena and Angier Avenue is not provided.
- A northbound off-ramp from US 70 is provided for access to Carr Road.
- EEC roadway bridges over Angier Avenue and Norfolk Southern rail lines is provided in lieu of the railroad bridges previously shown in the 1982 document.
- A new typical section for US 70 (six-lane divided highway with variable-width median) from north of NC 98 to the East End Connector.
- A new single box culvert to carry flow at Little Lick Creek and one of its tributaries.

Alternative 4 – This is the southernmost alternative and is located close to Glover Road. Alternative 4 is similar to the 1982 FEIS Alternative 3. It begins on US 70 south of its interchange with Cheek Road, continues traveling west to east between Pleasant Drive and Glover Road. The project terminates north of Ellis Road. See Figure 2-5.

2.5.2.2 *Alternative Impacts*

An evaluation of the impacts related to natural resources, the human environment, and the physical environment was completed using the functional design for each of the four alternatives. With respect to the natural environment, the four alternatives were screened for impacts to wetlands and streams. None of the alternatives will impact threatened or endangered species, water supply critical areas, 100-year flood plains, or greenways. The analysis of impacts related to the human environment focused on residential, business, church and cemetery relocations. There are no impacts to schools, parks or historic sites. The physical impacts include project length and complexity, construction costs, right-of-way requirements, and affected superfund sites. Table 2-2 summarizes the impacts of each alternative with respect to key design features and physical, human, and natural resources. More details on the environmental impacts of the proposed project are provided in Chapters 3 and 4.



Not To Scale

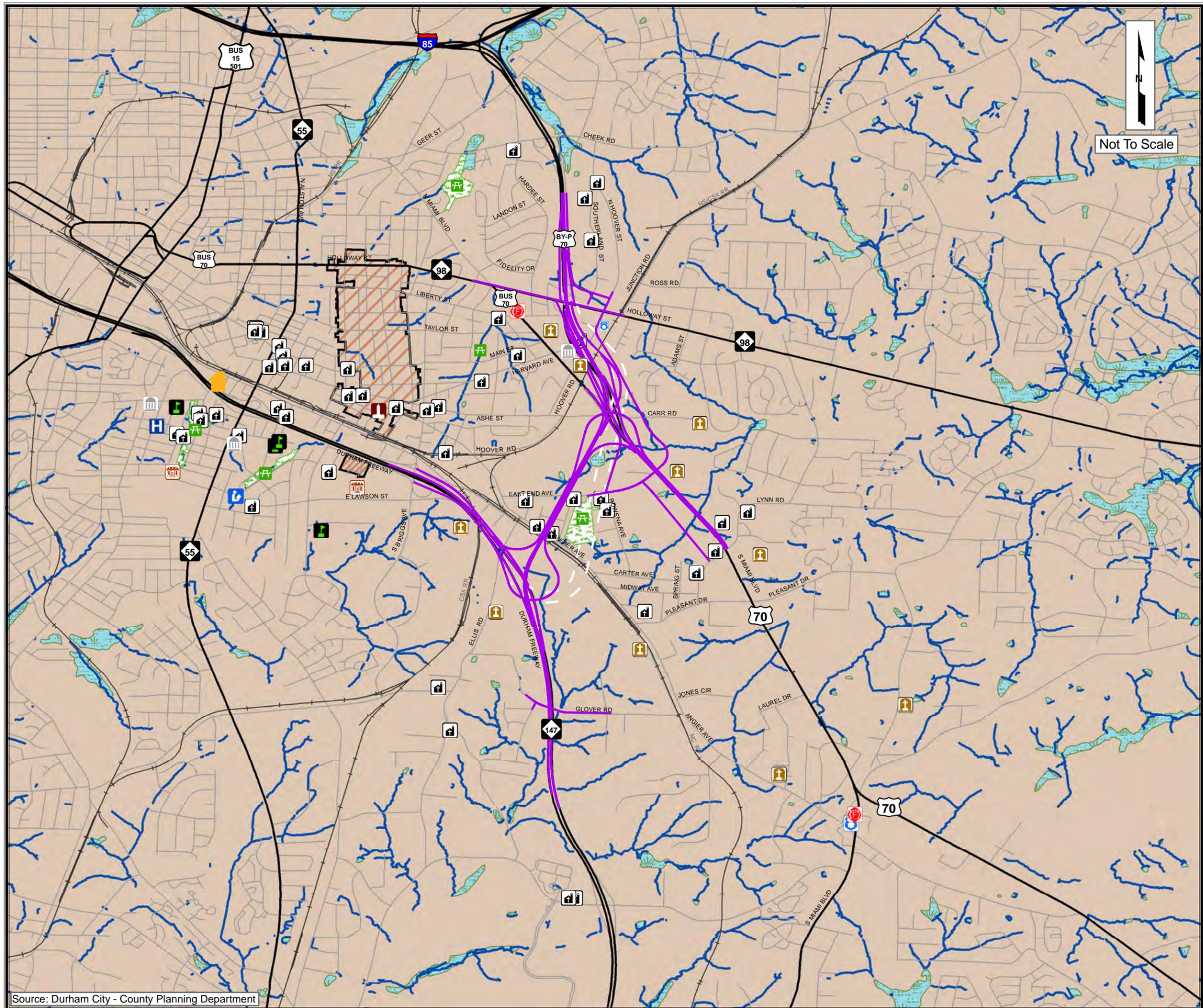
PRELIMINARY ALTERNATIVE 1

EAST END CONNECTOR

LEGEND

-  Place of Worship
-  Cemetery
-  Local Historical Landmark
-  Park
-  Public School
-  College or University
-  Police Department
-  Fire Station
-  Government Building
-  Community Centers
-  Library
-  Hospital
-  National Historic District
-  Wetlands (National Wetland Inventory)
-  Streams
-  1982 FEIS Alternative 1 Design Corridor (Approximate Location)

Source: Durham City - County Planning Department



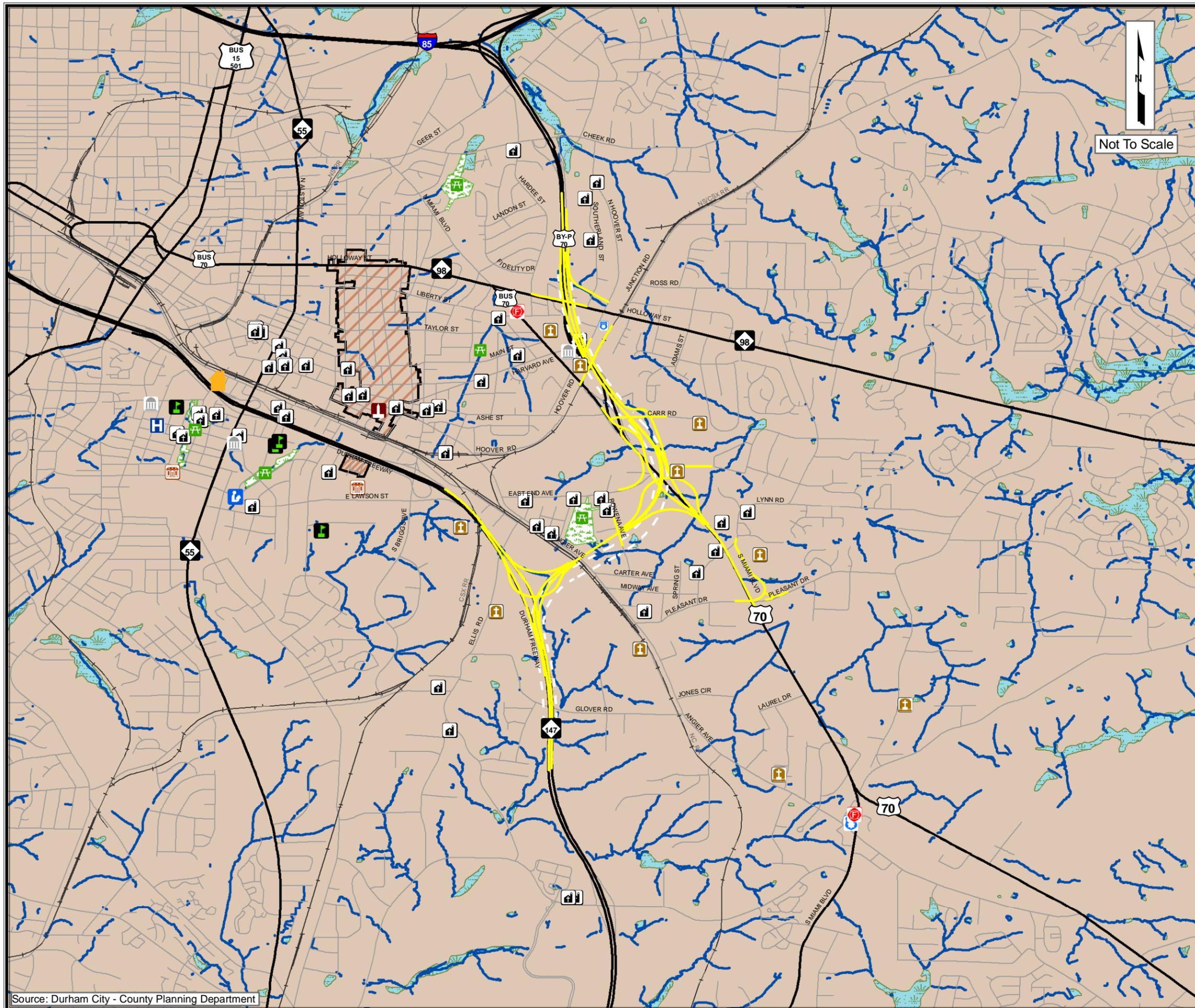
Source: Durham City - County Planning Department

PRELIMINARY ALTERNATIVE 2

EAST END CONNECTOR

LEGEND

-  Place of Worship
-  Cemetery
-  Local Historical Landmark
-  Park
-  Public School
-  College or University
-  Police Department
-  Fire Station
-  Government Building
-  Community Centers
-  Library
-  Hospital
-  National Historic District
-  Wetlands (National Wetland Inventory)
-  Streams
-  1982 FEIS Alternative 2 Design Corridor (Approximate Location)



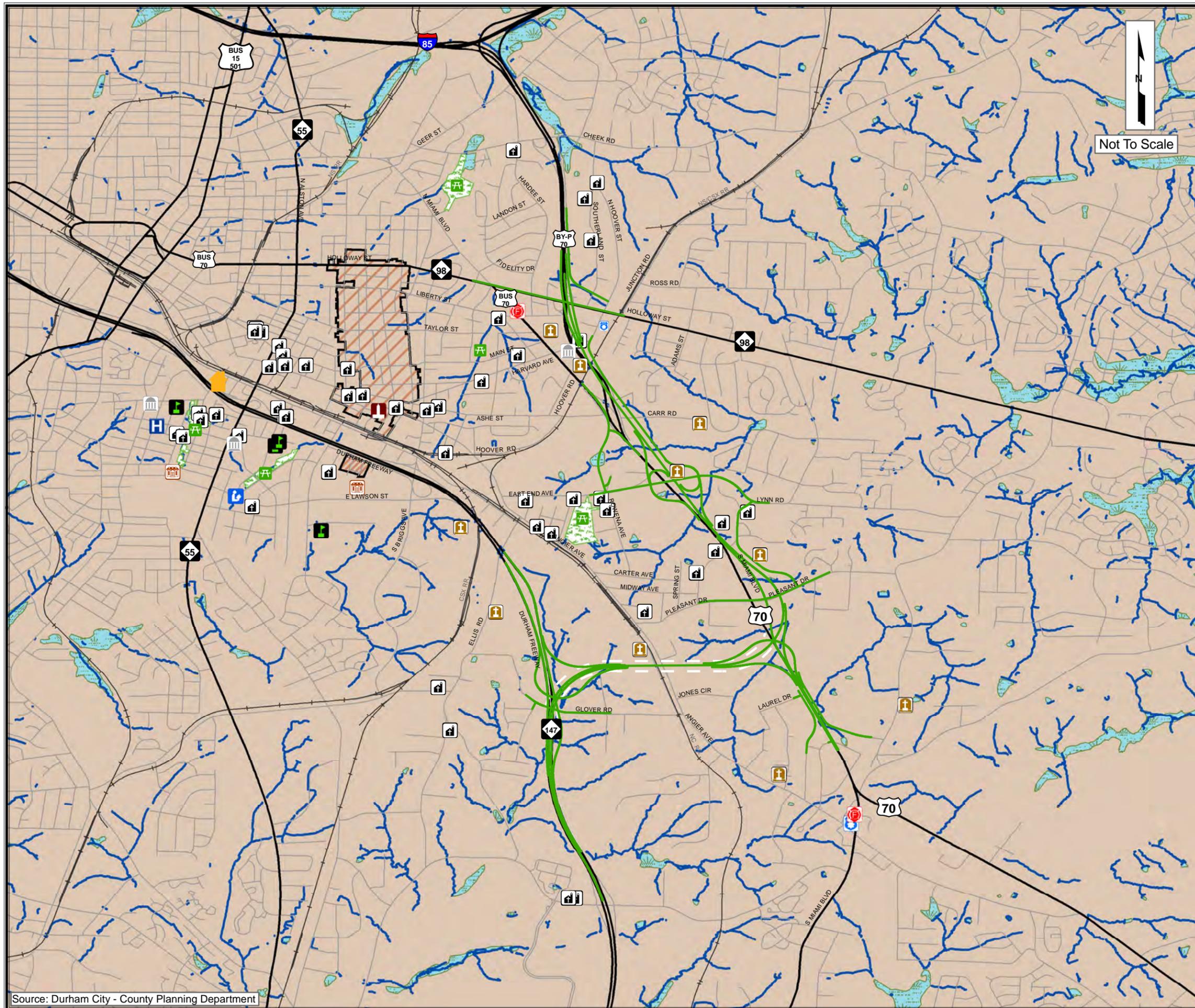
Source: Durham City - County Planning Department

PRELIMINARY ALTERNATIVE 3

EAST END CONNECTOR

LEGEND

-  Place of Worship
-  Cemetery
-  Local Historical Landmark
-  Park
-  Public School
-  College or University
-  Police Department
-  Fire Station
-  Government Building
-  Community Centers
-  Library
-  Hospital
-  National Historic District
-  Wetlands (National Wetland Inventory)
-  Streams
-  1982 FEIS Recommended Design Corridor (Approximate Location)



Source: Durham City - County Planning Department

PRELIMINARY ALTERNATIVE 4

EAST END CONNECTOR

LEGEND

-  Place of Worship
-  Cemetery
-  Local Historical Landmark
-  Park
-  Public School
-  College or University
-  Police Department
-  Fire Station
-  Government Building
-  Community Centers
-  Library
-  Hospital
-  National Historic District
-  Wetlands (National Wetland Inventory)
-  Streams
-  1982 FEIS Alternative 3 Design Corridor (Approximate Location)

**Table 2-2
Alternatives Analysis Summary**

Impact Category	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Project Description				
Project Length (Miles)	3.58	3.77	3.61	5.04
Total Length - all roadway improvements (Miles)	22.02	21.5	15.7	20.3
Replace Existing Structures				
Number of Railroad Structures	1	1	1	1
Square Feet of Railroad Structures	21,955	22,774	15,134	15,134
Number of Grade Separation	6	7	2	2
Square Feet of Grade Separation	104,862	119,417	51,967	51,967
Temporary Railroad Structures (detour)				
Number of Railroad Structures	2	3	2	2
Square Feet of Railroad Structures	13,440	19,848	3,850	3,850
Proposed Structures (New Locations)				
Number of Railroad Structures	1	2	0	0
Square Feet of Railroad Structures	8,184	8,571	0	0
Number of Grade Separation	11	12	7	8
Square Feet of Grade Separation	331,250	308,809	158,605	144,918
Constructability - Design/Phasing Complexity				
Low, Moderate or Highly Complex	High	High	Moderate	Moderate
Roadway Capacity				
Traffic Volume (Vehicles per day)	106,300	106,300	106,300	106,300
Natural Resources Impacts				
Wetlands & Ponds (acres)	0.25	1.05	1.4	2.3
Stream Crossings (Linear Feet)	4,700	6,000	5,711	15,000
Stream Buffers (acres)	11	14	12	36
Human Environment Impacts				
Residential Relocations (number)	18	75	17	39
Business Relocations (number)	15	25	9	10
Environmental Justice Areas	Yes	Yes	Yes	Yes
Churches (number of takings)	1 church office	3 churches; 1 church office	1 church office; 1 church (lease space)	1 church office
Cemeteries (number of takings)	1 cemetery (5 gravesites)	1 cemetery (5 gravesites)	1 cemetery (0 gravesites)	1 cemetery (0 gravesites)
Physical Environment Impacts				
Railroad Crossings	11	6	2	2
USEPA- Superfund Sites Impacted	1site (1.1 ac.)	1 site (1.6 ac.)	0	0
Right-of Way				
Right-of-Way (acres)	133	119	88	225
Construction Limits (acres)	262	277	205	326
Costs				
Construction Costs (Millions)	\$190	\$195	\$137	\$150

Notes:

- Boxes shown in black have the greatest impacts as compared to the other alternatives.
- Construction costs do not include right-of-way or relocation costs.
- Impacts based on ultimate EEC six-lane section (three continuous lanes each direction)

2.6 Traffic Operations Analyses

The following is a summary of the Travel Analysis Report prepared for the North Carolina Department of Transportation (NCDOT) by RS&H Architects-Engineers-Planners, Inc. in August 2007. This report evaluated the existing and future traffic flow conditions along freeway segments and on other local streets that are expected to be affected by the proposed project.

The traffic analysis is used to guide the design of the project and is based on the levels of service methods outlined in the Transportation Research Board's Highway Capacity Manual. Level of service is a qualitative measure describing operational conditions within a traffic stream and generally describes traffic conditions in terms of speed, travel time, maneuverability, comfort, convenience, and safety. Six levels of service are defined for each type of facility or traffic movement. They are given letter designations, from A to F, with level-of-service A representing the best operating conditions and level-of-service F the worst.

The Travel Analysis Report was prepared using the traffic projections provided by NCDOT (dated July 6, 2006) and assumes that the proposed six-lane East End Connector facility (three continuous lanes in each direction) is in place and will provide a continuous freeway connection between I-85 and I-40. The East End Connector will include semi-directional interchanges with both US 70 and NC 147. Also, intersection improvements along NC 98 (Holloway Street) between Miami Boulevard and Junction Road are assumed to be in place. Figure 2-6 shows the lane configurations used for this analysis.

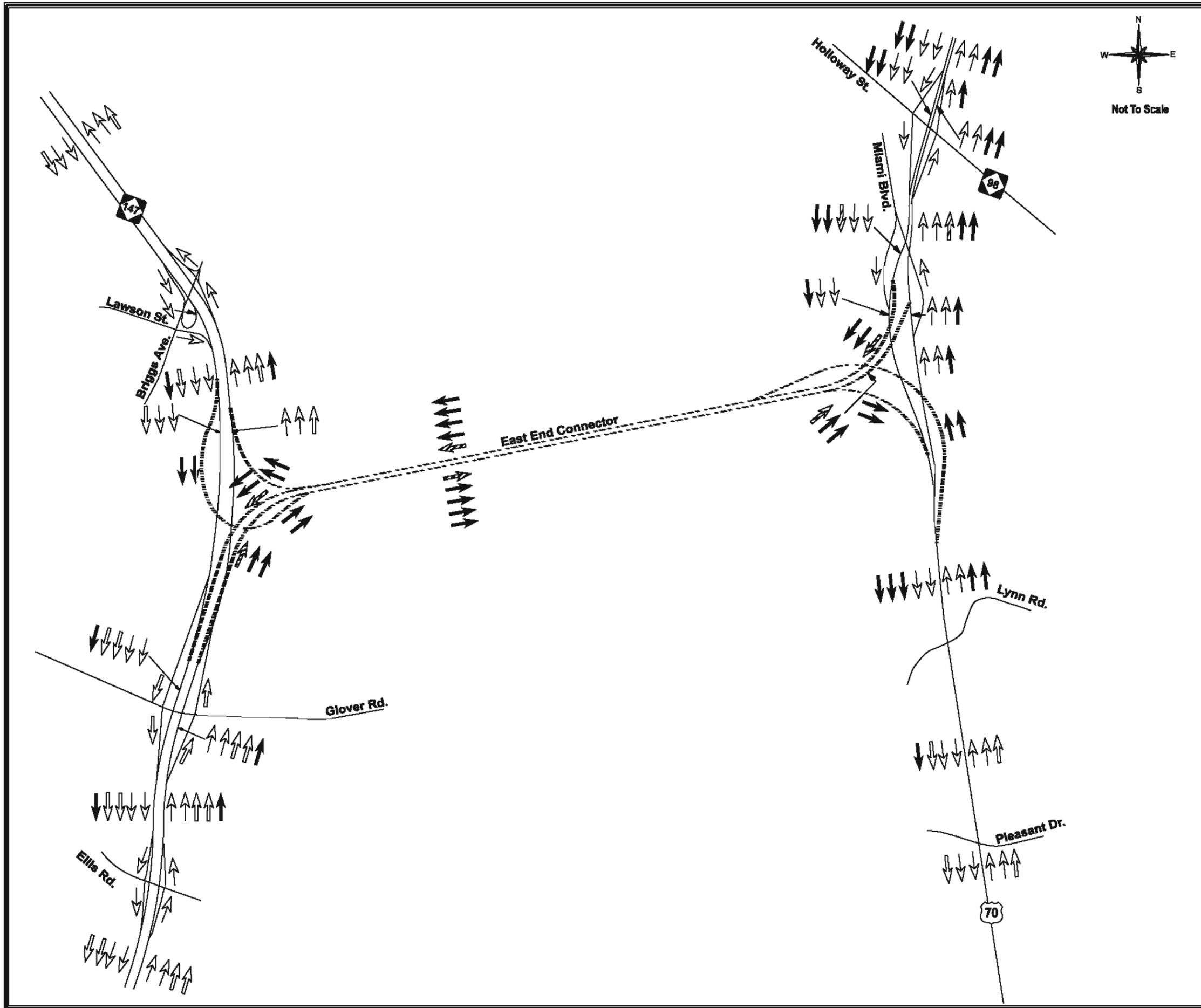
2.6.1 Year 2035 Traffic Projections

The NCDOT Transportation Planning Branch provided the 24-hour traffic forecasts that were used to develop traffic volumes for the 2006 Base Year, 2030 No-Build, and 2030 Build Conditions. The 2030 model estimates were increased to the design year of 2035 using growth rates calculated from model volumes.

For this traffic study a single traffic forecast was utilized for all four build alternatives. This single forecast was justified because all alternatives having similar lengths, termini, and alignments. Exact locations where traffic congestion will be of concern will differ but will be similar between alternatives. Also, traffic volume splits will differ between the alternatives; however, these differences will be negligible when compared to the overall traffic congestion issues.

The travel analysis report evaluated three possible future year scenarios as listed below:

- Scenario 1: Consists of all the improvements in the DCHC MPO's long range transportation plan including all improvements that are part of the EEC project.
- Scenario 2: Includes all the improvements in Scenario 1 except for NC 147/ Glover Road interchange.
- Scenario 3: Includes all the improvements in Scenario 1 except for the direct connection to US 70 from Miami Boulevard connector.



LANE CONFIGURATION

MAINLINE AND RAMPS

2035 BUILD CONDITIONS

EAST END CONNECTOR

LEGEND

- Existing
- ⇌ Programmed (Other Projects)
- Interim Build
- Ultimate Build (2035)

For the purpose of this analysis, it was determined that Scenario 1 with all future roadway improvements in-place best reflects the common features related to the four alternatives and therefore will be used to represent the results of the capacity analysis. Figure 2-7 shows the peak hour mainline traffic volumes utilized.

2.6.2 Freeway Mainline Capacity Analysis

A freeway mainline capacity analysis was conducted for twenty (20) roadway segments on the following freeways for the AM and PM peak hours:

- NC 147 – six one-way segments
- East End Connector – six one-way segments
- US 70 – eight one-way segments

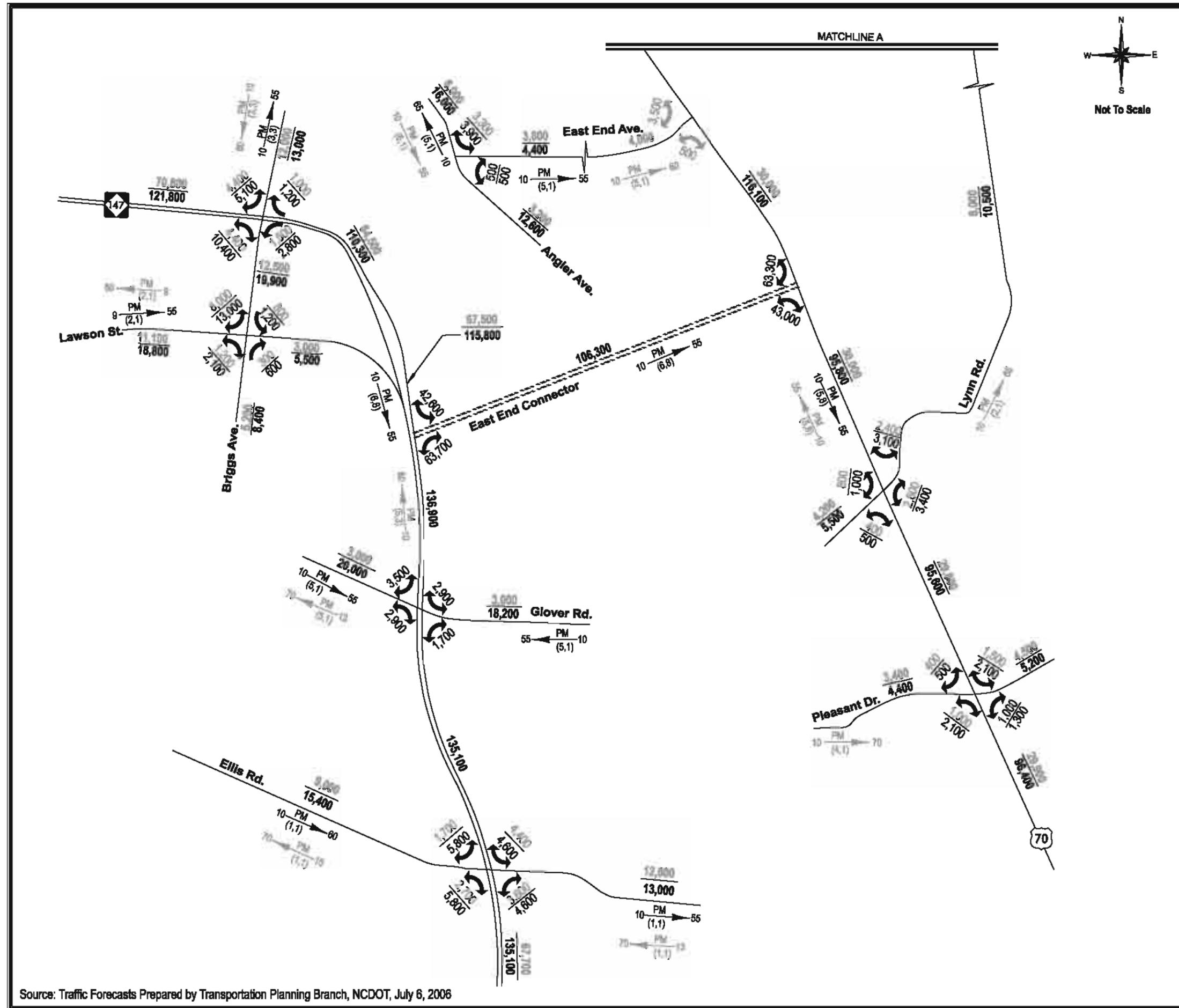
The 2035 freeway mainline capacity analysis indicated that, with the proposed improvements, all freeway segments that are part of the East End Connector project will function at Level of Service C or better throughout the day, a good rate of traffic flow compared to Level of Service F under the 2035 No-Build Conditions. See Table 2-3.

2.6.3 Freeway Merge/Diverge Capacity Analysis

Proposed 2035 freeway merge/diverge capacity analyses were conducted for nineteen (19) merge/diverge junctions at the following five interchanges for the AM and PM peak hours:

- NC 147 at Ellis Road (four junctions)
- NC 147 at Glover Road (four junctions)
- NC 147 at Briggs Avenue (five junctions)
- US 70 Bypass at NC 98 ((four junctions)
- US 70 Bypass at US 70 Business (two junctions)

For the merge/diverge junctions analyzed, traffic will flow at Level of Service D or better at 14 of the 19 junctions, an acceptable rate of traffic flow for peak hour conditions. By comparison, traffic flowed at Level of Service F (failure) at these 14 locations under the 2035 No Build Conditions.



Source: Traffic Forecasts Prepared by Transportation Planning Branch, NCDOT, July 6, 2006

**DAILY TRAFFIC VOLUMES
MAINLINE, RAMPS, AND INTERSECTIONS**

EAST END CONNECTOR

LEGEND

Vehicles Per Day (vpd)

2006 Volumes

2035 Volumes

DHV — PM — D 2035 Volumes (d,t)

(Shown only at locations where it defers from the 2006 factors)

DHV Design Hourly Volume (%)

D Directional Split (%)

PM Peak Period

→ Direction of Flow

(d,t) Dual, TT-ST Trucks (%)

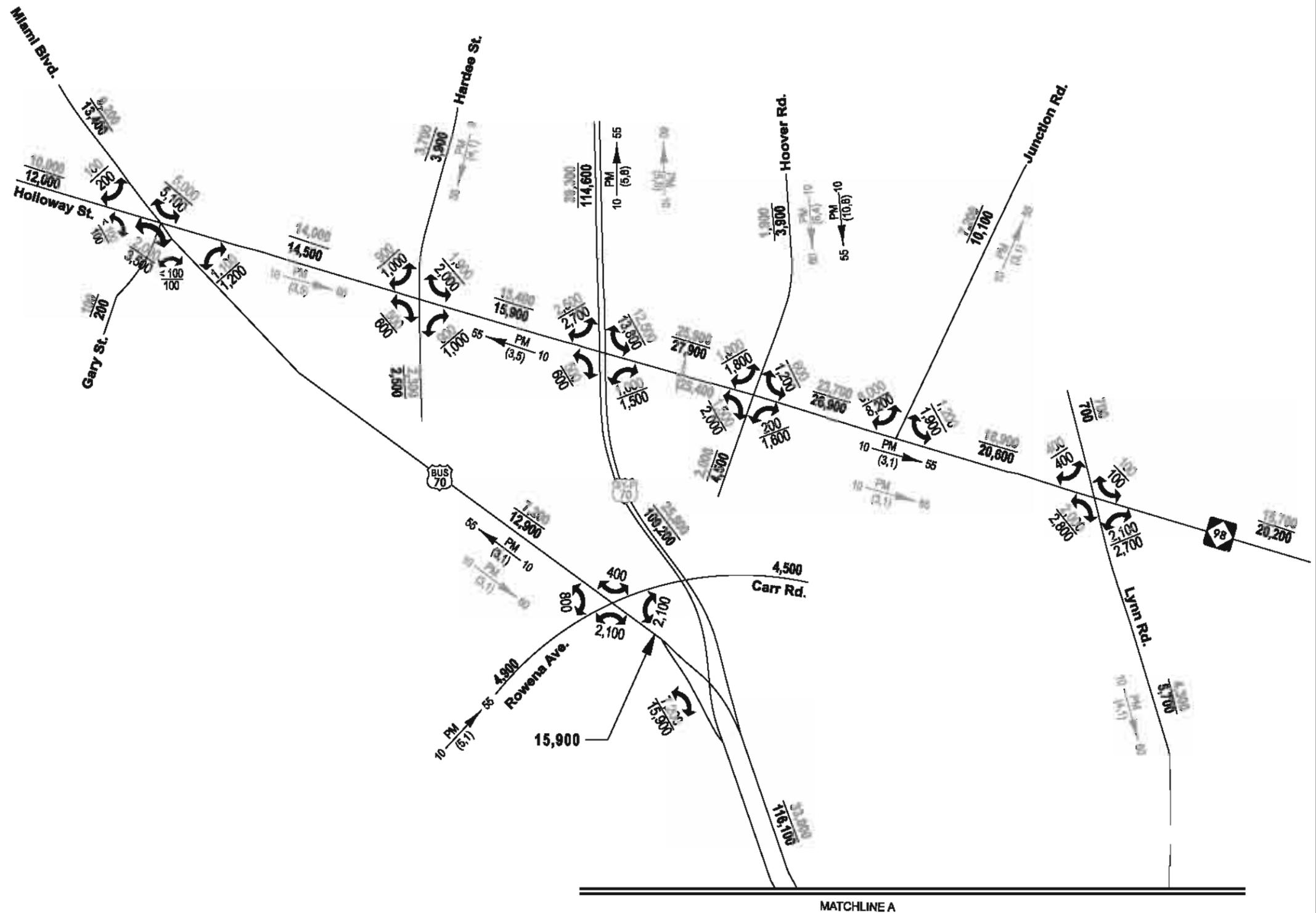
East End Connector
MARLBOROUGH COUNTY (TP-Project No. 0407)

Figure 2-7

Sheet 1 of 2

**DAILY TRAFFIC VOLUMES
MAINLINE, RAMPS, AND INTERSECTIONS**

EAST END CONNECTOR



LEGEND

Vehicles Per Day (vpd)

1000 2006 Volumes
000 2035 Volumes

DHV PM → D 2006 Volumes

DHV PM → D 2035 Volumes
(d,t)

(Shown only at locations where it defers from the 2006 factors)

DHV Design Hourly Volume (%)

D Directional Split (%)

PM Peak Period

→ Direction of Flow

(d,t) Dual, TT-ST Trucks (%)

**Table 2-3
Freeway Mainline Capacity Analysis ³
2035 Build Conditions**

Freeway	Section	AM Peak Hour		PM Peak Hour	
		Density ¹	LOS ²	Density ¹	LOS ²
NC 147					
Northbound	Ellis Road to Glover Road	21.8	C	26.2	D
	Glover Road to East End Connector	21.5	C	25.1	C
	East End Connector to Briggs Avenue	28.0	D	26.9	D
Southbound	Briggs Avenue to East End Connector	26.9	D	28.0	D
	East End Connector to Glover Road	25.1	C	21.5	C
	Glover Road to Ellis Road	26.2	D	21.8	C
US 70 Bypass					
Northbound	Lynn Road to westbound East End Connector	24.1	C	21.1	C
	Westbound East End Connector to US 70 Business	16.6	B	16.3	B
	US 70 Business to eastbound East End Connector	12.1	B	10.8	A
	Eastbound East End Connector to Holloway Street	17.7	B	20.0	C
Southbound	Holloway Street to westbound East End Connector	20.0	C	17.7	B
	Westbound East End Connector to US 70 Business	10.8	A	12.1	B
	US 70 Business to eastbound East End Connector	16.3	B	16.6	B
	Eastbound East End Connector to Lynn Road	16.8	B	19.3	C
East End Connector					
Eastbound	Northbound NC 147 diverge junction to southbound NC 147 entrance ramp	17.4	B	22.6	C
	Southbound NC 147 entrance ramp to southbound US 70 exit ramp	17.5	B	22.8	B
	Southbound US 70 exit ramp to northbound US 70 merge junction	17.4	B	22.6	C
Westbound	Southbound US 70 diverge junction to northbound US 70 entrance ramp	22.6	C	17.4	B
	Northbound US 70 entrance ramp to northbound NC 147 exit ramp	22.8	C	17.5	B
	Northbound NC 147 exit ramp to southbound NC 147 merge junction	22.6	C	17.4	B

¹ Measured in passenger cars per mile per lane (pc/mi/ln)

² Level of Service

³ Based on the ultimate six-lane EEC section (three continuous lanes in each direction)

The locations where traffic will continue to flow at a poor rate (Level of Service E or F) are at the interchange of NC 147 with Briggs Avenue because this interchange is beyond the limits set for the East End Connector project. As part of this project, one auxiliary lane in each direction is carried on NC 147 between the East End Connector and the Briggs Avenue ramps. The effect of this improvement is for traffic to flow at Level of Service D at the northbound NC 147 exit ramp with Briggs Avenue. On southbound NC 147, traffic will continue to flow at a poor Level of Service (E or F) even with the auxiliary lane because of the high volume of through traffic on NC 147. It should be noted that under 2035 No-Build conditions the analysis indicated that more than one additional through lane will be needed in each direction of NC 147 to improve traffic flow conditions to acceptable Levels of Service in the vicinity of Briggs Avenue.

A summary of the results of the freeway merge/diverge capacity analysis for the 2035 Build Conditions is provided in Table 2-4.

**Table 2-4
Freeway Merge/Diverge Capacity Analysis
2035 Build Conditions**

Interchange	Junction	AM Peak Hour		PM Peak Hour	
		Density ¹	LOS ²	Density ¹	LOS ²
NC 147 at Ellis Road	NB exit ramp	31.6	D	34.9	D
	NB entrance ramp	21.5	C	23.4	C
	SB exit ramp	30.2	D	25.9	C
	SB entrance ramp	26.8	C	24.3	C
NC 147 at Glover Road	NB exit ramp	25.0	C	27.6	C
	NB entrance ramp	20.8	C	23.5	C
	SB exit ramp	27.2	C	24.6	C
	SB entrance ramp	18.7	B	17.0	B
NC 147 at Briggs Avenue	NB exit ramp	29.8	D	28.3	D
	NB entrance ramp	38.7	F	38.0	F
	SB – WB exit ramp	39.0	F	39.4	F
	SB – EB exit loop	36.4	E	37.1	E
	SB entrance ramp	35.2	E	36.7	F
US 70 Bypass at US 70 Business	NB exit ramp	24.5	C	24.6	C
	SB entrance ramp	19.4	B	19.1	B
US 70 Bypass at Holloway Street	NB exit ramp	23.1	C	25.9	C
	NB entrance ramp	22.8	C	24.4	C
	SB exit ramp	30.6	D	31.0	D
	SB entrance ramp	16.4	B	15.3	B

¹ Measured in passenger cars per mile per lane (pc/mi/ln)

² Level of Service

2.6.4 Freeway Weaving Capacity Analysis

A 2035 freeway weaving capacity analysis was conducted at the following four segments for the AM and PM peak hours:

- Northbound NC 147 between Westbound East End Connector and Briggs Avenue
- Southbound NC 147 between Briggs Avenue and Eastbound East End Connector
- Eastbound East End Connector between NC 147 and US 70
- Westbound East End Connector between US 70 and NC 147

Traffic volumes on NC 147 weaving segments were estimated based on the proportions of the upstream and downstream mainline and ramp traffic volumes. For instance, traffic on NC 147 before the merge point will be proportioned to the downstream mainline and off-ramp traffic based on the total volume on each of the downstream facilities. A similar approach is used for proportioning upstream on-ramp traffic.

Weaving traffic volumes on the East End Connector were estimated using a more detailed approach because of the high volumes on the East End Connector. A select link analysis was developed that provided detailed information about the travel patterns for selected ramp traffic. The analysis used the regional travel demand model to identify the travel routes of trips passing through a selected link on a ramp. Based on this select link analysis, it was determined that 90 percent of traffic from southbound US 70 to westbound East End Connector will be traveling towards southbound NC 147 and the remaining 10 percent will be traveling towards northbound NC 147. Similarly, 85 percent of the traffic from the northbound US 70 to westbound East End Connector will be traveling towards northbound NC 147 and the remaining 15 percent will be traveling towards southbound NC 147. This analysis assumed that the reverse pattern will be the same: 90 percent of the traffic traveling eastbound on the East End Connector to southbound US 70 will be traveling southbound on NC 147; 85 percent of the traffic traveling eastbound on the East End Connector to northbound US 70 will be traveling northbound on NC 147. Using these trip distribution patterns, the weaving traffic volumes on the East End Connector were estimated.

The weaving capacity analysis for the East End Connector indicated that traffic demand on the weaving segment between US 70 and NC 147 will flow at Level of Service C or better in both directions; a good rate of traffic flow. The weaving capacity analysis for NC 147 between the East End Connector and Briggs Avenue indicates that weaving traffic demand will exceed the roadway capacity (Level of Service F) during both the AM and PM peak periods. The analysis indicates that the high through traffic volumes are the cause of the poor rate of traffic flow. It should be noted that the proposed East End Connector will decrease traffic volumes on NC 147 and thereby improve traffic flow conditions. Additional roadway improvements needed on this segment are beyond the limits of this project.

A summary of the results of the freeway weaving segment capacity analysis for the 2035 Build Conditions is provided in Table 2-5.

**Table 2-5
Freeway Weaving Capacity Analysis
2035 Build Conditions**

Freeway	Section	AM Peak Hour		PM Peak Hour	
		Density ¹	LOS ²	Density ¹	LOS ²
NC 147					
Northbound	East End Connector to Briggs Avenue	48.13	F	41.84	F
Southbound	Briggs Avenue to East End Connector	53.21	F	46.00	F
East End Connector					
Eastbound	NC 147 to US 70	19.11	B	26.31	C
Westbound	US 70 to NC 147	26.31	C	19.11	B

¹ Measured in passenger cars per mile per lane (pc/mi/ln)

² Level of Service

2.6.5 Freeway Ramp Capacity Analysis

A freeway ramp capacity analysis was conducted for 23 ramps at the following five interchanges for the AM and PM peak hours:

- NC 147 at Ellis Road (four ramps)
- NC 147 at Glover Road (four ramps)
- NC 147 at East End Connector (two ramps)
- NC 147 at Briggs Avenue (five ramps)
- US 70 Bypass at NC 98 ((four ramps)
- US 70 Bypass at US 70 Business (two ramps)
- US 70 at East End Connector (two ramps)

Traffic at all 23 ramps analyzed for this study will continue to flow with a volume-to-capacity ratio of 0.80 or better throughout the day, a good rate of traffic flow. See Table 2-6.

**Table 2-6
Freeway Ramp Capacity Analysis ³
2035 Build Conditions**

Interchange	Ramp	Capacity ¹	AM Peak Hour		PM Peak Hour	
			Volume ¹	V/C ²	Volume ¹	V/C ²
NC 147 at Ellis Road	NB exit ramp	1,800	495	0.28	524	0.29
	NB entrance ramp	1,800	431	0.24	620	0.34
	SB exit ramp	1,800	620	0.34	431	0.24
	SB entrance ramp	1,800	524	0.29	495	0.28
NC 147 at Glover Road	NB exit ramp	1,800	264	0.15	185	0.10
	NB entrance ramp	1,800	218	0.12	469	0.26
	SB exit ramp	1,800	469	0.26	218	0.12
	SB entrance ramp	1,800	185	0.10	264	0.15
NC 147 at East End Connector	NB entrance ramp	3200	2,450	0.77	1,862	0.58
	SB exit ramp	3200	1,862	0.58	2,450	0.77
NC 147 at Briggs Avenue	NB exit ramp	1,800	527	0.29	427	0.24
	NB entrance ramp	1,800	781	0.43	760	0.42
	SB – WB exit ramp	1,800	534	0.30	498	0.28
	SB – EB exit loop	1,400	226	0.16	283	0.20
	SB entrance ramp	1,800	427	0.24	527	0.29
US 70 at East End Connector	NB exit ramp	3200	2,461	0.77	1,865	0.58
	SB entrance ramp	3200	1,865	0.58	2,461	0.77
US 70 Bypass at US 70 Business	NB exit ramp	1,800	716	0.40	875	0.49
	SB entrance ramp	1,800	875	0.49	716	0.40
US 70 Bypass at Holloway Street	NB exit ramp	1,800	81	0.05	147	0.08
	NB entrance ramp	1,800	948	0.53	675	0.38
	SB exit ramp	1,800	675	0.38	948	0.53
	SB entrance ramp	1,800	147	0.08	81	0.05

¹ Measured in vehicles per hour

² Volume-to-capacity ratio

³ Based on the ultimate six-lane EEC section (three continuous lanes in each direction)

2.6.6 Intersection Capacity Analysis

The 2035 Build Conditions capacity analyses were performed for the following 15 intersections in the study area:

Intersections with Signals

- Ellis Road at NC 147 Southbound Ramps
- Ellis Road at NC 147 Northbound Ramps
- Glover Road at NC 147 Southbound Ramps
- Glover Road at NC 147 Northbound Ramps
- Miami Boulevard (US 70 Business) at Carr Road

- Holloway Street at Miami Boulevard (US 70 Business)
- Holloway Street at Hardee Street
- Holloway Street at US 70 Bypass Eastbound Ramps
- Holloway Street at US 70 Bypass Westbound Ramps
- Holloway Street at Hoover Road
- Holloway Street at Junction Road
- Holloway Street at Lynn Road

Intersections without Signals

- Angier Avenue at East End Avenue
- Briggs Avenue at NC 147 Northbound Ramps
- Briggs Avenue at Lawson Street/NC 147 Southbound Ramps

At all twelve (12) of the signalized intersections, overall traffic will flow at Level of Service D or better throughout the day. At the three unsignalized intersections, the left-turn demand on the minor streets will exceed the approach capacity resulting in intersection capacity failure. See Table 2-7.

It should be noted that in the DCHC MPO Long Range Transportation Plan, US 70 south of Lynn Road is proposed to become a grade-separated freeway with full control of access. Therefore, the intersections of US 70-Pleasant Drive and US 70-Lynn Road were not analyzed.

2.6.7 Traffic Demand on Local Roadways

Through Traffic on Local Streets – As previously shown, traffic conditions on local roadways are forecast to increase over the next 25 years. Table 2-8 provides a comparison of the current and projected traffic conditions for these roadways with and without the proposed East End Connector. This table indicates that with the EEC in place, forecasted 2035 traffic volumes along S. Mangum Street, S. Duke Street, and S. Gregson Street will closely match current volumes, thereby reducing future congestion. Also, the EEC is projected to reduce traffic volumes on S. Alston Avenue by 33 percent when compared to forecasted volumes without the EEC. S. Roxboro Street forecasts indicate a small reduction in traffic volumes with the EEC constructed.

**Table 2-7
Intersection Capacity Analysis
2035 Build Conditions**

Intersection Location	Controller	Level of Service									
		AM Peak Hour					PM Peak Hour				
		Overall	EB	WB	NB	SB	Overall	EB	WB	NB	SB
Ellis Road at NC 147 SB Ramps	Signal	C	C	C	N/A	C	C	D	C	N/A	C
Ellis Road at NC 147 NB Ramps	Signal	C	B	C	D	N/A	C	C	C	D	N/A
Glover Road at NC 147 SB Ramps	Signal	C	C	B	N/A	D	C	C	B	N/A	D
Glover Road at NC 147 NB Ramps	Signal	C	B	C	D	N/A	C	C	C	D	N/A
Angier Avenue at East End Avenue	E-W Stop	N/A	N/A	F	N/A	A	N/A	N/A	F	N/A	B
Briggs Avenue at Lawson Street	E-W Stop	N/A	F	N/A	B	A	N/A	F	N/A	B	A
Briggs Avenue at NC 147 NB Ramps	E-W Stop	N/A	N/A	F	C	N/A	N/A	N/A	F	C	N/A
US 70 Business at Carr Road	Signal	C	C	C	B	C	C	C	C	B	C
Holloway Street at Miami Boulevard	Signal	D	C	D	D/ D ¹	D	D	C	C	D/ D ¹	D
Holloway Street at Hardee Street	Signal	B	A	A	D	D	B	A	A	D	D
Holloway Street at US 70 Bypass EB Ramps	Signal	C	C	B	A	C	C	C	B	A	C
Holloway Street at US 70 Bypass WB Ramps	Signal	C	B	C	D	A	C	B	C	D	A
Holloway Street at Hoover Road	Signal	C	C	C	E	D	D	D	B	F	F
Holloway Street at Junction Road	Signal	C	C	C	D	N/A	C	C	C	C	N/A
Holloway Street at Lynn Street	Signal	C	C	B	D	C	C	C	B	D	C

N/A – Not Applicable

¹ The Holloway Street / Miami Boulevard/ Gary Street intersection is a five-legged intersection with Holloway Street running east-west, Miami Boulevard north-south and Gary Street northeast. The NB approach lists the Miami Boulevard Level of Service first, followed by the Gary Street Level of Service.

**Table 2-8
Traffic Demand on Local Roadways**

Street Name	Location	2006 Volume	2035			
			No-Build		Build	
			Volume	% Change	Volume	% Change
S. Alston Avenue ¹	At NCRR ²	21,600	42,000	+94%	34,700	+61%
S. Mangum Street	At NCRR	9,700	12,300	+27%	9,700	0%
S. Roxboro Street	At NCRR	11,800	15,700	+33%	15,000	+27%
S. Duke Street	At NCRR	13,300	16,500	+24%	13,300	0%
S. Gregson Street	At NCRR	13,000	18,400	+42%	13,000	0%

¹ Alston Avenue is currently a 2-lane roadway with plans to be upgraded to a 4-lane facility (2 lanes in each direction) in 2011. NCDOT STIP Division 5 Durham County – U 3308.

² North Carolina Railroad

Source: *Traffic Forecast for Project U-0071 (East End Connector) Durham County, North Carolina Department of Transportation; July 6, 2006.*

2.6.8 Conclusions

The purpose of the Travel Analysis Report is to evaluate the existing and future traffic flow conditions along NC 147, US 70, and other affected local streets to determine the feasibility of meeting future travel demand with and without the proposed East End Connector. According to the traffic forecasts provided by the NCDOT Transportation Planning Branch, travel demand under the 2035 No-Build Conditions indicate that all existing freeway mainline segments and merge/diverge junctions and nine out of fourteen intersections analyzed will fail to serve the future travel demand during at least one peak hour of the day. This analysis clearly shows that the existing transportation system without any additional roadway improvements will be incapable of accommodating the future increase in travel demand.

2.7 Detailed Study Alternative(s)

The Merger Team met on Tuesday, February 13, 2007 to review the alternatives considered and to reach agreement on Concurrence Point 2 – alternatives to be brought forward for detailed study. Of the four build alternatives considered, the Team decided to carry three alternatives forward that met the purpose and need for the project - Alternatives 1, 3, and 4. Alternative 2 was not carried forward due to the significant number of residential and business relocations; impacts to five gravesites and one USEPA Superfund Site; and the complexity of construction resulting in the highest construction costs. The No-Build alternative was not carried forward because it did not meet the project's purpose and need.

After further study of Alternatives 1, 3, and 4, the Merger Team reconvened on June 19, 2007, to select the Least Environmentally Damaging Practicable Alternative (LEDPA/ Preferred Alternative) – Alternative 3. Alternative 3 was selected as the LEDPA/ Preferred Alternative because this alternative has the shortest total project length; the fewest residential and business relocations; minimal natural system impacts; the least amount of required right-of-way; and the lowest project cost. It should be noted that Alternative 3 is effectively the same alternative selected in the 1982 FEIS.

3.0 Existing Environment

This section of the Environmental Assessment describes the existing human, physical, and natural environments within the study area for the proposed East End Connector (EEC) and provides an overview of the base conditions for the assessment of the potential impacts of each of the preliminary study alternatives. Because existing environmental data for the 1982 FEIS is more than 25 years old it was determined that all information about the physical, human and natural environments will be updated as part of this document.

All existing conditions descriptions are based on information currently available from federal, state, and local agencies; field observations; and meetings with local officials and citizens.

3.1 Human and Physical Environment Characteristics

This section provides a summary of the characteristics of the human environment described in the Community Impact Assessment Report prepared for the project in 2008. It includes information regarding the population trends, economic activity, community facilities and services, and neighborhood cohesion that currently exist within the EEC study area. The planning documents and other information reviewed in this analysis include the following:

- U.S. Census Bureau 2000
- Durham Comprehensive Plan (2005)
- Durham State of the Economy (2006)
- A Strategic Workforce Development Plan for Durham, NC (2005)
- Durham Major Employers Directory (2005)
- Durham Trails and Greenways Master Plan (2001)
- Durham Parks and Recreation Master Plan 2003-2013 (2003)
- East Durham Open Space Plan (2005)
- Durham Geographic Information Systems Department

3.1.1 Population Characteristics

The sections below describe the current population characteristics and the expected growth within the EEC study area and the City and County of Durham.

3.1.1.1 Population Profile

The majority of the information contained in this section is based on the U.S. Census Bureau 2000 data and excerpts from the Durham Comprehensive Plan (2005). The EEC study area includes eight census tracts and 12 census block groups. Census tracts are statistical subdivisions of a county. Census block groups are a subset of the census tract and provide detail of census data. The census tracts are shown in Figure 3-1.

**MINORITY / ETHNIC
POPULATION**
2000 U.S. CENSUS

EAST END CONNECTOR

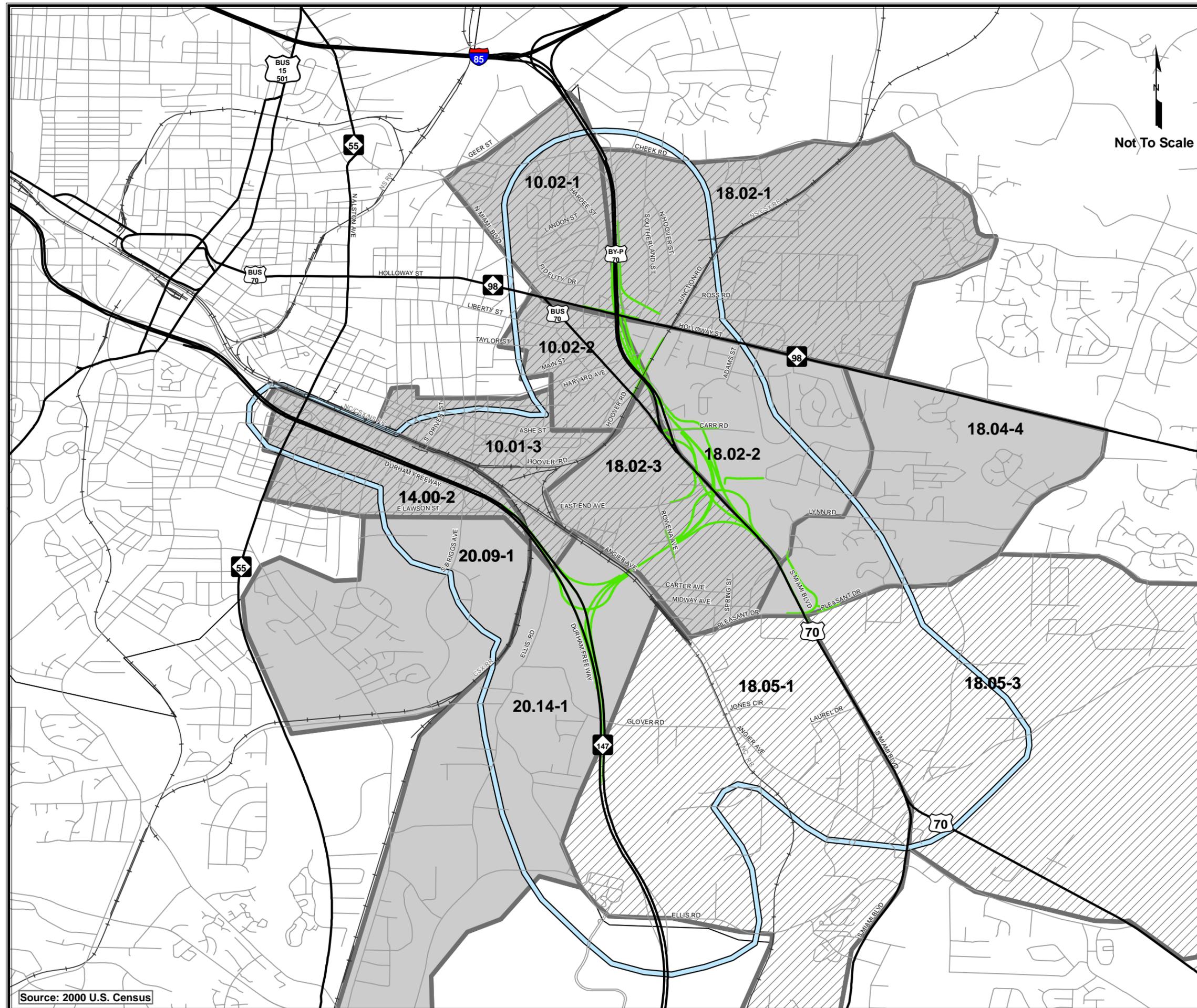
LEGEND

-  34% or greater minority population
-  6% or greater Hispanic population
-  Alternative #3 Alignment

 Human Environment
Study Area Boundary



FIGURE 3-1



As shown in Table 3-1, 2000 Census data indicate that the population of the City of Durham was 187,035 and the population of Durham County was 223,314. More recent population estimates for the year 2004 as reported by the Durham City-County Planning Department indicate that the City population was 206,902 and the County population was 242,079. These estimates indicate the County and City grew at a fairly high rate of 8 and 11 percent, respectively, during the past four years.

From 1990-2000, the County's population grew by almost 41,500, representing an increase of about 22.8 percent. Much of Durham County's growth occurred within the City of Durham. The City population grew over the past decade from about 136,611 to 187,035, representing a decade-long increase of almost 37 percent. A portion of the increase in City population is from annexation in addition to natural growth and net migration. Growth has been concentrated in south Durham over the past decade, especially in the area north of I-40 and south of Chapel Hill Boulevard and Cornwallis Road. The portion of Durham County south of I-40 has also seen strong growth. Because of annexation, the land area of the City increased from almost 73 square miles in 1990 to over 98 square miles in 2000.

**Table 3-1
Population Profile of Durham and North Carolina**

	City of Durham	Durham County	North Carolina
Population (2000 Census)	187,035	223,314	8,049,313
Rate of Population Growth, 1990-2000	36.9 %	22.8 %	21.4 %
Proportion African-American	43.8 %	39.5 %	20.0 %
Proportion Hispanic	8.6 %	7.6 %	4.7 %
Percent Under 18 Years Old	22.9 %	22.9 %	24.4 %
Percent 65 Years and Older	9.4 %	9.7 %	12.0 %

Sources: 2000 U.S. Census; U.S. Census "Annual Demographic Survey," March 2001

The Triangle region is projected to continue to be an attractive area to live and work which will continue to generate additional demands on the infrastructure and transportation systems in the Durham area. Durham County's population is expected to grow significantly over the next three decades. The medium growth projections indicated that Durham County will grow from 223,314 in 2000 to about 328,600 by 2030. The increase of almost 105,300 new residents represents a growth rate of about 47 percent over three decades or an annual average increase of about 1.29 percent.

3.1.1.2 *Racial/Ethnic Composition*

Figure 3-1 shows the census tracts and census block groups that are within the EEC study area along with the percentages of the minority/ ethnic population. Table 3-2 shows the total population and racial/ethnic composition of the 12 census block groups that are located within or partially within the EEC study area as well as Durham County and the state based on 2000 Census data. Based on the population distribution at the census block group level, the highest concentrations of residents in the study area reside north of Holloway Street (NC 98) and south and west of Durham Freeway (NC 147).

Durham County has a white population of 51 percent and a minority population of 49 percent, of which 7.6 percent is Hispanic. Table 3-2 shows the racial/ethnic composition (by percentages) within the EEC study area based on 2000 Census data. As shown in Figure 3-1 the census block groups located north of Glover Road have the largest percentage of minority population (greater than 50 percent). The census block groups located north of Holloway Street (NC 98), west of US 70 Bypass and north of Durham Freeway (NC 147), and south of Pleasant Drive have the largest Hispanic population—greater than 10 percent. The census block groups located south of Pleasant Drive have the largest white population—greater than 77 percent—within the study area. Overall, the population within the EEC study area is comprised largely of minorities (Black/African-American and Hispanic) and at higher ratios than for Durham County or the state.

**Table 3-2
EEC Study Area Racial/Ethnic Composition**

Census Block Group	Total Pop.	White	Black/ African American	Hispanic or Latino (any race)	AIAN*	Asian	NHPI*	Other race	Two or more races	Total Minority Pop.
Study Area Total	23,285	7,343 (32%)	13,578 (58%)	2,420 (10.4%)	72	576	4	1,291	421	15,942 (68%)
Durham County	223,314	113,698 (51%)	88,109 (39%)	17,039 (7.6%)	660	7,350	79	9,404	4,014	109,616 (49%)
North Carolina	8,049,313	5,804,656 (72%)	1,737,545 (22%)	378,963 (4.7%)	99,551	113,689	3,983	186,629	103,260	2,244,657 (28%)

* AIAN- American Indian and Alaska Native; NHPI- Native Hawaiian and Other Pacific Islanders.

Source: 2000 U.S. Census

3.1.2 Economic Characteristics

The Triangle region's economy historically has been associated with the agricultural and manufacturing sectors. The tobacco and textile industries were the foundation of the Durham area economy for the past several decades; however, both of these industries have experienced dramatic reductions in the workforce. Despite these reductions, employment in the County's manufacturing sector has increased by nine percent during the past decade. Although the County's manufacturing sector as a whole has expanded with the manufacturing employment peak of 40,000 jobs in 2001, by 2004, nearly 9,000 of these jobs (related to computers and communications electronics) had been eliminated.

In recent decades, the economy has become more diverse to include a range of high-technology industries, research and development, computer sciences, medical services, and higher educational institutions. The Research Triangle Park (RTP), other technology-based office parks, and surrounding universities and colleges have experienced significant growth during the past 30 years. More than 140 companies employ almost 40,000 workers, making RTP among the nation's largest and most successful planned research and development parks. The resulting economic growth from RTP has been significant. Approximately 20 industrial, office, and retail parks surround RTP and serve the park's companies and workers. The continued expansion of the RTP in the project study area and elsewhere is forecasted to

generate additional jobs and development within its vicinity. This growth in turn has stimulated the wholesale, retail, and service sectors to support the increased activities in the high-tech industries. The employment sectors that are anticipated to experience the greatest gains are the professional services jobs related to higher education, information technology, healthcare, and biosciences.

3.1.2.1 Employment

As shown in Table 3-3, Durham County had a total employment of 114,375 in 2000. According to the North Carolina Department of Commerce by the fourth quarter of 2007, County employment had increased to 129,957 and the unemployment rate was 3.8 percent (well below state and national averages). The current unemployment rate has risen with the onset of the recession in 2008.

The largest employment sectors within the EEC study area are the government (includes public administration, educational, health and social services) finance, insurance, and real estate sectors (includes professional, scientific, and management services). Together, these sectors comprise approximately 47 percent of the employment within the EEC study area. Major employers (greater than 100 employees) within the EEC study area are located within the western portion of the study area in close proximity to Durham Freeway (NC 147) and include Durham Technical Community College (739 employees); Durham Exchange Club, Inc. (392 employees; - assembly, packaging services and vocational rehabilitation programs); AlSCO, Inc. (150 employees; industrial supplies and services); North Carolina Mutual Wholesale Drug, Inc. (132 employees; - wholesale distributor of drugs and sundries); and Brenntag Southeast, Inc. (131 employees; - chemical products distributor).

**Table 3-3
EEC Study Area Employment by Sector**

Census Block Group	Agriculture	Const.	Finance, Ins and Real Estate	Gov't.	Mfg.	Other Services	Whsle.	Retail Trade	Transp Info and Utilities	Total Employed
Study Area Total	45	966	1,842	3,181	1,409	1,178	229	1,096	823	10,769
Durham County	333	7,817	20,630	40,721	11,977	12,762	2,113	9,518	8,504	114,375
North Carolina	61,185	312,038	527,297	889,069	755,252	442,493	131,330	439,868	266,209	3,824,741

Source: 2000 U.S. Census

As stated in the DCHC MPO 2030 Long Range Transportation Plan, the employment growth in the MPO area is projected to increase by approximately 73 percent between the years 2002 and 2030, indicating that the Durham area will continue to be a major employment center in the future. This increased employment will also create the need for increased housing, public services, and transportation demand on the area roadways and transit systems.

The City of Durham provides tax credit incentives for businesses which locate or expand in the targeted redevelopment areas in central Durham. The State Development Zone designation qualifies businesses for tax or franchise tax credits.

Most of the EEC study area located east of Angier Avenue and north of Pleasant Drive is located within the State Development Zone.

3.1.2.2 *Income*

The income levels for Durham County, summarized in Table 3-4 reflect the County's success in attracting jobs requiring residents who have already earned their post-secondary degrees. Durham County's average income is among the highest in the state. According to the 2000 Census, Durham County had the State's fifth highest median household income in 1999. The County's median household income was \$43,337, more than 10 percent higher than the statewide figure of \$39,184.

Table 3-4 and Figure 3-2 show the areas of low-income populations (below the federal poverty level) within the EEC study area based on 2000 Census data.

**Table 3-4
EEC Study Area Annual Household Income**

	< 20 K	20-30 K	30- 40K	40-50 K	50-99 K	> 100 K	Total Households	HH Median
Study Area Total	2,346	1,404	1,260	920	2,355	450	8,735	N/A
Durham County	18,830	11,305	10,861	9116	27,432	11,457	89,001	\$43,337
North Carolina	739,085	443,665	412,665	355,195	887,797	294,875	3,133,282	\$39,184

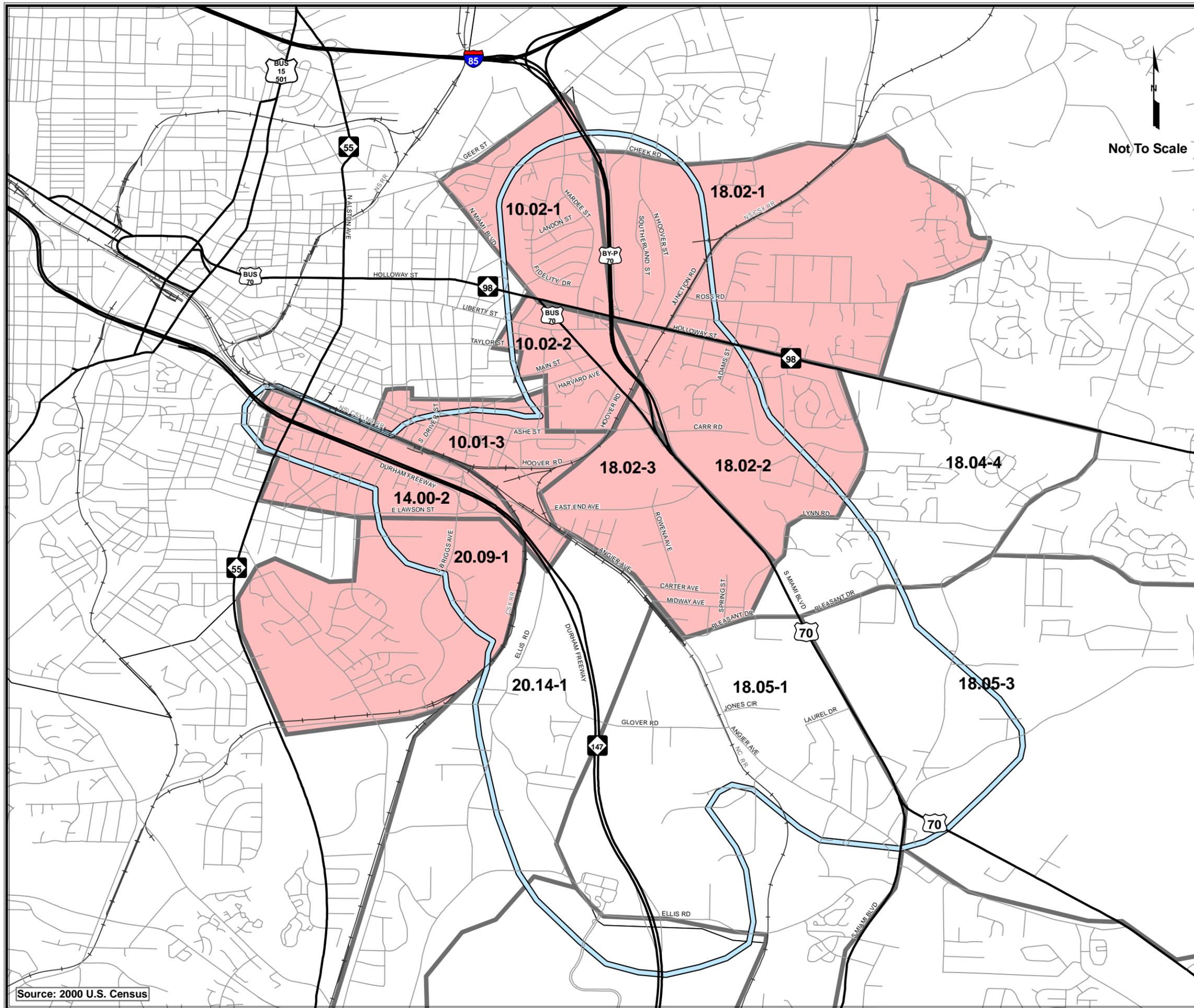
Source: 2000 U.S. Census

3.1.2.3 *Commuting Patterns*

The 2000 Census data available on the commuting patterns by mode and travel time for the EEC study area indicates that 92 percent of commuters in the study area depend primarily on the automobile for most travel. Four percent use public transit; two percent walk to work.

Approximately 72 percent of commute times of residents within the EEC study area are under 30 minutes; 22 percent have a commute time of 30 to 60 minutes.

Increasingly, Durham residents are finding jobs outside the County. At the same time, Durham businesses are increasingly dependent on employees who live elsewhere. According to the 2000 Census, approximately 75,000 people that work in Durham County do not live in the County. Conversely, 25,000 people who live in Durham work outside of the County.



LOW - INCOME POPULATION
1999 POVERTY THRESHOLDS

EAST END CONNECTOR

LEGEND

Low-Income Populations

- 0 to 13%
- 14% or greater

Human Environment Study Area Boundary

East End Connector
DURHAM COUNTY (TIP Project No. U-0071)

FIGURE 3-2

3.1.3 Neighborhoods

The EEC study area is a mix of the older neighborhoods in the urban area within the city limits of Durham and some newer residential areas within the suburban fringe of the city. The residential areas are generally older established neighborhoods of low to medium density with single-family residences located throughout the area. There are also several newer scattered apartment complexes and single-family residences located east of US 70 Bypass and south of Holloway Street. Many of these neighborhoods are bounded by industrial land uses and undeveloped parcels.

The residential development in the southern portion of the study area includes low-density, semi-rural properties and is not organized into defined neighborhoods. The northern portion of the study area has several large parcels in industrial use and community service (cemeteries). The majority of the properties located adjacent to the Durham Freeway (NC 147), Angier Avenue and US 70 corridors are light and heavy industrial uses with mostly trucking/warehousing/distribution and manufacturing activities along with some commercial parcels. These land uses are intermingled with older residential properties.

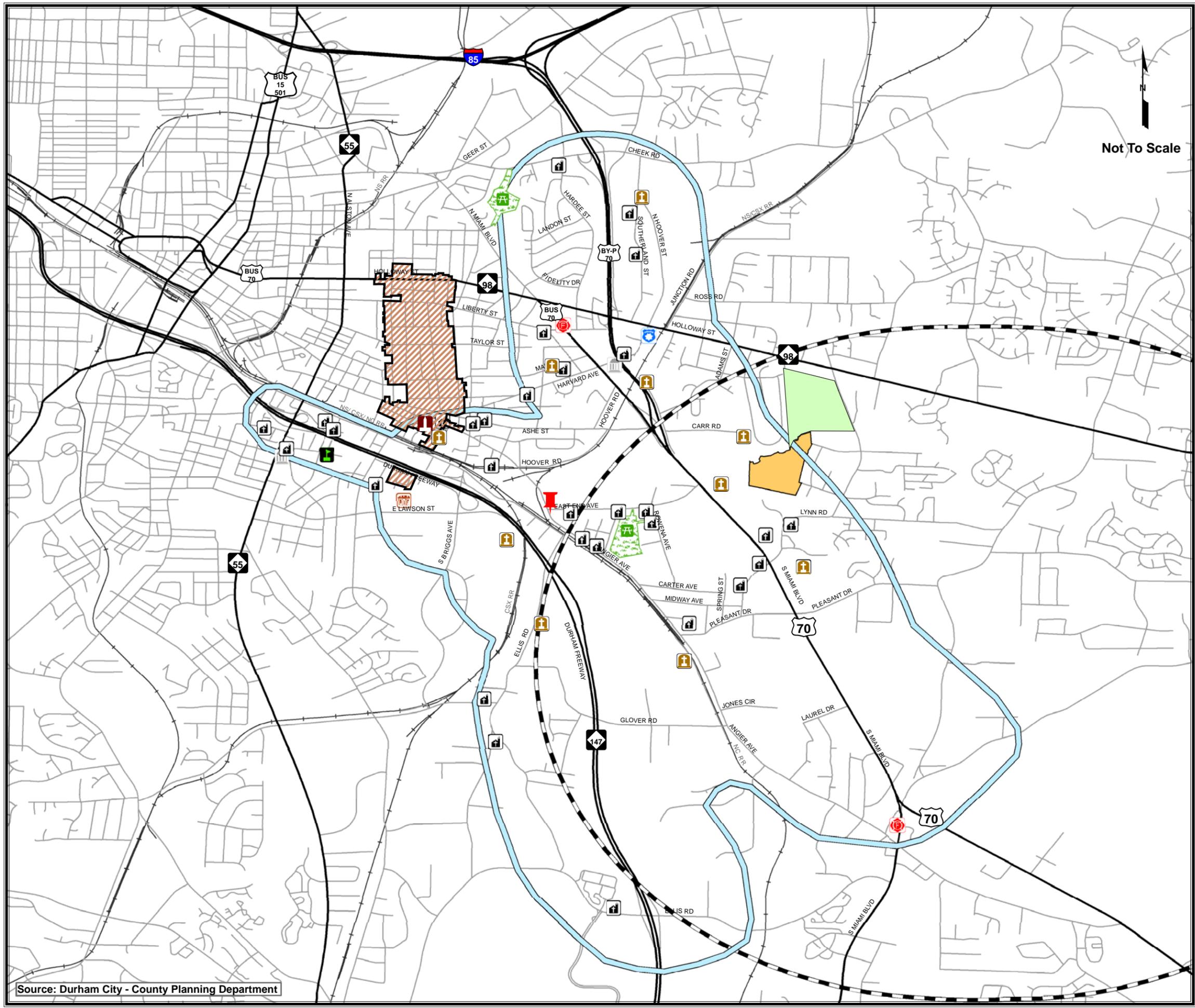
Figure 3-3 shows the locations and names of the current neighborhood organizations as identified on the Neighborhood Organization Map (2006) prepared by the Durham City-County Planning Department. The southern portion of the EEC study area is designated as the Delmar Drive Neighborhood Group which also includes the Cedar Hills Community. Two other neighborhoods that have been traditionally recognized in or near the study area are referred to as Hayestown, located in the vicinity of East End Avenue and Angier Avenue, and Birchwood Heights, located east of the study area along NC 98. The Partners Against Crime (PAC) District 1 and District 4 are also located within the vicinity of the EEC study area.

Although there has been strong residential growth in some parts of Durham, the EEC study area has experienced relatively modest growth in residential and commercial development. Population and household growth in most of the neighborhoods within the EEC study area has been at slower rates as compared to other areas of Durham. The EEC study area has not attracted the same level of residential or commercial investment or expansion as compared to the suburban areas of Durham. As a result, the communities within the study area have experienced a decline in new business start-ups and private investment.

The majorities of the neighborhoods in the study area are comprised of low to middle-income households and have higher than average crime rates. Median household income levels for most of the neighborhoods within the EEC study area are considerably lower than those for the City of Durham and Durham County. Approximately 20 percent of the population within the study area has annual incomes at or below the federally designated poverty level.

3.1.4 Community Facilities and Services

Community facilities and services include educational facilities, religious institutions, health care facilities, government offices and public safety facilities (police, fire, and rescue), cultural facilities (e.g., libraries, museums, historic sites, etc.), and parks/recreational and community center facilities. Several of these types of facilities are located throughout the EEC study area as indicated in Figure 3-3 and listed in Table 3-5.



Not To Scale

COMMUNITY FACILITIES AND NEIGHBORHOODS

EAST END CONNECTOR

LEGEND

-  Place of Worship
-  Cemetery
-  Local Historical Landmark
-  Park
-  Public School
-  College or University
-  Police Department
-  Fire Station
-  Government Building
-  National Historic District
- Neighborhood Organizations**
-  Cedar Hills Community
-  Delmar Drive Neighborhood Group
-  Birchwood Heights
-  Hayestown Community

 Human Environment Study Area Boundary

Source: Durham City - County Planning Department

**Table 3-5
EEC Study Area Community Facilities**

Facility	Location
Burton Elementary School	Mathison Ave.
Durham Technical Community College	Cooper St.
Ambassador Cathedral Church	S Briggs Ave.
Angier Avenue Baptist Church	Angier Ave.
Believers Assembly Christian Church	Harvard Ave.
Bible Gospel Church	Angier Ave.
Calvary Baptist Church	Lynn Rd.
Church of God & True Holiness	East End Ave.
Church of God & True Holiness	King St.
Christian Apostolic Holiness	Humphrey St.
East Durham Church of God	Southerland St.
Emmanuel Pentecostal Temple	E. Main St.
Evangel Assembly of God	Lynn Rd.
Faith Gospel Tabernacle	Troy St.
Fellowship Free Will Baptist Church	Southerland St.
Full Gospel United Holiness	Ashe St.
God's Holy Temple Trustees	East End Ave.
Greater Joy Baptist Church	Hardee St.
Greater New Birth Baptist Church	Harvard Ave.
Highway House of Holy Prayer	Rowena Ave.
Immanuel Holiness Mission Church	Post Ave.
Immanuel Free Will Baptist	Ellis Rd.
Jones Miracle Temple Holiness	Humphrey St.
Living Waters Christian Community	Lynn Rd.
New Trinity Pentecostal	Lynn Rd.
Oak Grove United Am Free Will	Colfax St.
Orange Grove Missionary Baptist Church	East End Ave.
Protestant Episcopal Church	Liberty St.
Russell Memorial Christian	Alston Ave.
Sherron Acres Free Will Baptist Church	Lynn Rd.
Zion Temple United Church of Christ	Sparella St.
Watson Cemetery	N. Hoover Rd.
Woodlawn Memorial Park	Liberty St.
Cemetery	S. Hoover Rd.
Holloway Cemetery	Carr Rd.
Barbee Family Cemetery	Salem St.
Cemetery	East of S. Briggs Ave.
Cemetery	East of Miami Boulevard.
Barbee Family Cemetery	Ellis Rd.
Cemetery	Angier Ave.
Douglas G. Hill Cemetery	East End Ave. at US 70
NC State Highway and Public Works	Harvard Ave.
County of Durham	E Main St.
Durham Fire Station	N. Miami Boulevard.
Durham Fire Station	S. Miami Boulevard
Durham Police Substation	Holloway St.
Former Fidelity Bank Building (Local Landmark)	Intersection of Driver St. and Angier Ave.
East Durham National Historic District	North of Angier Ave.
Durham Cotton Village National Historic District	South of Bowen St.
C. R. Wood Park	East End Ave.
Sherwood Park	N. Miami Boulevard.

Source: Durham GIS Department; Durham City-County Planning Department; Field Surveys

3.1.4.1 *Educational Facilities*

There is one public elementary school within the westernmost portion of the EEC study area. There is one community college, Durham Technical Community College located within the EEC study area near the Durham Freeway (NC 147) and Briggs Avenue interchange.

3.1.4.2 *Religious Institutions*

Many churches and cemeteries/memorial parks are located within the EEC study area, as indicated in the community facilities list provided in Table 3-5. The largest cemetery within the EEC study area is the Woodlawn Memorial Park located immediately west of Miami Boulevard/US 70 Bypass and south of Liberty Street.

3.1.4.3 *Health Care Facilities*

There are no major health care facilities within the EEC study area; however several major hospitals are located within the City of Durham and Duke University northwest of the project area.

3.1.4.4 *Government and Public Safety Facilities*

Within the EEC study area there are two fire stations; one station is located on North Miami Boulevard north of Liberty Street and another station is located on South Miami Boulevard near Angier Avenue intersection. A police station is located on Holloway Street (NC 98) east of US 70 Bypass. Two government or public safety facilities are located within the study area; the North Carolina State Highway and Public Works office is located west of US 70 Bypass and south of Harvard Avenue, and a Durham County government facility is located on East Main Street.

3.1.4.5 *Cultural Facilities*

The East Durham National Historic District and the Durham Cotton Mills Village National Historic District are located on the western edge of the EEC study area. There is a local historic landmark known as the former Fidelity Bank building located on the western edge of the study area at the intersection of Driver Street and Angier Avenue.

The North Carolina Department of Cultural Resources, State Historic Preservation Office conducted a historic architectural review of the EEC study area and determined that there are no State or National historic resources located within the study area that will be affected by the proposed project.

3.1.4.6 *Parks/Recreational and Community Facilities*

There are two community parks located within the EEC study area. Sherwood Park is a community park located on the northwestern edge of the EEC study area north of Miami Boulevard.

The C. R. Wood Park is a community park and recreation center located south of East End Avenue and west of Rowena Avenue. There are no additional parks currently

planned within the study area, however, improvements are planned to the C.R. Wood Park according to information included in the Durham Parks and Recreation Master Plan 2003-2013. These plans will not expand the park, only improve the existing facility.

There are currently no existing trails or greenways within the EEC study area, however, the Durham Trails and Greenways Master Plan (2001) identifies expansion plans for the Little Lick Creek Trail system, located northeast of the study area.

3.1.5 Noise

The following is an excerpt from the Preliminary Traffic Noise Analysis Report, Proposed East End Connector, Durham County, and prepared by the Traffic Noise and Air Quality Section, North Carolina Department of Transportation, July 30, 2007.

The Federal Highway Administration (FHWA) developed noise abatement criteria (NAC) and procedures to be used in the planning and design of highways, as set forth in Title 23 CFR Part 772 - *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. A summary of the noise abatement criteria for various land uses is presented in Table 3-6. Traffic noise impacts occur when the predicted traffic noise levels either: (a) approach or exceed the FHWA noise abatement criteria (with “approach” meaning within 1 dBA of the Table 3-6 value), or (b) substantially exceed the existing noise levels. Table 3-7 provides the NCDOT definition of “substantial increase.”

**Table 3-6
Noise Abatement Criteria**

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

Source: Title 23 Code of Federal Regulations (CFR) Part 772, U. S. Department of Transportation, Federal Highway Administration.

**Table 3-7
Criteria for Substantial Noise Increase**

Hourly A-Weighted Sound Level – Decibels (dBA)	
Existing Noise Level in Leq (h)	Increase in dBA from Existing Noise Levels to Future Noise Levels
<=50	>=15
51	>=14
52	>=13
53	>=12
54	>=11
>=55	>=10

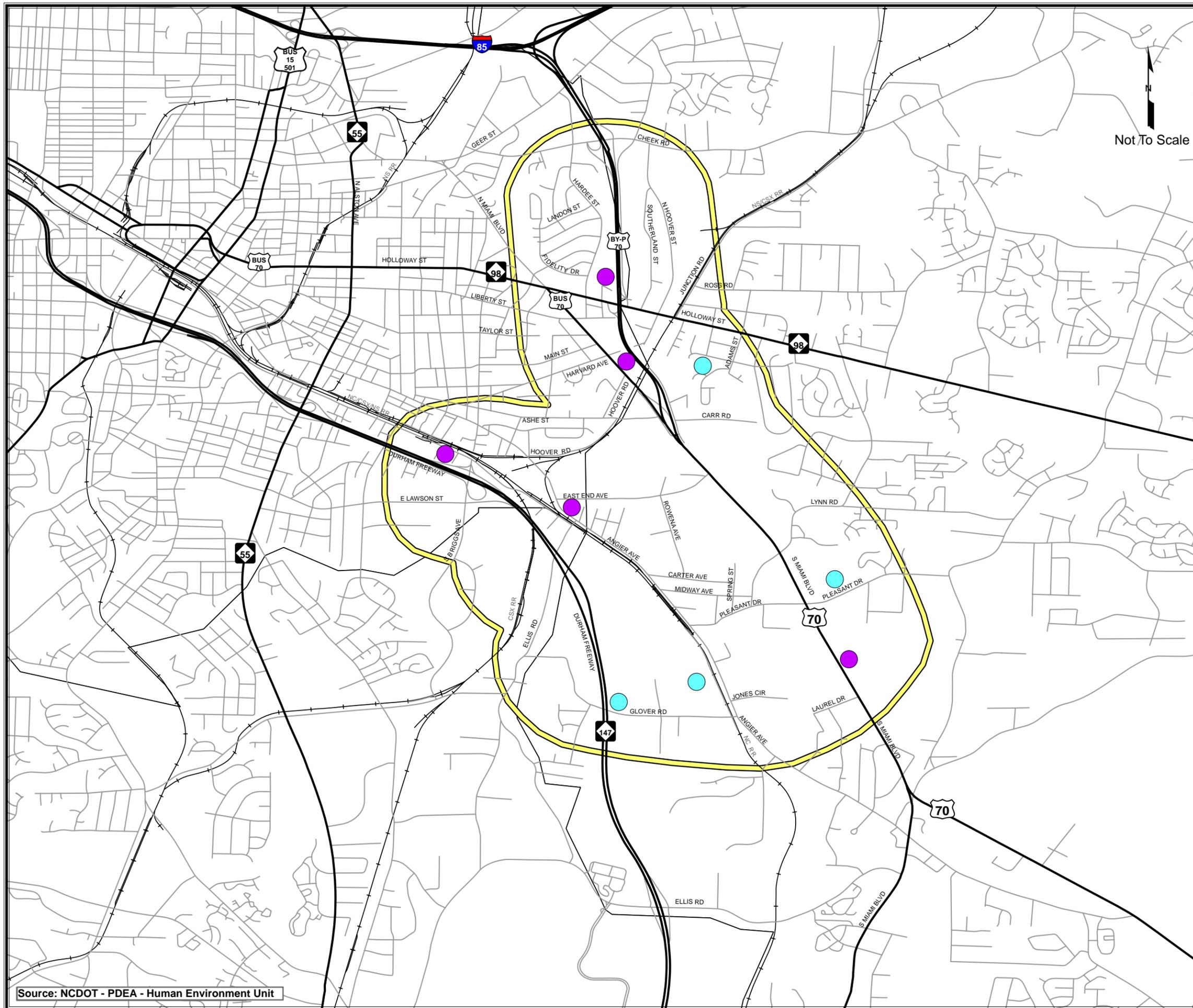
Source: North Carolina Department of Transportation Noise Abatement Policy (09/02/04).

3.1.5.1 Characteristics of Noise

Noise is defined as unwanted sound. It is emitted from many sources, including motor vehicles, airplanes, railroads, power generation plants, and factories. Motor vehicle noise, or traffic noise, is usually a composite of noise from engine exhaust, drive trains, and tire-roadway interaction. The magnitude of noise is typically described by its sound pressure. The range of sound pressures humans can hear varies greatly. Sound pressures described in decibels (dB) are called sound pressure levels and are often defined in terms of frequency-weighted scales (A, B, C, and D). The A-weighted scale is used almost exclusively to describe traffic noise because A-weighted sound quantities often correlate well with the subjective response of people to the magnitude of a sound level. For example, A-weighting takes into account the fact that humans are more sensitive to higher frequency sounds than lower frequency sounds. Sound levels measured using an A-weighted decibel scale are expressed as dBA. The hourly average sound level (Leq (h)), or equivalent sound level, is the level of constant sound which, in an hour, will contain the same acoustic energy as the time-varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of steady noise levels with the same energy content.

3.1.5.2 Traffic Noise Measurement and Modeling

NCDOT personnel collected ambient noise measurements within the proposed project corridors to determine ambient (existing) noise levels for the identified land uses. Existing noise levels, measured 50 feet from the edge of pavement, range from 70.7 to 63.0 dBA. A background noise level of 50.0 dBA was determined for the project, for use in areas where traffic is not the predominant noise source. The ambient measurement locations are shown in Figure 3-4 and described in Table 3-8.



Source: NCDOT - PDEA - Human Environment Unit

AMBIENT NOISE MEASUREMENT SITES

EAST END CONNECTOR

LEGEND

- Ambient Background Noise Sample Site
- Ambient Traffic Noise Sample Site

General Study Area Boundary



FIGURE 3-4

**Table 3-8
Ambient Noise Levels (Leq)**

Site	Location	Description	Noise Level (dBA)
1	US 70 at Antique Store	Grassy	68.3
2	US 70 South of Holloway Street at DMV Office	Grassy	68.9
3	US 70 Service Road (Southbound) North of Holloway Street	Grassy	70.7
4	Angier Avenue at Orange Grove Missionary Church Parking Lot	Paved	63.8
5	East Pettigrew Street at Duane Street (Haskell's Properties)	Grassy	63.0
BG1	Pleasant Drive Northeast of US 70	N/A	59.2
BG2	Springwood Park Apartment Complex	N/A	48.9
BG3	Glover Road at Bills's Iron Works	N/A	56.1
BG4	Jones Circle	N/A	52.8
Y1	Holloway Street East of US 70	Modeled	69.4
Y2	Holloway Street West of US 70	Modeled	67.2
Y3	NC 147 from start to Proposed Connector	Modeled	74.7

Note: The ambient noise level sites were measured at 50 feet from edge of pavement of the nearest lane of traffic.

The Traffic Noise Model TNM® 2.5 was used to predict future noise levels in this study. Existing roadway and traffic conditions were input into TNM® 2.5 to calculate existing noise levels for a comparison with those noise levels actually measured. These calculated noise levels averaged less than 2 dBA difference from measured noise levels, indicating that the computer model is sufficiently reliable in predicting noise levels. A change in noise levels of 3 dBA or less is generally considered barely perceptible.

TNM® 2.5 was used to predict future noise levels and determine noise impacts during the peak hour of the design year 2035. The maximum extent of the modeled 72 dBA and 67 dBA noise level contours is approximately 256 feet and 400 feet, respectively, from the center of the proposed roadway. When traffic noise impacts are predicted, examination and evaluation of noise abatement measures for reducing or eliminating the noise impacts must be considered for all impacted receptors.

3.1.6 Air Quality

The following is an excerpt from the Air Quality Analysis Report, Proposed East End Connector, Durham, prepared by the Traffic Noise and Air Quality Section, North Carolina Department of Transportation, May 10, 2007.

The U.S. Environmental Protection Agency (USEPA) has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants as listed in Table 3-9. The Clean Air Act, last amended in 1990, establishes primary and secondary standards for these pollutants considered harmful to public health and the environment.

**Table 3-9
National Ambient Air Quality Standards**

Pollutant	Primary Stds.	Averaging Times	Secondary Stds.
Carbon Monoxide	9 ppm (10 mg/m ³)	8-hour	None
	35 ppm(40 mg/m ³)	1-hour	None
Lead	1.5 µg/m ³	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 µg/m ³)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM ₁₀)	Revoked	Annual (Arith. Mean)	
	150 µg/m ³	24-hour	
Particulate Matter (PM _{2.5})	15.0 µg/m ³	Annual (Arith. Mean)	Same as Primary
	35 µg/m ³	24-hour	
Ozone	0.08 ppm	8-hour	Same as Primary
	0.12 ppm	1-hour(Applies only in limited areas)	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arith. Mean)	-----
	0.14 ppm	24-hour	-----
	-----	3-hour	0.5 ppm (1300 µg/m ³)

Source: US Environmental Protection Agency

Notes: Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m³), and micrograms per cubic meter of air (µg/m³).

Durham County is currently designated as an ozone non-attainment area and carbon monoxide maintenance area based on the federal air quality standards as specified in Table 3-9. The entire Triangle region was designated as a non-attainment area for the 8-hour ozone standard in June 2004. The ozone non-attainment designation indicates that the area experiences ozone pollutant levels higher than the NAAQS. Therefore, the region is required to demonstrate that mitigation measures will be taken to reduce the ozone level by reducing vehicle use and traffic congestion conditions within the region in order to bring the area back into compliance with the federal air quality standards.

The Clean Air Act Amendments of 1990 require that transportation plans, programs, and projects conform to the NC State Implementation Plan (SIP) for achieving federal air quality standards.

The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) 2030 Long-Range Transportation Plan (LRTP) and the DCHC MPO 2009-2015 Metropolitan Transportation Improvement Plan (MTIP) are in conformity with the SIP as indicated in the Conformity Analysis and Determination Report (April 2005) prepared for the Triangle region.

The DCHC MPO is currently updating its long range transportation plan. It has completed its draft 2035 Long Range Transportation Plan and Air Quality Analysis and Conformity Determination Report, which documents the 2035 Plan's compliance with federal air quality regulations. The DCHC policy board, the Transportation Advisory Committee, approved the final 2035 LRTP and AQ Report on May 13, 2009. The MPO awaits final approval by the Federal Highway Administration. These plans identify transportation control measures designed to reduce emissions from transportation sources, including roadway and transit improvements, bicycle and pedestrian facilities, and land use planning. These plans also identify the proposed East End Connector project as a high-priority roadway improvement project for the Durham area.

3.1.7 Farmlands

The Farmland Protection Policy Act (FPPA) of 1981 requires federal agencies to consider the impact of land acquisition actions and projects on prime and important farmland. Land dedicated to urban uses is exempt from the requirements of the Act. Within the EEC study area there is currently land located in the southwest portion of the study area between Durham Freeway (NC 147) and Angier Avenue that is used as pastureland for cattle and horses. There does not appear to be any cultivated cropland within the study area. The entire study area is committed to urban and suburban uses, as indicated by the Durham City/County Future Land Use Map.

3.1.8 Utilities

The existing major electrical utilities within the EEC study area are owned by Duke Energy Corporation and include the high voltage electrical transmission lines that run north to south along the US 70 corridor and cross Durham Freeway (NC 147) and Angier Avenue in the southern portion of the study area. These lines connect to the electrical substation located near the intersection of Hoover Road and Ashe Street. There is a natural gas pipeline substation and a cellular communications tower located east of US 70 and south of Pleasant Drive. A municipal water tower is located west of Durham Freeway (NC 147) near Ellis Road in the southwestern portion of the study area.

3.1.9 Visual Environment

The EEC study area is predominantly an urban/suburban landscape that consists mostly of low-to medium-density, single-family residential developments with some scattered multi-family apartment complexes. Relatively large, wooded tracts remain, scattered among residential subdivisions. Commercial and industrial properties are generally located along the US 70, Angier Avenue, Durham Freeway (NC 147) and Holloway Street corridors.

The terrain is generally flat to gently rolling hills with wooded corridors along the creeks and tributaries. The areas of undeveloped land are located in the vicinity of the smaller tributaries of Little Lick Creek and in the southern portion of the EEC study area. No visually significant water features or natural habitats exist within the study area, or any important manmade or natural features with unique views or aesthetic value.

3.1.10 Hazardous Materials

The NCDOT GeoEnvironmental Section conducted a field reconnaissance survey in March 2006, and a follow-up survey of the study area in January 2007. The main purpose of this

investigation was to identify properties within the study area that are or may be contaminated by hazardous materials or waste, thus resulting in increased project costs and possible future liability if acquired by NCDOT. Geoenvironmental areas of concern may include, but are not limited to, active and abandoned underground storage tank (UST) sites, hazardous waste sites, regulated landfills and unregulated dumpsites. Based on these surveys, GIS information, and Durham Sanborn maps, 44 possible sites presently or formerly containing petroleum underground storage tanks (USTs) and four (4) hazardous waste (Superfund) sites were identified and are listed in Table 3-10. No apparent landfill was identified within the project limits.

**Table 3-10
 USTs, Hazardous Waste & Other Contaminated Sites**

Facility ID	Type	Facility Name	Facility Address	Facility Owner
0-000281	UST	Servitex, Inc.	1720 Lawson Street	Servitex, Inc.
0-000753	UST	Carolina Distributing	712 Ellis Road	Long Beverage, Inc.
0-001100	UST	Worth Chemical Corporation	2418 Pettigrew Street	Worth Chemical Corporation
0-001678	UST	M.M. Fowler, Inc. - Durham Plan	600 Gulf Street	M.M. Fowler, Inc.
0-001679	UST	Gallant's Auto Service	2201 Angler Avenue	M.M. Fowler, Inc.
0-002268	UST	Joyland BP	2406 Holloway Street	M.M. Fowler, Inc.
0-003282	UST	Don C. Christian Co., Inc.	901 South Miami Boulevard	Don C. Christian Co., Inc.
0-003788	UST	Araismith's (Durham)	208 Muldee Street	Carolina Freight Carriers Corp.
0-015070	UST	Circle K #4731	2502 Holloway Street	Circle K Stores, Inc.
0-015269	UST	Ryder Transportation Service #13	300 Muldee Street	Ryder Truck Rental, Inc.
0-015134	UST	Roxboro Concrete Services, Inc.	1014 Ellis Road	Chandler Concrete Company, Inc.
0-015321	UST	Trico Electric Supply Co.	1912 Pettigrew Street	Harris Oil Company of Durham, Inc.
0-015414	UST	Whitney Enterprises, LLC	2001 Cheek Road	Whitney Enterprises, Inc.
0-015588	UST	Reynolds-Durham Sheds	706 Ellis Road	Durham Warehousing Corporation
0-015832	UST	Hertz Equipment Rental Corporation	1002 Ellis Road	The Hertz Corporation
0-015687	UST	Roadway Express, Inc.	920 Ellis Road	Roadway Express, Inc.
0-016114	UST	O'Neal's Quickie Mart	1907 Cheek Road	Cary Oil Company, Inc.
0-015850	UST	Sears Roebuck & Company	222 North Hoover Road	Sears Roebuck & Company
0-015890	UST	SouthChem, Inc.	2000 E. Pettigrew Street	SouthChem, Inc.
0-016054	UST	Fellowship Church	617 Southerland Street	Gwaltney Oil & Gas Company, Inc.
0-016056	UST	Corner Quick Mart	2929 Angler Avenue	Gwaltney Oil & Gas Company, Inc.
0-016370	UST	Gage Carolina Metals, Inc.	1648 Lawson Street	Bonus Properties/C. McAlexander
0-016343	UST	Pantry #3162 (ETNA 281)	2301 Holloway Street	The Pantry, Inc.
0-016290	UST	PSNC Durham Operations Center	3001 Harvard Street	Public Service Company of NC, Inc.
0-016442	UST	Bilboa Food Mart #353	3641 Angler Avenue	Marshall Oil Company, Inc.
0-016461	UST	Burton Lines, Inc.	815 Ellis Road	Burton Lines, Inc.

Table 3-10 (Continued)
USTs, Hazardous Waste & Other Contaminated Sites

Facility ID	Type	Facility Name	Facility Address	Facility Owner
0-016515	UST	Strayhorn's Waste Oil Service	2219 Glover Road	Leo Lewis Stray Horn
0-016535	UST	Tops Texaco mart #7	921 North Miami Boulevard	Tops Petroleum Corporation
0-016480	UST	Angler Avenue Central Office	2923 Angler Avenue	General Telephone Co. of the South
0-16852	UST	Harlan Laws Corporation	304 Muldee Street	Harlan Laws Corporation
0-020047	UST	L & M Garbage Service	3319 Angler Avenue	Euma Clayton
0-023408	UST	NC-041	1007 North Miami Boulevard	Crown Central Petroleum Corporation
0-027518	UST	Fast Fare #NC-567	1001 South Miami Boulevard	Crown Central Petroleum Corporation
0-030661	UST	Brown Transport Corporation	2700 Angler Street	Stewart Wallace
0-031975	UST	North Hoover Warehouse	224 North Hoover Road	North Hoover Warehouse Association
0-031990	UST	Durham Division Warehouse	211 Hoover Road	Public Service Company of NC, Inc.
0-033671	UST	Cherokee Sanford Group Durham P	South Hoover Road	Cherokee Sanford Group
0-036498	UST	Durham Technical Community College	1616 Cooper Street	Durham Technical Community College
No record	UST	Perry Wholesale Tire	2900 Angler Avenue	Boyd Perry
No record	UST	Tellis Foreign Auto Repair	951 South Miami Boulevard	Tellis Tsoumbos
No record	UST	Durham Harley Davidson	819 North Miami Boulevard	Charles Wellons
No record	UST	Smile Gas #44	1401 South Miami Boulevard	Gabriel Araos
No record	UST	Equipment Brokerage Services	1750 Lawson Street	Ben Tart
No record	UST	PSNC Durham Operations	214 South Hoover Road	Ken Johnson
991-278-524	Superfund	Environmental Recycling Co./Armageddon	1901 East Peabody Street	N/A
991-278-714	Superfund	CaroChem-SouthChem	540 Gulf SE	N/A
003-196-193	Superfund	Pifer Industries, Inc.	2210 East Pettigrew Street	EHK Properties, Inc.
075-582-197	Superfund	Amore Chemical/Worth Chemical	2418 East Pettigrew Street	Worth Chemical Corporation

3.1.11 Floodplains / Floodways

The State of North Carolina, through the Federal Emergency Management Agency's (FEMA's) Cooperating Technical Community partnership initiative, was designated as the first Cooperating Technical State (CTS). As a CTS, the State has assumed primary ownership and responsibility of the Flood Insurance Rate Maps (FIRMs) for all North Carolina communities as part of the National Flood Insurance Program (NFIP). This effort includes conducting flood hazard analyses and producing updated, digital FIRMs (DFIRMs). DFIRM data for the East End Connector project area, based on aerial photography, were downloaded from the North Carolina Floodplain Mapping Program website (NCFMP, 2006). These data define floodway boundaries as a tool for floodplain management.

Based on FEMA's definition, the floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of the stream and the adjacent floodplain area that needs to be kept free of encroachment so a 100-year flood can be carried without increasing the level and extent of flood elevations. The 100-year flood is defined as an event that has a 1 percent probability of occurring in any given year. The area between the floodway boundary and the 100-year floodplain boundary is known as the floodway fringe or the 100-year floodplain. Streams for which detailed hydrological studies have not been conducted do not have defined floodways, and the mapped 100-year floodplains boundaries are shown as estimated boundaries only.

Durham County and the City of Durham are participants in the National Flood Insurance Regular Program administered by the Federal Emergency Management Agency (FEMA). Portions of the study area have streams for which designated FEMA regulated 100-year flood hazard zones and floodways have been established (See Figure 3-5). However, none of the proposed alternative alignments will impact any FEMA designated 100-year flood hazard zones or floodways. The NCDOT Hydraulics Unit will ensure compliance with applicable floodplain management ordinances in the design phase of the project.

3.1.12 Parks, Recreational Lands, and Wildlife Refuges

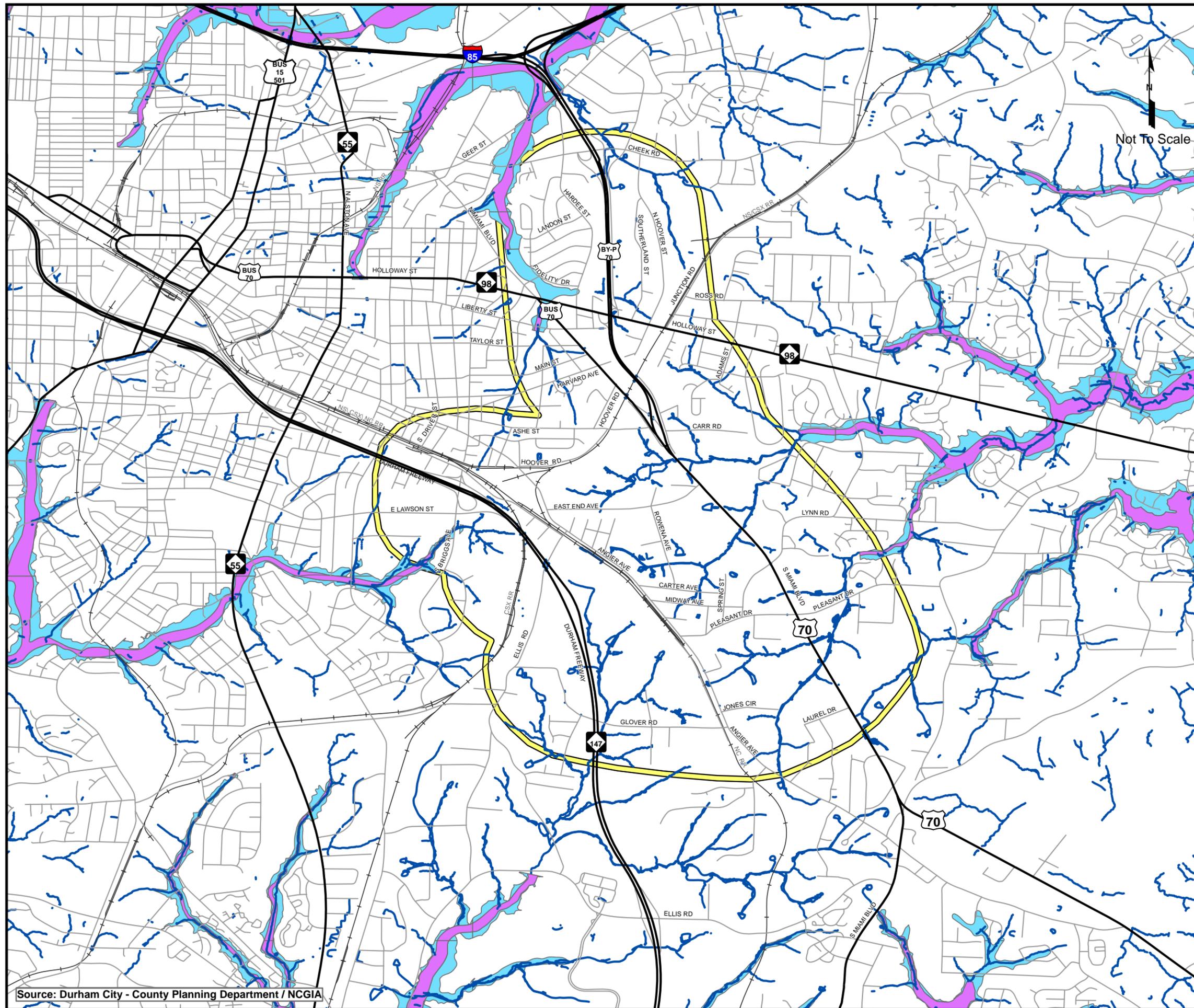
No designated Wild and Scenic River, state/national forest, gameland or preservation areas are located within the EEC study area.

3.2 Cultural Resources

This project is subject to compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implemented by the Advisory Council of Historic Preservation's Regulations for Compliance with Section 106, codified as 36 CFR Part 800. Section 106 requires Federal agencies to take into account properties included in or eligible for inclusion in the National Register of Historic Places and to afford the Advisory Council a reasonable opportunity to comment on such undertakings.

3.2.1 Historic Architectural Resources

The East Durham National Historic District and the Durham Cotton Mill Village National Historic District are located on the western edge of the EEC study area and there is a local historic landmark known as the former Fidelity Bank building located at the intersection of Driver Street



FLOODPLAINS

EAST END CONNECTOR

LEGEND

- Floodway
- 100-Year Floodplain
- Streams/Wetlands

- General Study Area Boundary

Source: Durham City - County Planning Department / NCGIA



FIGURE 3-5

and Angier Avenue, near the western boundary of the study area. However, none of these will be affected by the proposed project.

The North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO) determined that no historic resources would be affected by the project; therefore, the SHPO has no comment on the project undertaking. See their memorandum, dated August 14, 2006 in Appendix A.

3.2.2 Archaeological Resources

In a memorandum dated August 14, 2006, the North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO) indicated that they had conducted a review of the proposed project and found that no historic or prehistoric resources would be affected by the project. Therefore, no archaeological survey of the project area was required. A copy of this memorandum is included in Appendix A.

3.3 Land Use and Transportation Planning

This section presents a description of the existing land use, zoning designations/land use controls, future land use, and transportation improvement plans that pertain to the EEC study area. The planning documents reviewed for this section include the following:

- Durham Comprehensive Plan (2005, amended 2009)
- Durham Unified Development Ordinance (2006)
- Durham-Chapel Hill-Carrboro Metropolitan Planning Organization 2030 Long Range Transportation Plan (2005)
- Durham-Chapel Hill-Carrboro Metropolitan Planning Organization FY 2009-2015 Transportation Improvement Program (TIP) Regional Priority List (2005)
- Phase 1 Regional Rail Final EIS for Triangle Transit (2002)
- Durham Bicycle and Pedestrian Plan (2006)
- Central Durham Gateways Plan (Final Draft 2009)
- Draft 2035 Long Range Transportation Plan

3.3.1 Land Use Plans

The City-County government of Durham is the land use planning and zoning authority for the EEC study area. The majority of the EEC study area is located within the City limits with only the southernmost portion east of Durham Freeway (NC 147) and south of Pleasant Drive outside the municipal limits. This southernmost section is in the City's extraterritorial jurisdiction.

The EEC study area is also within the designated Urban Growth Area (UGA) of the City of Durham. The UGA boundary is a tool used to manage physical growth and guide future development in a way that is consistent with Durham's Comprehensive Plan.

The Durham Comprehensive Plan, adopted in February 2005 and amended in January, 2009, provides a guide for the growth and development of the Durham area and offers a vision, goals, objectives, and policies that enable the City and County to manage future growth in the area. The Plan includes a number of "elements" that contain policies and goals addresses specific topics, including transportation. The Comprehensive Plan establishes a series of "development tiers" to guide growth and development throughout the County. The majority of the land in the

EEC study area has been previously developed. As designated in the Comprehensive Plan, approximately half of the study area is located within the “Urban” development tier, and half within the “Suburban” development tier. While the transportation element of the Comprehensive Plan calls out few specific transportation improvement projects, it does identify as key issues connectivity within Durham, regional transportation coordination, and the integration of land use and transportation planning, among others. The Plan’s transportation element points to the role of the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) in leading transportation planning for Durham and coordinating this effort within the region, as appropriate.

The Central Durham Gateways Plan, in Final Draft form, recommends improvements that will enhance the “view from the road” along NC 147 and US 15-501 and other major entrance corridors into Durham. The need for the Plan was identified in the Comprehensive Plan. The Plan’s emphasis is on establishing an attractive visual image by creating visual interest and variety with a unified streetscape image. The Plan notes that once the East End Connector is constructed, the NC 147 study area boundaries should be reassessed, with its interchange with the EEC being considered for the Gateway Plan study area’s eastern terminus.

3.3.1.1 Existing Land Use and Zoning Characteristics

The City of Durham encompasses about 62,540 acres, almost 98 square miles, representing about one-third of the County. About 86 percent of the land within the municipal limits is classified as “developed.” Residential uses accounted for about 38 percent of developed land in the City, with low-density residential development accounting for half of that. Land developed for commercial, office, industrial, and utility uses comprises about 13 percent of total developed land in the City.

The project study area is characterized by an overall low density residential development pattern interspersed with wooded undeveloped tracks, particularly in the vicinity of smaller tributaries to Little Lick Creek in the eastern portion of the study area and along the freeway and railroad corridors. Medium density residential land use is found in the western portion of the study area, north of Hoover Road. Some commercial and industrial uses are interspersed throughout the study area, with the most concentrated business areas along Ellis Road, west of the Durham Freeway and along Miami Boulevard. Institutional and public facilities such as churches, parks, and schools are dispersed throughout the study area. Section 3.1 provides more information on these facilities, as well as neighborhoods within the EEC study area. Figure 3-6 shows the existing land uses within the EEC study area.

The major zoning classifications within the study area are Residential Urban/Suburban, Industrial, and Commercial.

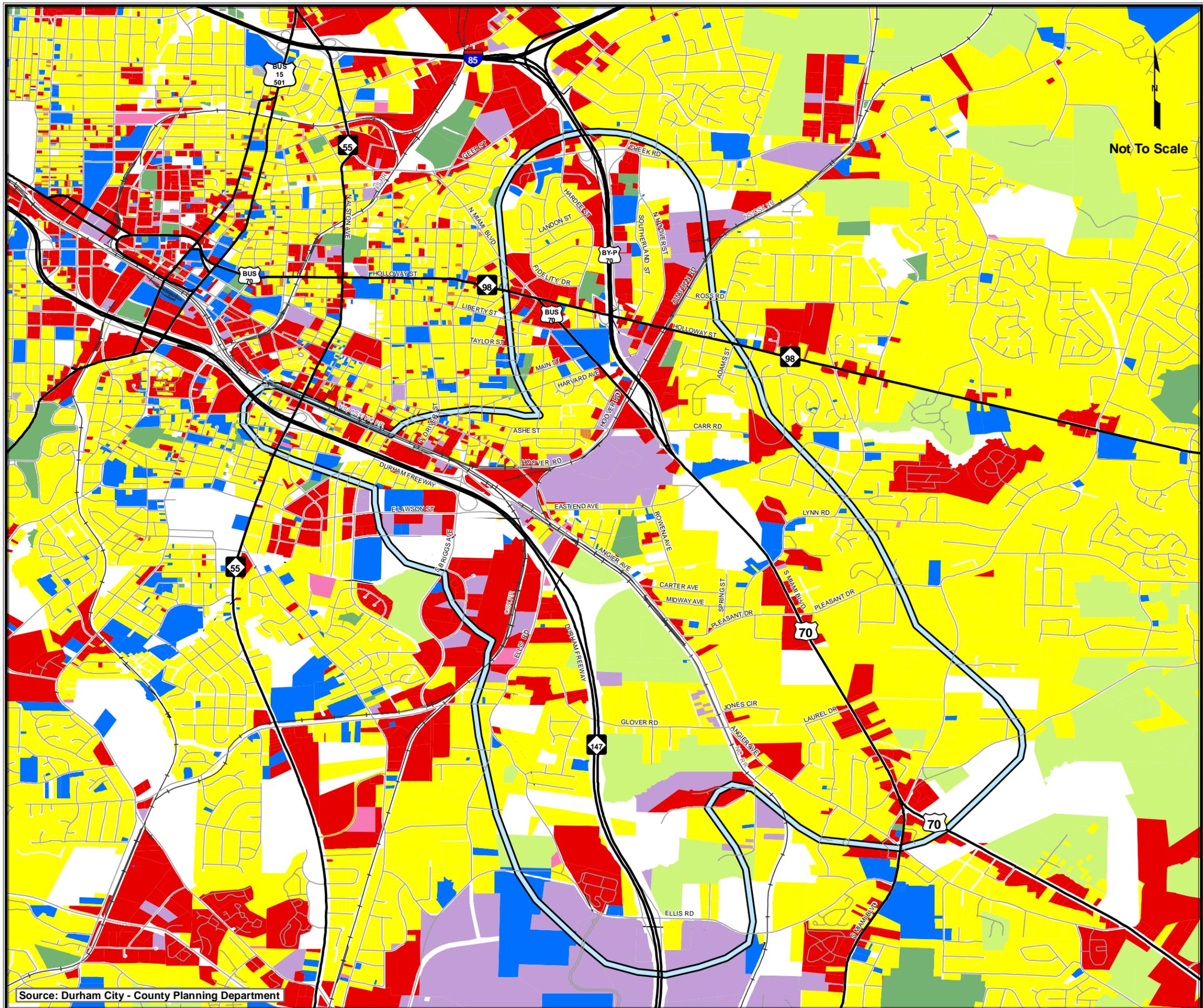
3.3.1.2 Future Land Use

Although large sections of the EEC study area are developed, large parcels of undeveloped land remain, particularly in the eastern portion of the study area. Future land uses are expected to be similar to existing land use patterns. The future land uses designated within the EEC study area are based on the Durham Future Land Use Map (2008). As shown in Figure 3-7 low and medium density residential is anticipated for much of the eastern portion of the study area, with some changes from low density to medium density throughout the study area. Industrial development is expected to

expand into the undeveloped parcels both immediately north and south of the Durham Freeway and along the rail lines that run through the center of the EEC study area. Commercial develop will continue along the southern portion of US 70 Bypass, Angier Avenue, and at the Holloway Street and US 70 Business and Bypass area.

3.3.2 Transportation Plans

The EEC was identified as a necessary highway improvement in the North Carolina Department of Transportation 2009-2015 State Transportation Improvement Program (NCDOT TIP); the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization 2030 Long Range Transportation Plan (LRTP); and the 2009-2015 Metropolitan Transportation Improvement Program (MTIP) Regional Project Priority List. The proposed transportation improvement projects, including highway, transit, and bicycle facilities that are within the vicinity of the EEC study area, are summarized below. The Draft 2035 Long Range Transportation also includes the East End Connector and a needed roadway improvement. The Plan has been approved by the DCHC MPO policy committee and is awaiting approval by the Federal Highway Administration.



EXISTING LAND USE

EAST END CONNECTOR

LEGEND

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Agricultural
- Community Service
- Commercial
- Industrial
- Historical
- Public Service
- Recreation/Parks
- Other/ Vacant

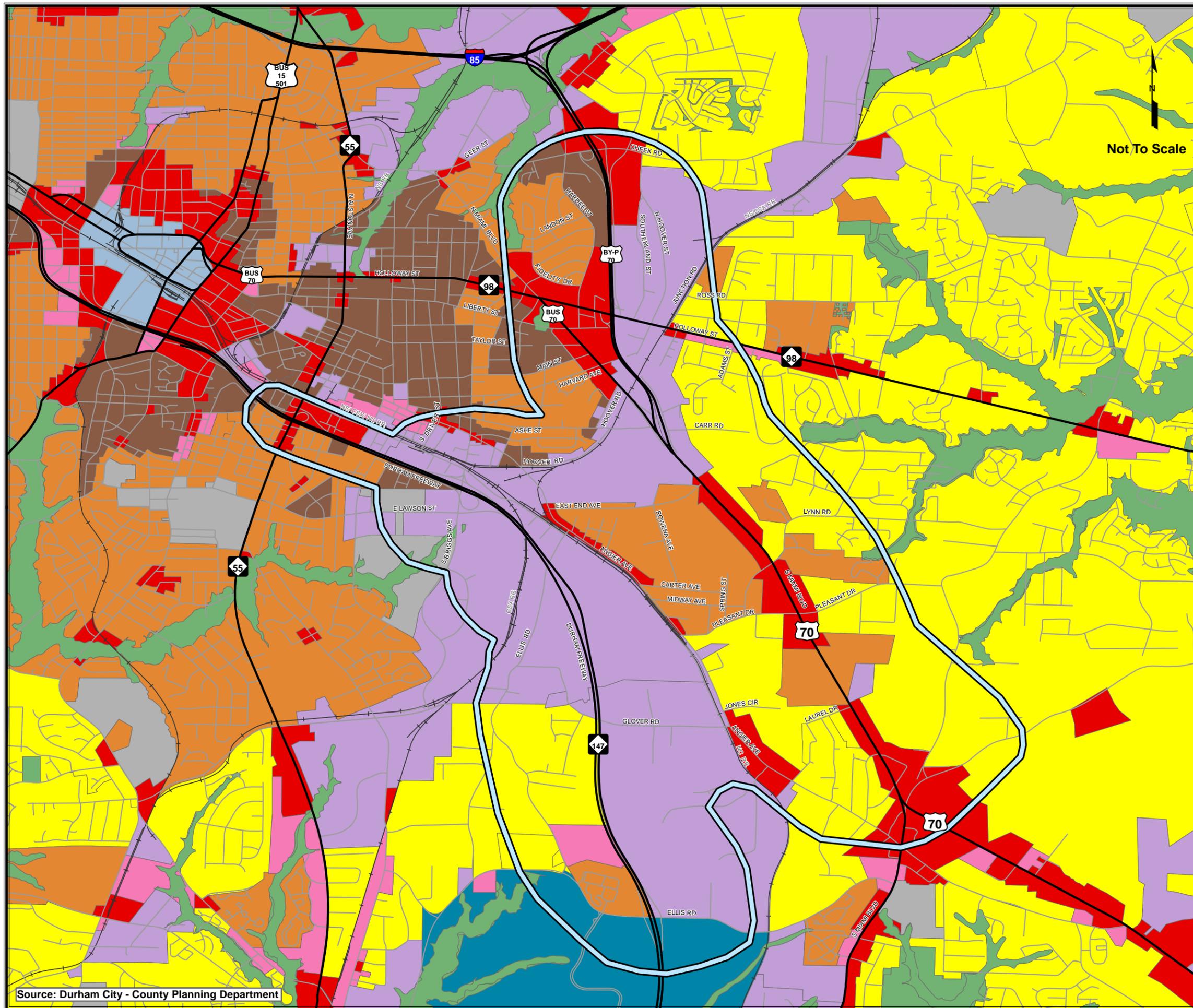
Human Environment Study Area Boundary



FIGURE 3-6

Source: Durham City - County Planning Department

Not To Scale



Source: Durham City - County Planning Department

FUTURE LAND USE

EAST END CONNECTOR

LEGEND

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Agricultural
- Commercial
- Industrial
- Office
- Institutional
- Recreation / Open Space
- Research / Research Applications

Human Environment Study Area Boundary



FIGURE 3-7

3.3.2.1 Highway Plans

The EEC project is listed in the NCDOT 2009-2015 TIP as TIP number U-0071. The project is programmed for right-of-way acquisition in federal fiscal year 2010 and construction in federal fiscal year 2013. The NCDOT 2008-2015 TIP previously indicated a right-of-way acquisition date of federal fiscal year 2010 with a construction date of fiscal year 2014. Table 3-11 lists U-0071 and the other roadway-related improvement projects that have programmed funding by NCDOT and are in, or near, the EEC study area.

**Table 3-11
Projects in Vicinity of EEC Study Area**

TIP No.	Route	Length (miles)	Description	Construction Year 2009-2015 TIP
U-0071	EEC	2.5	East End Connector - NC 147 to north of NC 98. Multilane divided freeway, on new location.	FY 2013
U-2831B	Briggs Ave Extension	1.6	Riddle Rd to So-Hi Dr - Two lanes on multi-lane right-of-way.	Unfunded - Future Years
U-4010	NC 98	0.3	Widening of NC 98 (Holloway St) center turn lane from east of US 70 to east of Junction Rd.	Under Construction
U-4446	NC 147	N/A	NC 147, I-40 to I-85 - Install ITS infrastructure improvements.	Under Construction
U-4720	US 70	7.8	US 70 - Lynn Rd to the proposed Northern Durham Pkwy. Upgrade to limited access control freeway.	Unfunded - Future Years
U-3308	NC 55	1.0	NC 55 (Alston Avenue), NC 147 (I.L. "Buck" Dean Freeway) to US 70 Bus.-NC 98 (Holloway Street). Widen to four lane divided facility and replace Norfolk-Southern Railroad bridges.	FY 2011

The DCHC MPO 2030 LRTP was approved in April 2005. The 2030 LRTP lists the highway, transit, fixed-guideway, bicycle, and other transportation facilities and services that are planned through the year 2030. These transportation projects are intended to meet the expected future demand for transportation facilities and services in the DCHC MPO planning area and bring the MPO area into conformity with the federal air quality standards. The 2030 LRTP complies with the provisions of the Clean Air Act Amendments of 1990 and accomplishes the intent of the NC State Implementation Plan

(SIP). Figure 3-8 identifies the roadway improvements proposed through the year 2030 which are located in the vicinity of the EEC study area. The 2030 LRTP assumes the EEC project is complete and is part of the roadway network for the 2020 (air quality) analysis year.

The 2030 LRTP lists the EEC as one of the most important highway projects in the MPO area and characterizes the EEC as a critical link needed to improve the connectivity of the highway system within the Triangle region.

The Transportation Advisory Committee (TAC) of the DCHC MPO has approved its Draft 2035 Long Range Transportation Plan and is awaiting federal approval of the document. Approval is anticipated in mid-2009. Like the 2030 Plan, it is a multi-modal planning document. The East End Connector project is one of a number of roadway improvement projects included in the 2035 Plan.

3.3.2.2 *Transit Service*

Bus Transit

The City of Durham operates the Durham Area Transit Authority (DATA), which provides a variety of services including local bus service, para-transit, park-and-ride, and vanpool services. DATA provides over 13,000 passenger trips daily on 19 fixed bus routes.

Within the EEC study area, DATA bus services operates five fixed bus routes (Routes 2, 3, 13, 15, 16). Bus Route 2 travels along most of the major thoroughfares in the study area, including US 70 Business, Angier Avenue, and East End Avenue, and has an average weekday ridership of approximately 2,172 passengers per day. Route 3, one of the highest ridership routes in the City has an average weekday ridership of 2,500. Routes 13, 15, and 16 travel along major thoroughfares in the study area such as Durham Freeway (NC 147), Holloway Street (NC 98), Liberty Street, and Briggs Avenue.

Triangle Transit also operates a regional bus and shuttle service and vanpool and paratransit programs in the Triangle region, but does not currently serve the EEC study area.

Rail Transit

Amtrak operates daily passenger rail service in the Durham area; the rail station is located in downtown Durham. Although the Amtrak route passes through the EEC study area within the rail corridor that generally parallels Angier Avenue, there is no station in the study area.

One rail transit service is proposed within the EEC study area—the Southeast High Speed Rail Corridor. However, no Triangle Transit or High Speed Rail station is proposed within the EEC study area.

**2030 LONG RANGE
TRANSPORTATION PLAN
PROJECTS**

Durham - Chapel Hill - Carrboro
Metropolitan Planning Organization

EAST END CONNECTOR

LEGEND

Roadway Improvement

- - - 2 - 3 Lane New Location
- 2 - 3 Lane Improvement
- - - - 4 - 5 Lane Divided New Location
- 4 - 5 Lane Divided Improvement
- ==== Upgrade to Freeway
- ==== New Freeway/Expressway
- Upgrade Existing Freeway
- Widening and HOV Projects

Improvement Completion Date

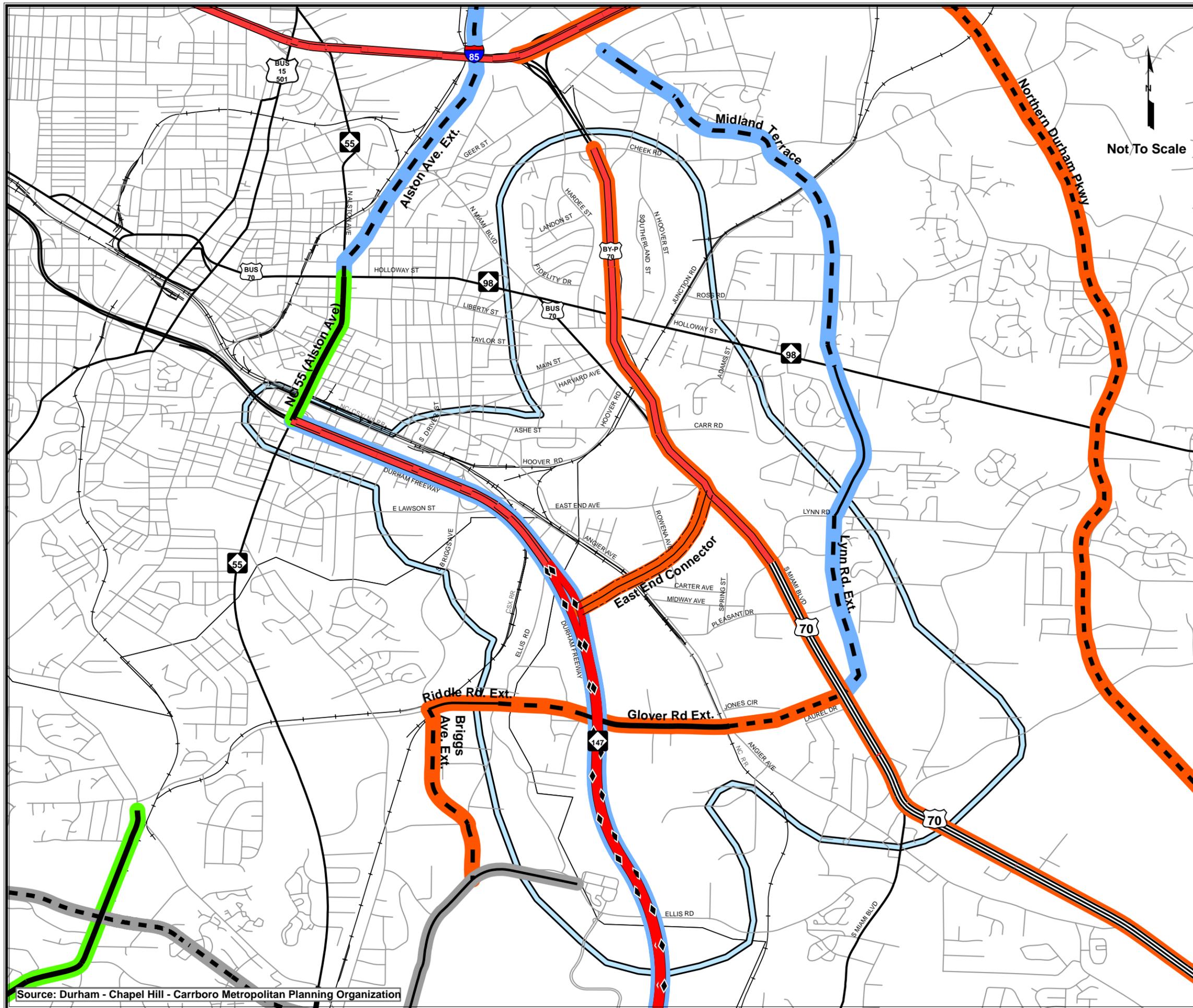
- Year 2010
- Year 2020
- Year 2030
- Complete

Note: This map depicts the location of the East End Connector as it was shown in the DCHC MPO 2030 Long Range Transportation Plan.

Human Environment Study Area Boundary



FIGURE 3-8



Not To Scale

3.3.2.3 *Bicycle and Pedestrian Plans*

The DCHC MPO 2030 LRTP and the Draft 2035 LRTP recommends the future implementation of extensive bicycle and pedestrian projects within the MPO area. Within the EEC study area, bicycle lanes are recommended along the major thoroughfares of Angier Avenue, Briggs Avenue, Cheek Road and Glover Road. Pedestrian facilities are recommended primarily in areas with heavy pedestrian traffic generators such as schools, parks, and business districts.

3.4 **Natural Environment Characteristics**

This natural environment characteristics section summarizes existing conditions related to the topography, soils and geologic formations, the biotic communities and wildlife, water resources, and jurisdictional issues within the study area.

The following are excerpts from three natural systems studies prepared for the study area:

- *U-0071- East End Connector Wetland, Stream and Buffer Delineation, Durham County, North Carolina, Natural Systems Study, North Carolina Department of Transportation, prepared by KCI Associates, November 2004.*
- *U-0071- East End Connector Wetland, Stream Buffer and Threatened and Endangered Species Report, Durham County, North Carolina, North Carolina Department of Transportation, December 2006.*
- *Excerpts are taken from Biotic Communities and Protected Species Report, East End Connector, Durham, North Carolina, North Carolina Department of Transportation, Project Development and Environmental Analysis Branch, prepared by the Natural Environment Unit, May 2007*

3.4.1 Geology/Topography/Soils

A general description of the regional characteristics, including geology, topography, and soils, is provided below.

3.4.1.1 *Geology*

As described in the Durham County Inventory of Important Natural Areas, Plants and Wildlife, North Carolina Natural Heritage Program, 1999, the East End Connector project is in the north central portion of North Carolina in Durham County. It is situated within the Piedmont physiographic province, in the Triassic Basin. Geography of the Triassic Basin includes overlying easily erodible sedimentary rocks and areas that are dissected by meandering waterways with wide floodplains.

3.4.1.2 *Topography*

Local elevation differences in the Triassic Basin are often less than in surrounding regions, with rocks that are more erodible. Rolling topography with rounded hills and long, low ridges characterize the Piedmont province. Elevations within the project study area range from 300 to 415 feet above mean sea level, as determined from the southeast Durham, North Carolina United States Geological Survey (USGS) 7.5 minute quadrangle (USGS, 2002).

3.4.1.3 Soils

The general soil map in the Soil Survey of Durham County (SCS, 1976) provides the soil associations in the project study area. An association consists of one or more major soil and some minor soils. Soil associations are part of a unique landscape that shows a distinct pattern of soils, relief, and drainage. The project study area is mapped within the White Store-Creedmoor soil association. This association is described as occurring on gently sloping to moderately steep, moderately well drained soils that have a subsoil of dominantly firm and very firm clay on uplands. The association is comprised of approximately sixty-five percent (65 percent) White Store soils, ten percent (10 percent) Creedmoor soils, and twenty-five percent (25 percent) Mayodan, Pinkston, and Iredell soils. The City of Durham and most of its suburbs fall within this association.

Nine (9) other soil types, subdivided into twelve (12) specific mapping units, were also mapped in the project study area. These soil types include: Creedmoor sandy loam (CrB), Granville sandy loam (GrB), Mayodan sandy loam (MfC), (MfD), (MfE), Mayodan-Urban land complex (MrC), Gullied land (Gu), Iredell loam (IrB), Pinkston fine sandy loam (PfC) and (PfE), Urban land (Ur), and White Store-Urban land complex (WwC). Table 3-12 summarizes the characteristics of the soil types.

3.4.2 Biotic Communities and Wildlife

The following are excerpts from *Biotic Communities and Protected Species Report, East End Connector, Durham, North Carolina, North Carolina Department of Transportation, Project Development and Environmental Analysis Branch, prepared by Natural Environment Unit, May 2007.*

Biotic communities (terrestrial and aquatic) and Federal Species of Concern (FSC) were examined.

3.4.2.1 Methodology

Research was conducted prior to field investigations. Information sources used in this research included the following:

- U.S. Geological Survey (USGS) Quadrangle map for Southeast Durham (2002)
- 2005 Aerial Photography provided by Durham County
- U.S. Fish and Wildlife Service (USFWS) list of federally protected species (website; last updated January 29, 2007)
- N.C. Natural Heritage Program (NCNHP) database of state protected species, rare species, and rare habitats (website; last updated March 1, 2007)
- NCNHP lists of rare plants and animals of North Carolina (2006)
- N.C. Department of Environmental and Natural Resources (NCDENR), N.C. Division of Water Quality (NCDWQ), and N.C. Wildlife Resources Commission (NCWRC) resource information

**Table 3-12
Soil Mapping Units**

Map Unit	Soil Series	Slope	Drainage	General Characteristics
CrB	Creedmoor sandy loam	2-6%	Moderately Well-Drained	Very slow permeable soils with a seasonally high water table about 18 inches (45.72 centimeters [cm]) from the soil surface. Located on broad ridges on uplands.
GrB	Granville sandy loam	2-6%	Well-Drained	Moderately permeable soils with a seasonally high water table of more than 72 inches (182.8 cm) from the soil surface. Located on narrow side slopes on uplands.
Gu	Gullied land	N/A	N/A	Gullied land is so severely eroded and gullied that it cannot be identified by soil series.
IrB	Iredell loam	2-6%	Moderately Well-Drained	Slowly permeable soils with a seasonally high water table of more than 18 inches (45.72 cm) from the soil surface.
MfC	Mayodan sandy loam	6-10%	Well-Drained	Moderately permeable soils with a seasonally high water table of more than 72 inches (182.8 cm) from the soil surface. Located on narrow side slopes on uplands.
MfD	Mayodan sandy loam	10-15%	Well-Drained	Moderately permeable soils with a seasonally high water table of more than 72 inches (182.8 cm) from the soil surface. Located on side slopes adjacent to the major drainage ways on uplands.
MfE	Mayodan sandy loam	15-25%	Well-Drained	Moderately permeable soils with a seasonally high water table of more than 72 inches (182.8 cm) from the soil surface. Located on side slopes adjacent to the major drainage ways on uplands.
MrC	Mayodan- Urban-land complex	0-10%	Well-Drained	The complex consists of 30% Mayodan soil and 70% Urban land that are covered by streets, houses and other impervious surfaces. The Urban land may have been cut or filled.
PfC	Pinkston fine sandy loam	2-10%	Well-Drained or Excessively Drained	Moderately rapid permeable soils with a seasonally high water table of more than 72 inches (182.8 cm) from the soil surface. Located on broad ridges and narrow side slopes on uplands.
PfE	Pinkston fine sandy loam	10-25%	Well-Drained or Excessively Drained	Moderately rapid permeable soils with a seasonally high water table of more than 72 inches (182.8 cm) from the soil surface. Located on side slopes adjacent to major drainage ways on uplands.
Ur	Urban land	N/A	N/A	Soils have been cut, filled, graded or changed so that the original soil characteristics have altered or destroyed. Impervious surfaces such as buildings, pavement cover about 80% of the mapping unit.
WsB	White Store sandy loam	2-6%	Moderately Well-Drained	Very slowly permeable soils with a seasonally high water table of about 18 inches (45.72 cm) from the soil surface. Located on broad ridges on uplands.
WsC	White Store sandy loam	6-10%	Moderately Well-Drained	Very slowly permeable soils with a seasonally high water table of about 18 inches (45.72 cm) from the soil surface. Located on narrow side slopes on uplands.
WsE	White Store sandy loam	10-25%	Moderately Well-Drained	Very slowly permeable soils with a seasonally high water table of about 18 inches (45.72 cm) from the soil surface. Located on side slopes adjacent to major drainage ways in uplands.
WwC	White Store- Urban land complex	0-10%	Moderately Well-Drained	The complex consists of White Store soil and Urban land. This unit consists of impervious areas that are covered by streets, houses and other impervious surfaces. Portions or all of the unit have been cut or filled.

NCDOT biologists conducted field investigations on March 23, March 26, and March 29, 2007.

Field determined boundaries of plant communities were transcribed onto aerial photography while in the field, then digitized in the office into ArcGIS shapefiles for use in mapmaking and data analysis. Communities were assessed within the proposed right-of-way (ROW) boundaries of each alternative. Dominant plant species were identified in each stratum for each plant community. When necessary, Radford et al. (1968), Weakley (unpublished), and similar literature pertaining to the characteristics of vascular flora were used to assist in plant identification. When possible, plant community descriptions were based on the classifications utilized by Schafale and Weakly (1990). Jurisdictional waters, delineated during field visits, were further investigated to determine the presence of aquatic habitat and wildlife, as documented in one of the three previous natural resource reports performed in 1994, 2004, and 2007.

Wildlife occurrences were determined through field observations, habitat evaluation within each alternative, the analysis of secondary indicators left by terrestrial and avian fauna (tracks, scat, burrows, nests, and evidence of feeding), as well as by performing reviews of supporting literature. Literature that was either reviewed or used in species identification included Elbroch (2003), Sibley (2000), Menhinick, (1991), Webster, et al. (1985), and Martof, et al. (1980). The NCDWQ Stream Fish Community Assessment Program database was also utilized to assess ichthyofauna.

Biotic resources include terrestrial and aquatic communities. This section describes the communities encountered and the relationships between fauna and flora found within these communities. The composition and distribution of biotic communities within each of the three alternatives are reflective of the topography, hydrologic influences, and the project area's past and present land uses. Descriptions of the terrestrial systems are presented in the context of plant community classifications and generally follow those presented by Schafale and Weakly (1990), where possible. The dominant flora and fauna observed, or likely to occur, in each community are described and discussed.

3.4.2.2 *Terrestrial Communities*

Three (3) primary community types were identified within each of the three alternatives. These included 1) Maintained/Disturbed areas 2) Mixed Pine/Hardwood Forest and 3) Pine Forest, described below.

Maintained Disturbed

The Maintained/Disturbed community type was the most abundant community found in each of the three alternatives. The types of Maintained/Disturbed habitat were highly variable and included: 1) industrial and commercial facilities and their associated properties 2) agricultural fields 3) maintained lawns 4) roads and associated roadsides 5) power line and sewer line rights-of-way, 6) clear-cut areas 7) cut-over areas now in the early stages of secondary succession 8) disturbed, wooded medians and 9) individual homes and housing subdivisions.

Mixed Pine/Hardwood Forest

The Mixed Pine/Hardwood community type was the most abundant natural community within each of the three alternatives. Within this general community type, there were two natural communities observed that are described in Schafale and Weakley (1990): 1) Mesic Mixed Hardwood Forest (Piedmont Subtype) and 2) Dry-Mesic Oak-Hickory Forest.

Pine Forest

This community type was found throughout each of alternatives and was interspersed within and adjacent to areas of Mixed Pine/Hardwood Forest. It is distinct from the Mixed Pine/Hardwood Forest community, and therefore described separately, due to the dominance of coniferous species, specifically loblolly pine. In most cases, this community developed as a result of an unknown disturbance, followed by secondary succession. However, one stand of young, planted loblolly pine was observed along Holloway St., east of US 70 and adjacent to a set of railroad tracks. The stand was extremely dense, with an approximate age of less than 10 years. In typical Pine Forest, the dominant canopy species was loblolly pine, but some hardwood species were observed.

3.4.2.3 Terrestrial Wildlife

Avifauna either visually or aurally observed in the Mixed Pine/Hardwood, Pine Forest, or wooded median communities during field visits included Carolina chickadee (*Poecile carolinensis*), northern cardinal (*Cardinalis cardinalis*), American crow (*Corvus brachyrhynchos*), blue jay (*Cyanocitta cristata*), American robin (*Turdus migratorius*), northern mockingbird (*Mimus polyglottos*), tufted titmouse (*Baeolophus bicolor*), pine warbler (*Dendroica pinus*), eastern towhee (*Pipilo erythrophthalmus*), common grackle (*Quiscalus quiscula*), dark-eyed junco (*Junco hyemalis*), Carolina wren (*Thryothorus ludovicianus*), white-breasted nuthatch (*Sitta carolinensis*), mourning dove (*Zenaidura macroura*), and red-bellied woodpecker (*Melanerpes carolinus*). Many of the above-noted species may also be observed in more open, Maintained/Disturbed areas, either passing through those areas to access other forested habitat or foraging for food. Additional species observed in Maintained/Disturbed areas included killdeer (*Charadrius vociferous*) and belted kingfisher (*Ceryle alcyon*), turkey vulture (*Cathartes aura*), red-shouldered hawk (*Buteo lineatus*), and red-tailed hawk (*Buteo jamaicensis*).

Mammalian species likely to be found include gray squirrels (*Sciurus carolinensis*), white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), eastern cottontail (*Sylvilagus floridanus*) and several mouse species (*Mus* spp.).

Herpetofauna include black rat snake (*Elaphe obsoleta*), copperhead (*Agkistrodon contortrix*), garter snake (*Thamnophis sirtalis*), rough green snake (*Opheodrys aestivus*), eastern box turtle (*Terrapene carolina*), fence lizard (*Sceloporus undulatus*), green anole (*Anolis carolinensis*), and a variety of skink species (Family: *Scincidae*).

Amphibian species either visually or aurally observed during field visits include gray treefrog (*Hyla chrysoscelis* or *Hyla versicolor*), upland chorus frog (*Pseudacris triseriata*), and spring peeper (*Pseudacris crucifer*). All three amphibian species

were observed near water. Other amphibian species that are typical to these terrestrial communities include American toad (*Bufo americanus*), green frog (*Rana clamitans*), bullfrog (*Rana catesbeiana*), and several salamander species (families *Ambystomatidae* and *Plethodontidae*).

3.4.2.4 Aquatic Communities and Wildlife

The proposed project is located in both the Neuse River and Cape Fear River Basins (Hydrologic Units 03020201 and 03030002, respectively). In the Neuse River watershed, waters drain to either Little Lick Creek or Goose Creek, both of which drain to Falls Lake. In the Cape Fear River basin, waters drain into either Third Fork Creek or Northeast Creek, both of which drain to Jordan Lake.

The aquatic communities either found within or running through each of the three alternatives include streams, man-made ponds, and associated jurisdictional wetlands. Vegetation along the larger streams and ponds included riparian species such as sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), and ironwood (*Carpinus caroliniana*). Common tree species observed in jurisdictional wetlands include, but are not limited to, tulip poplar (*Liriodendron tulipifera*), American elm (*Ulmus Americana*), red maple (*Acer Rubrum*), sweet gum (*Liquidambar styraciflua*), black willow (*Salix nigra*), green ash (*Fraxinus pennsylvanica*), and winged elm (*Ulmus alata*). Herbaceous and vine species observed include Japanese grass (*Microstegium vimineum*), poison ivy (*Toxicodendron radicans*), devil's beggartick (*Bidens frondosa*), spotted lady's thumb (*Polygonum persicaria*), marsh dewflower (*Murdannia keisak*), tearthumb (*Polygonum sagittatum*), cattail (*Typha latifolia*), camphorweed (*Pluchea camphorata*), soft rush (*Juncus effusus*), and various sedge species (*Carex spp.*).

Common amphibians within the study area's aquatic communities include gray treefrog, upland chorus frog, spring peeper, bullfrog, green frog, pickerel frog (*Rana palustris*), northern cricket frog (*Acris crepitans*), northern dusky salamander (*Desmognathus fuscus*), two-lined salamander (*Eurycea bislineata*), three-lined salamander (*Eurycea guttolineata*), eastern newt (*Notophthalmus viridescens*), marbled salamander (*Ambystoma opacum*), and spotted salamander (*Ambystoma maculatum*). Aquatic fauna include a variety of benthic macroinvertebrates including mayflies, stoneflies, caddisflies, dragonflies, damselflies, beetles, chironomid midges, craneflies, amphipods, isopods, and crayfish. The intermittent and smaller perennial streams most likely support only chironomid midges, beetles, oligochaetes, crayfish, isopods, and amphipods.

The North Carolina Department of Water Quality does not maintain a fish monitoring station on any surface waters within any of the three build alternatives. However, a sampling site for their Stream Fish Community Assessment Program exists along Ellerbe Creek (Station SR 1709, Neuse River Basin), approximately 1.5 miles north of the project. This site was sampled on April 11, 1995, and April 14, 2005. Common species observed during these surveys included satfin shiner (*Cyprinella analostana*), swallowtail shiner (*Notropis procne*), redbreast sunfish (*Lepomis auritus*), and green sunfish (*Lepomis cyanellus*). Two additional fish monitoring stations are located to the west of the project area in the Cape Fear River Basin, one along Hew Hope Creek (Station SR 2220) and the other along Third Fork Creek (Station NC 751). Station 2220 was last surveyed on May 3, 2003, and Station NC

751 was last surveyed on June 16, 1993. Abundant species observed at these two monitoring sites included satinfish, redbreast sunfish, green sunfish, bluegill (*Lepomis macrochirus*), eastern mosquito fish (*Gambusia holbrooki*), and redbreast sunfish (*Esox americanus*).

3.4.3 Water Resources

Water resource assessments include the physical characteristics likely to be impacted by the proposed project, best usage classifications, and water quality aspects of the water resources.

3.4.3.1 Surface Water Characteristics

The proposed project may impact surface waters of both the Neuse River and Cape Fear River Basins (Hydrologic Units 03020201 and 03030002, respectively). For the Neuse River watershed, the project area is located in DWQ subbasin 03-04-01. Study area waters drain to either Little Lick Creek or Goose Creek, both of which drain to Falls Lake. For the Cape Fear River basin, the project area is located in DWQ subbasin 03-06-05. Study area waters drain into either Third Fork Creek or Northeast Creek, both of which drain to Jordan Lake.

Two studies were performed, including the November 2004 Natural Systems Study prepared by KCI Associates and the May 2007 Biotic Communities and Protected Species Report prepared by the NCDOT. These studies are summarized below.

There are 62 jurisdictional streams in the study area as shown in Table 3-13 and Table 3-14. Streams S-1 through S-35 were mapped using non-survey grade GPS. Most of the streams found on the USGS quadrangle map (Little Lick Creek, S-O, S-P, S-Q, S-R and S-S) were not mapped with GPS. In addition, unnamed stream S-U and Third Fork Creek (after its intersection with S-D) were mapped using photogrammetry.

3.4.3.2 Best Usage Classification

The North Carolina Department of Water Quality (NCDWQ) establishes best usage classifications for the waters of North Carolina. These classifications are established through water quality tests. Higher quality waters are best used for domestic purposes whereas lower quality waters may be used for recreational or economic purposes.

Little Lick Creek was assigned a best usage classification of WS-IV NSW [DWQ index #27-9-(0.5)]; both Third Fork Creek [DWQ index # 16-41-1-12-(1)] and Northwest Creek [DWQ index # 16-41-1-17-(0.3)] have a best usage classification of C NSW. WS-IV waters are used as sources of water supply for drinking, culinary, or food processing purposes where a more protective WS-1, WS-II, or WS-III classification is not feasible. In general, these waters are protected as water supplies in moderately to highly developed watersheds. The C designation denotes waters suitable for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture. Secondary recreation refers to human body contact with waters on an infrequent or incidental basis.

**Table 3-13
Jurisdictional Streams within the Project Area
(NCDOT – Natural Systems Study, November 2004, KCI Associates)**

Stream	Class	River Basin	Approx. Length (ft)	Buffers ¹	Stream Association
S-1	Perennial	Neuse	450	Yes	Little Lick Creek
S-2	Intermittent	Neuse	1,750	Yes	UT to Little Lick Creek
S-3	Perennial	Neuse	900	Yes	UT to Little Lick Creek
S-4	Intermittent	Neuse	200	Yes	UT to Little Lick Creek
S-5	Intermittent	Neuse	200	Yes	UT to Little Lick Creek
S-6	Perennial	Neuse	6,950	Yes	UT to Little Lick Creek
S-7	Intermittent	Neuse	600	Yes	UT to Little Lick Creek
S-8	Intermittent	Neuse	900	Yes	UT to Little Lick Creek
S-9	Intermittent	Neuse	1,000	Yes	UT to Little Lick Creek
S-10	Intermittent	Neuse	950	Yes	UT to Little Lick Creek
S-11	Intermittent	Neuse	350	Yes	UT to Little Lick Creek
S-12	Intermittent	Neuse	50	Yes	UT to Little Lick Creek
S-13	No Record	Neuse	50	Yes	UT to Little Lick Creek
S-14	Intermittent	Neuse	50	Yes	UT to Little Lick Creek
S-15	Intermittent	Neuse	60	Yes	UT to Little Lick Creek
S-16	Intermittent	Neuse	950	Yes	UT to Little Lick Creek
S-17	Intermittent	Neuse	100	Yes	UT to Little Lick Creek
S-18	Perennial	Neuse	5,400	Yes	UT to Little Lick Creek
S-19	Intermittent	Neuse	650	Yes	UT to Little Lick Creek
S-20	Intermittent	Neuse	200	Yes	UT to Little Lick Creek
S-21	Intermittent	Neuse	400	Yes	UT to Little Lick Creek
S-22	Intermittent	Neuse	50	Yes	UT to Little Lick Creek
S-23	Perennial	Neuse	500	Yes	UT to Little Lick Creek
S-24	Intermittent	Neuse	1,050	Yes	UT to Little Lick Creek
S-25	Intermittent	Neuse	150	Yes	UT to Little Lick Creek
S-26	Intermittent	Neuse	1,100	Yes	UT to Little Lick Creek
S-27	Perennial	Neuse	1,300	Yes	UT to Little Lick Creek
S-28	Intermittent	Neuse	150	Yes	UT to Little Lick Creek
S-29	Intermittent	Neuse	50	Yes	UT to Little Lick Creek
S-30	Perennial	Cape Fear	2,350	No	UT to Northeast Creek
S-31	Intermittent	Cape Fear	50	No	UT to Northeast Creek
S-32	Perennial	Cape Fear	1,500	No	UT to Northeast Creek
S-33	Intermittent	Cape Fear	90	No	UT to Northeast Creek
S-34	Intermittent	Cape Fear	50	No	UT to Northeast Creek
S-35	Intermittent	Neuse	500	Yes	UT to Little Lick Creek

¹ Buffer rules are not applicable to Cape Fear River Basin.

UT – Unnamed Tributary

**Table 3-14
Jurisdictional Streams within the Project Area
(NCDOT – Biotic Communities and Protected Species Report, May 2007)**

Stream	Class	River Basin	Approx. ² Length (ft)	Buffers ³	Stream Association
S-A	Intermittent ¹	Neuse	1098	Yes	UT to Little Lick Creek
S-B	Intermittent	Neuse	527	No	UT to Little Lick Creek
S-C	Intermittent	Cape Fear	440	No (CF)	UT to Third Fork Creek
S-D	Perennial	Cape Fear	737	No (CF)	UT to Third Fork Creek
S-E	Perennial	Cape Fear	198	No (CF)	UT to Third Fork Creek
S-F	Perennial	Cape Fear	801	No (CF)	UT to Northeast Creek
S-G	Intermittent	Cape Fear	3103	No (CF)	UT to Northeast Creek
S-H	Intermittent ¹	Cape Fear	1727	No (CF)	UT to Northeast Creek
S-J	Intermittent ¹	Neuse	6974	Yes	UT to Little Lick Creek
S-K	Deemed non-jurisdictional by USACE	Neuse	68	Yes	UT to Little Lick Creek
S-L	Intermittent	Neuse	33	Yes	UT to Little Lick Creek
S-M	Intermittent	Neuse	217	Yes	UT to Little Lick Creek
S-N	Intermittent	Neuse	204	Yes	UT to Little Lick Creek
S-O	Perennial	Neuse	2200	Yes	UT to Little Lick Creek
S-P	Perennial	Cape Fear	3855	No (CF)	UT to Northeast Creek
S-Q	Perennial	Cape Fear	2493	No (CF)	UT to Northeast Creek

Table 3-14, (Continued)
Jurisdiction Streams within the Project Area
(NCDOT – Biotic Communities and Protected Species Report, May 2007)

Stream	Class	River Basin	Approx. Length²	Buffers³	Stream Association
S-R	Perennial	Cape Fear	780	No (CF)	UT to Northeast Creek
S-S	Perennial	Neuse	2785	Yes	UT to Little Lick Creek
S-T	Perennial	Neuse	521	Yes	UT to Little Lick Creek
S-U	Perennial	Neuse	1467	Yes	UT to Little Lick Creek
S-V	Intermittent	Neuse	998	Yes	UT to Little Lick Creek
S-W	Intermittent	Cape Fear	75	No (CF)	UT to Northeast Creek
S-X	Intermittent	Neuse	56	No	UT to Little Lick Creek
S-Y	Perennial	Neuse	104	Yes	UT to Little Lick Creek
S-Z	Perennial ⁴	Neuse	271	No	UT to Little Lick Creek
Little Lick Creek	Perennial	Neuse	4435	Yes	Little Lick Creek
Third Fork Creek	Perennial	Cape Fear	1580	No (CF)	Third Fork Creek

¹ Mitigation required per the USACE

² Length was calculated in Microstation and ArcMap

³ The streams listed as 'No (CF)' are in the Cape Fear River basin, which does not have any buffer rules

⁴ This stream scored a 29 on the DWQ stream form—since 30 is the perennial cutoff, a professional judgment was made to move this stream to the perennial category

UT – Unnamed Tributary

The nutrient sensitive waters (NSW) supplemental classification is intended for waters vulnerable to excessive growth of microscopic or macroscopic vegetation due to an increased nutrient input (usually nitrogen and/or phosphorus). In general, management strategies for point and nonpoint source pollution control require control of nutrients such that excessive growths of vegetation are reduced or prevented and there is no increase in nutrients over target levels. Neither High Quality Waters (HQW), Water Supplies (WS-I: undeveloped watersheds or WS-II: predominantly undeveloped watersheds), nor Outstanding Resource Waters (ORW) occur within 1.0 mile of the study area.

3.4.3.3 *Listed Waters in Section 303(d) of the Clean Water Act*

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have established. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop total maximum daily contaminant loads for these waters.

A review of the Final 2006 303(d) list for North Carolina indicates that Little Lick Creek in the Neuse River watershed and Third Fork Creek in the Cape Fear River watershed are impaired (NCDENR-DWQ, 2003). The most recent final list (2006) shows that Little Lick Creek is impaired due to low dissolved oxygen resulting from construction and impaired biological integrity possibly due to urban runoff and storm sewers. Third Fork Creek is impaired due to biological integrity, possibly due to effluent from a wastewater treatment plant.

3.4.4 Jurisdictional Issues

The US Army Corps of Engineers under the Clean Water Act has jurisdiction over waters of the United States and regulates activities that may impact these waters through issuance of permits.

3.4.4.1 *Waters of the United States*

This section contains information on streams and wetlands in the study area, which fall under the broad category of "Waters of the United States" as defined in 33 CFR §328.3(a). Waters of the United States include most inter- and intrastate surface waters, tributaries, and wetlands. Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions are considered "wetlands" under 33 CFR §328.3(b). Wetlands generally include swamps, marshes, bogs, and similar areas. Any action that proposes to place dredged or fill materials into Waters of the United States falls under the jurisdiction of the US Army Corps of Engineers (USACE), and must follow the statutory provisions under Section 404 of the Clean Water Act (33 U.S.C. 1344).

3.4.4.2 *Wetlands and Surface Waters*

In 2004 a natural system study was initiated that covered the study boundaries for Alternatives 1, 2 and 3. During the 2004 Natural Systems Study, onsite meetings were held with representatives of the US Army Corps of Engineers (USACE) and the North Carolina Department of Water Quality (NCDWQ). Meetings were held on four occasions

in May, June, and July 2004 to obtain jurisdictional concurrence of the wetland, stream, and riparian buffer delineations.

A summary of the wetlands, streams, and buffers identified and mapped within the project study area is provided as follows:

- Thirty-nine (39) jurisdictional wetland units were delineated and mapped, totaling approximately 10.2 acres.
- Seven (7) primary streams containing thirty-five (35) mapped stream segments were identified and mapped, totaling approximately 31,000 linear feet.
- Approximately 26,960 linear feet of Neuse River riparian buffers were mapped.

Subsequent to the 2004 study, a second natural systems study was initiated to include the area associated with Alternative 4 and two wetlands near the US 70 and NC 98 interchange. For the 2007 Report, a site visit with the USACE was conducted on November 2, 2006, to determine the jurisdictional status of the twenty-seven streams, twenty-three wetlands, and six ponds found in the study area. Of this total, twenty-six streams, fifteen wetlands, and three ponds were determined to be jurisdictional and subject to regulatory oversight and permitting by the USACE. All wetlands were mapped using GPS equipment with sub-meter accuracy. The only wetland not fully delineated was W-T and its boundaries were estimated based on observation and contour lines found on the USGS quadrangle map.

The jurisdictional streams, their classifications, length in study area, and buffer status are found in Table 3-13 and Table 3-14. The wetlands and their classifications, ratings, area, and jurisdictional status are shown in Table 3-15 and Table 3-16 as illustrated in Figure 3-9.

3.4.4.3 *Riparian Buffers*

The Neuse River Buffer Rules (15A NCAC 2B .0233), administered by the DWQ, applies to 50-foot wide buffers directly adjacent to qualifying surface waters in the Neuse River Basin, including intermittent and perennial streams, estuaries, and lakes and ponds that maintain a connection to the watershed network. The purpose of the rules is to protect and preserve existing riparian buffers in the Neuse River Basin and to maintain their nutrient removal functions. See Table 3-13 and Table 3-14 for those streams where the buffer rules apply.

As previously stated, on-site meetings with NCDWQ representatives were held on June 24, July 1, and July 30, 2004, to obtain concurrence on the mapped streams and buffers. A site visit with NCDWQ was conducted on November 8, 2006 to determine buffer locations on questionable streams. As a result of that visit, a stream previously rated ephemeral, S-V, was scored as intermittent by NCDWQ, making it subject to the Neuse buffer rules.

NCDWQ has established that small impacts to jurisdictional waters are "Allowable" with prior written authorization from DWQ. This "Allowable" amount is defined as impacts less than 150 linear feet or 1/3 of an acre. However, if the project impacts more than 150 linear feet of riparian buffer or 1/3 of an acre, the impact is "Allowable with Mitigation" and an Authorization Certificate must be obtained for the project from NCDWQ, in addition to a 401 Water Quality Certification and USACE 404 Permit. Mitigation measures are discussed in section 4 of this document.

**Table 3-15
Verified Wetlands and Ponds within the Project Study Area
(NCDOT – Natural Systems Study, November 2004, KCI Associates)**

Wetland	Classification ¹	Wetland Type	Area (Acres)
Wetland 1	PUBHh	Impounded	0.19
Wetland 2	PEM1A	Wetland with Stream	0.15
Wetland 3	PF01A	Wetland	0.01
Wetland 4	PF01E	Wetland with Stream	0.28
Wetland 5	PUBEx	Impounded	0.13
Wetland 8	PUBHh	Impounded	0.84
Wetland 9	PF01E	Wetland	0.01
Wetland 10	PUBEhd	Impounded/Adjacent with Stream	0.87
Wetland 11	PUBEx	Impounded/Wetland	0.05
Wetland 12	PUBHhxd	Impounded with Break	0.22
Wetland 13	PUBHh	Impounded	0.32
Wetland 14	PEM1E	Wetland Seep	0.01
Wetland 15	PUBEhd	Impounded with Break	0.11
Wetland 16	PF01E	Wetland with Stream	0.14
Wetland 17	PUBEhd	Impounded with Break	0.03
Wetland 18	PUBHhd	Impounded	0.14
Wetland 19	PF01E	Wetland	0.02
Wetland 20	PF01Eb	Beaver Pond/Wetland with Stream	0.29
Wetland 21	PF01E	Wetland with Stream Seep	0.14
Wetland 23	PUBHh	Impounded with Stream	2.87
Wetland 24	PEM1B	Wetland with Stream Beaver Dam	0.43
Wetland 25	PF01A	Wetland with Seep Stream	0.18
Wetland 26	PRBch	Impounded with Quarry	0.09
Wetland 27	PF01Ax	Wetland	0.01
Wetland 28	PEM1A	Wetland	0.04
Wetland 29	PF01A	Wetland	0.05
Wetland 30	PF01A	Wetland near NC 98 with Ephemeral Stream	0.06
Wetland 31	PSS1E	Wetland near NC 98	0.07
Wetland 32	PUBHh	Impounded	0.22

Table 3-15 (Continued)
Verified Wetlands and Ponds within the Project Study Area
(NCDOT – Natural Systems Study, November 2004, KCI Associates)

Wetland	Classification ¹	Wetland Type	Area (Acres)
Wetland 33	PUBHh	Impounded	1.17
Wetland 34	PUBHh	Impounded	0.09
Wetland 35	PUBHh	Impounded	0.26
Wetland 36	PUBHh	Impounded	0.26
Wetland 37	PUBEx	Impounded	0.06
Wetland 38	PUBEx	Impounded	0.06
Wetland 39	PFO1A	Wetland	0.04
Wetland 40	PF01B	Wetland	0.07
Wetland 41	PUBHh	Impounded	0.03
Wetland 42	PUBHh	Impounded	0.16
TOTAL ACRES			10.2

¹ P=Palustrine; FO1=Forested, broad-leaved deciduous; SS1=Scrub-shrub, broad-leaved deciduous; EM1,2=Emergent, persistent or non-persistent; UB=Unconsolidated bottom; A=Temporarily flooded; C=Seasonally flooded; F=Semi-permanently flooded; H=Permanently flooded (Cowardin et al., 1976).

**Table 3-16
Verified Wetlands and Ponds within the Project Study Area
(NCDOT-Biotic Communities and Protected Species Report, May 2007, NEU)**

Wetland	Classification ¹	Wetland Type	Area (acres) ²
W-A	PEM1A	Non-riverine	0.04
W-B	PF01A	Riverine	0.08
W-C	PSS1C	Riverine	0.18
W-D	PSS1A	Riverine	0.06
W-E	PEM2A	Non-riverine	0.01
W-F	PEM2A	Riverine	0.03
W-G	PF01A	Non-riverine	0.01
W-H	PEM1F	Non-riverine	0.005
W-I	PEM2A	Non-riverine	0.02
W-J	PEM2A	Non-riverine	0.02
W-K	PF01A	Riverine	0.09
W-L	PF01A	Riverine	0.01
W-M	PEM2A	Riverine	0.13
W-N	PF01A	Non-riverine	0.06
W-O	PF01A	Riverine	0.38
W-P	PF01A	Riverine	0.4
W-R	PSS1C	Riverine	0.1
W-S	PF01C	Riverine	0.05
W-T	PSS1C	Riverine	0.742 ³
W-U	PFO1A	Riverine	0.05
W-V	PSS1C	Riverine	0.17
W-W	PEM1C	Riverine	0.11
W-X	PF01C	Riverine	0.12
P-1	PUBH	N/A	0.42
P-2	PUBH	N/A	0.41
P-3	PUBH	N/A	0.21
P-4	PUBH	N/A	0.34
P-5	PUBH	N/A	0.27
P-6	PUBH	N/A	0.44

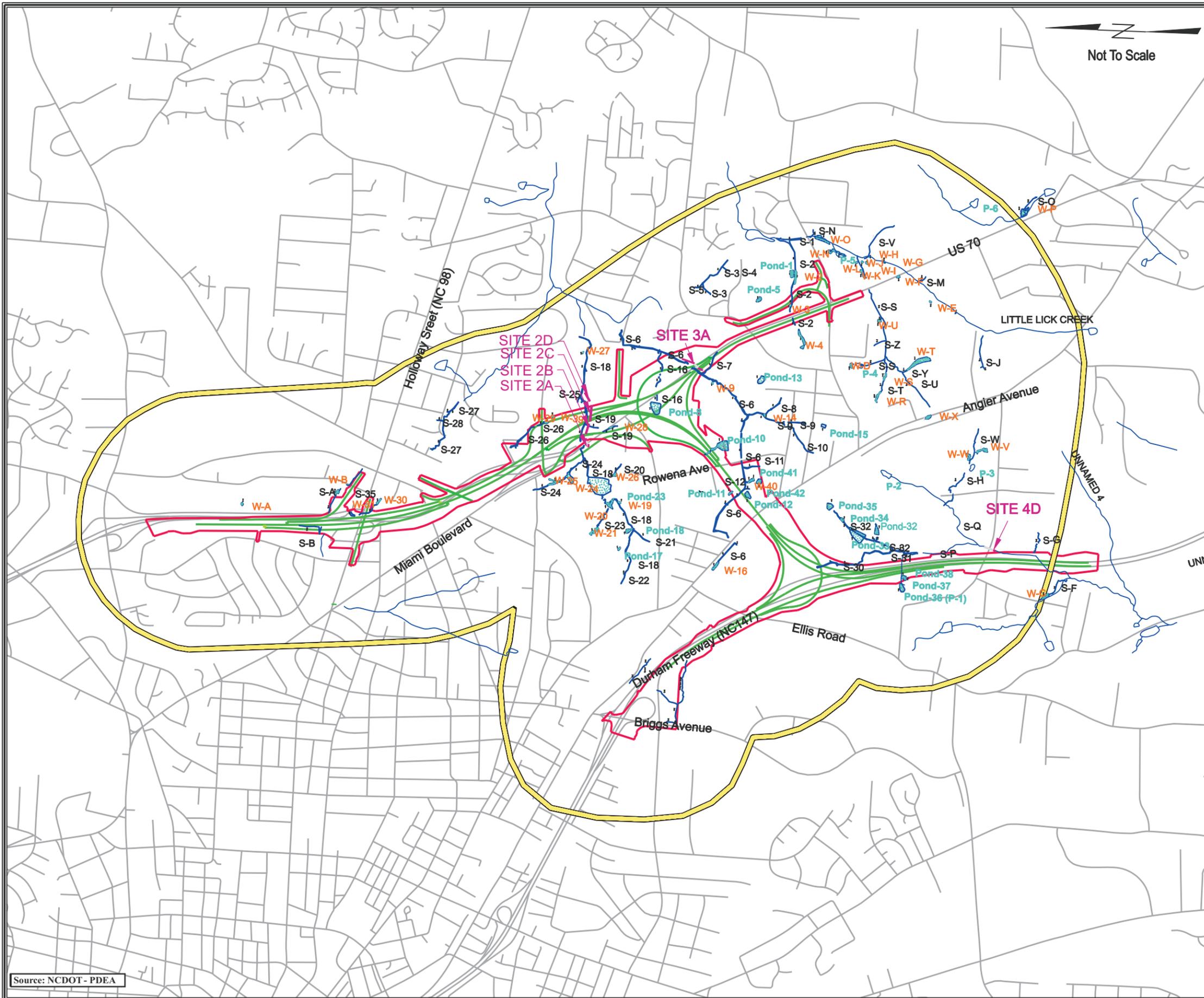
¹ P=Palustrine; FO1=Forested, broad-leaved deciduous; SS1=Scrub-shrub, broad-leaved deciduous; EM1,2=Emergent, persistent or non-persistent; UB=Unconsolidated bottom; A=Temporarily flooded; C=Seasonally flooded; F=Semi-permanently flooded; H=Permanently flooded (Cowardin et al., 1976).

² Area was calculated in Microstation, except for P-1 through P-6 where area was calculated in ArcMap

³ Area is estimated since this wetland was not fully delineated

⁴ These ponds, while jurisdictional, are in the Cape Fear River basin, which is not subject to buffer rules

⁵ Pond is subject to the Neuse River basin buffer rules



Not To Scale

STREAMS AND WETLANDS

EAST END CONNECTOR

LEGEND

- Proposed Roadway
- Proposed Right-of-Way
- S - XX** Streams
- W - XX** Wetlands
- Pond - XX** Ponds
- P - XX** Ponds
- SITE XX** Culvert Locations

NOTE: Impounded Wetlands from 2007 Natural Systems Study Labeled as Ponds.

General Study Area Boundary

3.4.4.4 Protected Species

The following are excerpts from:

- *Biotic Communities and Protected Species Report, East End Connector, Durham, North Carolina, North Carolina Department of Transportation, Project Development and Environmental Analysis Branch, prepared by Natural Environment Unit, May 2007.*
- *Natural Systems Study: U-0071 Wetland, Stream and Buffer Delineation, North Carolina Department of Transportation Project Development and Environmental Analysis Branch, Office of Natural Environment, prepared by KCI Associates, 2004.*

Federally Protected Species

Plants and animals with federal classifications of Endangered (E), Threatened (T), Proposed Endangered (PE) and Proposed Threatened (PT) are protected under provisions of Section 7 and Section 9 of the Endangered Species Act of 1973, as amended.

As of January 31 2008, the USFWS lists two federally protected species for Durham County: smooth coneflower (*Echinacea laevigata*) and Michaux's sumac (*Rhus michauxii*). Surveys associated with these species were performed during field visits associated with the December 2006 natural resource investigation. Table 3-17 shows the Biological Conclusions resulting from those investigations.

**Table 3-17
Federally Protected Species for Durham County**

Scientific Name	Common Name	Status	Habitat Present	Field Observation	Biological Conclusion
<i>Haliaeetus leucocephalus</i>	Bald eagle	De-listed	No	None	N/A
<i>Echinacea laevigata</i>	Smooth coneflower	E	Yes	None	No Effect
<i>Rhus michauxii</i>	Michaux's sumac	E	Yes	None	No Effect

E - Endangered: A taxon "in danger of extinction throughout all or a significant portion of its range."

T - Threatened: A taxon "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

The bald eagle was previously listed by the U.S. Fish and Wildlife Service (USFWS) as a federally protected species for Durham County. However, according to a 2007 Federal Register release, the bald eagle was officially de-listed in the Lower 48 States and removed from the List of Endangered and Threatened Wildlife effective August 8, 2007 (72 FR 37346-37372; July 9, 2007). This species still receives protection under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Smooth coneflower is a perennial herb in the Aster family that grows up to five feet tall. Flower heads are usually solitary. The rays of the flowers (petal-like structures) are light pink to purplish in color, usually drooping. Flowering occurs from late May through mid July and fruits develop from late June to September. Smooth coneflower is typically found in open woods, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of way, usually on magnesium and calcium rich soils. Optimal sites are characterized by abundant sunlight. Smooth coneflower is threatened by fire suppression and habitat destruction resulting from highway construction, residential and commercial development as well as maintenance activities in roadside and utility rights-of-way.

Michaux's sumac is a densely hairy shrub, with erect stems from one to three feet in height. Flowers usually occur from June to July and are small, dense clustered and colored greenish yellow to white. A red drupe is produced through the months of August to October. Michaux's sumac is historically found in the coastal plain and piedmont of the Carolinas, Georgia and Florida. It grows in sandy or rocky open woods in association with basic soils and has a low reproductive capacity. At least twelve of the plant's 31 known populations in North Carolina are on highway rights-of-way, roadsides, or on the edges of artificially maintained clearings.

The bald eagle is a large raptor and has a wingspread of about seven feet. Adults have a dark brown body and wings, white head and tail, and a yellow beak. Juveniles are mostly brown with white mottling on the body, tail, and undersides of wings. No critical habitat has been published for the bald eagle.

The following biological investigation summaries have been reached for these species:

- Smooth Coneflower – surveys were completed for the original study area on August 29, 2006 and for the new study area between July and October, 2006. These surveys noted that potential habitat occurred in power line right-of-way areas, pastures, and other open areas. The survey found no occurrence of the coneflower within the study area.
- Bald Eagle – The distance from a large body of water coupled with the amount of development and other habitat alteration in the study area (and in a one-mile radius) preclude bald eagle nesting habitat. No foraging or nesting habitat exists for the bald eagle in the project area.
- Michaux's Sumac - Surveys were completed for the original study area on August 29, 2006 and for the new study area between July and October, 2006. These surveys noted that potential habitat occurred in power line right-of-way areas, pastures, and other open areas. The survey found no occurrence of Michaux's Sumac within the study area.

A re-survey of these species along with a NCNHP GIS search was performed on September 9, 2008. Results from this re-survey indicate the biological conclusion of "No Effect" remains valid for the two federally protected species.

Federal Species of Concern

There are thirteen (13) Federal Species of Concern (FSCs) listed by the USFWS for Durham County. A review of GIS-based data supplied to NCDOT by NCNHP (last updated on February 13, 2008) revealed no known occurrences of any of these

species within 1.0 mile of the study area. FSCs are not afforded federal protection under the ESA and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as Threatened or Endangered. FSCs are defined as species under consideration for listing for which there is insufficient information to support listing as Threatened or Endangered. The status of these species may be upgraded at any time, thus they are included here for consideration. Table 3-18 lists the FSCs and whether suitable habitat is present.

**Table 3-18
Federal Species of Concern for Durham County**

Scientific Name	Common Name	Federal Status ¹	State Status ²	Habitat Present
<i>Ambloplites cavifrons</i>	Roanoke bass	FSC	SR	Yes
<i>Anguilla rostrata</i>	American eel	FSC	W1	Yes
<i>Etheostoma collis</i> <i>population 2</i>	Carolina darter – Eastern Piedmont Population	FSC	SC	Yes
<i>Fusconaia masoni</i>	Atlantic pigtoe	FSC	E	Yes
<i>Gomphus septima</i>	Septima's clubtail	FSC	SR	Yes
<i>Lampsilis cariosa</i>	yellow lampmussel	FSC	E	Yes
<i>Lasmigona subviridis</i>	green floater	FSC	E	Yes
<i>Lythrurus matutinus</i>	pinewoods shiner	FSC	W2	Yes
<i>Noturus furiosus</i>	Carolina madtom	FSC	SC (PT)	Yes
<i>Somatogyrus virginicus</i>	panhandle pebblesnail	FSC	SR	No
<i>Delphinium exaltatum</i>	tall larkspur	FSC	E-SC	Yes
<i>Juglans cinerea</i>	butternut	FSC	W5A	Yes
<i>Monotropis odorata</i>	sweet pinesap	FSC	SR-T	Yes

¹ FSC – Federal Species of Concern

² SR – Significantly rare; W-1-Watch Category 1; SC-Special Concern; E-Endangered; W-2 Watch Category 2; W5A – Watch Category 5A; T-Throughout the Area.

4.0 Preferred Alternative Environmental Consequences

This chapter summarizes the potential effects on the human, physical, and natural environments that may result from the proposed East End Connector project. The impacts described below are based on the evaluation of functional design plans for four alternatives described in Chapter 2 with detail descriptions of the impacts for the preferred alternative – Alternative 3.

The impact assessment of the preferred alternative, Alternative 3, uses the functional design plans developed for the improvements to US 70 and the ultimate EEC six lane facility (three continuous lanes in each direction) during the alternatives analysis described in Chapter 2. The result of that analysis is an affirmation that the preferred alternative from the 1982 FEIS continues to be the least environmentally damaging and practicable alternative (LEDPA).

The proposed facility is approximately 3.6 miles long and will ultimately include three continuous through lanes in each direction plus auxiliary lanes as needed. Initial construction will include a build section of only four lanes (two continuous lanes in each direction) in order to reduce initial project costs. Design elements include a median 50 feet wide, 6 feet wide inside shoulders, and 14 feet outside shoulders.

4.1 Human and Physical Environment

This section summarizes impacts of the proposed East End Connector (EEC) project on the human and physical environment as detailed in the Community Impact Assessment Report. That report includes community-related impacts, and the impacts to various aspects of the social characteristics and cultural character of the study area. Also included are analyses of changes in local access and travel patterns, impacts to community cohesion and employment as a result of property acquisitions/relocations, and potential environmental justice impacts associated with the proposed project. The consistency of the EEC with the land use and transportation plans for the project study area is also reviewed.

4.1.1 Community

The East End Connector (EEC) project study area is bounded by Cheek Road to the north, Glover Road to the south, US70 to the east, and NC147 to the west. This boundary as it relates to community facilities and neighborhoods was previously shown in Figure 3-3.

In addition to the changes in accessibility and local traffic circulation patterns within the study area, other community level impacts of the proposed EEC project will include right-of-way acquisitions and relocation of residences, businesses, and other types of property necessary to construct the project, as well as related impacts to neighborhood cohesion and community facilities and resources.

4.1.1.1 Local Access and Travel Patterns

The EEC Alternative 3, including the reconstruction of US 70, will result in changes in access to local streets and travel patterns within some portions of the study area. The alternative has been designed to maintain access to the major roadways and to existing developments in the area. Although there will not be a complete loss of access to any properties within the study area (apart from those parcels that will be taken as part of right-of-way acquisition for the

project), there will be some changes in access to various areas because of the new EEC facility and its connections to NC 147 and US 70, as well as the upgrading of US 70 to a controlled-access freeway.

As stated earlier, the future traffic volumes and over-capacity travel conditions along US 70 will result in congested conditions at all major intersections along this facility including Holloway Street, East End Avenue, Lynn Road, and Pleasant Drive. The increased capacity provided by the reconstruction of US 70 as a controlled-access facility, along with the construction of the EEC, will provide for improved traffic flow conditions and safer access to these major roadway facilities within the study area.

The closure of some of the existing intersections along US 70 will redistribute trips to other intersections, which will result in increased travel distances for some local trips in the study area. In addition, the proposed closures of some existing intersections, and the addition of new service roadways to provide improved accessibility to the areas both east and west of US 70, may result in increased traffic volumes on some local roadways.

For Alternative 3, the US 70 and Holloway Street interchange will be reconstructed as a compressed urban diamond with signalized ramp intersections which will provide a much improved and safer access than currently exists. Access to Muldee Street will be provided by a new roadway connection to Hoover Road, which connects to Holloway Street. These roadway improvements will be coordinated with the planned reconstruction of Holloway Street from US 70 to Junction Road to provide a center turn lane.

Generally, for Alternative 3, the major changes to local access and travel routes within the EEC study area will be associated with the reconstruction of US 70 from Holloway Street to Pleasant Drive.

In order to maintain adequate access to roadways and properties in the study area, the construction of Alternative 3 will include the provision of new roadway connections and alternate access routes as described below:

- A new service road on the east side of US 70 will connect Holloway Street to an improved Hoover Road that extends to Carr Road. This new service road will improve accessibility to land parcels along the east side of the US 70 corridor within the study area. Most of the properties adjacent to this corridor are undeveloped or underdeveloped and are zoned and planned for industrial uses.
- With the new interchange of the East End Connector and Durham Freeway (NC 147), access to the local roadways will not change from the existing conditions.

In addition, the reconstruction of US 70 and changes to the existing intersections along the corridor from Holloway Street to Lynn Road as proposed for Alternative 3 will create some new travel patterns for local traffic circulation within the study area as summarized below:

- With the re-connection of East End Avenue to US 70 via a new service road connection; an additional 0.5 mile of travel will be required.
- With the reconstruction of the intersection of Lynn Road and US 70 to allow only right-in/right-out turning movements, access to northbound US 70 from Lynn Road west of US 70 will require an additional one mile of travel via Lynn Road and Pleasant Drive to its intersection with US 70.
- With the reconstruction of the intersection of Lynn Road and US 70 to allow only right-in/right-out turning movements, access to southbound US 70 from Lynn Road east of US 70 will require an additional 0.5 miles of travel via the new service road to Pleasant Drive.

In addition to changes in local travel patterns for motorists in the study area, there will also be changes required to some of the current Durham Area Transit Authority (DATA) bus transit routes within the study area. DATA Route 2 and possibly Route 15 will require an approximate 0.5 additional miles of travel to serve patrons in the study area because of the re-connection of the East End Avenue intersection with US 70. It is expected that these bus routes will provide service by using the new service roadways and new local street connections/extensions where possible.

The existing and proposed rail transit systems, as well as the existing and planned bicycle routes and greenways, are not expected to be directly impacted by the proposed alternatives.

Major freight railroad corridors are located in the study area. They generally parallel Durham Freeway (NC 147) and Angier Avenue, and also cross US 70 Business and US 70 Bypass via an overpass. Alternative 3 proposes to reconstruct the existing overpass, which will require construction of a temporary railroad bypass during construction. The East Durham Rail Yard is an area of major switching operations and is located on the west side of Angier Avenue in the vicinity of Ellis Road. Again, Alternative 3 will cross the rail yard, however a sufficiently long bridge structure will be constructed to ensure no interruption of rail service.

4.1.2 Relocations and Neighborhood Cohesion

The following is a summary of right-of-way acquisition and relocation impacts by the proposed project to residences, businesses, and community facilities and resources as identified by the NCDOT Relocation Assistance Program in May 2007 (see the Appendix for NCDOT Relocation Reports). As the project advances, further modifications and refinements will be made to the design plans which may affect the number and type of properties that will be acquired for the proposed EEC project.

The relocation policies administered by the NCDOT require that all displacements of properties and structures be adequately compensated as per the guidelines of the NCDOT relocation assistance program and in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, as amended by 100-17; regulations at 49 CFR 24). The NCDOT has three programs to minimize the inconvenience of relocation: relocation assistance; relocation moving payments; and

relocation replacement housing payments or rent supplements. Last Resort Housing is a program used when comparable replacement housing is not available, or is unavailable within the financial means of those being displaced, and the replacement payment exceeds the federal and State legal limitation. The purpose of the program is to allow broad latitudes in methods of implementation by the State so that decent, safe, and sanitary replacement housing can be provided. The Community Impact Assessment Report includes more detailed information about NCDOT's Relocation Assistance Program.

The right-of-way to be acquired for the East End Connector will affect a mixture of residential, commercial, industrial and other privately-owned properties.

The construction of Alternative 3, the preferred alternative, will require acquisition of 17 residences, nine businesses, and will affect one church and one church office according to relocation estimates provided by NCDOT (May 2007). Of these acquisitions, six (6) residences and three (3) businesses are owned by minorities dispersed throughout the study area. Although all displacements are within areas having high low-income and minority populations, relocation opportunities are anticipated to be readily available within the community. The types and total number of estimated minority and low-income relocations for Alternative 3 is based on functional design mapping of the proposed alignment and is subject to change as the project progresses through preliminary and final design phases. Figures 3-1 and 3-2 in Chapter 3 show the relationship of Alternative 3 to minority/ethnic and low-income populations in the study area.

The 17 residential displacements associated with Alternative 3 are dispersed throughout the corridor. The Relocation Report identified more than 300 nearby decent safe and sanitary housing units for potential relocation.

Business displacements along US 70 will be minimized through the provision of a service road between Lynn Road and Pleasant Drive, providing access to the existing businesses from the rear of the properties.

The nine business displacements associated with Alternative 3 are generally industrial, manufacturing, and commercial establishments. The majority of the business/commercial right-of-way acquisitions will be located along US 70, along NC 147, and in an underdeveloped area between US 70 and NC 147. There are many parcels of undeveloped or underdeveloped land in the study area that are zoned and planned for industrial and commercially development, and it appears that there will be suitable relocation sites for the displaced businesses within the nearby vicinity, thereby minimizing the impacts to the community. The displaced businesses are not large employers (i.e., greater than 100 employees); therefore, these displacements are not expected to result in substantial impacts to the local business community or employment base.

4.1.3 Community Facilities and Services

With Alternative 3, there will be no relocation impact to police, fire, or emergency services; or schools, parks, or other community facilities; with the exception of right-of-way impacts to one church, one church office and one park in the study area.

4.1.3.1 *Impacts to Churches*

The preferred alternative will impact two churches: the Living Water Christian Church at the intersection of US 70 and Lynn Road and to the Believers Assembly Christian Church on Harvard Avenue. The construction of the East End Connector will result in the acquisition of the church office of Living Waters Christian Church, formerly a residence near US 70. There is sufficient vacant land on church grounds to rebuild the facility closer to the church. This church serves a mixed population of both white and minority members. Because a suitable relocation site is available on the church's property and the church sanctuary is unaffected, it is anticipated that no significant adverse impacts to minority and/or low-income populations related to community cohesion will occur as a result of this relocation. The construction of the East End Connector will result in the acquisition of the Believers Assembly Christian Church that rents a building on Harvard Avenue just east of US 70. This church serves a mixed population of both white and minority members. Because suitable relocation sites are available nearby, it will be anticipated that no significant adverse impacts to minority and/or low-income populations related to community cohesion will occur as a result of this relocation.

4.1.3.2 *Impacts to Parks - Section 4(f) De Minimis Impact Analysis*

Section 4(f) of the Department of Transportation Act of 1966, as amended, (23 U.S.C. 138) states that the U.S. Department of Transportation "may not approve the use of land from a significant publicly-owned park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that: (i) There is no feasible and prudent alternative to the use of land from the property; and (ii) The action includes all possible planning to minimize harm to the property resulting from such use." For Section 4(f), a "use" is defined as one of the following:

- A direct use – property is permanently incorporated into the right-of-way of the transportation project;
- A temporary use – property is temporarily occupied in a way that is adverse to the property's purpose; or
- A constructive use – a use that occurs when the "the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the property activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features, or attributes of the property are substantially diminished." (23 CFR 774.15(a))

In 2005, Congress amended Section 4(f) in its passage of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), specifically in Section 6009(a). An important change was the introduction of the de minimis procedures for processing minor impacts to Section 4(f) resources. Subsequent to the passage of SAFETEA-LU, the FHWA amended the Section 4(f) regulations (23 CFR 774.3(b), 23 CFR 774.5(b) and 23 CFR 774.17) and issued guidance for determining de minimis

findings (Guidance for Determining De Minimis Impacts for Section 4(f) Resources).

Based on those regulations and guidance documents, the use of land from a publicly-owned park, recreation area, or wildlife and waterfowl refuge may be determined to be de minimis if:

- The transportation use of the park, together with any impact, avoidance, minimization, and mitigation or enhancement measures do not adversely affect the activities, features, and attributes that qualify the resource for protection under Section 4(f).
- The official(s) with jurisdiction over the property is informed of FHWA's intent to make the de minimis impact finding, based on his/her written concurrence that the project will not adversely affect the activities, features, and attributes that qualify the property for protection under Section 4(f).
- The public has been afforded an opportunity to review and comment on the affects of the project on the proposed activities, features, and attributes of the Section 4(f) resource.

According to the provisions set forth in Section 6009(a) of SAFETEA-LU, once the US Department of Transportation determines that a transportation use of property from a Section 4(f) resource constitutes a de minimis impact, analysis of avoidance alternatives is not required and the Section 4(f) evaluation process is complete.

C.R Wood Park: C.R. Wood Park is a 17.4 acre park owned by the City of Durham. It is located at 417 S. Commonwealth Avenue, between East End Avenue to the north and Angier Avenue to the south (see Figure 4-1). The proposed East End Connector will lie to the southeast of the park. The park includes a ball field, basketball courts, the Hayestown Community Center, a playground, and picnic facilities. The playground at the park was recently renovated and upgrades to the public restrooms are planned. The park's recreational facilities are located on the northern side of the park, with the southern side remaining undeveloped and wooded to serve as a buffer to the planned freeway.

Impacts to C.R. Wood Park: The preferred alternative will require the use of approximately 0.08 acre of land from the extreme southeastern corner of the C.R. Wood Park, as shown in Figure 4-1. The land impacted is undeveloped and wooded and contains no recreational facilities.

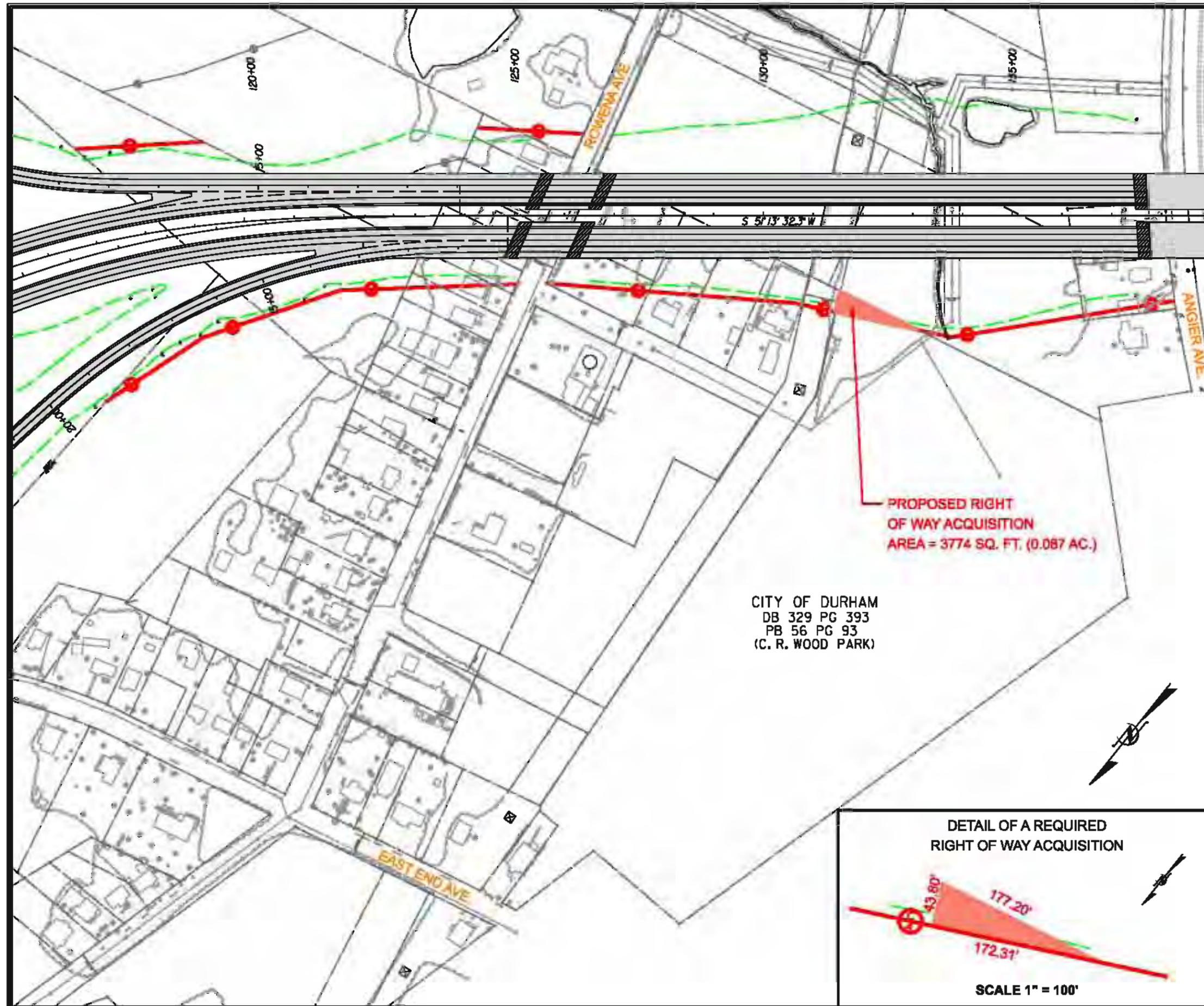
Based on coordination with officials from the City of Durham Parks and Recreation Department, the Federal Highway Administration finds that the East End Connector will not adversely affect the activities, features, and attributes that qualify the park for protection under Section 4(f). Therefore, pending the review of public comments on the proposed use of land from the C.R. Wood Park, the Federal Highway Administration intends to determine that the use of land from the park constitutes a de minimis Section 4(f) impact, as defined in 23 CFR 774.17. The City of Durham was informed of FHWA's determination that no adverse effects to the park will result from the project and of the agency's

DE MINIMIS ACQUISITION
C.R. WOOD PARK

EAST END CONNECTOR

LEGEND

- AREA OF ACQUISITION REQUIRED
- PROPOSED ROADWAY
- CONSTRUCTION LIMITS
- CONTROL OF ACCESS / RIGHT OF WAY LIMITS
- PROPERTY LINE



SCALE 1" = 200'



FIGURE 4-1

expectation that the impact will constitute a de minimis use of land from a Section 4(f) resource. The City concurs that the East End Connector will have no adverse effect on the C.R. Wood Park (see letter dated August 28, 2009 in Appendix A), pending anticipated mitigation.

The anticipated de minimis finding will include the Section 4(f) requirement that all possible planning to minimize harm to the resource has been achieved (23 CFR 774.117(5)). The NCDOT will mitigate the use of the parkland by paving the C.R. Wood parking lot and/or tennis courts, as proposed by the City of Durham. This will be coordinated with the City of Durham Parks and Recreation Department.

Public Involvement: A pre-hearing open house, to which the public is invited for informal discussion on the project, and a public hearing, will be held for the East End Connector project after completion of the Environmental Assessment. The proposed use of land from the C.R. Wood Park will be presented at the meetings. Notices regarding the proposed *de minimis* use of land from the park will be posted at the C.R. Wood Park community center prior to the meetings.

Section 6(f) of the Land and Water Conservation Fund Act: The Land and Water Conservation Fund Act of 1965, as amended (16 USC 4601-4 et seq), established a federal program to stimulate preservation and development of outdoor recreational resources by providing matching grants to states and local governments for use in acquiring and developing public outdoor recreation facilities. The program is currently administered by the National Park Service.

A number of “post completion” responsibilities apply to each recreation area or facility assisted with Land and Water Conservation Fund (LWCF) grants, as documented in Section 6(f)(3) of the Act. One such responsibility in the law states that property acquired or improved with LWCF monies must remain in public outdoor recreation use and cannot be partly or wholly converted to another use without approval by the National Park Service, pursuant to 36 CFR 59 and guidelines set forth by the National Park Service in the Land and Water Conservation Fund State Assistance Program: Federal Financial Assistance Manual (October, 2008). Replacement land of equal value and recreational use must be provided for any land converted to non-recreational uses.

The entire C.R. Wood Park is included within the 6(f)(3) boundary map for LWCF grant number 37-00118. A formal request to the National Park Service to convert the 0.08 acre of land needed for the East End Connector will be made by the project sponsor, the City of Durham, with assistance from the NCDOT. Prior to approval of the conversion, the following steps must be accomplished:

- All practical alternatives to the conversion must have been considered.
- The fair market value of both the property to be converted and the replacement property must be determined. The replacement property must be of at least equal value to the property to be converted.
- The replacement property must be of “reasonably equivalent usefulness and location” as the converted property.

- The replacement property must meet the eligibility requirements for LWCF assisted acquisition and must be a viable recreation area.
- The impact of the conversion on the remainder of the Section 6(f)(3) resource must be considered. The unconverted area must remain recreationally viable.
- All necessary coordination with the appropriate federal agencies must be satisfied, including compliance with Section 4(f) of the Department of Transportation Act of 1966.
- The environmental review requirements under NEPA must be satisfied and all environmental review requirements for other federal actions must be met.
- All state intergovernmental review procedures must be followed, as appropriate.
- The proposed conversion and replacement land must be consistent with the State Comprehensive Outdoor Recreation Plan (SCORP).

The NCDOT met with Parks and Recreation officials with the City of Durham and the LWCF Coordinator with the North Carolina Parks and Recreation Division to discuss the parkland conversion and identify possible replacement land options. A potential replacement parcel was identified and work has begun on the environmental review and assessment of value of that land. Every effort will be made to find appropriate replacement land adjacent to the C.R. Wood Park. The City of Durham is on record as supporting the use of the 0.08 acre area of the C.R. Wood Park for the proposed East End Connector and will act as the project sponsor in the conversion process.

4.1.4 Impacts to Environmental Justice Populations

The following sections summarize the impacts of the proposed East End Connector (EEC) project to the environmental justice populations. The impacts may affect the extent to which these populations will share equally in the benefits of the proposed action. Impacts were evaluated with regard to community cohesion, accessibility to community facilities and services, the number and types of displacements and relocations, and the general economic impacts of the proposed EEC facility. The number and type of facilities impacted and the number of minority and low-income populations affected were obtained from the Relocation Reports prepared by the North Carolina Department of Transportation Relocation Assistance Program prepared in May 2007 and are included in the Appendix. Because the report was based on functional design plans, the results are subject to change as preliminary and final design plans are developed for the selected alternative.

4.1.4.1 *Federal Regulations and Policies*

Title VI of the Civil Rights Act of 1964 and related statutes require that federal agencies ensure that no person is excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity that receives federal financial assistance on the basis of race, color, national origin, age, sex, disability, or religion.

Federal Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was enacted in 1994 and provides that "each federal agency make achieving environmental

justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations.”

There are three fundamental environmental justice principals that are to be considered in the application of this executive order:

- To ensure the full and fair participation by all potentially affected communities in the decision-making process
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations
- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations

The U.S. Council on Environmental Quality’s “CEQ Environmental Justice Guidance Under the National Environmental Policy Act” (1998) defines “disproportionately high” effects as those that (1) affect a population that is more than 50 percent minority and/or low-income, or (2) affect a minority and/or low-income population that represents a proportion “meaningfully greater” than the average minority and/or low-income population for an appropriate geographic reference area.

4.1.4.2 *Public Involvement Activities*

To ensure the full and fair participation by all potentially affected communities in the decision-making process, an extensive community involvement process was undertaken. The following is a summary of the activities for including the public in the decision-making process. A more detailed description of the public involvement activities is included in Chapter 5 under Public Involvement and in the Public Involvement Technical Report.

Information was provided to the public via newsletters, email, a toll-free number, and a website. Newsletters and fact sheets were prepared, in both English and Spanish, which summarized information and key decisions about the project. A phone number and an email address were clearly visible as a point of contact. The newsletters were mailed to approximately 5000 addresses and were also made available through the project website, at public meetings, and through the NCDOT and City of Durham offices. The project has received more than 150 calls and 60 emails since early 2006. The Team responded to every call with a personal return call that enabled the caller to discuss his/her concerns and to receive individualized information. When appropriate, information was mailed to the caller as a follow-up. In a similar manner, responses were sent to every email correspondent. A record of all telephone and email correspondence is included in the Public Involvement Technical Appendix.

To ensure that all community members were able to participate equally, NCDOT held a series of general public meetings and met with neighborhood groups within the study area. Three Citizens Informational Workshops (CIW)

were held to ensure that everyone in the community was informed about the project and could participate in the meetings. Six presentations were made to City and County elected officials to inform them of the project progress and to obtain feedback. Twelve other meetings with community groups were scheduled: five meetings with Partners Against Crime (PAC) Areas 1 and 4; one meeting with the Inter-Neighborhood Council; one meeting with the Orange Grove Missionary Baptist Church and eight meetings with an Ad Hoc Citizens Committee organized by the City Council. (Additional information concerning the AD-HOC committee is located in section 5.2 of this document.) These meetings reached approximately 300 community members in addition to those attending the formal Citizens Informational Workshops.

4.1.4.3 *Community Cohesion*

The February 2008 Community Impact Assessment prepared for this project discusses in detail the impacts to community cohesion for each of the three detailed study alternatives. The preferred alternative alignment, Alternative 3, either follows existing facilities or, where there is a new alignment, crosses mainly undeveloped property adjacent to three neighborhoods. The Hayestown and East End communities lie to the north of the proposed alignment and a loosely-knit unnamed community is to the south of the alignment.

The EEC study corridors were developed to minimize impacts to residential areas, with a focus toward avoiding bisecting neighborhoods within the study area. While the preferred alternative does not directly impact most study area neighborhoods, Alternative 3 does unavoidably impact a residential area along Rowena Avenue. This neighborhood of 45 to 50 homes developed in a linear fashion near the intersection of Rowena and East End Avenues. Approximately seven residences on Rowena Avenue, at the southern end of the neighborhood, will be displaced. These seven houses were either built and /or sold subsequent to the 1982 FEIS document. Other nearby residents will experience noise impacts due to the proposed project. More information on noise abatement is provided in section 4.1.7.

The preferred alternative will travel in close proximity to two other residential communities, in the vicinity of Carr Road and Lynn Road, and will cross two neighborhood streets. Although Lynn Road will be realigned to intersect Pleasant Drive rather than US 70, substantial changes in traffic patterns or volumes are not anticipated. The nearby Birchwood Heights neighborhood should not be directly affected. Some additional residential displacements will occur throughout the study area. Mitigation measures have been planned to relieve indirect neighborhood impacts associated with the EEC's proximity. These measures include possible sound barriers at noise sensitive locations and provisions for bridge structures spanning residential streets, including Rowena Avenue and Carr Road, so that access and connectivity are maintained. These community avoidance and mitigation measures minimize adverse impacts to neighborhood cohesion, community facilities, and other similar resources within the study area.

According to the NCDOT relocation report, six (6) of the seventeen (17) displaced residences and three (3) of the nine (9) businesses are minority-

owned. None of the residents have incomes below the poverty level. When compared to other major highway construction projects, the number of properties taken is small and results in minimal disruption to neighborhoods or communities. Also, the impacted properties are not concentrated in one neighborhood, but are instead dispersed through the project corridor. Users of public facilities and services, including minority and/or low-income populations, will have substantially the same accessibility to these facilities with the East End Connector and other related roadway improvements as exists today.

4.1.4.4 *Avoid, Minimize, and Mitigate Impacts to Minority and Low-Income Populations*

Analysis of the North Carolina 2000 census data indicates that the Durham County has a minority population that is approximately half (49%) of the County's total population and a low-income population that closely matches the state averages (1% higher). In comparison, the EEC study area has somewhat larger minority and low-income populations of 68 percent minority, 10 percent Hispanic, and 20 percent low-income. Given these population percentages, the EEC study area is a minority and low-income community. As a result, and in accordance with Federal Executive Order 12898, efforts are being developed to avoid, minimize, and mitigate impacts to these populations, including public involvement opportunities as described above under section 4.1.4.2.

Implementation of any of the alternatives considered for the East End Connector project will have both beneficial and adverse impacts to communities within the study area. A variety of methods have been implemented to address potential adverse impacts presented by the EEC project.

Early during the planning process avoidance measures were considered. The three alternatives selected for detailed study were the results of a process that eliminated a fourth alternative that adversely impacted a minority community - Hayestown Community. The alignments for the remaining Alternatives 1, 3 and 4 were developed within corridors that do not travel directly through neighborhoods or communities thereby avoiding and minimizing minority and low-income adverse impacts. Furthermore, business impacts were avoided through design of service roads for each alternative along US 70, maintaining access to adjacent properties.

Table 4-1 indicates the results of selectively designing corridors that avoid and minimize impacts to the surrounding communities. As summarized, Alternative 1 passes through primarily industrial and commercial areas, affecting nine (9) minority residences and three (3) minority businesses scattered throughout the study area. Alternative 3 avoids impacts by passing between three (3) communities, Hayestown, East End, and an unnamed community, and affects six (6) minority residences and three (3) minority businesses scattered throughout the study area. Alternative 4 passes through a predominantly undeveloped or low density area, displacing eighteen (18) minority residences and four (4) minority businesses scattered throughout the study area. These minority and low income relocation impacts are not disproportionate when compared to the non-minority relocation impacts. As shown in Table 4-1, in all

cases, the number of non-minority relocation impacts equal or exceed the number of minority and low income relocation impacts.

**Table 4-1
Estimated Minority and Low Income Relocations
for the East End Connector Facility**

East End Connector	Residential Relocations			Business Relocations			Total Relocations		
	Minority	Low Income	Non Minority	Minority	Low Income	Non Minority	Minority	Low Income	Non Minority
Alternative 1	9	0	9	3	0	12	12	0	21
Alternative 3	6	0	11	3	0	6	9	0	17
Alternative 4	18	0	21	4	0	6	22	0	27

Source: May 2007 NCDOT Relocation Reports

Although the entire study area meets threshold requirements for candidate minority and low-income populations, both the small number of residences and businesses taken and the proportion of residences and businesses taken that are owned by minority or low-income populations indicate that there will be no disproportionately high and adverse property impacts to low-income or minority populations for the preferred alternative, Alternative 3. Also, this alternative does not endanger community cohesion and existence given that the corridor crosses near the western edge of the Delmar Drive Neighborhood Group and has no relocations within the Hayestown or East End Communities to the north or the loosely-knit unnamed community to the south.

Relocation opportunities are anticipated to be readily available. The May 2007 NCDOT Relocation Report identified more than 300 nearby, decent, safe, and sanitary housing units for potential owner relocations. NCDOT will assist affected property owners in locating nearby, safe, and similar dwellings during the relocation process in accordance with their Relocation Assistance Program.

After selection of Alternative 3 as the least environmentally damaging and practicable alternative (LEDPA), the NCDOT in conjunction with the City of Durham formed an Ad-Hoc steering committee of local citizens who are working closely with the designers in furthering community involvement and minimizing the impacts of the plan. Members of this committee include eight citizen representatives from Durham's Partners Against Crime (PAC) Districts 1 and 4. Additional information concerning the Ad-Hoc committee is located in section 5.2 of this document. Minimization and mitigation suggestions that have been generated during the Ad-Hoc committee meetings that have been implemented or are being considered for this project include the following items:

- A separate community workshop was held on December 10, 2007 where three dimensional renderings and animated visualization of the project was presented.
- The City of Durham established volunteer organizations that will provide free legal and real estate professional services to the impacted properties.

- Increased public outreach, especially to those in the community who rent their current dwelling.
- Potential sidewalk and bike lane improvements.
- Potential noise wall aesthetic improvements.

As discussed previously in section 4.1.1.1, design measures have been provided to avoid and minimize adverse impacts to local access and traffic congestion. Local access to the EEC will be provided at the US 70/Holloway Street interchange and the US 70/ Lynn Road Intersection. Two existing access points will be relocated at East End Avenue and Lynn Road resulting in an approximate one-half mile re-routing of traffic. In other areas, access will remain unchanged or will be improved. A service road has been located to ensure access is maintained for local residents and businesses along the east side of US 70. This new service road will improve accessibility to land parcels, possibly resulting in land use changes and redevelopment. Overall, the EEC will relieve future congestion on local streets, improving the community's mobility and quality of life as it relates to commuting. The EEC also provides a vital link for transporting goods and services to and from the broader community as a whole. These changes in access offer opportunities for improved land use leading to positive economic benefit.

Other measures considered in providing uninterrupted access include provisions for grade separation bridges at Rowena Avenue and Angier Avenue. In order to reduce construction costs, these bridges will initially be constructed to accommodate the build section only (two continuous through lanes and two auxiliary lanes in each direction - eight lanes total) and will allow local traffic to pass undisturbed under the EEC. Surrounding communities are also expected to benefit from the diversion of truck traffic from these local roadways on to the EEC facility. This diversion will assist in relieving congestion. EEC bridges over Rowena Avenue and Angier Avenue will be widened in the future to accommodate the 6-lane facility (ultimate section). In addition, alternative modes of travel for the communities are being explored including provisions for sidewalk and bicycle lane improvements. Currently, NCDOT and the City are negotiating potential locations and cost sharing for these features. These locations have been documented by the City of Durham and presented to the Ad-Hoc committee for review.

4.1.5 Accessibility and Economic Development

The East End Connector facility is expected to have an overall positive economic impact on the Durham area by providing a much improved regional connection between major roadways in the City and the County. The new freeway connector and the upgrading of US 70 to freeway standards along with the construction of additional local access/service roads will provide greater accessibility to some existing businesses and some undeveloped properties in portions of the study area. The provision of new service roadways and other local roadway extensions to those areas that currently have very limited or no access could also stimulate growth and increase development.

The EEC facility will also provide a direct route for commercial truck traffic through the area which could also result in fewer trucks on local streets, enhanced marketability of industrial sites, and reduced travel costs for existing businesses in the area.

4.1.6 Potential Community Impact Mitigation Measures

Methods to address potential adverse community impacts of a project include avoidance, minimization, mitigation, and enhancement. The EEC mitigation plan development involves the individual landowners, the communities within the study area, the various resource management agencies, and local governments having jurisdictional responsibilities within the project area. Mitigation measures will continue to be developed during the subsequent design and construction phases consistent with the levels of impacts associated with the project and the effectiveness of the mitigation. The general types of mitigation plans that are being developed and coordinated between the City of Durham and NCDOT include:

- local access control plans including service roads and signage for the affected roadways and properties in the study area;
- enhancement and enforcement of land development controls and restrictions within the project study area (e.g., zoning ordinances, growth strategy plans);
- relocation plans for displaced residences, businesses, and other affected properties;
- bicycle/pedestrian improvements for suitable locations and compatible with Durham City-County plans for these types of facilities.
- bridge aesthetics enhancements;
- project lighting;

4.1.7 Noise

The following is an excerpt from the Preliminary Traffic Noise Analysis Report, Proposed East End Connector, Durham County, and prepared by the Traffic Noise and Air Quality Section, North Carolina Department of Transportation, July 30, 2007.

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dBA of the Table 3-7 value), or [b] substantially exceed the existing noise levels. The NCDOT definition of substantial increase is shown in Table 3-8. Consideration for noise abatement measures must be given to receptors that fall in either category.

In accordance with the NCDOT 2004 Traffic Noise Abatement Policy, Federal and State governments are not responsible for providing noise abatement measures for new development for which building permits are issued within the noise impact area of a proposed highway after the Date of Public Knowledge. The Date of Public Knowledge of the location of a proposed highway project will be the approval date of the final document (likely a FONSI). For development occurring after this date, local governing bodies are responsible for ensuring that noise compatible designs are utilized along the proposed facility.

Two criteria determine traffic noise impacts: a) locations approaching or exceeding FHWA noise abatement standards or b) locations where there is a substantial increase over existing noise levels. Results from the EEC Traffic Noise Model (TNM 2.5[©]) are shown in Table 4-2, and are in accordance with Title 23 CFR Part 772. For the proposed East End Connector alignment, noise levels at thirteen (13) locations are predicted to exceed FHWA NAC criteria. With respect to the exterior traffic noise level, there are eleven (11) receptors with substantial noise level impacts having substantial increases above ambient levels that range up to +22 dBA. Of these, there is one area of eight (8) receptors with predicted impacts in the vicinity of Rowena Avenue that could be considered for noise abatement. When real-life noises are

heard, it is barely possible to detect noise level changes of 2-3 dBA. A 5-dBA change is more readily noticeable.

The preferred alternative should be reevaluated during the project's design phase to develop a more detailed determination of the noise impacts and appropriate mitigation measures. The final decision regarding noise abatement measures will be made only upon completion of the project final design and the public involvement process. Figure 3-4 in Chapter 3 shows the relationship of Alternative 3 to noise receptors in the study area.

**Table 4-2
Predicted Traffic Noise Impacts**

Characteristic	Residences	Churches	Businesses	Total
Approaches or Exceeds FHWA NAC*				
Number of Sites	9	1	3	13
Substantial Increase in Exterior Noise Levels				
Number of Sites	8	0	3	11

*NAC- Noise Abatement Criteria

Per Traffic Noise Model 2.5 and in accordance with 23 CFR Part 772

Source: Preliminary Traffic Noise Analysis Report, Proposed East End Connector, Durham County, prepared by the Traffic Noise and Air Quality Section, North Carolina Department of Transportation, July 30, 2007.

4.1.7.1 Traffic Noise Abatement Measures

If traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures must be given to all impacted receptors. The following discussion addresses the applicability of mitigation measures to the proposed project.

Highway Alignment Selection

Highway alignment selection involves the horizontal or vertical orientation of the proposed improvements in such a way as to minimize impacts and costs. For noise abatement, horizontal alignment selection is primarily a matter of locating the roadway at a sufficient distance from noise sensitive areas. Alternatives studied did consider noise sensitive areas; however, shifting the alignment specifically for noise abatement would result in other unacceptable impacts including displacements of neighborhoods or destruction of natural systems. Alternatives studied considered the cumulative impacts on the human and physical environment with noise abatement being only one of the many potential project impacts.

Traffic System Management Measures

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

Noise Barriers

Noise barriers reduce noise levels by blocking the sound path between a noise sensitive area and a roadway. This measure is most often used on high-speed, limited-access facilities where noise levels are high and there is adequate space for continuous barriers. Access restrictions permit the application of solid mass, attenuable measures to effectively diffract, absorb and reflect highway traffic noise. These measures consist of the use of materials such as concrete, wood, metal, earth or vegetation. However, these mitigating measures may not be feasible or reasonable in all cases, particularly for receptors that front a primary or secondary roadway in the project area. Reduction of the traffic noise from the proposed roadway may not substantially lower the noise levels at these receptors due to the noise level contributions from the primary or secondary roadways. Furthermore, for isolated receptors, or where the application of physical abatement may not achieve at least a 5 dBA reduction, the probable noise reduction in relation to the benefits provided as compared to the cost may not be reasonable.

NCDOT conducted a noise barrier evaluation at the location of predicted impacts along the proposed alignment. The evaluation was accomplished in two steps. First, a qualitative barrier evaluation was performed for each impacted receptor that considered each receptor's FHWA NAC activity category, source-receptor relationships, impacted site densities, and the ability to have continuous barriers. The second step of the barrier evaluation involved computer modeling of noise barriers at the potential location, using the TNM traffic noise prediction model. Only one area was identified as a potential location for noise mitigation in the form of a noise barrier.

For a noise barrier to be considered feasible, it must meet, among other factors, the following conditions:

- Provide a minimum insertion loss of 5 dBA, preferably 8 dBA or more (for receptors directly adjacent to the project)
- Be located in an acoustic environment where no other noise sources are present
- Be suitable for construction given the topography of the location

Other primary considerations of the reasonableness of noise barrier installation are that it is cost effective per NCDOT Noise Abatement Policy and that development of the impacted structure (residence, business, etc.) occurred before the date of public knowledge.

In accordance with the NCDOT 2004 Traffic Noise Abatement policy, Federal and State governments are not responsible for providing noise abatement measures for new development for which building permits are issued within the noise impact area of a proposed highway after the date of public knowledge. The date of public knowledge of the location of a proposed highway project will be the approval date of the final document (Categorical Exclusion, FONSI, or Record of Decision - for this project, likely a FONSI). For development occurring after this date, local governing bodies are responsible to ensure that noise compatible design are utilized along the proposed facility.

The identified noise-impacted area along the proposed alignment is located on the north side of the East-West Connector between the NC 147 and US 70 interchanges in the vicinity of Rowena Avenue. Based on preliminary studies described in this report, the likely noise abatement measure for this area is a pile and panel concrete wall that benefits five receptors. The potential wall would range in height from 10 to 12 feet and would be approximately 1,082 feet long. Also, in order to be effective, the noise barrier would be constructed on the elevated bridge at Rowena Avenue and corresponding roadway approaches, resulting in additional costs in structure design and construction. The resulting effects on aesthetics and sunlight on adjacent properties by an elevated noise structure will be discussed with property owners and residents, including NCDOT noise policy, and policy regarding alternative mitigation during the project's final design phase to determine more accurately the noise impacts and appropriate mitigation measures.

Other Mitigation Measures Considered

The acquisition of property in order to provide buffer zones to minimize noise impacts is not considered to be a feasible noise mitigation measure for this project. The cost to acquire impacted receptors for buffer zones will exceed the abatement threshold allowed cost per benefited receptor. The use of buffer zones to minimize impacts to future sensitive areas is not recommended because this could be accomplished through land use control.

The use of vegetation for noise mitigation is not considered reasonable for this project, due to the substantial amount of right-of-way necessary to make vegetative barriers effective. FHWA research found that a vegetative barrier should be approximately 100' wide to provide a 3-dBA reduction in noise levels. In order to provide a 5-dBA reduction, substantial amounts of additional right-of-way will be required. The cost of the additional right-of-way and plant sufficient vegetation is estimated to exceed the allowable abatement threshold for benefited receptors. Noise insulation was also considered; however, no public or non-profit institutions were identified that will be eligible for consideration for noise insulation.

4.1.8 Air Quality

The following is an excerpt from the Air Quality Analysis Report, Proposed East End Connector, Durham, and prepared by the Traffic Noise and Air Quality Section, North Carolina Department of Transportation, May 10, 2007.

Air pollution originates from various sources. Emissions from industry and internal combustion engines are the most prevalent sources. The impact resulting from highway construction ranges from intensifying existing air pollution problems to improving the ambient air quality. Changing traffic patterns are a primary concern when determining the impact of a new highway facility or the improvement of an existing highway facility. Motor vehicles emit carbon monoxide (CO), nitrogen oxide (NO), hydrocarbons (HC), particulate matter, sulfur dioxide (SO₂), and lead (Pb) (listed in order of decreasing emission rate). Automobiles are considered the major source of CO in the project area. For this reason, most of the analysis presented herein is concerned with determining expected carbon monoxide levels in the vicinity of the project due to traffic flow.

4.1.8.1 CO Microscale Analysis

A microscale air quality analysis was performed to determine future CO concentrations resulting from the proposed highway improvements. CAL3QHC - A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections" was used to predict the CO concentration near sensitive receptors. The worst-case air quality scenario was determined to be in the vicinity of the intersection of US 70 and SR 1815 (Pleasant Drive). The predicted one-hour average CO concentrations for the evaluation years of 2015, 2020, and 2035 are 5.40, 5.20 and 5.90 ppm, respectively. Comparison of the predicted CO concentrations with the NAAQS (maximum permitted for one-hour averaging period =35 ppm; 8-hour averaging period =9ppm) indicates no violation of these standards. Since the results of the worst-case one-hour CO analysis for the build scenario is less than 9 ppm, it can be concluded that the 8-hour CO level does not exceed the standard. (See the Air Quality Technical Appendix for input data and output.)

4.1.8.2 Attainment Status

The project is located in Durham County, which is within the Raleigh-Durham-Chapel Hill nonattainment area for ozone (O₃) and the Raleigh-Durham nonattainment area for carbon monoxide (CO) as defined by the EPA. The 1990 Clean Air Act Amendments (CAAA) designated these areas as moderate nonattainment areas for CO. However, due to improved monitoring data, these areas were redesignated as maintenance for CO on September 18, 1995. The area was designated nonattainment for O₃ under the eight-hour ozone standard effective June 15, 2004. Section 176(c) of the CAAA requires that transportation plans, programs, and projects conform to the intent of the state air quality implementation plan (SIP). The current SIP does not contain any transportation control measures for Durham County. The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization 2030 Long Range Transportation Plan (LRTP) and the 2009-2015 Metropolitan Transportation Improvement Program (MTIP) conform to the intent of the SIP. The USDOT made a

conformity determination on the LRTP on June 29, 2007, and the MTIP on October 1, 2008. The current conformity determination is consistent with the final conformity rule found in 40CFR Parts 51 and 93. There are no significant changes in the project's design concept or scope, as used in the conformity analyses.

4.1.8.3 *Mobile Source Air Toxics*

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling emissions of Hazardous Air pollutants from Mobile Sources in 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in Figure 4-2.

The EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(1) that will address these issues and could adjust the full 21 and the primary 6 MSATs.

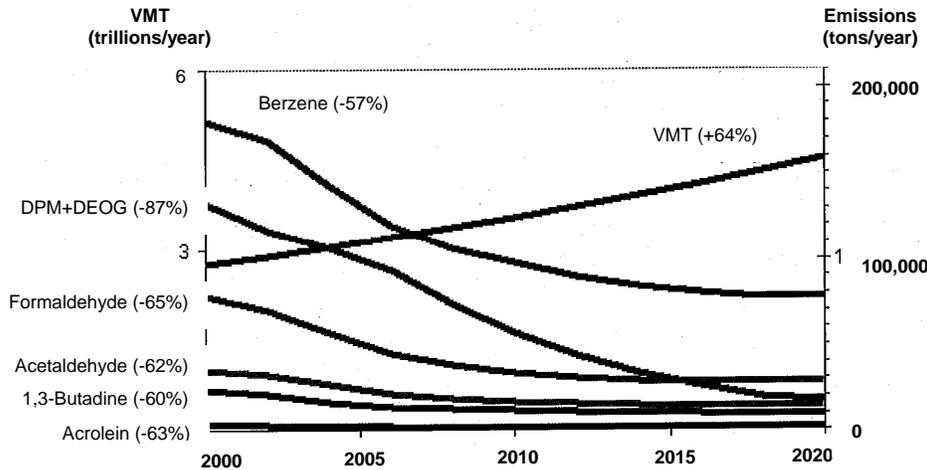
Unavailable Information for Project Specific MSAT Impact Analysis

This EA includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the alternatives in this EA. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

Evaluating the environmental and health impacts from MSATs on a proposed highway project involves several key elements, including emissions modeling; dispersion modeling in order to estimate ambient concentrations resulting from the

estimated emissions; exposure modeling in order to estimate human exposure to the estimated concentrations; and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

**Figure 4-2
Vehicle Miles Traveled (VMT)
vs. Emissions, 2000-2020**



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50 percent. Gasoline RVP and oxygenate content are held constant. VMT: Highway Statistics 2000, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5 percent/ "DPM + DEOG" is based on MOBILE6.2- generated factors for elemental carbon, organic carbon and SO4 from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns.

Emissions

The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model – emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE 6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE 6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large

projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

Dispersion

The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas of use in establishing project-specific MSAT background concentrations.

Exposure Levels and Health Effects

Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current technologies for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupported assumptions will have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments will not be useful to decision makers, who will need to weight this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for

local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or state level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information Systems (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at <http://www.epa.gov/iris>. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicity of these chemicals or mixtures.

Benzene is characterized as a known human carcinogen. The potential carcinogenicity of acrolein cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.

Formaldehyde is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.

1,3-butadiene is characterized as carcinogenic to humans by inhalation.

Acetaldehyde is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.

Diesel exhaust (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases. Diesel exhaust also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes – particularly respiratory problems¹. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that will be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

¹ South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality; NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives will have "significant adverse impacts on the human environment."

This document provides a quantitative analysis of MSAT emissions relative to the alternatives and acknowledges that some of the project alternatives may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

As discussed above, technical shortcomings of emissions and dispersion models prevent meaningful or reliable estimates of MSAT emissions and effects of this project. Also, these models are an uncertain science with respect to health effects. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions – if any – from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives*, found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

The additional travel lanes contemplated as part of the project alternatives will have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under certain Build Alternatives than the No-Build Alternative. The localized increases in MSAT concentrations will likely be most pronounced along US 70, whose traffic will be re-directed to the new proposed East End Connector. Upon completion of the East End Connector, the localized increases in MSAT concentrations will most likely decrease on US 70, due to increased speed and the existence of the East End Connector. However, as discussed above, the magnitude and the duration of these

potential increases compared to the No-Build Alternative cannot be accurately quantified due to the inherent deficiencies of current models.

In sum, when a highway is widened and, as a result, moves closer to receptors, the localized levels of MSAT emissions for Alternative 3 could be higher relative to the No-Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSATs will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover will, over time, cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

Lessening the effects of mobile source air toxics should be considered for projects with substantial construction-related MSAT emissions that are likely to occur over an extended building period, and for post-construction scenarios where the NEPA analysis indicates potentially meaningful MSAT levels. Such mitigation efforts should be evaluated based on the circumstances associated with individual projects and they may not be appropriate in all cases. However, there are a number of available mitigation strategies and solutions for countering the effects of MSAT emissions.

During construction of the proposed project, all materials resulting from clearing and grubbing, demolition or other operations will be removed from the project, burned or otherwise disposed of by the Contractor. Any burning done will be done in accordance with applicable local laws and ordinances and regulations of the North Carolina SIP for air quality in compliance with 15 NCAC 2D.0520. Care will be taken to insure burning will be done at the greatest practical distance from dwellings and not when atmospheric conditions are such as to create a hazard to the public. Burning will be performed under constant surveillance. Also during construction, measures will be taken to reduce the dust generated by construction when the control of dust is necessary for the protection and comfort of motorists or area residents. This evaluation completes the assessment requirements for air quality of the 1990 Clean Air Act Amendments and the NEPA process, and no additional reports are necessary.

4.1.9 Farmlands

Farmland soils located within an urbanized area or in an area committed to urban development by the local governing entity are exempt from the 1981 Farmland Protection Policy Act (FPPA) regulations. The EEC study area is located within a primarily urban/suburban setting and entirely within the designated Urban Growth Area boundary of the City of Durham; therefore, no further consideration of potential impacts to farmland is required.

4.1.10 Utilities

The following is a summary of the Utility Estimates Report, Proposed East End Connector, Durham, prepared by North Carolina Department of Transportation, May 3, 2007.

Major existing utilities within the study area include electrical transmission lines, telephone lines, natural gas lines, water lines, and sanitary sewer lines. Construction of Alternative 3 will require some adjustment, relocation, or modification to public utilities in the study area. Also, relocations of up to nine large transmission towers will be required east of Angier Avenue. During final design, all utility providers will be contacted, and coordination will be undertaken to ensure that the proposed design will not lead to a substantial disruption of service during construction. See Table 4-3.

**Table 4-3
Utility Relocation Cost Estimates**

Utility	East End Connector
Power Line	\$4,760,489
Utility Pole	\$173,720
Gas Lines	\$190,197
New Water Line Construction	\$100,000
New Sewer Line Construction	\$62,000
Total	\$5,286,406

Source: East End Connector Utility Estimate Worksheet, North Carolina Department of Transportation, May 3, 2007.

4.1.11 Visual Impacts

Analysis of the visual impacts is limited to addressing publicly accessible views of the landscape associated primarily with roadways and public lands. The viewer groups analyzed are those with views of the project as opposed to viewer groups with views from the project. The viewer impact study did not identify any natural features with aesthetic value that may require protection from the construction of the East End Connector.

The freeway will have visual impacts along US 70, Rowena Avenue, Angier Avenue and along the Durham Freeway. Visual impacts will be at a minimum along US 70 except on South Miami Boulevard near East End Avenue. Here, the overpasses will be viewed by property adjacent to the East End Connector. The East End Connector will have bridges over Rowena Avenue and Angier Avenue which will visually impact the residences adjacent to the roadway. Along the Durham Freeway adjacent property (mostly businesses) will be visually impacted by the overpasses in the area that connect the freeway to the East End Connector. In most cases the proposed roadway's visual impacts will be negligible due to its significant separation from the nearby properties and because of natural vegetation buffers. Also, for many properties the East End Connector will be an improvement to a roadway that already exists, resulting in minimal increased visual impacts. Possible mitigation measures to properties with significant visual impacts could include placing vegetated landscaped buffers along the proposed right-of-way.

4.1.12 Hazardous Materials

The hazardous materials analysis is contained in the GeoEnvironmental Impact Evaluation Report, Proposed East End Connector, Durham, and prepared by Geotechnical Engineering Unit of the North Carolina Department of Transportation, March 2006 and January 2007.

According to the geotechnical surveys, of the 44 possible sites presently or formerly containing petroleum underground storage tanks (USTs), four hazardous waste (superfund) sites identified were within the project study area, and nine (9) UST sites were located within 100 feet of Alternative 3. With respect to the hazardous waste (Superfund) sites, no site was located in proximity to the proposed alignment.

If it becomes apparent during final design that potential hazardous materials or waste sites may be impacted, additional detailed assessments will be conducted to determine the specific materials and locations, and whether remediation will be required.

4.2 Land Use and Transportation Planning

Alternative 3, the preferred alternative, is consistent with all land use and transportation plans adopted by the City of Durham, Durham County and the Durham/ Chapel Hill/ Carrboro Metropolitan Planning Organization (DCHC MPO). The EEC has been a component of the long-range planning initiatives of the City of Durham and Durham County for many years and is consistent with the state, regional, and local transportation plans for the area. The proposed East End Connector project is consistent with the City / County Comprehensive Plan and the long range transportation plan (LRTP) developed and approved by the DCHC MPO.

4.3 Cultural Resources

4.3.1 Historic Architecture Resources

There are no historic architectural resources located within the study area that will be affected by the proposed EEC project. The correspondence from SHPO dated August 14, 2006 regarding this determination is included in Appendix A.

4.3.2 Archaeological Resources

The North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO) conducted a review of the EEC project study area and determined that there are no archeological resources located within the study area that will be affected by the proposed EEC project. The correspondence from SHPO dated August 14, 2006 regarding this determination is included in Appendix A.

4.4 Natural Environment

The Biotic Communities and Protected Species Report, East End Connector, Durham, North Carolina, North Carolina Department of Transportation, Project Development and Environmental Analysis Branch, prepared by the Natural Environmental Unit, May 2007 has a detailed analysis of the project impacts.

4.4.1 Biotic Community and Wildlife

4.4.1.1 *Terrestrial Community and Wildlife*

Construction of the project will have various impacts on the biotic resources in the study area. Any construction-related activities in or near these resources have the potential to impact biological functions. Table 4-4 provides the acreage of the three community types within the proposed alignment. The amount of impact may be higher or lower than the coverage areas listed below, depending on whether revisions/modifications are made during preliminary and final design. Approximately half of the area impacted is comprised of the maintained/disturbed community which includes lawns, farmland, and right-of-way.

**Table 4-4
Coverage Area of Terrestrial Communities**

Community Type	Acres (ac)	Percent of Total(%)
Maintained/Disturbed*	137.26	49.86
Mixed Pine/Hardwood Forest	99.55	36.16
Pine Forest	38.48	13.98
TOTAL	275.30	100.00

* The surface areas of the roadways were included when calculating maintained/disturbed acreage.

4.4.1.2 *Aquatic Community and Wildlife*

Environmental impacts from construction activities may result in long term or irreversible effects to aquatic organisms and to their habitat because of their acute sensitivity to changes in their environment. Impacts usually associated with in-stream construction include alterations to the substrate and impacts to adjacent streamside vegetation. Such disturbance within the substrate leads to increased siltation, which can clog the gills and/or feeding mechanisms of benthic organisms, fish, and amphibian species. Siltation may also cover benthic macroinvertebrates with excessive amounts of sediment that inhibit their ability to obtain oxygen.

4.4.2 Water Resources

4.4.2.1 *Major Drainage Structures*

The East End Connector crosses a number of streams and drainage areas for which bridges, box culverts, or pipe culverts will be required. Table 4-5 lists the major drainage structures associated with Alternative 3. The stream numbers referenced in the table and the Alternative 3 corridor are shown in Figure 3-9 in Chapter 3. Correspondence regarding hydraulic

recommendations for the proposed project is included in the Natural Resources Technical Report.

**Table 4-5
Major Drainage Structures**

Site Number	Stream	Recommended Structure	Comments
2A	S-18 – UT	6'x8' RCBC	Retain
2B	S-18 – UT	6'x9' RCBC	New
2C	S-18 - UT	7'x9' RCBC	New
2D	S-18 - UT	7'x9' RCBC	New
3A	S-6 - UT	6'x9.5' RCBC	Retain & Extend
4D	S-P - UT	7'x6' RCBC	Retain

RCBC – Reinforced Concrete Box Culvert

All hydraulic structures will be designed such that the proposed structures will not substantially increase upstream flooding and will not increase the flood hazard potential of the existing floodplain. No channel relocations are anticipated based on the preliminary engineering designs for the East End Connector; however, if channel relocations are required in the final design, they will be designed according to the most recent guidelines for open channels and will match the existing channel as closely as possible. It should be noted that the recommended structure sizes are preliminary and could be subject to change during final design when more detailed information is available.

Natural channel design techniques will be investigated and pursued in the area of the culverts for stabilization purposes. The standard sedimentation and erosion control measures adopted by the NCDOT for the installation of culverts will be followed.

4.4.2.2 *Stream/Pond Impacts*

The U-0071 – East End Connector, Wetland, Stream Buffer and Threatened And Endangered Species Report, Durham County, North Carolina prepared by the NCDOT includes details about each stream.

The number and length of impacted perennial stream channels and ponds for the preliminary engineering design of Alternative 3 as of December 2006 are represented in Table 4-6 and Table 4-7. Anticipated surface water impacts were calculated based on the length of each stream within the estimated construction limits. Additional areas outside the project study area might be indirectly affected due to changes in water levels and siltation from construction activities; however, impacts to these areas were not calculated.

Two Lynn Road realignment options were presented to the Merger 01 Team on December 13, 2007. General consensus was that either option presented minimum jurisdictional water impacts. The realignment option subsequently chosen resulted in the impacts shown in Table 4-6 and Table 4-7.

**Table 4-6
Estimated Stream Impacts**

Stream / Seasonality	Stream Name	Estimated Impacts		
		Linear Impacts (Ft)	Zone 1 Buffer Impacts (Ac)	Zone 2 Buffer Impacts (Ac)
Intermittent	S-2 – UT to Little Lick	105	0.14	0.10
Perennial	S-6 – UT to Little Lick	940	1.29	0.86
Intermittent	S-7 – UT to Little Lick	185	0.25	0.17
Intermittent	S-16 – UT to Little Lick	558	0.77	0.51
Perennial	S-18 – UT to Little Lick	750	1.03	0.69
Intermittent	S-19 – UT to Little Lick	618	0.85	0.57
Intermittent	S-26 – UT to Little Lick	480	0.66	0.44
Perennial	S-30 – UT to Northeast	250	N/A*	N/A*
Intermittent	S-35 – UT to Little Lick	468	0.64	0.43
Intermittent **	S-A – UT to Little Lick	490	0.67	0.45
Intermittent	S-B – UT to Little Lick	462	0.64	0.42
Perennial	S-D – UT to Third Fork Creek	225	N/A *	N/A *
Lynn Rd. Realignment				
Intermittent	S-2 – UT to Little Lick	180	0.25	0.17
Total		5,711	7.19	4.81

* Cape Fear Basin – No Buffer Regulation

** Mitigation Required by the USACE

**Table 4-7
Estimated Pond Impacts**

Wetland	Impact (acres)	Description	Type	NCDWQ Rating
Pond 8	0.84	PUBHh	N/A	N/A
Pond 10	0.07	PUBEhd	N/A	N/A
Pond 12	0.22	PUBHhxd	N/A	N/A
Total	1.13			

Perennial streams are those meeting the criteria set forth by the North Carolina Division of Water Quality (NCDWQ). The perennial streams are considered to be significant, in that they possess the consistent hydrology to support aquatic populations. Streams for which mitigation of impacts may be required are classified based on guidance from the US Army Corps of Engineers (USACE). The USACE is responsible for making the final decision regarding required mitigation. Compensatory mitigation is required for stream channel impacts greater than 150 linear feet.

Where the need for stream relocations is anticipated, coordination with the US Fish and Wildlife Service (USFWS) and the NC Wildlife Resources Commission (NCWRC) will be completed in accordance with mandates expressed in the Fish and Wildlife Coordination Act (72 Stat. 563, as amended, 16 USC 661 et seq. [1976]).

Mitigation must be provided for important stream channel impacts exceeding 150 linear feet. Complete bridging of the stream channel will not require mitigation, but construction of standard culverts will require mitigation for the disturbed stream channel. A conceptual mitigation plan will be developed during final design and coordinated with the North Carolina Ecological Enhancement Program. The following mitigation measures to eliminate or reduce short-term and long-term water quality impacts will be incorporated wherever practicable:

- Development of roadway alignments that avoid streams and ponds to the extent possible.
- Use of design measures to protect water quality, including avoiding stormwater discharge into public water supplies, minimizing stream crossings, and minimizing segments of roadway that closely parallels streams.
- Use of grass shoulders, grass lined ditches, and vegetative buffers to intercept highway runoff.
- Implementation of construction practices that protect stream bottom habitat from siltation by sedimentation control, retention of riparian vegetation buffers, and restoration of stream bottom habitat taken by construction.
- Restricting the use of scuppers (bridge deck drains) on bridges.

4.4.2.3 *Floodplain / Floodways*

Durham County and the City of Durham are participants in the National Flood Insurance Regulatory Program. The proposed alignment for the East End Connector project will not directly impact areas designated as 100-year floodplain/floodway. One mapped flood zone just outside the project limits is worth noting. The site is located just north of the intersection at Holloway Street (NC98) and North Miami Boulevard. (Business US70). The limits of work along Holloway Street stop just north of the culvert/ stream crossing; therefore, the proposed alternative currently has no impact to the flood zone. If during the final design the project limits are extended, the established floodway could be impacted.

4.4.3 Jurisdictional Issues

4.4.3.1 *Impacts to Jurisdictional Wetlands and Surface Waters*¹

Table 4-8 provides a detailed listing of potential direct impacts to wetlands based on the estimated construction limits shown on the preliminary engineering designs as of August 2007. The U-0071 – East End Connector Wetland, Stream, Buffer and Threatened and Endangered Species Report (December 2006) includes additional details about the wetlands. Figure 3-9 in Chapter 3 shows the jurisdictional wetlands, streams, and ponds delineated within the East End Connector and their relationship to the Alternative 3 corridor. Section 4.5.2.2 above discusses stream/pond impacts in detail.

¹ Source: The U-0071 East End Connector Wetland, Stream, Buffer, and Threatened and Endangered Species Report (December 2006) prepared by NCDOT-NEU.

As previously mentioned, two Lynn Road realignment options were presented during the Merger 01, 4A Concurrence meeting on December 13, 2007. The realignment option chosen resulted in no additional wetland impacts.

An assessment of the jurisdictional wetlands was performed using the fourth version of NCDWQ's Guidance for Rating the Values of Wetlands in North Carolina. This method assigns values to the wetland areas with respect to six criteria: 1) water storage, 2) bank/shoreline stabilization, 3) pollutant removal, 4) wildlife habitat, 5) aquatic life habitat, and 6) recreation/education. Jurisdictional wetlands were subdivided and characterized according to type, then each distinct wetland was evaluated for the six criteria based on current field conditions, using the applicable flow chart. The result is a numerical assignment between 0 and 100 for each wetland.

In addition to the direct impacts within the right-of-way of the preliminary engineering designs, other adverse impacts to wetlands and aquatic sites associated with project construction could include direct or indirect hydrologic impacts resulting from the alteration of drainage patterns. The concentration of overland flow into pipes and the potential increases in stormwater runoff could lead to downstream channel incision and consequent wetland hydrology alterations. In addition to permanent alterations, temporary adverse impacts also may occur, such as temporary pond dewatering and stream diversion during the construction of bridges and culverts, and temporary clearing and filling associated with underground utility relocation and construction access.

**Table 4-8
Estimated Wetland Impacts**

Wetland	Impact (acres)	Description	Type	NCDWQ Rating
W-28	0.04	PEM1A	Riverine	29
W-B	0.09	PF01A	Riverine	47
W-31	0.07	PSS1E	Non-riverine	16
W-39	0.04	PF01A	N/A	49
Pond 11	0.05	PUBEx	Non-riverine	16
Total	0.29			

4.4.3.2 *Permits*

Because this project will likely impact more than 300 feet of jurisdictional stream and/or a ½ acre of jurisdictional wetlands, an Individual Permit from the USACE is anticipated to satisfy Section 404 of the Clean Water Act. Additionally, an Individual Section 401 Water Quality Certification must be obtained from the DWQ.

The Neuse River Buffer Rules applies to 50-foot wide riparian buffers directly adjacent to applicable surface waters of the Neuse River basin. The preferred alternative is anticipated to impact approximately 12 acres of riparian buffer, comprised of 7.19 acres in Zone 1 and 4.81 acres in Zone 2 (see Table 4-6). While this impact is not considered significant, a Neuse River riparian buffer

Authorization Certificate will be needed in addition to a USACE Section 404 permit and a DWQ Section 401 Water Quality Certification.

4.4.3.3 *Mitigation Evaluation*

Mitigation is defined in NEPA regulations (40 CFR Section 1508.20 and 40 CFR Part 230) as efforts that a) avoid, b) minimize, c) rectify, d) reduce or eliminate, or e) compensate for adverse impacts to the environment. Mitigation of wetland impacts is recommended in accordance with Clean Water Act (CWA) Section 404(b)(1) Guidelines (40 CFR Part 230), FHWA step down procedures (23 CFR Sections 777.1 et seq.), mitigation policy mandates articulated in the USACE/USEPA Memorandum of Agreement (MOA; Page and Wilcher 1990), Executive Order 11990 (42 FR 26961 [1977]), and US Fish and Wildlife Service mitigation policy directives (46 FR 7644-7663 [1981]).

Section 404(b)(1) Guidelines, the USACE/USEPA MOA, and Executive Order 11990 stress avoidance and minimization as primary considerations for protection of Waters of the United States. These efforts, and other measures that may be implemented later in the design process in consultation with the USACE, are described below.

Avoidance and Minimization

During the planning and design process, the following design changes (summarized in Table 4-9) were made to avoid and minimize impacts. Wetland impacts were reduced by 0.16 acres. Stream impacts were reduced by 2,020 linear feet.

- The proposed East End Connector was shifted to avoid stream S-11. It also was shifted to a 90-degree skew to cross stream S-6. The proposed alignment also avoids wetland W-40, and ponds 41 and 42. Additionally, the narrowest median that meets design standards was selected for the corridor.
- The Rowena Avenue Extension was eliminated. Instead, access was provided along East End Avenue Extension. As a result, impacts to wetland W-26, Pond 23 and streams S-18 and S-24 were avoided.
- The northbound NC 147 flyover ramp was replaced with a left exit off the East End Connector reducing the impact to stream S-30.
- The Miami Boulevard northbound exit ramp was shifted closer to US 70, reducing the length of impact to S-18.
- Jurisdictional impacts were further minimized by adding guardrail, which allows fill slope limits to be reduced at stream and wetland crossings.

**Table 4-9
Avoidance and Minimization Summary**

Feature	Potential Impact Prior to Avoidance and Minimization	Anticipated Impact
S-11	370 LF	0 LF
W-40	0.07 AC	0 AC
Pond 41	0.03 AC	0 AC
Pond 42	0.16 AC	0 AC
Pond 23	0.29 AC	0 AC
W-26	0.09 AC	0 AC
S-18	475 LF	0 LF
S-24	145 LF	0 LF
S-30	1280 LF	250 LF

The potential mitigation sites listed in Table 4-10 will be further discussed during the Merger 01 4B and 4C concurrence meetings. Decisions regarding final mitigation plans for the project will be made in cooperation with the Ecological Enhancement Program (EEP), the USACE, and the NCDWQ.

**Table 4-10
Potential On-Site Mitigation**

Stream Id	Stream Name	Status	Existing Conditions & Restraints	Mitigation potential	Comments
S-A	UT to Little Lick Creek	intermittent - important	stream located between two businesses in deep gully, sewer line present	maybe	potential relocation, will revisit with 25% plans
S-6 (@ city park)	UT to Little Lick Creek	perennial	highly incised, riparian buffer present, adj. to sewer line near park	maybe	will be bisected by connector, revisit southern portion w/ 25% design plans

Compensatory Mitigation

The purpose of compensatory mitigation is to replace the lost functions and values from a project's impacts to Waters of the United States. Mitigation could include restoration, creation, enhancement, or preservation of wetlands and streams. Mitigation should be implemented as close to the impacts as possible. The amount of mitigation required is determined on a case-by-case basis. Typical mitigation ratios (amount of mitigation required compared to amount impacted) for wetland mitigation are 2:1 for restoration (meaning 2 acres must be restored for every 1 acre impacted), 3:1 for creation, 4:1 for enhancement, and 10:1 for preservation. Typical ratios for stream mitigation are 2:1 (2 feet of mitigation for every 1 foot impacted), 2:1 for restoration, 4:1 for enhancement, and 10:1 for preservation.

Currently, NCDWQ requires a minimum of 1:1 restoration for wetland and stream impacts.

If on-site opportunities are not sufficient to mitigate for potential wetland and stream impacts, or are not available for mitigation, off-site compensatory mitigation will be accomplished through coordination with the North Carolina Ecosystem Enhancement Program (NCEEP). The USACE, NCDOT and NC Department of Environment and Natural Resources entered into a Memorandum of Agreement (MOA) in July 2003 that established procedures for providing compensatory mitigation through NCEEP to offset impacts to streams and wetlands from NCDOT projects. The three parties agreed that mitigation for transportation projects should occur before impacts and using a watershed approach. Appropriate compensatory mitigation requirements for wetland and stream impacts from Alternative 3 will be determined in consultation with the appropriate federal and state environmental resource and regulatory agencies.

The conclusion of these surveys was that the proposed project will have no effect on federally protected species.

4.5 Construction

Construction of the preferred alternative, Alternative 3, may cause temporary adverse impacts to the local environment, including impacts to air quality, water quality, noise, and biotic communities. Construction impacts are generally short-term in nature and can be controlled, minimized, or mitigated through the use of Best Management Practices and standard NCDOT procedures.

Short-term impacts to adjacent land uses during construction, especially in built-up areas, will occur due to the movement of workers and materials through the area and construction activities. Construction noise and dust, as well as temporary disruption of traffic flow on local roads, may also affect residences, businesses, and farming operations in the vicinity of the project. Coordination between the NCDOT and landowners regarding construction scheduling and access to the construction site and right-of-way will minimize any such disruptions.

Potential construction-related impacts are briefly summarized below.

4.5.1 Air Quality

Temporary degradation of the air quality in the project area will result from the construction of the project. Initial clearing and grubbing will produce dust and exhaust emissions. Open burning, if allowed, also will contribute to local air pollution. The contractor will be responsible for controlling dust at the project site and at areas affected by the construction, including unpaved secondary roads, haul roads, access roads, disposal site, borrowed material sources, and production sites. Dust control measures may include the following activities:

- Minimizing exposed earth surface
- Temporary and permanent seeding and mulching
- Watering working and haul areas during dry periods
- Covering, shielding, or stabilizing material stockpiles
- Using covered haul trucks

Emissions from construction equipment are regulated by federal standards. Any burning of cleared materials will be conducted in accordance with applicable state and local laws, regulations and ordinances and the regulations of the North Carolina SIP for air quality, in compliance with 15 NCAC 2D.0520. Care will be taken to ensure burning occurs under constant supervision, at the greatest practical distance from homes, and not when weather conditions could create hazards.

4.5.2 Noise

Heavy construction equipment and blasting operations will generate noise and vibration. Although the study alternative traverses primarily low density residential areas, neighboring communities will be temporarily impacted. The duration and level of noise differs with each phase of construction. Typically, ground clearing and excavation generate the highest noise levels. Noise generated by construction equipment, including trucks, graders, bulldozers, concrete mixers, and portable generators can reach noise levels of 67 dBA to 98 dBA at a distance of 50 feet.

The NCDOT specifications require the contractor to limit noise levels to 80 dBA Leq in sensitive areas adjacent to the project. The NCDOT may also monitor construction noise and require abatement where limits are exceeded. The NCDOT also can limit work that produces objectionable noise during normal sleeping hours.

4.5.3 Water Quality

Erosion and sedimentation caused by construction activities could affect drainage patterns and water quality. In accordance with the North Carolina Sedimentation Pollution Control Act (15A NCAC 4B.0001-.0027), an erosion and sedimentation control plan must be prepared for land-disturbing activities that cover one or more acres to protect against runoff from a ten-year storm.

Prior to construction, an erosion and sedimentation control plan will be developed for Alternative 3 in accordance with the NCDENR publication *Erosion and Sediment Control Planning and Design* and the NCDOT's *Best Management Practices for Protection of Surface Waters*. These Best Management Practices include, but are not limited to the following activities:

- Using berms, dikes, silt barrier, and catch basins
- Vegetating or covering disturbed areas
- Conforming with proper clean-up practices

The NCDOT also has *Standard Specifications* that require proper handling and use of construction materials. The contractor will be responsible for taking every reasonable precaution throughout construction of the project to prevent pollution of any body of water. Pollutants such as chemicals, fuels, lubricants, bitumens, raw sewage, and other harmful wastes shall not be discharged into any body of water. The contractor also will be responsible for preventing soil erosion and stream siltation. Contractors shall not ford streams with mechanical equipment unless construction is required in the stream bed, including stream rerouting, channel improvements, and culvert construction.

Excavated materials will not be stockpiled or disposed of adjacent to, or in, areas where storm water runoff may cause erosions of the material into surface waters. If material storage

in these areas is unavoidable, the contractor must implement measures to prevent runoff. Contractors also must provide sanitary facilities for employees during project construction.

4.5.4 Biotic Communities

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

Impacts to biotic communities will be minimized as much as possible by restricting land clearing and construction operations within the project's right-of-way. The NCDOT will encourage the contractor to locate off-site staging and stockpiling to disrupt the least amount of natural habitat area. These areas will be revegetated once construction activities are complete, thus replacing habitat for some species.

4.5.5 Construction Waste

All construction waste material generated during the clearing, grubbing, and other construction phases will be removed from the project site and burned or disposed of by the contractor in accordance with state and local regulations. Litter and other general trash will be collected and disposed of at local landfill locations.

4.5.6 Utility Service

The proposed project will require some adjustment, relocation, or modification to existing utilities. Any disruption to utility service during construction will be minimized by phased adjustments to the utility line. All modifications, adjustments, or relocations will be coordinated with the affected utility company.

4.5.7 Maintenance of Traffic

Maintenance of traffic and sequence of construction will be planned and scheduled so as to minimize traffic delays within the project corridor. Maintenance and protection of traffic in conjunction with construction activities associated with this project will be prepared in accordance with the latest edition of the *Manual of Uniform Traffic Control Devices* and roadway specifications of the NCDOT. Signs will be used as appropriate to provide notice of road closures and other pertinent information to the traveling public. Advance notice through the local news media will be made to alert the public of traffic restrictions and construction related activities.

Truck traffic in the project area will increase during construction. Access to construction staging areas and the construction sites may require temporary access roadways. The traffic plan developed during the engineering design phase will define designated truck routes and parking areas for construction vehicles.

4.6 Indirect and Cumulative Effects

This assessment of indirect and cumulative effects of the proposed EEC project summarizes the findings of the Indirect and Cumulative Effects Report that details the potential impacts of the project on land use and development patterns within the study area that may occur over

the long term, and are separate from the direct impacts. This assessment focuses on the indirect and cumulative effects (ICE) of the proposed project that relate to anticipated changes to general land use and future development patterns within the EEC project study area and the surrounding vicinity of southern Durham County. The assessment of potential indirect and cumulative effects of the project includes consideration of how transportation facilities can influence long-term regional development and a range of other factors that also play a role in future development patterns.

Primary impacts are those that affect the area within and immediately adjacent to the proposed highway facility. Indirect and cumulative effects are those that result from actions and changes that occur over time and cannot be precisely predicted in a quantitative manner. Highway development may stimulate or induce indirect and cumulative effects that are not directly related to the construction of the proposed facility. Some of these effects may include increased land development, population, employment and economic growth, changes in traffic volumes, travel patterns and accessibility within the vicinity of the project.

Empirical studies and academic research have been conducted to evaluate the long-term effects of transportation projects on land use and development patterns; however, this relationship is not easily identified or measured in quantitative or qualitative terms. As stated in the Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina (Vol. II, November 2001), “empirical evidence indicates that transportation investments result in major land use changes only in the presence of other factors. These factors include: supportive local land use policies; local development incentives; availability of developable land; and a good investment climate.”

Land use changes in the project study area are guided by the land use and growth management plans of the City-County government of Durham and regional planning authorities. These plans and their implementation will determine to a large extent the future land use patterns and intensities of development that will occur in Durham County with, or without, the proposed project. The proposed EEC project is supported by, and consistent with, the local land use plans and policies.

The following sections summarize the potential for induced growth and land use changes within the region and the study area for the preferred alternative, Alternative 3. The No-Build Alternative is considered the baseline condition and assumes that all other planned roadway projects in the Long Range Transportation Plan will be constructed.

To evaluate the potential for Alternative 3 to induce land use changes and affect future development patterns within the study area and its vicinity, several factors were considered. These considerations include regional market conditions and development climate; forecasted growth; land supply and infrastructure, including availability of water and sewer; changes in local accessibility; and supportive public policies on development of the area as discussed in the previous sections.

4.6.1 Market Conditions and Development Potential

Based on the regional market forces and the development trends of southern Durham, the potential for Alternative 3 to induce land use changes within the EEC study area and the surrounding environs is expected to be moderate. However, considering that the primary function of the EEC facility is to provide increased capacity and connectivity for freeway travel within the southeastern region of Durham, it is expected that the southern part of Durham

County, as well as the RTP and the I-40 and Durham Freeway corridors, will have a higher potential for induced growth as a result of Alternative 3.

This potential regional growth could also generate increased economic development in terms of increased employment opportunities and tax revenues from the growth in the business sector that will likely occur as part of the future development of the southern Durham area.

4.6.2 Forecasted Growth

Overall, the Triangle region is rapidly urbanizing with moderate to high population and employment growth rates, particularly in the suburban areas. The southern portion of Durham County is the mid-point between the cities of Durham and Raleigh and the home of the expanding Research Triangle Park, one of the largest business/information/research and development technology centers in the nation.

The areas that are forecasted to experience the highest rates of population and employment growth are located primarily in the southern zones of Durham County along the US 70 and I-40 corridors and in the vicinity of the RTP. These areas are projected to experience the greatest increases in development over the next 20 years.

4.6.3 Land Supply and Infrastructure

The East End Connector is located in a partially developed area with most of the land within the city limits having municipal infrastructure services, however, these services are not extended to some of the larger parcels outside of the city limits. Alternative 3 is considered to have a moderate potential to create substantial demand for increased services.

4.6.4 Local Accessibility Changes

There is expected to be a moderate potential for Alternative 3 to induce substantial land use changes and development within the study area and the immediate vicinity based on the changes in accessibility. Direct access to a freeway facility will be available to surrounding properties, thereby providing easier shipping of products and faster commutes to urban centers. Given this change in accessibility, the best use of adjacent properties may shift to those land uses benefiting from a direct transportation link to surrounding interstate facilities.

4.6.5 Property Values

Based on the improved accessibility that will be provided by Alternatives 3 to the industrial and commercially zoned land within the study area, it is likely that industrial and commercial parcels in this area will experience increased property values. However, as stated earlier, there are several other factors apart from accessibility that influence property values, and because the factors change over time, it is difficult to accurately predict these changes in a quantitative manner.

4.6.6 Potential for Land Use Changes and Development

For Alternative 3, the preferred alternative, the construction of a new freeway facility and service roadways within the study area will result in varying levels of potential to induce land use changes and development in the study area and the surrounding vicinity. The increased

potential for development is based primarily on the construction of the new service roadways and local street connections as proposed for each alternative.

The potential development that may occur is expected to be primarily industrial and commercial uses along with some in-fill and increased density of residential uses, which is consistent with the local land use and growth management plans. Due to the urbanizing character of the southern portion of the study area, local planning authorities anticipate that increased development will continue in the southern portion of the County regardless of whether the proposed project is constructed. However, it is possible that the proposed project will accelerate the pace of development in the region.

The indirect and cumulative effects of the proposed EEC project should be considered in the context of other important factors including regional market conditions, land supply and availability of utility services, changes in accessibility and public policies regarding growth management. Based on these considerations, Alternative 3 is expected to have a generally moderate potential to induce substantial changes to land use and future development patterns both within, and nearby, the study area.

Table 4-11 is a summary of the potential for land use changes and indirect or induced growth to occur within the vicinity of Alternative 3. The potential ranges from low to moderately high based on the qualitative factors that enable or contribute to changes in the use of land and the pattern of development in the project vicinity.

**Table 4-11
Potential for Land Use Changes
Related to Indirect and Cumulative Effects**

Alternative	Forecasted Growth	Land Supply	Availability of Water/Sewer	Change in Accessibility	Public Policy
No-Build Alternative	Low	Moderate	Available	Low	Supportive
Build Alternative	Moderate	Moderate to High	Partially Available	Moderate	Supportive

4.6.7 Mitigation of Growth Impacts

Urban growth is often times initiated by major roadway improvements and as a result planning organizations, agencies, and municipalities develop programs with the intention of preparing for the effects of growth and intensified development. The EEC has been planned for several decades, therefore this project is consistent with local land use and transportation plans. As impacts are realized some policies may require further detailing to mitigate any unforeseen adverse aspects.

Corridor management plans help to preserve the overall function and intent of the highway corridor and provide the greatest safety and operational benefits of the facility. The Durham City-County governments have adopted land use policies and guidelines and zoning ordinances to control the densities and types of development that are permitted to occur within the study area and the County. The Urban Growth Area (UGA) was established to

reflect limitations as to the areas that will be provided with utility services and extensions in an effort to restrict development within water supply watersheds. The Unified Development Ordinance (UDO) for the Durham area contains the various development and permitting standards by which the zoning regulations and development policies of the Durham Comprehensive Plan are implemented. The UDO also specifies the environmental protection standards and permit regulations for the City and County. The State Development Zone designation qualifies businesses for tax or franchise tax credits. Most of the EEC study area located east of Angier Avenue and north of Pleasant Drive is located within the State Development Zone.

5.0 Agency Coordination and Public Involvement

The purpose of the agency coordination and public involvement program was to involve the general public, local elected officials, and the agencies responsible for overseeing the resources in the project area. The two components of the program included Agency Coordination and Public Involvement.

5.1 Agency Coordination

The East End Connector project followed the Merger 01 Process, which integrates FHWA's NEPA requirements and the Clean Water Act Section 404 regulations. Agencies involved in the Merger process included the Federal Highway Administration (FHWA), North Carolina Department of Transportation (NCDOT), US Army Corps of Engineers (USACE), US Fish and Wildlife Service (USFWS), US Environmental Protection Agency (USEPA), North Carolina Division of Water Quality (NCDWQ), North Carolina Wildlife Resource Commission (NCWRC), and the North Carolina State Historic Preservation Office (SHPO). These agencies met as the Merger Team to reach concurrence at various points in the project study process.

5.1.1 Project Scoping

An internal project scoping meeting, held on March 20, 2006, included representatives of NCDOT and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO). Since a Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) were completed in 1982 for the East End Connector as part of the Durham Freeway (NC 147) project, the first task was to determine at what point in the environmental review process the project will begin. It was determined that this effort will review the decision-making process followed by the FEIS with respect to updated background information to determine if the project could go forward as a Reevaluation of the Final EIS in accordance with the Federal NEPA/FHWA regulations.

5.1.2 Merger 01 Meetings

A meeting of Merger 01 Team co-chairs was held on April 17, 2006, to discuss the update of the environmental review process for the East End Connector project and the appropriate placement of the project into the Merger 01 process. Representatives of NCDOT, FHWA, NCDWQ and USACE were present. This meeting was a follow-up to the March 13, 2003 meeting of NCDOT, NCDWQ and USACE that focused on the possibility of the project being reviewed under a more condensed version of the full Merger 01 process.

As a result of the discussions of the April 17th meeting, NCDOT determined that the project will follow the Merger 01 process from the beginning. Information from the EIS documents of 1978 and 1982 will be updated as necessary to conduct an assessment of the previously considered alternatives for the East End Connector.

5.1.2.1 Concurrence Point 1

On December 12, 2006, the Merger 01 Team convened and a formal purpose and need statement (which was essentially unchanged from the EIS document of 1982) was presented. The proposed study area was slightly expanded from the study area in the 1982 document. It is generally bounded by Holloway Street/ Cheek Road to the north;

US 70 to the east; Glover Road and Pleasant Drive to the south and Durham Freeway (NC 147) to the west and includes an area roughly ¼ mile from the centerline of those roadways. The Team reached agreement on Concurrence Point 1—the purpose of, and need for, the project and the limits of the study area.

5.1.2.2 *Concurrence Point 2*

At the Concurrence Point 2 meeting held on February 13, 2007, the Merger Team reviewed four alternative plans to determine which should be carried forward for detailed study. The Merger Team determined that Alternative 2 could be eliminated due to costs and community impacts. The team also determined that Alternatives 1, 3 and 4 should be carried forward for detailed study using the functional design plans developed for the alternatives considered.

5.1.2.3 *Concurrence Point 2A and 3*

A NEPA/Section 404 Merger Concurrence Point 2A/3 meeting was held on June 19, 2007. The purpose of the meeting was to perform a bridging and alignment review for the detailed study alternatives carried forward and to select the least environmentally damaging practicable alternative for the proposed East End Connector project.

For Concurrence Point 2A, the Merger-01 Team concurred that culverts were suitable at all the stream crossings in the study area.

For Concurrence Point 3, the physical, natural and human environment impacts were presented for three Detailed Study Alternatives (1, 3, and 4). After reviewing the information, the Merger 01 Team selected Alternative 3 as the least environmentally damaging practicable alternative (LEDPA).

5.1.2.4 *Concurrence Point 4A*

At the Concurrence Point 4A meeting held on December 13, 2007, the Merger Team reached formal concurrence on avoidance and minimization measures for the Least Environmentally Damaging Practicable Alternative (LEDPA/ Preferred Alternative). Stream, pond and wetland impact data was discussed.

The Concurrence Point 1, 2, 2A, 3 and 4A agreements are included in the Appendix.

5.2 Public Involvement

Recognizing that transportation decisions affect citizens, neighborhoods and travel patterns, this project included a proactive public involvement program for disseminating information to the public and for receiving input from the affected community. The public involvement process provided complete information, timely public notices, opportunities for early involvement, and a public decision-making process. Under FHWA joint regulations (23 CFR Part 450) the following goals were met:

- Public involvement opportunities were provided throughout the process.
- Information about issues and processes was distributed in a timely manner to citizens; affected public agencies; local government officials; representatives of transportation agencies; private providers of transportation; other interested parties; and segments of the community affected by transportation plans, programs.

- Public access to technical and policy information used in the development of the alternatives and the selected alignment was provided.
- Adequate public notice of public involvement activities and time for public review and comment at key decision points was provided.
- Responses to public input were prompt during the development of the project.
- Neighborhood meetings were held in areas that encouraged participation by those traditionally underserved such as low-income and minority households.
- The East End Connector public involvement process was reviewed periodically to ensure that the process provided full and open access to all.

Information about the project was distributed through workshops, newsletters, neighborhood meetings, email, a telephone hotline, and the project website. Table 5-1 lists the community meetings held as part of the project.

5.2.1 Mailing List, Email, Newsletters, Hotline, Website, and Other Repositories

A computerized mailing list of more than 5,000 names of state, local, and federal environmental regulatory and resource agencies; elected officials; civic and business groups; local government agencies; interested persons; property owners; and renters was continually updated throughout the project. Through a toll-free phone number (800-734-7062) and email address EastEndConnectorProject@rsandh.com, the project responded to more than 150 calls and over 60 emails. The East End Connector webpage on the NCDOT internet site included project news and updates, the purpose and need statement, maps and evaluation of alternatives considered, meeting handouts, project newsletters, and contact information for the project team <http://www.ncdot.org/projects/eastendconnector/>. Three newsletters were prepared, in both English and Spanish, which summarized information and key decisions about the project. The newsletters and notices for the Citizens Informational Workshops were mailed to everyone on the mailing list. Listed below in Table 5-2 are the mailing dates and items discussed in each newsletter.

Other repositories for public information included the NCDOT and the DCHC MPO office. Once available for public review, the Environmental Assessment will also be available on the website.

**Table 5-1
Community Meetings**

Meeting Type	Date & Time	Location
Citizens Informational Workshops		
Workshop 1	September 26, 2006 4:00 to 7:00 PM	Fellowship Hall, Living Waters Christian Community Church, US 70 at Lynn Road
Workshop 2	January 31, 2007 4:00 to 7:00 PM	Fellowship Hall, Living Waters Christian Community Church, US 70 at Lynn Road
Workshop 3	December 10, 2007 4:00 to 7:00 PM	Fellowship Hall, Orange Grove Missionary Baptist Church, East End Avenue
Elected Officials Meetings		
Durham City-County Joint Planning Committee	June 6, 2006	Durham City Hall
Durham Board of County Commissioners	September 7, 2006	Durham County Commissioners Chambers
Durham City Council	September 7, 2006	Durham City Hall
Durham Board of County Commissioners	January 2, 2007	Durham County Commissioners Chambers
Durham City Council	January 4, 2007	Durham City Hall
Durham City Council	February 7, 2007	Durham City Hall
Neighborhood and Small Group Meetings		
Partners Against Crime Area 1	June 17, 2006	E.D. Mickel Recreation Center
Partners Against Crime Area 4	July 8, 2006	Campus Hills Park Community Center
Partners Against Crime Area 1	October 21, 2006	E.D. Mickel Recreation Center
Hayestown Neighborhood	November 14, 2006	Orange Grove Missionary Baptist Church, East End Avenue
Partners Against Crime Area 1	December 17, 2006	E.D. Mickel Recreation Center
Partners Against Crime Area 1	January 20, 2007	Eastway Elementary School
Interneighborhood Council	January 23, 2007	Durham Herald-Sun building
Durham Pac Leadership Council	July 23, 2007	Community Center
Ad Hoc Committee Meeting 1	August 9, 2007	Durham City Hall
Ad Hoc Committee Meeting 2	August 27, 2007	Durham City Hall
Ad Hoc Committee Meeting 3	September 19, 2007	Durham City Hall
Ad Hoc Committee Meeting 4	October 10, 2007	Durham City Hall
Ad Hoc Committee Meeting 5	November 7, 2007	Durham City Hall
Ad Hoc Committee Meeting 6	December 5, 2007	Durham City Hall
Ad Hoc Committee Meeting 7	January 30, 2008	Durham City Hall
Ad Hoc Committee Meeting 8	December 10, 2008	Durham City Hall

**Table 5-2
Newsletters**

	Date Mailed	Items Discussed
Newsletter 1	May 2006	<ul style="list-style-type: none"> • Project Highlights <ul style="list-style-type: none"> ○ Overview of Project ○ History ○ Environmental Study Process ○ Map of Study Area
Newsletter 2	January 2007	<ul style="list-style-type: none"> • Project Descriptions <ul style="list-style-type: none"> ○ Alternative 1 (Map Included) ○ Alternative 2 (Map Included) ○ Alternative 3 (Map Included) ○ Alternative 4 (Map Included) • Project Impacts • Alternatives Development Workshop Schedule
Newsletter 3	August 2007	<ul style="list-style-type: none"> • Project Overview <ul style="list-style-type: none"> ○ Background ○ Selection of Alternative 3 as the Preferred Alternative ○ Next Steps • Ad Hoc Committee formation • Proposed Location of the EEC • Project Impacts

5.2.2 Citizens Informational Workshops and Neighborhood Meetings

Three Citizens Informational Workshops (CIW) were held to ensure full and fair participation by all potentially affected communities in the transportation decision-making process. The first workshop focused on the purpose of the project and provided background information about the environmental review process. The second workshop provided information about the alternatives being considered including maps and evaluations of the four alternatives. The third workshop provided information on the LEDPA/ Preferred Alternative and included presentation of EEC visualization animations along with three dimensional renderings at specific proposed bridge sites.

The workshops were advertised in four local newspapers- two daily papers (*Durham Herald-Sun*, the *Chronicle*), one weekly paper (*Durham Independent*) and one Spanish-language weekly paper (*Que Pasa*). Approximately 5000 meeting notices were mailed to area residents and about 500 people representing a multi-cultural cross-section of the community attended the three workshops.

The meetings had an open house format with team members available to answer questions. The intent was to inform the community about the project and receive input on possible alternatives.

5.2.3 AD HOC Advisory Committee Meeting

Subsequent to the selection of a preferred alternative, the Durham City Council recommend that an Ad Hoc Advisory Committee be formed to work with NCDOT in avoiding, minimizing and mitigating any adverse impacts to the greatest extent possible. The committee has addressed relocation policy, noise impact issues, ways of visualizing the project, environmental justice issues, community enhancement and economic development opportunities related to the project. To date there have been eight Ad Hoc Committee meetings.

5.2.4 Elected Officials Presentations

The project team took a collaborative approach with city and county officials, emphasizing that the East End Connector is a project identified by the DCHC MPO as its highest priority project. As co-sponsors of the project, it was the responsibility of the team to assure that the local elected officials were well-informed about community-related activities and that these officials will be able to respond to citizens' comments with current project information.

The Team made six presentations to the Durham City Council and the Durham County Board of Commissioners at critical decision-making points in the process as previously shown in Table 5-1. Both City Council and the County Board voted to officially endorse the project.

5.2.5 Neighborhood and Small Group Meetings

In response to the elected officials' requests, and in an effort to take a pro-active approach to ensure that affected groups are reached, NCDOT contacted several community groups and neighborhood organizations to schedule presentations. Groups that were contacted include Partners Against Crime (PAC) Areas 1 and 4, the Inter-Neighborhood Council, and the Orange Grove Missionary Baptist Church. The PACs are community organizations established by the Durham City Police force to address community-related issues. The Durham City-County Joint Planning Committee recommended that the Team meet with PACs 1 and 4. The Inter-Neighborhood Council is a community-wide organization that reflects broader views representative of communities outside of the study area. The Orange Grove Missionary Baptist Church on East End Avenue was contacted to host a neighborhood meeting because of its location in the heart of the project area. A total of fifteen community meetings were held between June 2006 and January 2008. These meetings reached approximately 300 community members in addition to those attending the formal Citizens Informational Workshops.

5.2.6 Public Involvement Summary

A public involvement summary has been prepared providing detailed information on the meetings and public notifications described above. This summary is included in the appendix of this document.

6.0 Environmental Assessment Conclusion

This Environmental Assessment (EA) of the East End Connector project reviewed the changes that have occurred to the project and in the project study area since the publication of the FEIS in 1982. The Federal Highway Administration concludes, in accordance with 23 CFR 771.130(c), that an EA is the appropriate document for conducting a reevaluation of the 1982 FEIS to “assess the impacts of changes, new information, or new circumstances” that have transpired since 1982. Areas evaluated in the EA include the project’s purpose and need, alternatives, affected environment, and environmental consequences. As a result of the analyses included in this EA and pursuant to 23 CFR 771.130, the Federal Highway Administration has determined that a supplemental EIS is not necessary for the proposed East End Connector.

The EA has confirmed that the project’s purpose and need and alternatives are consistent with the original 1982 FEIS document. The affected environment of the project area has also remained consistent with those documented previously, with the few exceptions described in previous chapters. These changes in the affected environment do not alter the selection or evaluations of the alternatives studied in detail in the FEIS. Impacts associated with the alternatives presented in the FEIS will either change or will change proportionally based on the updated data.

Based on this assessment of changes and events that have occurred since 1982, the FEIS adequately represents the project purpose and need, study area, alternatives, and impacts.

The Preferred Alternative, Alternative 3, differs from the 1982 FEIS recommended design as previously shown in Figure 2-4 and as follows below:

- The most recent EEC alignment has been designed to interstate standards.
- Previously a single point urban interchange was shown for NC 98. This study provides a compressed diamond design at this location.
- Rowena Avenue has not been extended to Miami Boulevard. Instead, East End Avenue and Rowena Avenue will have access to US 70 via connection to a service road.
- In the 1982 FEIS a proposed service road connecting Lynn Road and Pleasant Road was mentioned; however, no design was provided. As part of this EA, a service road design is provided between the two roadways.
- A service road between Rowena and Angier Avenue is not provided.
- A northbound off-ramp from US 70 is provided for access to Carr Road.
- EEC roadway bridges over Angier Avenue and Norfolk Southern rail lines is provided in lieu of the railroad bridges previously shown in the 1982 document.
- A new typical section for US 70 (six-lane divided highway with variable-width median) from north of NC 98 to the East End Connector is provided
- A new single box culvert to carry flow at Little Lick Creek and one of its tributaries is provided.

Table 6-1 provides an analysis of the Preferred Alternative Impacts as described under this EA document. These impacts have not resulted in any change to the regulatory compliance of the project. Additionally, these impacts do not affect the decision made in selecting the Preferred Alternative. Based on the results of this Environmental Assessment, it is concluded that the

FEIS prepared for the project and as updated with this document remains a valid document in accordance with NEPA regulations.

**Table 6-1
Preferred Alternative – Significant Impact Analysis**

Section of EA	Significant Impact?
4.1.1 Community	No. Community cohesion will be maintained through the extension of Rowena Avenue to US 70 and a grade separation of the East End Connector over Rowena Avenue to maintain its connection to Carter Avenue.
4.1.1.1 Transportation Services	No. The existing and proposed rail transit systems, bicycle routes and greenways are not expected to be impacted, but some of the current Durham Area Transit Authority bus routes will be modified. During construction, there will be no interruption to rail service along the major freight railroad corridors located in the study area.
4.1.1.1 Access Changes	No. Generally, for the preferred alternative , the major changes to local access and travel routes within the EEC study area will be associated with the reconstruction of US 70 from Holloway Street to Pleasant Drive. The project will change travel patterns for motorists traveling from south of Durham to I-85 by providing a freeway-to-freeway alternative to the current through-town routes to I-85, via Gregson and Duke Streets. As a result, traffic volumes on those roadways are expected to be maintained at 2006 levels in 2035, rather than increase by 24 percent under the no-build condition. In order to maintain adequate access to roadways and properties in the study area, the construction of Alternative 3 will include the provision of new roadway connections and alternate access routes. In addition, the reconstruction of US 70 and changes to the existing intersections along the corridor from Holloway Street to Lynn Road as proposed for Alternative 3 will create some new travel patterns for local traffic circulation within the study area.
4.1.2 Relocations	No. The preferred alternative will displace 17 residents, 9 businesses, and 1 church.
4.1.3 Community Facilities & Services	No. The preferred alternative will impact the Living Water Christian Church office at the intersection of US 70 and Lynn Road and the Believers Assembly Christian Church on Harvard Avenue. One 4(f) and 6(f) resource will be impacted – City of Durham’s C. R. Wood Park. Approximately 0.08 acre of undeveloped land will be acquired from the park. A de minimis impact has been determined for this resource.

Section of EA	Significant Impact?
4.1.4.4 Environmental Justice	<p>No.</p> <p>The preferred alternative alignment, Alternative 3, either follows existing facilities or, where there is a new alignment, crosses mainly undeveloped property adjacent to three neighborhoods.</p> <p>The number of non-minority relocation impacts equals or exceeds the number of minority and low income relocation impacts. Relocation opportunities are expected to be readily available within the project area.</p> <p>Also, the impacted properties are not concentrated in one neighborhood, but are instead dispersed through the project corridor. Users of public facilities and services, including minority and/or low-income populations, will have substantially the same accessibility to these facilities with the East End Connector and other related roadway improvements as exists today.</p> <p>The provision of new service roadways and other local roadway extensions to those areas that currently have very limited or no access could also stimulate growth and increase development.</p>
4.1.5 Economic Impact	<p>No.</p> <p>The East End Connector facility is expected to have an overall positive economic impact on the Durham area. The new freeway connector along with the construction of additional local access/service roads will provide greater accessibility to some existing businesses and some undeveloped properties in the study area.</p> <p>The EEC facility will also provide a direct route for commercial truck traffic through the area which could result in fewer trucks on local streets, enhanced marketability of industrial sites, and reduced travel costs for existing businesses in the area.</p>
4.1.7 Noise	<p>No.</p> <p>The identified noise-impacted area along the proposed alignment is located on the north side of the East End Connector in the vicinity of Rowena Avenue. Based on the NCDOT Traffic Noise Abatement Policy, a noise barrier was determined to be feasible and reasonable at this location. The likely noise abatement measure for this area is a pile and panel concrete wall that benefits five receptors. The potential wall would range in height from 10 to 12 feet and would be approximately 1,082 feet long.</p>
4.1.8 Air Quality	<p>No.</p> <p>The carbon monoxide hotspot analysis determined the project is in conformity with air quality standards.</p> <p>The localized levels of Mobile Source Air Toxics (MSAT) emissions for the preferred alternative could be higher relative to the No-Build Alternative, but this could be offset due to increases in speeds and reductions in congestion.</p>

Section of EA	Significant Impact?
4.1.9 Farmlands	No. The study area is located within the designated Urban Growth Area boundary for the City of Durham; therefore, no consideration of potential impacts is required.
4.1.10 Utilities	No. Construction of the preferred alternative will require some adjustment, relocation, or modification to public utilities in the study area. Also, relocation of up to nine large transmission towers will be required east of Angier Avenue. During final design, all utility providers will be contacted, and coordination will be undertaken to ensure that the proposed design will not lead to a substantial disruption of service during construction
4.1.11 Aesthetics	No. In most cases the proposed roadway's visual impacts will be negligible due to its significant separation from the nearby properties and because of natural vegetation buffers. Also, for many properties the project will be an improvement to a roadway that already exists, resulting in minimal increased visual impacts.
4.1.12 Hazardous Materials	No. Nine underground storage tank sites are located within 100 feet of the preferred alternative. Also, four hazardous waste sites are located within the project study area, but none are in proximity to the proposed alignment. None of these sites are currently anticipated to be impacted by the project.
4.2 Land Use & Transportation Planning	No. The preferred alternative is consistent with all land use and transportation plans adopted by local and State planning agencies.
4.3 Cultural Resources	No. There are no cultural resources impacts located within the study area.
4.4.1 Biotic Community and Wildlife	No. The endangered species addressed in the study area include the bald eagle (de-listed), smooth coneflower, and Michaux's sumac. None of these species were found in the study area.
4.4.1.2 Impacts to Aquatic Communities	No. Prior to construction, an Erosion and Sedimentation Control Plan/Stormwater Pollution Prevention Plan will be developed for the preferred alternative in accordance with the NCDENR publication <i>Erosion and Sediment Control Planning and Design</i> and the NCDOT's <i>Best Management Practices for Protection of Surface Waters</i> , to minimize any adverse impacts to aquatic communities. These Plans will be implemented and maintained throughout the construction period.
4.4.2 Water Resources	No. All hydraulic structures will be designed to not substantially increase upstream flooding and not increase the flood hazard potential of the existing floodplain. The standard sedimentation and erosion control measures adopted by the NCDOT for the installation of culverts will be followed.

Section of EA	Significant Impact?
4.4.2.3 Flood Hazard Evaluation	No. The proposed alignment will not directly impact areas designated as 100-year floodplain/floodway.
4.4.3 Jurisdictional Areas	No. Approximately 5,711 linear feet of streams, 0.29 acres of wetlands, and 1.13 acres of ponds will be affected in the study area. The NCDOT will coordinate the project with the Ecological Enhancement Program (EEP) to mitigate the stream impacts identified above. Efforts will be made to mitigate the wetland impacts on-site. If suitable on-site wetland mitigation is unavailable, wetland impacts also will be mitigated through the EEP.
4.4.3.2 Permits	No. A Neuse River riparian buffer Authorization Certificate will be needed in addition to a USACE Section 404 permit and a DWQ Section 401 Water Quality Certification.
4.4.3.3 Mitigation	No. Decisions regarding final mitigation plans for the project will be made in cooperation with the Ecological Enhancement Program, the USACE, and the NCDWQ. If on-site opportunities are not sufficient to mitigate for potential wetland and stream impacts, or are not available for mitigation, off-site compensatory mitigation will be accomplished through coordination with the North Carolina Ecosystem Enhancement Program (NCEEP).
4.5 Construction	No. Construction of the preferred alternative may cause temporary adverse impacts to the local environment, including impacts to air quality, water quality, noise, and biotic communities. Construction impacts are generally short-term in nature and can be controlled, minimized, or mitigated through the use of Best Management Practices and standard NCDOT procedures.

7.0 References

U. S. Department of Transportation Federal Highway Administration and N. C. Department of Transportation. 1982 Final Environmental Impact Statement and Section 4 (f) Statement for the Durham East-West Freeway, from I-85 to US 70 Durham County, Federal Aid Project (F-58-1 (10), State Project 8.1414601 (U-71 and U-77).

Benjamin, Peter, United States Department of the Interior Fish and Wildlife Service, to Gregory Thorpe, North Carolina Department of Transportation Project Development and Environmental Analysis, February 28, 2006.

City of Durham. Department of Water Management. 2005. *Annual Sanitary Sewer System Report*. Durham, NC

City of Durham. Department of Water Management. 2005. *Water Quality Report 2005*. Durham, NC.

City of Durham. 1959. *City of Durham Major Thoroughfare Plan*. Durham, NC.

City of Durham, County of Durham. 2006. *Durham, North Carolina Unified Development Ordinance*. Durham, NC.

City of Durham Office of Economic and Workforce Development, County of Durham, Durham Convention & Visitors Bureau, Greater Durham Chamber of Commerce, Downtown Durham, Inc. 2006. *State of Durham's Economy*. Durham, NC

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

Durham-Chapel Hill-Carrboro Metropolitan Planning Organization. 2008. *2009-2015 Metropolitan Transportation Improvement Program*.

Durham-Chapel Hill-Carrboro Metropolitan Planning Organization. 2005. *The 2030 Long Range Transportation Plan*.

Durham-Chapel Hill-Carrboro Metropolitan Planning Organization. 2005. *Regional Priority List FY 2009-2015 TIP*. Durham, NC: City of Durham Transportation Division

Durham City-County Planning Department. 2005. *Durham Comprehensive Plan*. Prepared for the Durham City Council and Durham County Board of Commissioners. Durham, NC.

Durham City-County Planning Department. 2001. *Durham Trails and Greenways Master Plan*. Durham, NC.

Durham City-County Planning Department. 2005. *East Durham Open Space Plan*. Durham, NC.

Durham Parks and Recreation Department. 2003. *Durham Parks and Recreation Master Plan 2003-2013*. Durham, NC.

Ecological Consultants. 1994. *Natural Systems Report for U-71*. Prepared for N.C. Department of Transportation. Raleigh, NC

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Federal Highway Administration. 1987. *Guidance for Preparing and Processing Environmental and Section 4(f) Documents – Technical Advisory T6640.8a*, 1987.

Greater Durham Chamber of Commerce. 2004. *Major Development Trends in Durham County*.

KCI Associates. 2004. *Natural Systems Study: East End Connector Wetland, Stream and Buffer Delineation*. Prepared for North Carolina Department of Transportation, Project Development and Environmental Analysis Branch, Office of Natural Environment. Raleigh, NC.

North Carolina Department of Environmental, Health, and Natural Resources. Division of Environmental Management. Water Quality Section. 1995. *Guidance for Rating the Values of Wetlands in North Carolina, 4th Version*. Raleigh, NC.

North Carolina Department of Environment and Natural Resources. Division of Water Quality. 2003. *North Carolina Water Quality Assessment and Impaired Waters List (2002 integrated 305(b) and 303(d) report, Final Version*. Raleigh, NC.

North Carolina Department of Environment and Natural Resources. Division of Water Quality. 2002/2004. *Neuse River Basin: Nutrient Sensitive Waters Management Strategy: Protection and Maintenance of Riparian Buffers (15A NCAC 2B. 0233)*. Raleigh, NC.

North Carolina Department of Environment and Natural Resources. Division of Water Quality. Wetlands/401 Unit. 1999. *North Carolina DWQ Stream Classification Form – Internal Guidance Manual, version 2.0*. Raleigh, NC.

North Carolina Department of Environment and Natural Resources. Division of Water Quality. 2005. *Identification Methods for the Origins of Intermittent and Perennial Streams, version 3.1*. Raleigh, NC.

North Carolina Department of Environment and Natural Resources. Office of Conservation and Community Affairs. Natural Heritage Program. 2005. *Database of Rare Species and Unique Habitats (Element Occurrences)*. Raleigh, NC.

North Carolina Department of Transportation. 1998. *Administrative Action Draft Re-evaluation of a Final Environmental Impact Statement*. Raleigh, NC.

North Carolina Department of Transportation. 1982. *Administrative Action Final Environmental Impact Statement and Section 4(f) Statement*. Raleigh, NC.

North Carolina Department of Transportation. 1982. *Durham East-West Freeway from I-85 to US 70 Final Environmental Impact Statement*.

North Carolina Department of Transportation. 2006. *Traffic Forecast for Project U-0071 (East End Connector) Durham County*.

North Carolina Department of Transportation. 2005. *Traffic Safety Systems Management Unit of the Traffic Engineering and Safety Systems Branch*.

North Carolina Department of Transportation. 2004. *North Carolina Strategic Highway System*.

North Carolina Department of Transportation, 2004. *NCDOT Long Range Transportation Plan*.

North Carolina Department of Transportation. 2008. *NCDOT 2009-2015 Transportation Improvement Program*.

North Carolina Department of Transportation. 2005. *Section 404/NEPA Merger 01 Process Information*. Raleigh, NC.

North Carolina Department of Transportation. Division of Highways. Highway Design Branch. 2007. *Geoenvironmental Impact Evaluation, Project 34745.1.1 (TIP # U-0071), Durham- East End Connector from NC 147 (Buck Dean Freeway) to North of NC 98*.

North Carolina Department of Transportation. Division of Highways. Planning and Research Branch. 1988. *Durham-Chapel Hill-Carrboro Urban Area Proposed Thoroughfare Plan*. Prepared for the City of Durham, the Town of Chapel Hill and the Town of Carrboro. Raleigh, NC.

North Carolina Department of Transportation. Division of Highways. Planning and Environmental Branch. 1991. *Durham-Chapel Hill Carrboro Urban Area Thoroughfare Plan*. Prepared for the City of Durham, the Town of Chapel Hill and the Town of Carrboro. Raleigh, NC.

North Carolina Department of Transportation. Division of Highways. Project Development and Environmental Analysis Branch. 2005. *Administrative Action Environmental Assessment and Draft Section 4(f) Evaluation*. Raleigh, NC.

North Carolina Department of Transportation. Division of Highways. Project Development and Environmental Analysis Branch. May 10, 2007. *Air Quality Analysis for U-0071, NC 147, US 70 from NC 98 to Pleasant Drive, Durham County*. Prepared by Traffic Noise /Air Quality Section. Raleigh, NC.

North Carolina Department of Transportation, Division of Highways. Project Development and Environmental Analysis Branch, Office of Natural Environment. December, 2006. *U-0071 East End Connector Wetland, Stream Buffer and Threatened and Endangered Species Report*.

North Carolina Department of Transportation, Division of Highways. Project Development and Environmental Analysis Branch, Natural Environment Unit. May, 2007. *Biotic Communities and Protected Species Report, East End Connector*. Raleigh, NC.

North Carolina Department of Transportation, Division of Highways. Project Development and Environmental Analysis Branch, Office of Human Environment. July 30, 2007. *Highway Traffic Noise/ Construction Noise Analysis, Proposed Durham East End Connector*. Raleigh, NC.

North Carolina Department of Transportation. Division of Highways. Transportation Planning Branch. 2004. *Strategic Highway Corridors Designated Corridors*. Prepared for the North Carolina Board of Transportation. Raleigh, NC

North Carolina Department of Transportation. Division of Highways. Transportation Planning Branch. 2004. *Strategic Highway Corridors Vision Plan Triangle Area*. Prepared for the North Carolina Board of Transportation. Raleigh, NC.

North Carolina General Assembly. 2003. *The North Carolina Highway Trust Fund Act*. §136, Article 14.

North Carolina General Assembly. 1971. *State Environmental Policy Act of 1971*. §113A, Article 1.

North Carolina General Assembly. 1989. *State Highway Trust Fund Bond Act of 1989*. §136, Article 14.

Pullman, Elizabeth and Ann Simpson, eds. 1999. *The Durham County Inventory of Important Natural Area, Plants, and Wildlife*. North Carolina Natural Heritage Program.

Radford, A.E., H.E. Ahles, and G.R. Bell. 1968. *Manual of the Vascular Flora of the Carolinas*. Chapel Hill, NC: The University of North Carolina Press.

Reed, P.B., Jr. 1988. *National List of Plant Species that Occur in Wetlands: Southeast (Region 2)*. U.S. Fish and Wildlife Service Biol. Rep. 88(26.2).

Resource Management Group, Inc. (RMG). 1992. *National List of Plant Species that Occur in Wetlands: Region 2—Southeast*. Grand Haven, MI.

RS&H Architects, Engineers, Planners, Inc. 2007. *Community Impact Assessment Technical Report, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

RS&H Architects, Engineers, Planners, Inc. 2007. *Indirect and Cumulative Effects Technical Report, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

RS&H Architects, Engineers, Planners, Inc. 2007. *Public Involvement Technical Report, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

RS&H Architects, Engineers, Planners, Inc. 2007. *Travel Analysis Report Volume 1, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

RS&H Architects, Engineers, Planners, Inc. 2007. *Travel Analysis Report Volume 2, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

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

Sheffield, Jane, Marian O'Keefe, Ruth Little, Betsy Gohdes-Baten. 2003. *Durham County Historic Architecture Inventory*. Durham City-County Planning Department. Durham, NC.

Soil Survey Staff (SSS). 1999. *Soil Taxonomy, A Basic System of Soil Classification for Making and Interpreting Soil Surveys*. USDA. Natural Resource Conservation Service. Agricultural Handbook No. 436. Washington, DC: U.S. Government Printing Office. 869 pp.

Transportation Research Board. 2000. *Highway Capacity Manual*. Washington, DC: Government Printing Office

U. S. Congress. 1970. *National Environmental Policy Act of 1969*, Public Law 91-190.

U. S. Department of Agriculture. National Technical Committee for Hydric Soils. 1985. *Hydric Soils of the United States*. 183 pp.

U. S. Department of Agriculture. Natural Resources Conservation Service. 1995. *Hydric Soils of North Carolina*.

U. S. Department of Agriculture. Natural Resources Conservation Service. 1998. *Field Indicators of Hydric Soils in the United States Version 4.0*. United States Department of Agriculture, Natural Resources Conservation Service, Wetland Science Institute and Soils Division in cooperation with National Technical Committee for Hydric Soils.

U. S. Department of Agriculture. Natural Resources Conservation Service. 2003. *National Soil Survey Handbook, Title 430-VI*.

U.S. Department of Agriculture. Soil Conservation Service. 1976. *Soil Survey of Durham County, North Carolina*. Publication of the National Cooperative Soil Survey.

U.S. Fish and Wildlife and Wildlife Service. 1995. U. S. Fish and Wildlife Service. NWI Map. Southeast Durham, NC.

U.S. Geological Survey. 2002. United States Geological Survey 7.5 Minute Topographic Map. Southeast Durham, NC Quadrangle.

Wolf, Keens & Company. 2004. *Durham Cultural Master Plan Summary*. Prepared for the Durham County Commissioners.

8.0 Technical Appendices (Separate Documents)

KCI Associates. 2004. *Natural Systems Study: East End Connector Wetland, Stream and Buffer Delineation*. Prepared for North Carolina Department of Transportation, Project Development and Environmental Analysis Branch, Office of Natural Environment.

North Carolina Department of Transportation. Division of Highways. Highway Design Branch. 2007. *Geoenvironmental Impact Evaluation, Project 34745.1.1 (TIP # U-0071), Durham- East End Connector from NC 147 (Buck Dean Freeway) to North of NC 98*.

North Carolina Department of Transportation. Division of Highways. Project Development and Environmental Analysis Branch. May 10, 2007. *Air Quality Analysis for U-0071, NC 147, US 70 from NC 98 to Pleasant Drive, Durham County*.

North Carolina Department of Transportation, Division of Highways. Project Development and Environmental Analysis Branch, Office of Natural Environment. December, 2006. *U-0071 East End Connector Wetland, Stream Buffer and Threatened and Endangered Species Report*.

North Carolina Department of Transportation, Division of Highways. Project Development and Environmental Analysis Branch, Natural Environment Unit. May, 2007. *Biotic Communities and Protected Species Report, East End Connector*.

North Carolina Department of Transportation, Division of Highways. Project Development and Environmental Analysis Branch, Office of Human Environment. July 30, 2007. *Highway Traffic Noise/ Construction Noise Analysis, Proposed Durham East End Connector*.

RS&H Architects, Engineers, Planners, Inc. 2007. *Community Impact Assessment Technical Report, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

RS&H Architects, Engineers, Planners, Inc. 2007. *Indirect and Cumulative Effects Technical Report, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

RS&H Architects, Engineers, Planners, Inc. 2007. *Travel Analysis Report, East End Connector*, Prepared for North Carolina Department of Transportation. Charlotte, NC.

Appendix A
Agency Comments & Coordination

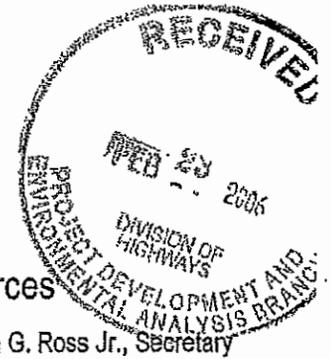


North Carolina Department of Environment and Natural Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary

February 21, 2006



Gregory Thorpe
NC DOT
Project Development And Analysis
1548 Mail Service Center
Raleigh NC 27699-1548

Re: Durham, East End Connector from NC 147 (Buck Dean Freeway) to north of NC 98, Federal-Aid
Project NHP-76-1(2), WBS 34745.1.1, U-0071

Dear Mr. Thorpe:

The Natural Heritage Program has one current record of a rare plant species within 2 kilometers of your project area, as shown on the map included with your letter of 6 February 2006.

Liatris squarrulosa (Earle's Blazing Star) a NC Significantly Rare plant species, has recently been found at the Jenkins Road Diabase area, in the roadway ditches and in the cleared powerline easement east of Jenkins Road.

Although our maps do not show records of natural heritage elements within the project area, we have no evidence that rare species are not present. The area simply may not have been surveyed. The use of Natural Heritage Program data should not be substituted for actual field surveys, particularly if the project area contains suitable habitat for rare species, significant natural communities, or priority natural areas. If you do find rare species during field surveys, we encourage you to report them to the Natural Heritage Program using the enclosed Rare Plant and Animal Field Survey Forms.

You may wish to check the Natural Heritage Program database website at www.ncnhp.org for a listing of rare plants and animals and significant natural communities in the county and on the topographic quad map.

Please do not hesitate to contact me at 919-715-8700 if you have questions or need further information.

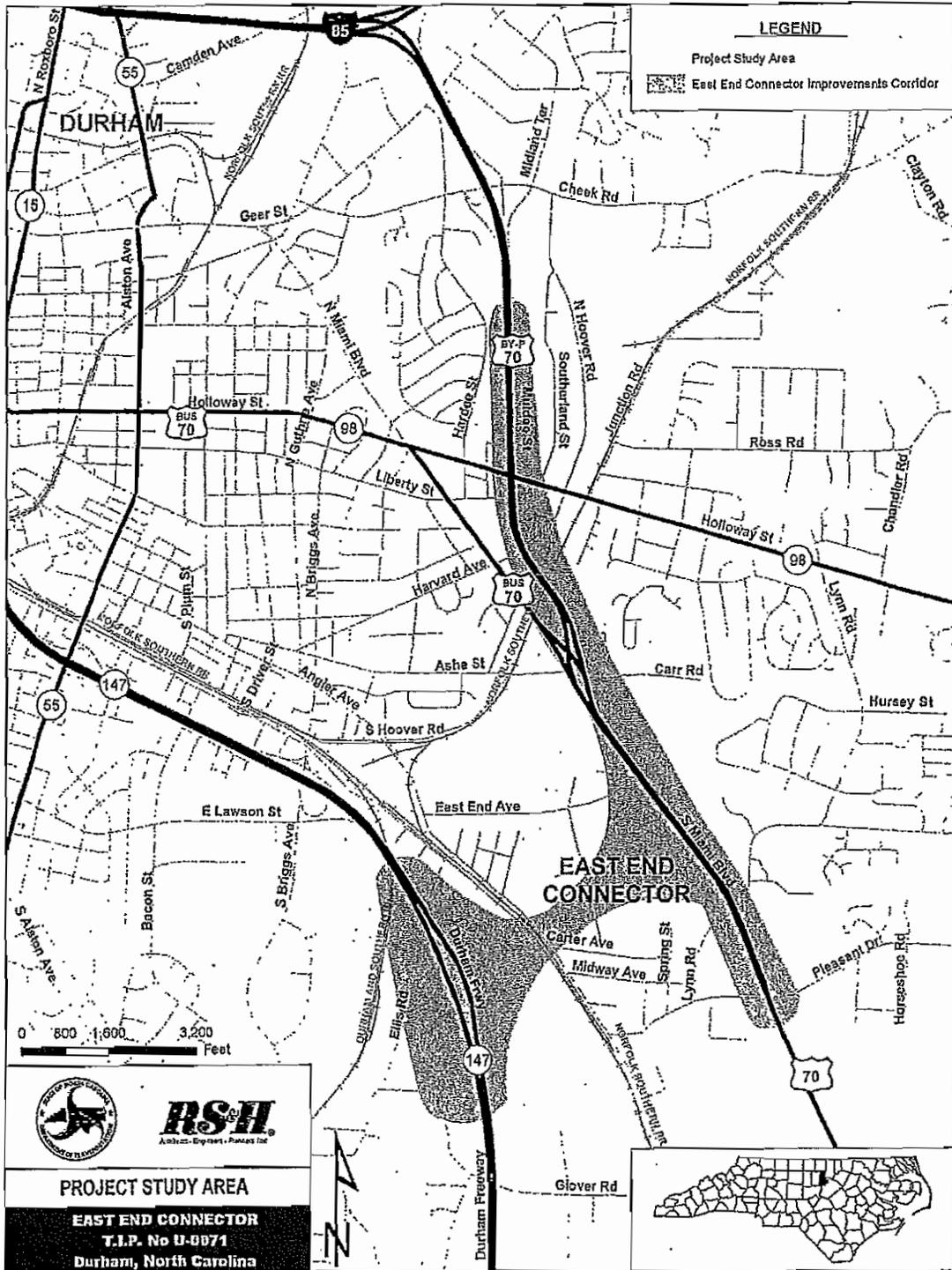
Sincerely,

Misty Franklin, Botanist
NC Natural Heritage Program

1601 Mail Service Center, Raleigh, North Carolina 27699-1601
Phone: 919-715-8700 \ FAX: 919-715-3085 \ Internet www.ncnhp.org

An Equal Opportunity / Affirmative Action Employer - 50 % Recycled \ 10 % Post Consumer Paper

One
North Carolina
Naturally





NORTH CAROLINA NATURAL HERITAGE PROGRAM
SPECIAL ANIMAL SURVEY FORM

Scientific Name :

Common Name:

Observer(s):

Date(s) of Observation:

County:

7.5' Quad Map:

Exact Location (be specific! – attach copy of map with site marked):

Number of Animals (include age and sex, if known):

Type of Observation (sight record, vocal record, specimen, photograph, etc.):

Behavior of Animals (singing, foraging, at nest, etc.):

Habitat (use NC NHP natural community name if known; describe dominant vegetation, maturity of vegetation, slope, aspect, etc.):

Owner(s) of Land, if known:

Other Comments (significance of record, disturbance to habitat, etc.):

Person making this report:

Date:

Address:

Phone:

Return form to: N.C. Natural Heritage Program; Office of Conservation and Community Affairs
MSC 1601; Raleigh, NC 27699-1601



North Carolina Natural Heritage Program - Endangered And Rare Plant Field Survey Form
 Return form to: N.C. Natural Heritage Program, 1601 MSC, Raleigh, NC 27699-1601. Visit www.ncnhp.org.

Species: Common name: Survey date:

EO Number (if updating existing EO): County: 7.5' Quad Map:

Coordinates (if known): Elevation:
 If coordinates given, indicate coordinate system and datum (State Plane 1927 or 1983, UTM, etc):

Site Name (if this is within previously identified site):
 Site location and directions: (attach copy of map with site marked or use back of form to draw a sketch of the site):

Number of individuals: Define individual (stem, clump, etc.):

Size of area in which population occurs:

Estimate whether the entire population was surveyed, or only a portion:

Estimated Population Viability (circle one): Excellent Good Fair Poor Unknown Failed to find
 Population Viability Comments:

Phenology (include % or # in each stage): vegetative bud flower

Evidence of reproduction: fruit seedlings clonal/vegetative

Reproduction Comments:

Habitat (NC NHP natural community name and description, if known; include quality, soils, geology, etc.):

Associated species:

Invasive species noted & degree of threat from invasive species:

Area of apparently suitable habitat (suitable for, but not necessarily occupied by the species):

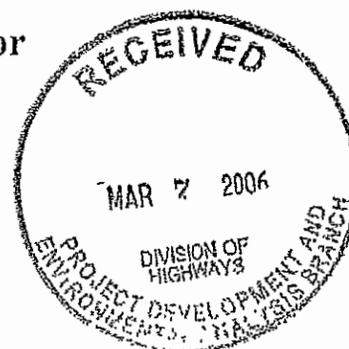
If the population is within a Right-of-Way, does suitable habitat exist outside Right-of-Way?



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

February 28, 2006



Gregory J. Thorpe, Ph.D.
North Carolina Department of Transportation
Project Development and Environmental Analysis
1548 Mail Service Center
Raleigh, North Carolina 27699-1548

Dear Dr. Thorpe:

This letter is in response to your request for comments from the U.S. Fish and Wildlife Service (Service) on the potential environmental effects of the proposed East End Connector from NC 147 (Buck Dean Freeway) to north of NC 98 in Durham County, North Carolina (TIP No. U-0071). These comments provide scoping information in accordance with provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661-667d) and section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

The Service does not have any specific comments for this project, but we recommend the following general conservation measures to avoid or minimize environmental impacts to fish and wildlife resources:

1. Wetland and forest impacts should be avoided and minimized to the maximal extent practical. Proposed highway projects should be aligned along or adjacent to existing roadways, utility corridors or other previously disturbed areas in order to minimize habitat loss and fragmentation. Highway shoulder and median widths should be reduced through wetland areas;
2. Crossings of streams and associated wetland systems should use existing crossings and/or occur on a bridge structure wherever feasible. Bridges should be long enough to allow for sufficient wildlife passage along stream corridors. Where bridging is not feasible, culvert structures that maintain natural water flow and hydraulic regimes without scouring or impeding fish and wildlife passage should be employed;
3. Bridges and approaches should be designed to avoid any fill that will result in damming or constriction of the channel or flood plain. To the extent possible, piers and bents should be placed outside the bank-full width of the stream. If spanning the flood plain is not feasible, culverts should be installed in the flood plain portion of the approach to restore some of the hydrological functions of the flood plain and reduce high velocities of flood waters within the affected area;

4. Bridge designs should include provisions for roadbed and deck drainage to flow through a vegetated buffer prior to reaching the affected stream. This buffer should be large enough to alleviate any potential effects from run-off of storm water and pollutants;
5. Off-site detours should be used rather than construction of temporary, on-site bridges. For projects requiring an on-site detour in wetlands or open water, such detours should be aligned along the side of the existing structure which has the least and/or least quality of fish and wildlife habitat. At the completion of construction, the detour area should be entirely removed and the impacted areas be planted with appropriate vegetation, including trees if necessary;
6. If unavoidable wetland or stream impacts are proposed, a plan for compensatory mitigation to offset unavoidable impacts should be provided early in the planning process. Opportunities to protect mitigation areas in perpetuity via conservation easements, land trusts or by other means should be explored at the outset;
7. Wherever appropriate, construction in sensitive areas should occur outside fish spawning and migratory bird nesting seasons. In waterways that may serve as travel corridors for fish; in-water work should be avoided during moratorium periods associated with migration, spawning and sensitive pre-adult life stages;
8. Best Management Practices (BMP) for Construction and Maintenance Activities should be implemented; and
9. Activities within designated riparian buffers should be avoided or minimized.

Section 7(a)(2) of the Endangered Species Act requires that all federal action agencies (or their designated non-federal representatives), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed threatened or endangered species. A biological assessment/evaluation may be prepared to fulfill the section 7(a)(2) requirement and will expedite the consultation process. To assist you, a county-by-county list of federally protected species known to occur in North Carolina and information on their life histories and habitats can be found on our web page at <http://nc-es.fws.gov/es/countyfr.html>.

Although the North Carolina Natural Heritage Program (NCNHP) database does not indicate any known occurrences of listed species near the project vicinity, use of the NCNHP data should not be substituted for actual field surveys if suitable habitat occurs near the project site. The NCNHP database only indicates the presence of known occurrences of listed species and does not necessarily mean that such species are not present. It may simply mean that the area has not been surveyed. If suitable habitat occurs within the project vicinity for any listed species, surveys should be conducted to determine presence or absence of the species.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a listed species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on

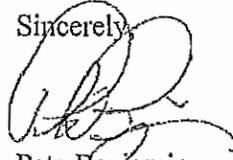
listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on listed species, then you are not required to contact our office for concurrence.

We reserve the right to review any federal permits that may be required for this project, at the public notice stage. Therefore, it is important that resource agency coordination occur early in the planning process in order to resolve any conflicts that may arise and minimize delays in project implementation. In addition to the above guidance, we recommend that the environmental documentation for this project include the following in sufficient detail to facilitate a thorough review of the action:

1. A clearly defined and detailed purpose and need for the proposed project, supported by tabular data, if available, and including a discussion of the project's independent utility;
2. A description of the proposed action with an analysis of all alternatives being considered, including the upgrading of existing roads and a "no action" alternative;
3. A description of the fish and wildlife resources, and their habitats, within the project impact area that may be directly or indirectly affected;
4. The extent and acreage of waters of the U.S., including wetlands, that are to be impacted by filling, dredging, clearing, ditching, or draining. Acres of wetland impact should be differentiated by habitat type based on the wetland classification scheme of the National Wetlands Inventory (NWI). Wetland boundaries should be determined by using the 1987 Corps of Engineers Wetlands Delineation Manual and verified by the U.S. Army Corps of Engineers;
5. The anticipated environmental impacts, both temporary and permanent, that would be likely to occur as a direct result of the proposed project. The assessment should also include the extent to which the proposed project would result in secondary impacts to natural resources, and how this and similar projects contribute to cumulative adverse effects;
6. Design features and construction techniques which would be employed to avoid or minimize impacts to fish and wildlife resources, both direct and indirect, and including fragmentation and direct loss of habitat;
7. Design features, construction techniques, or any other mitigation measures which would be employed at wetland crossings and stream channel relocations to avoid or minimize impacts to waters of the US; and,
8. If unavoidable wetland or stream impacts are proposed, project planning should include a compensatory mitigation plan for offsetting the unavoidable impacts.

The Service appreciates the opportunity to comment on this project. Please continue to advise us during the progression of the planning process, including your official determination of the impacts of this project. If you have any questions regarding our response, please contact Mr. Gary Jordan at (919) 856-4520, ext. 32.

Sincerely,

A handwritten signature in black ink, appearing to read "Pete Benjamin", written over the word "Sincerely,".

Pete Benjamin
Ecological Services Supervisor

cc: Eric Alsmeyer, USACE, Raleigh, NC
Nicole Thomson, NCDWQ, Raleigh, NC
Travis Wilson, NCWRC, Creedmoor, NC
Chris Militscher, USEPA, Raleigh, NC
John Sullivan, FHWA, Raleigh, NC



North Carolina Department of Administration

Michael F. Easley, Governor

Britt Cobb, Secretary

March 30, 2006

Mr. Shannon Lasater
NCDOT
Transportation Building
1548 Mail Service Center
Raleigh, NC 27699-1548

Dear Mr. Lasater:

Re: SCH File # 06-E-4220-0251; Scoping; Proposal East End Connector from NC 147 (Buck Dean Freeway) to north of NC 98, Durham county. TIP #U-0071

The above referenced environmental impact information has been reviewed through the State Clearinghouse under the provisions of the North Carolina Environmental Policy Act.

Attached to this letter are comments made by agencies reviewing this document which identify issues to be addressed in the environmental review document. The appropriate document should be forwarded to the State Clearinghouse for compliance with State Environmental Policy Act. Should you have any questions, please do not hesitate to call me at 807-2425.

Sincerely,

A handwritten signature in cursive script that reads "Chrys Baggett / SJG".

Ms. Chrys Baggett

Environmental Policy Act Coordinator

Attachments

cc: Region J

Mailing Address:
1301 Mail Service Center
Raleigh, NC 27699-1301

Telephone: (919)807-2425
Fax (919)733-9571
State Courier #51-01-00
e-mail Chrys.Baggett@ncmail.net

Location Address:
116 West Jones Street
Raleigh, North Carolina



North Carolina Department of Environment and Natural Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary

MEMORANDUM



TO: Chrys Baggett
State Clearinghouse

FROM: Melba McGee *MB*
Environmental Review Coordinator

SUBJECT: 06-0251 Scoping on Proposed Improvements to East End Connector
from NC 147 to North of NC 98 in Durham County

DATE: March 22, 2006

The Department of Environment and Natural Resources has reviewed the proposed information. The attached comments are for the applicant's information.

Thank you for the opportunity to review.

Attachments



March 17, 2006

MEMORANDUM

To: Melba McGee, Environmental Coordinator

From: Nicole Thomson, NC Division of Water Quality, Transportation Permitting Unit 

Subject: Scoping comments on proposed improvements to East End Connector from NC 147 (Buck Dean Freeway) to north of NC 98 in Durham County, Federal Aid Project No. NHF-76-1(2), State Project No. WBS 34745.1.1, TIP U-0071.

This office has reviewed the referenced document dated February 6, 2006. The Division of Water Quality (DWQ) is responsible for the issuance of the Section 401 Water Quality Certification for activities that impact Waters of the U.S., including wetlands. Preliminary analysis of the project reveals the potential for multiple impacts to perennial streams and jurisdictional wetlands in the project area. More specifically, impacts to:

Stream Name	River Basin	Stream Classification(s)	Stream Index Number
UT Northeast Creek	Cape Fear	C; NSW; 303(d)	16-41-1-17-(0.3)
Little Lick Creek	Neuse	WS-IV; NSW; 303(d)	27-9-(0.5)
UT's to Little Lick Creek	Neuse	WS-IV; NSW; 303(d)	27-9-(0.5)
UT to Ellerbe Creek	Neuse	WS-IV; NSW; 303 (d)	27-5-(0.7)

Further investigations at a higher resolution should be undertaken to verify the presence of other streams and/or jurisdictional wetlands in the area. In the event that any jurisdictional areas are identified, the Division of Water Quality requests that NCDOT consider the following environmental issues for the proposed project:

Project Specific Comments:

1. UT to Northeast Creek is class C;NSW; 303(d) waters of the State. UT to Northeast Creek is on the 303(d) list for impaired use for aquatic life due to urban runoff from storm sewers . DWQ is very concerned with sediment and erosion impacts that could result from this project. DWQ recommends that the most protective sediment and erosion control BMPs be implemented to reduce the risk of nutrient runoff to UT to Northeast Creek. DWQ requests that road design plans provide treatment of the storm water runoff through best management practices as detailed in the most recent version of NC DWQ *Stormwater Best Management Practices*.
2. Little Lick Creek and UT's to Little Lick Creek are class WS-IV;NSW; 303(d) waters of the State. Little Lick Creek and UT's to Little Lick Creek are on the 303(d) list for impaired use for aquatic life due to urban runoff from storm sewers and low dissolved oxygen . DWQ is very concerned with sediment and erosion impacts that could result from this project. DWQ

5. DWQ is very concerned with sediment and erosion impacts that could result from this project. NC DOT should address these concerns by describing the potential impacts that may occur to the aquatic environments and any mitigating factors that would reduce the impacts.
6. If a bridge is being replaced with a hydraulic conveyance other than another bridge, DWQ believes the use of a Nationwide Permit may be required. Please contact the US Army Corp of Engineers to determine the required permit(s).
7. If the old bridge is removed, no discharge of bridge material into surface waters is allowed unless otherwise authorized by the US ACOE. Strict adherence to the Corps of Engineers guidelines for bridge demolition will be a condition of the 401 Water Quality Certification.
8. Bridge supports (bents) should not be placed in the stream when possible.
9. Whenever possible, the DWQ prefers spanning structures. Spanning structures usually do not require work within the stream or grubbing of the streambanks and do not require stream channel realignment. The horizontal and vertical clearances provided by bridges allow for human and wildlife passage beneath the structure, do not block fish passage and do not block navigation by canoeists and boaters.
10. Bridge deck drains should not discharge directly into the stream. Stormwater should be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of NC DWQ *Stormwater Best Management Practices*.
11. If concrete is used during construction, a dry work area should be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete should not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.
12. If temporary access roads or detours are constructed, the site shall be graded to its preconstruction contours and elevations. Disturbed areas should be seeded or mulched to stabilize the soil and appropriate native woody species should be planted. When using temporary structures the area should be cleared but not grubbed. Clearing the area with chain saws, mowers, bush-hogs, or other mechanized equipment and leaving the stumps and root mat intact allows the area to re-vegetate naturally and minimizes soil disturbance.
13. Placement of culverts and other structures in waters, streams, and wetlands shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NC DWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.

Thank you for requesting our input at this time. The DOT is reminded that issuance of a 401 Water Quality Certification requires that appropriate measures be instituted to ensure that water quality standards are met and designated uses are not degraded or lost. If you have any questions or require additional information, please contact Nicole Thomson at (919) 715-3415.

cc: Eric Alsmeyer, US Army Corps of Engineers, Raleigh Field Office
Clarence Coleman, Federal Highway Administration, 310 New Bern Ave., Raleigh, NC 27601
Jon G. Nance, PE, Division 5 Engineer, 2612 N. Duke St, Durham, NC 27704
Chris Murray, Division 5 Environmental Officer, 2612 N. Duke St, Durham, NC 27704
Chris Militscher, Environmental Protection Agency
Travis Wilson, NC Wildlife Resources Commission
Gary Jordan, US Fish and Wildlife Service
William Gilmore, Ecosystem Enhancement Program
File Copy

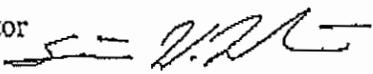


☒ North Carolina Wildlife Resources Commission ☒

MEMORANDUM

Richard B. Hamilton, Executive Director

TO: Melba McGee
Office of Legislative and Intergovernmental Affairs, DENR

FROM: Travis Wilson, Highway Project Coordinator
Habitat Conservation Program 

DATE: March 13, 2006

SUBJECT: Response to a scoping notification from the N. C. Department of Transportation (NCDOT) regarding fish and wildlife concerns for the proposed Durham East End Connector, Durham County, North Carolina. TIP No. U-0071, SCH Project No. 06-0251

This memorandum responds to a request from Gregory J. Thorpe of the NCDOT for our concerns regarding impacts on fish and wildlife resources resulting from the subject project. Biologists on the staff of the N. C. Wildlife Resources Commission (NCWRC) have reviewed the proposed improvements. Our comments are provided in accordance with certain provisions of the National Environmental Policy Act (42 U.S.C. 4332(2)(c)) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

In 1998 NCDOT completed the Draft Reevaluation of the FEIS for the Durham East End Connector. NCDOT will utilize the information contained in the 1998 Draft Reevaluation with updated information to prepare a State funded Supplemental State Environmental Impact Statement for the project. Wetland impacts are currently shown at 1.47 acres while stream and buffer impacts are not listed.

This facility is a new location facility from NC 147 to north of NC 98. The length of the project is approximately 3.7 miles. Due to the urban nature of the project area we anticipate moderate environmental impacts. It is unclear at this time if the project will be placed into the Merger 01 process. None-the-less NCDOT should avoid and minimize impacts to natural resources. At this time we do not have any specific concerns related to this project. To help facilitate document preparation and the review process, our general informational needs are outlined below:

1. Description of fishery and wildlife resources within the project area, including a listing of federally or state designated threatened, endangered, or special concern species. Potential borrow areas to be used for project

Memo

2

March 13, 2006

construction should be included in the inventories. A listing of designated plant species can be developed through consultation with:

The Natural Heritage Program
N. C. Division of Parks and Recreation
1615 Mail Service Center
Raleigh, N. C. 27699-1615
(919) 733-7795
WWW.ncsparks.net/nhp

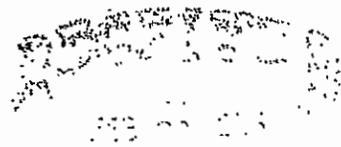
and,

NCDA Plant Conservation Program
P. O. Box 27647
Raleigh, N. C. 27611
(919) 733-3610

2. Description of any streams or wetlands affected by the project. The need for channelizing or relocating portions of streams crossed and the extent of such activities.
3. Cover type maps showing wetland acreages impacted by the project. Wetland acreages should include all project-related areas that may undergo hydrologic change as a result of ditching, other drainage, or filling for project construction. Wetland identification may be accomplished through coordination with the U. S. Army Corps of Engineers (COE). If the COE is not consulted, the person delineating wetlands should be identified and criteria listed.
4. Cover type maps showing acreages of upland wildlife habitat impacted by the proposed project. Potential borrow sites should be included.
5. The extent to which the project will result in loss, degradation, or fragmentation of wildlife habitat (wetlands or uplands).
6. Mitigation for avoiding, minimizing or compensating for direct and indirect degradation in habitat quality as well as quantitative losses.
7. A cumulative impact assessment section which analyzes the environmental effects of highway construction and quantifies the contribution of this individual project to environmental degradation.
8. A discussion of the probable impacts on natural resources which will result from secondary development facilitated by the improved road access.
9. If construction of this facility is to be coordinated with other state, municipal, or private development projects, a description of these projects should be included in the environmental document, and all project sponsors should be identified.

Thank you for the opportunity to provide input in the early planning stages for this project. If we can further assist your office, please contact me at (919) 528-9886.

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW



STATE NUMBER: 06-E-4220-0251 F02
DATE RECEIVED: 02/17/2006
AGENCY RESPONSE: 03/13/2006
REVIEW CLOSED: 03/17/2006

MS RENEE GLEDHILL-EARLEY
CLEARINGHOUSE COORD
DEPT OF CUL RESOURCES
ARCHIVES-HISTORY BLDG - MSC 4617
RALEIGH NC

REVIEW DISTRIBUTION
CC&PS - DEM, NFIP
DENR LEGISLATIVE AFFAIRS
DEPT OF AGRICULTURE
DEPT OF CUL RESOURCES
DEPT OF TRANSPORTATION
TRIANGLE J COG

PROJECT INFORMATION

APPLICANT: NCDOT

TYPE: State Environmental Policy Act

ERD: Scoping

DESC: Proposal East End Connector from NC 147 (Buck Dean Freeway) to north of NC 98,
Durham county. TIP #U-0071



*Ref 2k
Joy
ER 03/16
AS*

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED:

- NO COMMENT
- COMMENTS ATTACHED

SIGNED BY: Renee Gledhill-Earley

DATE: 3-7-06



PUBLIC SCHOOLS OF NORTH CAROLINA

STATE BOARD OF EDUCATION Howard N. Lee, *Chairman*

DEPARTMENT OF PUBLIC INSTRUCTION June St. Clair Atkinson, ED.D., *State Superintendent*

WWW.NCPUBLICSCHOOLS.ORG



March 27, 2006

MEMORANDUM

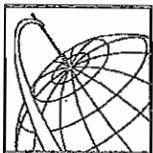
TO: Gregory J. Thorpe, Director
NC Department of Transportation
Project Development and Environmental Analysis Branch

FROM: Steven M. Taynton, Section Chief, School Planning 

SUBJECT: Durham East End Connector from NC 147 (Buck Dean Freeway) to north of NC 98, Durham County, Federal-Aid Project NHF-76-1(2), WBS 34745.1.1, U-0071

Enclosed is a response from Durham County Schools in regard to the above referenced inquiry.

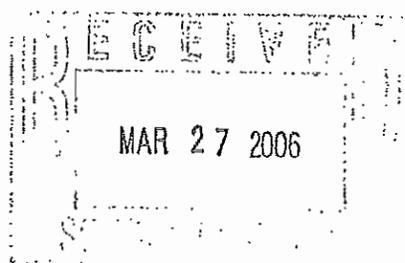
ST/pr
Enclosure



DURHAM PUBLIC SCHOOLS

Office of Operational Services

March 20, 2006



Steven M. Taynton
Section Chief – School Planning
Division of School Support
6319 Mail Service Center
Raleigh, NC 27699-6319

Dear Mr. Taynton,

Durham Public Schools' Transportation Services Department received a letter regarding the East End Connector project. Our staff has evaluated the impact of this project and has determined that impact on school bus routes or existing/proposed school sites will be minimal. We do request that work on the project that may cause significant road closings, detours or delays in the area be scheduled during non-school days (preferably between June 15 and August 25 of any year) if at all possible.

Please advise if you need further information. You may contact my office at 919-560-3822.

Best regards,

G. Scott Denton
Executive Director – Transportation Services
Durham Public Schools

Cc: Hugh Osteen, Asst. Supt. of Operational Services
Robert Sands, Ex. Dir. Construction & Capital Planning



North Carolina Department of Cultural Resources
 State Historic Preservation Office
 Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
 Lizabeth C. Evans, Secretary
 Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
 Division of Historical Resources
 David Brook, Director

August 14, 2006

MEMORANDUM

TO: Beverly Robinson
 NCDOT PDEA

FROM: Peter Sandbeck *for Peter Sandbeck*

SUBJECT: Improvement to East End Connector, NC 147 to US 70, U-0071, Durham County,
 CH 96-0147

Thank you for your letter of July 5, 2006, concerning the above project.

We have conducted a review of the proposed undertaking and are aware of no historic resources that would be affected by the project. Therefore, we have no comment on the undertaking as proposed.

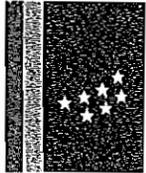
The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Barley, environmental review coordinator, at 919/733-4763. In all future communication concerning this project, please cite the above referenced tracking number.

cc: Mary Pope Furr
 Matt Wilkerson

	Location	Mailing Address	Telephone/Fax
ADMINISTRATION	507 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-4763/733-8653
RESTORATION	515 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6547/715-4801
SURVEY & PLANNING	515 N. Blount Street, Raleigh, NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6545/715-4801

DURHAM



1869
CITY OF MEDICINE

CITY OF DURHAM

City Manager's Office

101 CITY HALL PLAZA | DURHAM, NC 27701

919.560.4222 | F 919.560.4949

www.durhamnc.gov

August 28, 2009

Ms. Leza Wright Mundt, Project Planning Engineer
NCDOT Project Development and Environmental Analysis Branch
1548 Mail Service Center
Raleigh, North Carolina 27699-1548

RE: Durham East End Connector, C.R. Wood Park Impact

Dear Ms. Mundt:

On June 24, 2009, Beth Timson, Assistant Director for Development, Parks & Recreation, Mark Ahrendsen, Transportation Manager, and Ellen Beckmann, Transportation Planner, Public Works met with you to discuss the probable impact of the proposed East End Connector highway project on the C. R. Wood Park. As the design for the roadway has progressed, it became apparent that a small amount of right-of-way will be needed from C. R. Wood Park for the East End Connector project. The long-planned project will provide a high-speed connection between from the Durham Freeway and US 70, linking the two arterials with I-85.

The affected area within the park is located in its extreme southeast corner, adjacent to the power-line easement. Based on the current design, the area that will be converted to transportation use is estimated to be 3,774 square feet in size, or approximately 0.08 acre. The attached map illustrates the location of the impacted area within the park. According to Ms. Timson, the land is used as a buffer for the active recreational uses on the northern side of the park, and there are no plans to develop it for recreational purposes.

As a recreational facility owned by the City of Durham, C. R. Wood Park is afforded protection under Section 4(f) of the Department of Transportation Act, as amended (49 USC 303 and 23 USC 138), and Section 6009(a) of SAFETEA-LU (23 CFR 774). Provisions in SAFETEA-LU allow the Federal Highway Administration (FHWA) to make a finding of a *de minimis* impact to a Section 4(f) resource if certain conditions are met. These conditions include:

1. The transportation use of the park, together with any impact, avoidance, minimization, and mitigation or enhancement measures do not adversely affect the activities, features, and attributes that qualify the resource for protection under Section 4(f).

2. The official(s) with jurisdiction over the property are informed of FHWA's intent to make the *de minimis* impact finding, based on his/her written concurrence that the project will not adversely affect the activities, features, and attributes that qualify the property for protection under Section 4(f).

3. The public has been afforded an opportunity to review and comment on the affects of the project on the proposed activities, features, and attributes of the Section 4(f) resource. (This can be accomplished through the project development process underway for the East End Connector.)

The sale of the 0.08 acres of City property has not yet gone to the Durham City Council, and will ultimately need to do so. However, with assurances that NCDOT will provide the following mitigations to the reasonable satisfaction of the City Manager, the City of Durham will be able to concur that the proposed East End Connector will not adversely affect the activities, features, and attributes that make the park a significant recreational resource and qualify it for protection under Section 4(f):

1. During the project's final design phase, the NCDOT will make every effort to further minimize the use of land from the C. R. Wood Park.

2. NCDOT will provide reasonable replacement landscaping as a buffer between the park and the East End Connector, and will consider paving the existing parking lot and/or resurfacing the tennis courts, or providing something of similar value to the park.

Alternatively, the monetary equivalent of such mitigation could be provided to the City to carry out these activities.

I will look forward to receiving a letter or other written communication providing assurance that the mitigations referenced above will be incorporated into the East End Connector Project. The City of Durham has been informed that, based on this concurrence, the FHWA intends to make a *de minimis* finding regarding impacts to the C.R. Wood Park, thus satisfying the requirements of Section 4(f).

Sincerely,



Theodore L. Voorhees
Deputy City Manager

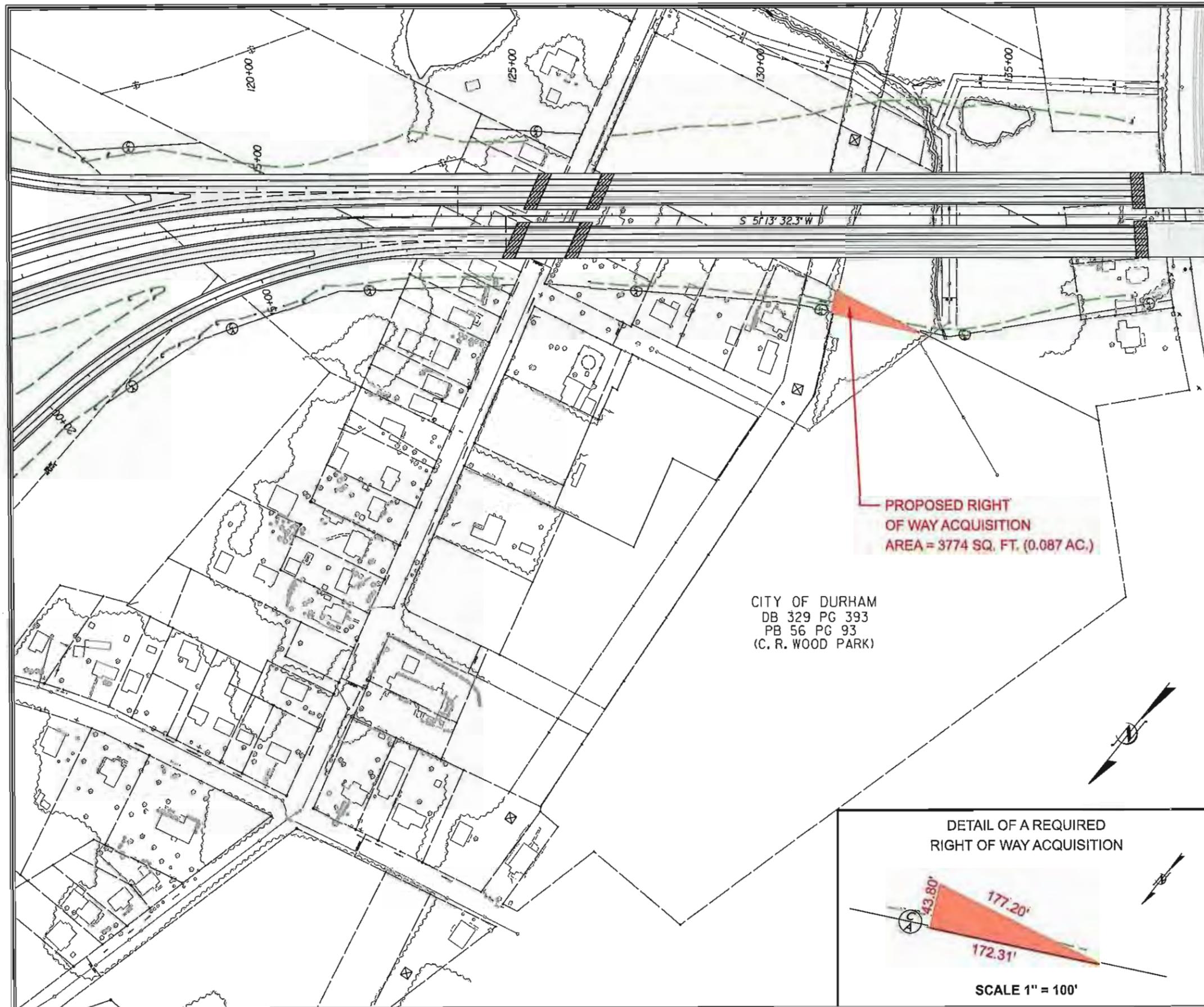
/tlv

DE MINIMIS ACQUISITION
C.R. WOOD PARK

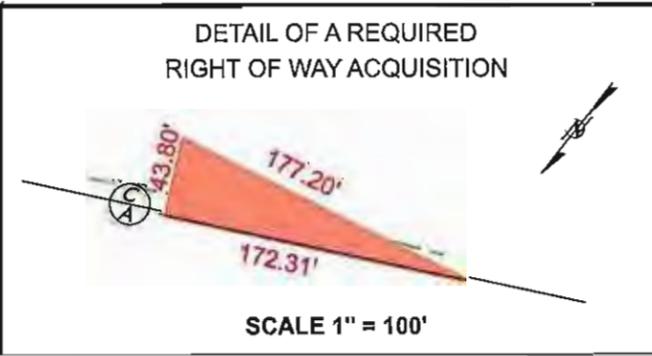
EAST END CONNECTOR

LEGEND

- AREA OF ACQUISITION REQUIRED
- PROPOSED ROADWAY
- CONSTRUCTION LIMITS
- CONTROL OF ACCESS / RIGHT OF WAY LIMITS
- PROPERTY LINE



CITY OF DURHAM
DB 329 PG 393
PB 56 PG 93
(C. R. WOOD PARK)



SCALE 1" = 200'



East End Connector

Durham, NC
T.I.P. No. U-0071

Merger Project Team Meeting Agreement

Concurrence Point No. 1. Purpose and Need

Project Name/Description: East End Connector, Durham, Durham County

TIP Project No.: U-0071
State Project No.: 8.1351501
Federal Aid Project No.: NHF-76-1(2)
WBS No.: 34745.1

Purpose of the Proposed Action:
The purpose of the proposed project is to:

- Improve roadway capacity for major freeways.
- Enhance transportation safety.
- Improve freeway connectivity between the Durham Freeway (NC 147) and US 70.
- Be consistent with the State/Local land use and transportation plans.

The Project Team as concurred on this date of December 18, 2006, with the purpose and need for the proposed project as stated above:

USACE Eric Alsmeyer NCDOT Beverly Robinson

USEPA Chris A. [Signature] USFWS Gary Jordan

NCDCR [Signature] NCDWQ Robert Riding

FHWA Thomas P. Ringler NCWRC S. W. [Signature]

DCHC MPO Self Muroko



East End Connector

Durham, NC
T.I.P. No. U-0071

RECEIVED

APR 14 2007

Merger Project Team Meeting Agreement

RALEIGH REGULATORY FIELD OFFICE

Concurrence Point No. 2 Detailed Study Alternatives Carried Forward

Project Name/Description: East End Connector, Durham, Durham County

TIP Project No.: U-0071
State Project No.: 8.1351501
Federal Aid Project No.: NHF-76-1(2)
WBS No.: 34745.1

Corridors under consideration:
The Project Team has concurred that the following corridors should be fully evaluated as Alternatives for the proposed East End Connector Project:

- Alternative 1:** Alternative 1 is the alignment closest to Durham, running east-west between East End Avenue and Hoover Road.
- Alternative 2:** Alternative 2 is located just south of Alternative 1 and bi-sects East End Avenue.
- Alternative 3:** Alternative 3 is located south of East End Avenue.
- Alternative 4:** Alternative 4 is the southernmost alternative and is located close to Glover Road.

The Project Team as concurred on this date of February 13, 2007, with the alternatives as stated above:

USACE *[Signature]* 4/25/07 NCDOT *Beverly Robinson*

USEPA *[Signature]* USFWS *Gary Jordan*

NCDCR *[Signature]* NCDWQ *Robert Ridings*

FHWA *Ther D. Bishop* NCWRC *[Signature]*

DCHC MP@ *Absent Len*

RECEIVED

Division of Highways

APR 30 2007

Preconstruction
Project Development and
Environmental Analysis Branch



East End Connector

Durham, NC
T.I.P. No. U-0071

Merger Project Team Meeting Agreement Concurrence Point No. 2A Detailed Bridging and Alignment Decisions

Project Name/Description: East End Connector, Durham, Durham County

TIP Project No.: U-0071
 State Project No.: 8.1351501
 Federal Aid Project No.: NHF-76-1(2)
 WBS No.: 34745.1

Bridging and Alignment Review:

The Project Team has concurred that the following locations have bridge or culvert crossings for Alternatives 1, 3 and 4 of the proposed East End Connector Project:

Corridors Under Consideration	Alignment Modifications Requested	Streams to be Bridged	Wetlands to be Bridged	Proposed Culvert Locations (Stream ID - Width x Height x Length)
Alternative 1				S-18 - 6' X 8' X 110'
				S-18 - 6' X 8' X 371'
				S-18 - 6' X 10' X 250'
				S-6 - 6' X 9.5' X 364'
				S-P - 7' X 6' X 249'
Alternative 3				S-18 - 6' X 8' X 311'
				S-18 - 6' X 9' X 200'
				S-18 - 6' X 9' X 290'
				S-18 - 7' X 9' X 175'
				S-6 - 6' X 9.5' X 249'
Alternative 4				S-P - 7' X 6' X 249'
				S-18 - 6' X 9' X 475'
				S-6 - 6' X 9.5' X 454'
				S-6 - 8' X 10' X 125'
				S-P - 7' X 7' X 280'
				S-P - 7' X 7' X 205'
				S-P - 7' X 6' X 249'
				S-P - 10' X 7' X 379'
				S-1 - 6' X 8' X 160'
				S-1 - 6' X 7' X 274'
			S-1 - 6' X 8' X 575'	
			S-1 - 8' X 9' X 150'	



East End Connector

Durham, NC
T.I.P. No. U-0071

The Project Team concurred on this date of June 19, 2007, with the bridging or culvert crossings and alignment revisions as stated on the previous page:

USACE Eric A. [Signature]

NCDOT Beverly Rosh

USEPA Cliff [Signature]

USFWS Gary Jordan

NCDCR Janet [Signature]

NCDWQ Robert [Signature]

FHWA Thomas D. Riggs

NCWRC [Signature]

DCHC MPO [Signature]



East End Connector

Durham, NC
T.I.P. No. U-0071

Merger Project Team Meeting Agreement Concurrence Point No. 3 Least Environmentally Damaging Practicable Alternative Selection

Project Name/Description: East End Connector, Durham, Durham County

TIP Project No.: U-0071
State Project No.: 8.1351501
Federal Aid Project No.: NHF-76-1(2)
WBS No.: 34745.1

Least Environmentally Damaging Practicable Alternative:

The Project Team has concurred that the below selected alternative is the least environmentally damaging practicable alternative for the proposed East End Connector Project:

- Alternative 1:** Alternative 1 is the alignment closest to Durham, running east-west between East End Avenue and Hoover Road.
- Alternative 3:** Alternative 3 is located south of East End Avenue.
- Alternative 4:** Alternative 4 is the southernmost alternative and is located close to Glover Road.

The Project Team concurred on this date of June 19, 2007, with the selection of LEDPA above:

USACE Eiri Alay

NCDOT Beverly Koh

USEPA Debra A.

USFWS Gary Jordan

NCDCR Sarah W. Gordon

NCDWQ Rob Riding

FHWA Thomas D. Riggs

NCWRC S. H. W.

DCHC MPO Paul Winters



East End Connector

Durham, NC
T.I.P. No. U-0071

Merger Project Team Meeting Agreement Concurrence Point No. 4A Avoidance and Minimization

Project Name/Description: East End Connector, Durham, Durham County

TIP Project No.: U-0071
State Project No.: 8.1351501
Federal Aid Project No.: NHF-76-1(2)
WBS No.: 34745.1

The Project Team has concurred on the following Avoidance and Minimization Measures for the LEDPA (Alternatives 3) of the proposed East End Connector Project:

Avoidance and Minimization

During the development of the preliminary engineering designs for the East End Connector, efforts were made to avoid and minimize impacts to wetlands and streams wherever practicable. Where stream crossings were unavoidable, they were located, within design constraints, as perpendicular as practicable, in order to minimize the length of stream impacted. Avoidance and minimization efforts for each impacted wetland area are described below.

The proposed East End Connector was shifted to avoid stream locations S-3 and S-11. It also was shifted to a 90-degree skew to cross stream S-6. The proposed alignment also avoids wetland W-40, and ponds 41 and 42.

The Rowena Avenue Extension was eliminated. Instead, access was provided along East End Avenue Extension. As a result, impacts to wetland W-25, pond 23 and stream S-18 were avoided.

The northbound NC 147 flyover ramp was replaced with a left exit off the East End Connector reducing the impact to stream S-30.

The Miami Boulevard northbound exit ramp was shifted closer to US70, reducing the length of impact to S-18.

Jurisdictional impacts were further minimized by adding guardrail which allowed fill slope limits to be reduced at stream and wetland crossings.



East End Connector

Durham, NC
T.I.P. No. U-0071

The Project Team concurred on this date of December 13, 2007, with the avoidance and minimization measures as stated above:

USACE	<u>Eric A. Alay</u>	NCDOT	<u>Beverly Polk</u>
USEPA	<u>Kathy H. Matthews</u>	USEWS	<u>Gary Jordan</u>
NCDCR	<u>Reese Medhill-Earley</u>	NCDWQ	<u>Rob Poling</u>
FHWA	<u>Thomas D. Ringler</u>	NCWRC	<u>S. J. R...</u>
DCHC MPO	<u>L. C. W...</u>		

**Appendix B
Relocation Reports**

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

E.I.S. CORRIDOR DESIGN

WBS ELEMENT:	34745.1.1	COUNTY	Durham	Alternate	1	of	4	Alternate
T.I.P. No.:	U-0071							
DESCRIPTION OF PROJECT:	Construct the Proposed East End Connector Connecting NC 147 and US 70							

ESTIMATED DISPLACED					INCOME LEVEL							
Type of Displacees	Owners	Tenants	Total	Minorities	0-15M	15-25M	25-35M	35-50M	50 UP			
Residential	18	0	18	9	0	0	6	12	0			
Businesses	15	0	15	3	VALUE OF DWELLING		DSS DWELLING AVAILABLE					
Farms	0	0	0	0	Owners		For Sale		For Rent			
Non-Profit	0	0	0	0	0-20M	\$ 0-150	0	0-20M	0	\$ 0-150	0	
ANSWER ALL QUESTIONS					20-40M	1	150-250	0	20-40M	0	150-250	0
Yes	No	Explain all "YES" answers.			40-70M	5	250-400	0	40-70M	3	250-400	0
	X	1. Will special relocation services be necessary?			70-100M	7	400-600	0	70-100M	3	400-600	0
X		2. Will schools or churches be affected by displacement?			100 UP	5	600 UP	0	100 UP	324	600 UP	0
X		3. Will business services still be available after project?			TOTAL	18	0	0	330	0	0	0
X		4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.			REMARKS (Respond by Number)							
X		5. Will relocation cause a housing shortage?			2. At least one (1) church "Believers Assembly Christian Church" will be affected by this alignment.							
	X	6. Source for available housing (list).			3. Some businesses will remain as in the before situation.							
	X	7. Will additional housing programs be needed?			4. See attached page #2.							
	X	8. Should Last Resort Housing be considered?			6. MLS, Realtor.com, and newspaper							
	X	9. Are there large, disabled, elderly, etc. families?			11. Durham County Housing Authority							
	X	10. Will public housing be needed for project?			12. Comparable DSS Housing is currently available.							
X		11. Is public housing available?			14. MLS, Realtor.com, and newspaper							
X		12. Is it felt there will be adequate DSS housing available during relocation period?										
	X	13. Will there be a problem of housing within financial means?										
X		14. Are suitable business sites available (list source).										
		15. Number months estimated to complete RELOCATION?			2 YEARS							

Robert H. Mathes, Jr. / tsg Right of Way Agent	May 9, 2007 Date	Ann Simpson Relocation Coordinator	5-11-07 Date
---	---------------------	---------------------------------------	-----------------

Question #4 Response:

(Alt. #1)

1. Chandler Concrete Construction 10 to 15 employees
2. NIX Upholstery 5 to 10 employees
3. Acme Door Corporation 5 to 10 employees
4. Car Dealership / Repair Shop 2 to 5 employees
5. Thomas Concrete of Carolina, Inc. 10 to 15 employees
6. TFC Recycling 20 employees
7. Antiques Buy and Sell 2 employees
8. United Signs, Screens, Printing Company 10 employees
9. GTI East Auto Exchange & Service 15 employees
10. Junk Yard
11. AMPC 10 employees
12. Rifenburg Construction, Inc. 15 employees
13. Clean Green, Inc. 50 employees
14. Sitework Contracting 15 employees
15. Holloway Towing 5 employees

AMS

E.I.S. CORRIDOR DESIGN

WBS ELEMENT:	34745.1.1	COUNTY	Durham	Alternate	3	of	4	Alternate
T.I.P. No.:	U-0071							
DESCRIPTION OF PROJECT:	Construct the Proposed East End Connector Connecting NC 147 and US 70							

ESTIMATED DISPLACED					INCOME LEVEL							
Type of Displacees	Owners	Tenants	Total	Minorities	0-15M	15-25M	25-35M	35-50M	50 UP			
Residential	17	0	17	6	0	0	0	5	12			
Businesses	9	0	9	3	VALUE OF DWELLING		DSS DWELLING AVAILABLE					
Farms	0	0	0	0	Owners		Tenants		For Sale	For Rent		
Non-Profit	0	0	0	0	0-20M	0	\$ 0-150	0	0-20M	0	\$ 0-150	0

ANSWER ALL QUESTIONS:											
Yes	No	Explain all "YES" answers.									
	X	1. Will special relocation services be necessary?									
X		2. Will schools or churches be affected by displacement?									
X		3. Will business services still be available after project?									
X		4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.									
	X	5. Will relocation cause a housing shortage?									
	X	6. Source for available housing (list).									
	X	7. Will additional housing programs be needed?									
	X	8. Should Last Resort Housing be considered?									
	X	9. Are there large, disabled, elderly, etc. families?									
	X	10. Will public housing be needed for project?									
X		11. Is public housing available?									
X		12. Is it felt there will be adequate DSS housing available during relocation period?									
	X	13. Will there be a problem of housing within financial means?									
X		14. Are suitable business sites available (list source).									
		15. Number months estimated to complete RELOCATION? 2 YEARS									

0-20M		20-40M		40-70M		70-100M		100 UP		TOTAL	
0	0	0	0	8	9	0	0	0	0	17	0
\$ 0-150		150-250		250-400		400-600		600 UP		DSS DWELLING AVAILABLE	
0	0	0	0	0	0	3	3	0	0	330	0

REMARKS (Respond by Number)

2. At least one (1) church "Living Waters Christian Community Church" will be affected by this alignment.

3. Some businesses will remain as in the before situation.

4. See attached page #2.

6. MLS, Realtor.com, and newspaper

11. Durham County Housing Authority

12. Comparable DSS Housing is currently available.

14. MLS, Realtor.com, and newspaper

Robert H. Matthews May 9, 2007 *Am Simpson* 5-11-07

(Alt. #3)

Question #4 Response:

1. GTI East Auto Exchange & Service 15 employees
2. United Sign, Services, & Printing Company 10 employees
3. Antiques Buy & Sell 2 employees
4. Junk Yard
5. Auto Repair Shop 5 employees
6. Furniture Store 10 employees
7. Clean Green, Inc. 50 employees
8. Holloway Towing 5 employees
9. Sitework Contracting 15 employees

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

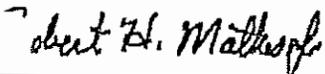
E.I.S. CORRIDOR DESIGN

WBS ELEMENT:	34745.1.1	COUNTY	Durham	Alternate	4	of	4	Alternate
T.I.P. No.:	U-0071							
DESCRIPTION OF PROJECT:	Construct the Proposed East End Connector Connecting NC 147 and US 70							

ESTIMATED DISPLACED					INCOME LEVEL					
Type of Displacees	Owners	Tenants	Total	Minorities	0-15M	15-25M	25-35M	35-50M	50 UP	
Residential	39	0	39	18	0	0	0	22	17	
Businesses	10	0	10	4	VALUE OF DWELLING		DSS DWELLING AVAILABLE			
Farms	0	0	0	0	Owners		Tenants		For Sale	
Non-Profit	0	0	0	0	0-20M	0	\$ 0-150	0	0-20M	0
					20-40M	0	150-250	0	20-40M	0
					40-70M	10	250-400	0	40-70M	3
					70-100M	20	400-600	0	70-100M	3
					100 UP	9	600 UP	0	100 UP	324
					TOTAL	39	0	0	330	0

ANSWER ALL QUESTIONS		
Yes	No	Explain all "YES" answers.
	X	1. Will special relocation services be necessary?
X		2. Will schools or churches be affected by displacement?
X		3. Will business services still be available after project?
X		4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
	X	5. Will relocation cause a housing shortage?
	X	6. Source for available housing (list).
	X	7. Will additional housing programs be needed?
	X	8. Should Last Resort Housing be considered?
	X	9. Are there large, disabled, elderly, etc. families?
	X	10. Will public housing be needed for project?
X		11. Is public housing available?
X		12. Is it felt there will be adequate DSS housing available during relocation period?
	X	13. Will there be a problem of housing within financial means?
X		14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 2 YEARS

REMARKS (Respond by Number)	
2.	At least two (2) churches will be affected by this alignment: Living Waters Christian Community Church Believers Assembly Christian Church
3.	Some business will remain as in the before situation.
4.	See attached page #2.
6.	MLS, Realtor.com, and newspaper
11.	Durham County Housing Authority
12.	Comparable DSS Housing is currently available.
14.	MLS, Realtor.com, and newspaper

	May 9, 2007 Date		5-11-07 Date
Robert H. Mathes, Jr. / tsg Right of Way Agent		Relocation Coordinator	

(Att. #4)

Question #4 Response:

- | | | |
|-----|----------------------------------|--------------|
| 1. | Holloway Towing | 5 employees |
| 2. | Rifenburg Construction, Inc. | 15 employees |
| 3. | Sitework Construction | 15 employees |
| 4. | City Auto Salvage | 20 employees |
| 5. | Circle K Stores, Inc. | 5 employees |
| 6. | Fish Restaurant | |
| 7. | Gas Station | 5 employees |
| 8. | Car Dealership | 2 employees |
| 9. | GTI East Auto Exchange & Service | 15 employees |
| 10. | Maintenance Yard | |
| 11. | Furniture Store | 10 employees |

Ans

Appendix C
Air Quality Analysis



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

RECEIVED
Division of Highways

MAY 16 2007

Preconstruction
Project Development and
Environmental Analysis Branch

MICHAEL F. EASLEY
GOVERNOR

May 10, 2007

LYNDO TIPPETT
SECRETARY

MEMORANDUM TO:

Beverly Robinson
Project Development Engineer - Central Region

FROM:

Bobby Dunn 
Traffic Noise/Air Quality Section

SUBJECT:

Air Quality Analysis for U-0071
NC 147, US 70 from NC 98 to Pleasant Drive,
Durham County, WBS # 34745.1.1

AIR QUALITY ANALYSIS

Air pollution originates from various sources. Emissions from industry and internal combustion engines are the most prevalent sources. The impact resulting from highway construction ranges from intensifying existing air pollution problems to improving the ambient air quality. Changing traffic patterns are a primary concern when determining the impact of a new highway facility or the improvement of an existing highway facility. Motor vehicles emit carbon monoxide (CO), nitrogen oxide (NO), hydrocarbons (HC), particulate matter, sulfur dioxide (SO₂), and lead (Pb) (listed in order of decreasing emission rate). Automobiles are considered the major source of CO in the project area. For this reason, most of the analysis presented herein is concerned with determining expected carbon monoxide levels in the vicinity of the project due to traffic flow.

Carbon Monoxide

In order to determine the ambient CO concentration at a receptor near a highway, two concentration components must be used: local and background. The local concentration is defined as the CO emissions from cars operating on highways in the near vicinity (i.e., distances within 400 feet) of the receptor location. The background concentration is defined by the North Carolina Department of Environment, Health and Natural Resources as "the concentration of a pollutant at a point that is the result of emissions outside the local vicinity; that is, the concentration at the upwind edge of the local sources." In this study, the local concentration was determined by the NCDOT Traffic Noise/Air Quality Staff using line source computer modeling and the background component was obtained from the North Carolina Department of Environment, Health and Natural Resources (NCDEHNR). Once the two concentration

MAILING ADDRESS:
NO DEPARTMENT OF TRANSPORTATION
OFFICE OF HUMAN ENVIRONMENT
1583 MAIL SERVICE CENTER
RALEIGH NC 27699-1583

TELEPHONE: 919-716-1500
FAX: 919-716-1522

WEBSITE: WWW.NCDOT.ORG

LOCATION:
PARKER LINCOLN BLDG
2728 CAPITAL BLVD
RALEIGH NC

components were ascertained, they were added together to determine the ambient CO concentration for the area in question and to compare to the National Ambient Air Quality Standards (NAAQS).

Ozone & Nitrogen Dioxide

Automobiles are regarded as sources of hydrocarbons and nitrogen oxides. Hydrocarbons and nitrogen oxides emitted from cars are carried into the atmosphere where they react with sunlight to form ozone (O₃) and nitrogen dioxide (NO₂). Automotive emissions of HC and NO_x are expected to decrease in the future due to the continued installation and maintenance of pollution control devices on new cars. However, regarding area-wide emissions, these technological improvements maybe offset by the increasing number of cars on the transportation facilities of the area.

The photochemical reactions that form ozone and nitrogen dioxide require several hours to occur. For this reason, the peak levels of ozone generally occur 10 to 20 kilometers downwind of the source of hydrocarbon emissions. Urban areas as a whole are regarded as sources of hydrocarbons, not individual streets and highways. The emissions of all sources in an urban area mix in the atmosphere, and, in the presence of sunlight, this mixture reacts to form ozone, nitrogen dioxide, and other photochemical oxidants. The best example of this type of air pollution is the smog that forms in Los Angeles, California.

Particulate Matter & Sulfur

Automobiles are not regarded as significant sources of particulate matter (PM) and sulfur dioxide (SO₂). Nationwide, highway sources account for less than seven percent of particulate matter emissions and less than two percent of sulfur dioxide emissions. Particulate matter and sulfur dioxide emissions are predominantly the result of non-highway sources (e.g., industrial, commercial, and agricultural). Because emissions of particulate matter and sulfur dioxide from automobiles are very low, there is no reason to suspect that traffic on the project will cause air quality standards for particulate matter and sulfur dioxide to exceed the NAAQS.

Lead

Automobiles without catalytic converters can burn regular gasoline. The burning of regular gasoline emits lead as a result of regular gasoline containing tetraethyl lead, which is added by refineries to increase the octane rating of the fuel. Newer cars with catalytic converters burn unleaded gasoline, thereby eliminating lead emissions. Also, the United States Environmental Protection Agency (EPA) has required the reduction in the lead content of leaded gasoline. The overall average lead content of gasoline in 1974 was approximately 0.53 gram per liter. By 1989, this composite average had dropped to 0.003 gram per liter. The Clean Air Act Amendments of 1990 made the sale, supply, or transport of leaded gasoline or lead additives unlawful after December 31, 1995. Because of these reasons, it is not expected that traffic on the proposed project will cause the NAAQS for lead to be exceeded.

CO Microscale Analysis

A microscale air quality analysis was performed to determine future CO concentrations resulting from the proposed highway improvements. "CAL3QHC - A Modeling Methodology For Predicting Pollutant Concentrations Near Roadway Intersections" was used to predict the CO concentration near sensitive receptors.

Inputs into the mathematical model used to estimate hourly CO concentrations consisted of a level roadway under normal conditions with predicted traffic volumes, vehicle emission factors, and worst-case meteorological parameters. The traffic volumes are based on the annual average daily traffic (AADT) projections. Carbon monoxide vehicle emission factors were calculated for the years 2015, 2020, and 2035 using the EPA publication "Mobile Source Emission Factors", and the MOBILE6 mobile source emissions computer model.

The background CO concentration for the project area was estimated to be 1.8 parts per million (ppm). Consultation with the North Carolina Department of Environment & Natural Resources' Air Quality Section indicated that an ambient CO concentration of 1.8 ppm is suitable for most suburban and rural areas.

The worst-case air quality scenario was determined to be in the vicinity of the intersection of US 70 and SR 1815 (Pleasant Drive). The predicted 1-hour average CO concentrations for the evaluation years of 2015, 2020, and 2035 are 5.40, 5.20 and 5.90 ppm, respectively. Comparison of the predicted CO concentrations with the NAAQS (maximum permitted for 1-hour averaging period = 35 ppm; 8-hour averaging period = 9 ppm) indicates no violation of these standards. Since the results of the worst-case 1-hour CO analysis for the build scenario is less than 9 ppm, it can be concluded that the 8-hour CO level does not exceed the standard. See Tables A1 through A3 for input data and output.

Attainment Status

The project is located in Durham County, which is within the Raleigh-Durham-Chapel Hill nonattainment area for ozone (O₃) and the Raleigh-Durham for carbon monoxide (CO) as defined by the EPA. The 1990 Clean Air Act Amendments (CAAA) designated these areas as moderate nonattainment area for CO. However, due to improved monitoring data, these areas were redesignated as maintenance for CO on September 18, 1995. The area was designated nonattainment for O₃ under the eight-hour ozone standard effective June 15, 2004. Section 176(c) of the CAAA requires that transportation plans, programs, and projects conform to the intent of the state air quality implementation plan (SIP). The current SIP does not contain any transportation control measures for Durham County. The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization 2030 Long Range Transportation Plan (LRTP) and the 2006-2012 Metropolitan Transportation Improvement Program (MTIP) conform to the intent of the SIP. The USDOT made a conformity determination on the LRTP on 6/15/05 and the MTIP on 11/14/05. The current conformity determination is consistent with the final conformity rule found in 40 CFR Parts 51 and 93. There are no significant changes in the project's design concept or scope, as used in the conformity analyses.

Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources in 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in Figure 1.

As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could adjust the full 21 and the primary 6 MSATs.

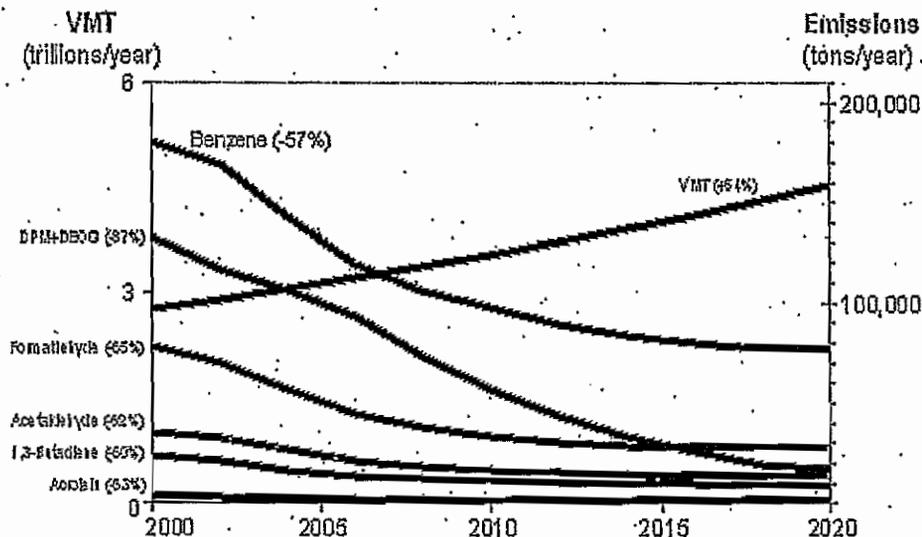
Unavailable Information for Project Specific MSAT Impact Analysis

This EA includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the alternatives in this EA. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

Information that is Unavailable or Incomplete: Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

Figure 1

U.S. Annual Vehicle Miles Traveled (VMT) vs. Mobile Source Air Toxics Emissions, 2000-2020



Notes: For on-road mobile sources, Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: Highway Statistics 2000, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM + DEOG" is based on MOBILE6.2-generated factors for elemental carbon, organic carbon and SO₄ from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns.

Emissions: The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model--emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large projects, but it is not

sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

Dispersion: The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

Exposure Levels and Health Effects: Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs: Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate

modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at <http://www.epa.gov/iris>. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

Benzene is characterized as a known human carcinogen.

The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.

Formaldehyde is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.

1,3-butadiene is characterized as carcinogenic to humans by inhalation.

Acetaldehyde is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.

Diesel exhaust (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.

Diesel exhaust also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems¹. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of impacts based upon theoretical approaches or research methods generally accepted in the scientific community: Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

This document provides a quantitative analysis of MSAT emissions relative to the various alternatives and acknowledges that some of the project alternatives may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions-if any-from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm.

The additional travel lanes contemplated as part of the project alternatives will have the effect of moving some traffic closer to nearby homes, schools and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under certain Build Alternatives than the No Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along US 70, which traffic will be re-directed to the new proposed East End Connector. Upon completion of the East End Connector, the localized increases in MSAT concentrations would most likely decrease on US 70, due to decrease in speed and the existence of the East End Connector. However, as discussed above, the magnitude and the duration of these potential increases compared to the No-build alternative cannot be accurately quantified due to the inherent deficiencies of current models. In sum, when a highway is widened and, as a result, moves closer to receptors, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSATs will be lower in other locations when traffic shifts away

from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover will, over time, cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

Lessening the effects of mobile source air toxics should be considered for projects with substantial construction-related MSAT emissions that are likely to occur over an extended building period, and for post-construction scenarios where the NEPA analysis indicates potentially meaningful MSAT levels. Such mitigation efforts should be evaluated based on the circumstances associated with individual projects, and they may not be appropriate in all cases. However, there are a number of available mitigation strategies and solutions for countering the effects of MSAT emissions.

During construction of the proposed project, all materials resulting from clearing and grubbing, demolition or other operations will be removed from the project, burned or otherwise disposed of by the Contractor. Any burning done will be done in accordance with applicable local laws and ordinances and regulations of the North Carolina SIP for air quality in compliance with 15 NCAC 2D.0520. Care will be taken to insure burning will be done at the greatest distance practical from dwellings and not when atmospheric conditions are such as to create a hazard to the public. Burning will be performed under constant surveillance. Also during construction, measures will be taken to reduce the dust generated by construction when the control of dust is necessary for the protection and comfort of motorists or area residents. This evaluation completes the assessment requirements for air quality of the 1990 Clean Air Act Amendments and the NEPA process, and no additional reports are necessary.

¹ South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

Table A1

CALBQHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0, JANUARY 1992

JOB: U-0071Y15 NC 147 DURHAM COUNTY

RUN: U0071Y15; NC 147 DURHAM COUNTY

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S ZO = 108. CM
 U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 1.8 PPM BRG = 0. DEGREES

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C QUEUE	
		X1	Y1	X2	Y2								*	(VEH)
1. NB APPR	*	18.0	-1000.0	18.0	.0	*	1000.	360. AG	2527.	12.8	.0	44.0		
2. NB LT	*	.0	-30.0	.0	-399.5	*	.370.	180. AG	197.	100.0	.0	12.0	1.72	18.8
3. NB RT	*	36.0	-30.0	35.9	-33.6	*	4.	181. AG	21.	100.0	.0	12.0	.04	.2
4. NB THRU	*	18.0	-30.0	18.0	-130.1	*	100.	180. AG	42.	100.0	.0	24.0	.88	5.1
5. NB DEPT	*	18.0	.0	18.0	1000.0	*	1000.	360. AG	2433.	12.8	.0	44.0		
6. SB APPR	*	-18.0	1000.0	-18.0	.0	*	1000.	180. AG	2511.	12.8	.0	44.0		
7. SB LT	*	.0	30.0	.0	2300.9	*	2271.	360. AG	203.	100.0	.0	12.0	****	115.4
8. SB RT	*	-36.0	30.0	-35.7	44.5	*	15.	1. AG	209.	100.0	.0	12.0	-.42	.7
9. SB THRU	*	-18.0	30.0	-18.0	110396.2	*	****	360. AG	417.	100.0	.0	24.0	****	****
10. SB DEPT	*	-18.0	.0	-18.0	-1000.0	*	1000.	180. AG	2405.	12.8	.0	44.0		
11. EB APPR	*	-1000.0	-12.0	.0	-12.0	*	1000.	90. AG	186.	12.8	.0	32.0		
12. EB LT	*	-36.0	.0	-50.8	.0	*	15.	270. AG	207.	100.0	.0	12.0	-.56	.7
13. EB THRU/RT	*	-36.0	-12.0	-1496.2	-12.4	*	1460.	270. AG	197.	100.0	.0	12.0	4.21	74.2
14. EB DEPT	*	.0	-12.0	1000.0	-12.0	*	1000.	90. AG	97.	12.8	.0	32.0		
15. WB APPR	*	1000.0	12.0	.0	12.0	*	1000.	270. AG	236.	12.8	.0	32.0		
16. WB LT	*	42.0	.0	137.6	.0	*	96.	90. AG	205.	100.0	.0	12.0	****	4.9
17. WB THRU/RT	*	42.0	12.0	46.9	12.0	*	5.	90. AG	9.	100.0	.0	12.0	.12	.3
18. WB DEPT	*	.0	12.0	-1000.0	12.0	*	1000.	270. AG	97.	12.8	.0	32.0		

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. NB LT	*	120	113	2.0	67	1600	77.80	1	3
3. NB RT	*	120	12	2.0	55	1600	77.80	1	3
4. NB THRU	*	120	12	2.0	2433	1600	77.80	1	3
7. SB LT	*	120	117	2.0	84	1600	77.80	1	3
8. SB RT	*	120	120	2.0	22	1600	77.80	1	3
9. SB THRU	*	120	120	2.0	2405	1600	77.80	1	3
12. EB LT	*	120	119	2.0	22	1600	77.80	1	3
13. EB THRU/RT	*	120	113	2.0	164	1600	77.80	1	3
16. WB LT	*	120	118	2.0	55	1600	77.80	1	3
17. WB THRU/RT	*	120	5	2.0	181	1600	77.80	1	3

Table A1 (Cont'd)

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT)		
	X	Y	Z
1. REC 1	65.0	60.0	5.0
2. REC 2	170.0	70.0	5.0
3. REC 3	60.0	180.0	5.0
4. REC 4	60.0	325.0	5.0
5. REC 5	-65.0	60.0	5.0
6. REC 6	-170.0	70.0	5.0
7. REC 7	-60.0	180.0	5.0
8. REC 8	-60.0	325.0	5.0
9. REC 9	-65.0	-60.0	5.0
10. REC 10	-170.0	-70.0	5.0
11. REC 11	-60.0	-180.0	5.0
12. REC 12	-60.0	-325.0	5.0
13. REC 13	65.0	-60.0	5.0
14. REC 14	170.0	-70.0	5.0
15. REC 15	60.0	-180.0	5.0
16. REC 16	60.0	-325.0	5.0

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND * CONCENTRATION

ANGLE * (PPM)

(DEGR)* REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16

THE HIGHEST CONCENTRATION IS 5.40 PPM AT 16 DEGREES FROM REC7 .

Table A2

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0, JANUARY 1992

JOB: U-0071Y20 NC 147 DURHAM COUNTY

RUN: U0071Y20; NC 147 DURHAM COUNTY

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S ZO = 108. CM
 U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 1.8 PPM BRG = 0. DEGREES

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. NB APPR	18.0	-1000.0	18.0	.0	1000.	360. AG	3100.	11.2	.0	44.0		
2. NB LT	.0	-30.0	.0	-512.0	482.	180. AG	170.	100.0	.0	12.0	1.97	24.5
3. NB RT	36.0	-30.0	35.9	-33.7	4.	181. AG	18.	100.0	.0	12.0	.04	.2
4. NB THRU	18.0	-30.0	18.0	-1277.4	1247.	180. AG	36.	100.0	.0	24.0	1.07	63.4
5. NB DEPT	18.0	.0	18.0	1000.0	1000.	360. AG	2966.	11.2	.0	44.0		
6. SB APPR	-18.0	1000.0	-18.0	.0	1000.	180. AG	3078.	11.2	.0	44.0		
7. SB LT	.0	30.0	.0	2748.1	2718.	360. AG	176.	100.0	.0	12.0	****	138.1
8. SB RT	-36.0	30.0	-35.7	44.5	15.	1. AG	180.	100.0	.0	12.0	-.42	.7
9. SB THRU	-18.0	30.0	-18.0	208570.4	****	360. AG	360.	100.0	.0	24.0	****	****
10. SB DEPT	-18.0	.0	-18.0	-1000.0	1000.	180. AG	2967.	11.2	.0	44.0		
11. EB APPR	-1000.0	-12.0	.0	-12.0	1000.	90. AG	194.	11.2	.0	32.0		
12. EB LT	-36.0	.0	-50.8	.0	15.	270. AG	179.	100.0	.0	12.0	-.56	.7
13. EB THRU/RT	-36.0	-12.0	-1586.2	-12.4	1550.	270. AG	170.	100.0	.0	12.0	4.41	78.7
14. EB DEPT	.0	-12.0	1000.0	-12.0	1000.	90. AG	95.	11.2	.0	32.0		
15. WB APPR	1000.0	12.0	.0	12.0	1000.	270. AG	242.	11.2	.0	32.0		
16. WB LT	42.0	.0	146.6	.0	105.	90. AG	177.	100.0	.0	12.0	****	5.3
17. WB THRU/RT	42.0	12.0	47.1	12.0	5.	90. AG	8.	100.0	.0	12.0	.13	.3
18. WB DEPT	.0	12.0	-1000.0	12.0	1000.	270. AG	96.	11.2	.0	32.0		

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. NB LT	120	113	2.0	77	1600	67.20	1	3
3. NB RT	120	12	2.0	57	1600	67.20	1	3
4. NB THRU	120	12	2.0	2966	1600	67.20	1	3
7. SB LT	120	117	2.0	89	1600	67.20	1	3
8. SB RT	120	120	2.0	22	1600	67.20	1	3
9. SB THRU	120	120	2.0	2967	1600	67.20	1	3
12. EB LT	120	119	2.0	22	1600	67.20	1	3
13. EB THRU/RT	120	113	2.0	172	1600	67.20	1	3
16. WB LT	120	118	2.0	57	1600	67.20	1	3
17. WB THRU/RT	120	5	2.0	185	1600	67.20	1	3

Table A2 (Cont'd)

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT)		
	X	Y	Z
1. REC 1	65.0	60.0	5.0
2. REC 2	170.0	70.0	5.0
3. REC 3	60.0	180.0	5.0
4. REC 4	60.0	325.0	5.0
5. REC 5	-65.0	60.0	5.0
6. REC 6	-170.0	70.0	5.0
7. REC 7	-60.0	180.0	5.0
8. REC 8	-60.0	325.0	5.0
9. REC 9	-65.0	-60.0	5.0
10. REC 10	-170.0	-70.0	5.0
11. REC 11	-60.0	-180.0	5.0
12. REC 12	-60.0	-325.0	5.0
13. REC 13	65.0	-60.0	5.0
14. REC 14	170.0	-70.0	5.0
15. REC 15	60.0	-180.0	5.0
16. REC 16	60.0	-325.0	5.0

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR) * REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16

THE HIGHEST CONCENTRATION IS 5.20 PPM AT 12 DEGREES FROM REC7 .

Table A3

CAL3QBC: LINE SOURCE DISPERSION MODEL - VERSION 2.0, JANUARY 1992

JOB: U-0071Y35 NC 147 DURHAM COUNTY

RUN: U0071Y35; NC 147 DURHAM COUNTY

SITE & METEOROLOGICAL VARIABLES

VS = 1.0 CM/S VD = 0 CM/S Z0 = 108. CM
 U = 1.0 M/S CLAS = 4 (D) ATTM = 60. MINUTES MIXH = 1000. M AMB = 1.8 PPM BRG = 0. DEGREES

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C QUEUE (VEH)
		X1	Y1	X2	Y2								
1. NB APPR	*	18.0	-1000.0	18.0	.0	1000.	360. AG	4820.	10.3	.0	44.0		
2. NB LT	*	.0	-30.0	.0	-4571.9	4542.	180. AG	163.	100.0	.0	12.0	**** 230.7	
3. NB RT	*	36.0	-30.0	35.9	-32.8	3.	181. AG	11.	100.0	.0	12.0	.05 .1	
4. NB THRU	*	18.0	-30.0	18.0	-9153.1	9123.	180. AG	22.	100.0	.0	24.0	1.62 463.5	
5. NB DEPT	*	18.0	.0	18.0	1000.0	1000.	360. AG	4650.	10.3	.0	44.0		
6. SB APPR	*	-18.0	1000.0	-18.0	.0	1000.	180. AG	4780.	10.3	.0	44.0		
7. SB LT	*	.0	30.0	.0	602.0	572.	360. AG	165.	100.0	.0	12.0	**** 29.1	
8. SB RT	*	-36.0	30.0	-35.7	46.6	17.	1. AG	167.	100.0	.0	12.0	-.47 .8	
9. SB THRU	*	-18.0	30.0	-18.0	812233.3	****	360. AG	335.	100.0	.0	24.0	**** *****	
10. SB DEPT	*	-18.0	.0	-18.0	-1000.0	1000.	180. AG	4650.	10.3	.0	44.0		
11. EB APPR	*	-1000.0	-12.0	.0	-12.0	1000.	90. AG	220.	10.3	.0	32.0		
12. EB LT	*	-36.0	.0	-53.0	.0	17.	270. AG	166.	100.0	.0	12.0	-.64 .9	
13. EB THRU/RT	*	-36.0	-12.0	-2215.3	-12.5	2179.	270. AG	160.	100.0	.0	12.0	**** 110.7	
14. EB DEPT	*	.0	-12.0	1000.0	-12.0	1000.	90. AG	90.	10.3	.0	32.0		
15. WB APPR	*	1000.0	12.0	.0	12.0	1000.	270. AG	250.	10.3	.0	32.0		
16. WB LT	*	42.0	.0	111.4	.0	69.	90. AG	166.	100.0	.0	12.0	**** 3.5	
17. WB THRU/RT	*	42.0	12.0	46.3	12.0	4.	90. AG	6.	100.0	.0	12.0	.13 .2	
18. WB DEPT	*	.0	12.0	-1000.0	12.0	1000.	270. AG	90.	10.3	.0	32.0		

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. NB LT	*	120	117	2.0	105	1600	62.40	1	3
3. NB RT	*	120	8	2.0	65	1600	62.40	1	3
4. NB THRU	*	120	8	2.0	4650	1600	62.40	1	3
7. SB LT	*	120	118	2.0	105	1600	62.40	1	3
8. SB RT	*	120	120	2.0	25	1600	62.40	1	3
9. SB THRU	*	120	120	2.0	4650	1600	62.40	1	3
12. EB LT	*	120	119	2.0	25	1600	62.40	1	3
13. EB THRU/RT	*	120	115	2.0	195	1600	62.40	1	3
16. WB LT	*	120	119	2.0	65	1600	62.40	1	3
17. WB THRU/RT	*	120	4	2.0	195	1600	62.40	1	3

Table A3 (Cont'd)

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT)			*
		X	Y	Z	
1. REC 1	*	65.0	60.0	5.0	*
2. REC 2	*	170.0	70.0	5.0	*
3. REC 3	*	60.0	180.0	5.0	*
4. REC 4	*	60.0	325.0	5.0	*
5. REC 5	*	-65.0	60.0	5.0	*
6. REC 6	*	-170.0	70.0	5.0	*
7. REC 7	*	-60.0	180.0	5.0	*
8. REC 8	*	-60.0	325.0	5.0	*
9. REC 9	*	-65.0	-60.0	5.0	*
10. REC 10	*	-170.0	-70.0	5.0	*
11. REC 11	*	-60.0	-180.0	5.0	*
12. REC 12	*	-60.0	-325.0	5.0	*
13. REC 13	*	65.0	-60.0	5.0	*
14. REC 14	*	170.0	-70.0	5.0	*
15. REC 15	*	60.0	-180.0	5.0	*
16. REC 16	*	60.0	-325.0	5.0	*

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR) * REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8 REC9 REC10 REC11 REC12 REC13 REC14 REC15 REC16

THE HIGHEST CONCENTRATION IS 5.90 PPM AT 162 DEGREES FROM REC8 .

**Appendix D
Noise Analysis**



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

July 30, 2007

MEMORANDUM TO: Beverly Robinson
Project Planning Engineer

FROM: Gregory A. Smith, P. E.
Traffic Noise & Air Quality Supervisor

SUBJECT: Highway Traffic Noise/Construction Noise Analysis
Proposed Durham East End Connector, Durham County,
State Project # 8.1351501, F.A. Project # NHF-76-1 (2)
TIP # U-0071, WBS # 34745.1.1

HIGHWAY TRAFFIC NOISE/CONSTRUCTION NOISE ANALYSIS

This analysis was performed to determine the effect on traffic noise levels in the immediate project area as the result of constructing a proposed East End Connector from NC 147 to US 70 in Durham County. (Figure N1).

This investigation includes an inventory of existing noise sensitive land uses and a field survey of ambient (existing) noise levels in the study area. It also includes a comparison of the predicted noise levels and the ambient noise levels to determine if traffic noise impacts can be expected resulting from the proposed project. Traffic noise impacts are determined from the current procedures for the abatement of highway traffic noise and construction noise, appearing as Part 772 of Title 23 of the Code of Federal Regulations. If traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures must be considered for reducing or eliminating the traffic noise impacts

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
OFFICE OF HUMAN ENVIRONMENT
1548 MAIL SERVICE CENTER
RALEIGH NC 27699-1548

TELEPHONE: 919-715-1500
FAX: 919-715-1522

WEBSITE: WWW.NCDOT.ORG

LOCATION:
PARKER LINCOLN BLDG
2728 CAPITAL BLVD
RALEIGH NC

CHARACTERISTICS OF NOISE

Noise is basically defined as unwanted sound. It is emitted from many sources including airplanes, factories, railroads, power generation plants, and highway vehicles. Highway noise, or traffic noise, is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually the decibel (dB). Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency weighted scales (A, B, C, or D).

The weighted-A decibel scale is used almost exclusively in vehicle noise measurements because it places the most emphasis on the frequency range to which the human ear is most sensitive (1,000-6,000 Hertz). Sound levels measured using a weighted-A decibel scale are often expressed as dBA. Throughout this report, all noise levels will be expressed in dBA's. Several examples of noise pressure levels in dBA are listed in Table N1.

Review of Table N1 indicates that most individuals in urbanized areas are exposed to fairly high noise levels from many sources as they go about their daily activities. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

- 1) The amount and nature of the intruding noise
- 2) The relationship between the background noise and the intruding noise
- 3) The type of activity occurring when the noise is heard

Over time, particularly if the noises occur at predicted intervals and are expected, individuals tend to accept the noises that intrude into their lives. Attempts have been made to regulate many of these types of noises including airplane noise, factory noise, railroad noise, and highway traffic noise. In relation to highway traffic noise, methods of analysis and control have developed rapidly over the past few years.

NOISE ABATEMENT CRITERIA

The Federal Highway Administration (FHWA) has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways to determine whether highway noise levels are or are not compatible with various land uses. These abatement criteria and procedures are set forth in the aforementioned Federal reference (Title 23 CFR Part 772). A summary of the noise abatement criteria for various land uses is presented in Table N2. The Leq, or equivalent sound level, is the level of constant sound which in a given situation and time period has the same energy as does time varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content.

AMBIENT NOISE LEVELS

Ambient noise measurements were taken in the vicinity of the project to determine ambient (existing) noise levels for the identified land uses. The purpose of this noise level information was to quantify the existing acoustic environment and to provide a base for assessing the impact of noise level increases. The existing Leq noise levels in the project area were measured at 50 feet from the edge of pavement and ranged from 63.0 dBA to 70.7 dBA. A background noise level of 50.0 dBA was determined for the project to be used in areas where traffic noise was not the predominant source. The ambient measurement locations are shown in Figure N1 and Table N3.

The existing roadway and traffic conditions were used with the most current traffic noise prediction model to calculate existing noise levels for comparison with noise levels actually measured. The calculated existing noise levels averaged less than 2 dBA difference from measured noise levels for the location where noise measurements were obtained. Hence, the computer model is a reliable tool in the prediction of noise levels. Differences in dBA levels can be attributed to "bunching" of vehicles, low traffic volumes, and actual vehicle speeds versus the computer's "evenly-spaced" vehicles and single vehicular speed.

PROCEDURE FOR PREDICTING FUTURE NOISE LEVELS

In general, the traffic situation is composed of a large number of variables that describe different cars driving at different speeds through a continual changing highway configuration and surrounding terrain. Due to the complexity of the problem, certain assumptions and simplifications must be made to predict highway traffic noise. The FHWA's Traffic Noise Model (TNM 2.5) software was used to predict future noise levels in this study. TNM 2.5 incorporates the number and type of vehicles on the planned roadway, their speeds, the physical characteristics of the road (curves, hills, depressed, elevated, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier top elevation to predict future traffic noise impacts.

In this regard, it is noted that only preliminary alignment was available for use in this noise analysis. The project proposes constructing a connector between NC 147 and US 70 in Durham County. This noise analysis evaluated three alternate alignments_ Alternate # 1, Alternate # 3 and Alternate #4. Only existing natural or man-made barriers were included as TNM physical characteristic factors in this analysis. All roadway sections and proposed interchanges were considered flat and at-grade, respectively. Thus, this analysis represents "worst-case" topographical conditions. The noise predictions made in this report are highway-related noise predictions for the traffic conditions during the design year 2035.

Peak hour design and level-of-service (LOS) C traffic volumes were compared, with volumes resulting in the noisiest conditions used with the proposed posted speed limits. Accordingly, the resultant noise levels indicated in this report will be no greater than

those during all other times. The TNM software was utilized to determine the number of land uses (by type) which will be impacted during the peak hour of the design year 2035. A land use is considered impacted when exposed to noise levels approaching or exceeding the FHWA noise abatement criteria and/or predicted to sustain a substantial noise increase shown in Table N2.

TRAFFIC NOISE IMPACTS AND NOISE CONTOURS

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dBA of the Table N2 value), or [b] substantially exceed the existing noise levels. The NCDOT definition of substantial increase is shown in the lower portion of Table N2. Consideration for noise abatement measures must be given to receptors that fall in either category. Table N4 lists the traffic noise exposures for approximately 225 sites using the traffic noise model.

In accordance with the NCDOT 2004 Traffic Noise Abatement Policy, Federal and State governments are not responsible for providing noise abatement measures for new development for which building permits are issued within the noise impact area of a proposed highway after the Date of Public Knowledge. The Date of Public Knowledge of the location of a proposed highway project will be the approval date of the final document (CE, FONSI, or ROD). For development occurring after this date, local governing bodies are responsible to ensure that noise compatible designs are utilized along the proposed facility.

The number of receptors in each activity category, for each section and for each alternate, that are predicted to become impacted by future traffic noise are shown in Table N5. These are noted in terms of those receptors expected to experience traffic noise impacts by either approaching or exceeding the FHWA NAC or by a substantial increase in exterior noise levels. In accordance with Title 23 CFR Part 772 and through utilization of TNM 2.5, the following highway traffic noise impacts were determined, by Alternate:

<u>Alternate</u>	<u>Residences</u>	<u>Businesses</u>	<u>Churches</u>
# 1	47	6	3
# 3	9	3	1
# 4	15	7	1

The maximum extent of the 72-dBA noise level contour is 256.4 feet from the center of the proposed roadway. The maximum extent of the 67-dBA noise level contour is 400.6 feet from the center of the proposed roadway. Contour information is shown by roadway section in Table N5. This information should assist local authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway within local jurisdiction. For example, with the proper information on noise, the local authorities can prevent further development of incompatible activities and land uses with the predicted noise levels of an adjacent highway.

Table N6 exhibits the exterior traffic noise level increases for the identified receptors by roadway section. There are 5, 11 and 17 substantial noise level impacts anticipated in the selection of Alternate # 1, Alternate # 3 and Alternate # 4, respectively. The predicted noise level increases above ambient levels for this project range up to +22 dBA. When real-life noises are heard, it is barely possible to detect noise level changes of 2-3 dBA. A 5-dBA change is more readily noticeable.

Alternate # 1 has one area of 35 predicted impacts located along NC 147 (Receptors R-188 through R-225) that could be considered for noise abatement. Alternate # 3 has one area of 8 predicted impacts (R-111 through R-142) and Alternate # 4 has 7 predicted impacts (R-110A through R-120A) located along the proposed connector that could be considered for noise abatement. The alternative selected as the preferred alignment should be reevaluated during the project's design phase to develop a more detailed determination of the noise impacts and appropriate mitigation measures. The final decision regarding noise abatement measures will be made only upon completion of the project final design and the public involvement process.

TRAFFIC NOISE ABATEMENT MEASURES

If traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures must be given to all impacted receptors. Studies up-to-date have concluded that Alternate # 3 is the preferred alternate; therefore, noise mitigation in the form of noise walls will be limited to Alternate #3. The following discussion addresses the applicability of mitigation measures to the proposed project.

Highway Alignment Selection

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

Traffic System Management Measures

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

Past project experience has shown that a reduction in the speed limit of 10 mph would result in a noise level reduction of approximately 1 to 2 dBA. Because most people cannot detect a noise reduction of up to 3 dBA and because reducing the speed limit would reduce roadway capacity, it is not considered a viable noise abatement measure.

This, and other traffic system management measures, including the prohibition of truck operations, are not considered to be consistent with the project's objective of providing a high-speed, limited-access facility.

Noise Barriers

Noise barriers reduce noise levels by blocking the sound path between a noise sensitive area and a roadway. This measure is most often used on high-speed, limited-access facilities where noise levels are high and there is adequate space for continuous barriers. Access restriction permit the application of solid mass, attenuable measures to effectively diffract, absorb and reflect highway traffic noise. Solid mass, attenuable measures may be constructed from an individual material or a combination of materials, such as concrete, wood, metal, earth or vegetation. However, these mitigating measures may not be feasible or reasonable in all cases, particularly for receptors that front a primary or secondary roadway in the project area. Reduction of the traffic noise from the proposed roadway may not substantially lower the noise levels at these receptors due to the noise level contributions from the primary or secondary roadways. Furthermore, for isolated receptors, or where the application of physical abatement may not achieve at least a 5 dBA reduction, the probable noise reduction in relation to the benefits provided as compared to the cost may not be reasonable.

For a noise barrier to provide sufficient noise reduction it must be high enough and long enough to shield the receptor from significant sections of the highway. Access openings in the barrier created by driveways or intersections severely reduce the noise reduction provided by the barrier. It then becomes economically unreasonable to construct a barrier for a small noise reduction. Safety at access openings (driveways, crossing streets, etc.) due to restricted sight distance is also a concern. To provide a sufficient reduction, a barrier's length normally must be 8 times the distance from the barrier to the receptor. For example, a receptor located 50 feet from the barrier would normally require a barrier 400 feet long. An access opening of 40 feet (10 percent of the area) would limit its noise reduction to approximately 4 dBA (FUNDAMENTAL AND ABATEMENT OF HIGHWAY TRAFFIC NOISE, Report No. FHWA-HHI-HEV-73-7976-1, USDOT, chapter 5, section 3.2, pages 5-27). These factors would not allow noise walls to be acceptable abatement measures along uncontrolled right-of-way. In addition, businesses, churches, and other related establishments located along a particular highway normally require accessibility and high visibility. Solid mass, attenuable measures for traffic noise abatement would tend to disallow these two qualities.

NCDOT conducted a noise barrier evaluation at the location of predicted impacts along Alternate #3, the likely preferred alignment. The evaluation was accomplished in two steps. First, a qualitative barrier evaluation was performed for each impacted receptor that considered each receptor's FHWA NAC activity category, source-receptor relationships, impacted site densities, and the ability to have continuous barriers.

The second step of the barrier evaluation involved computer modeling of noise barriers at the potential location, using the TNM traffic noise prediction model. The analysis was accomplished by develop barriers to meet minimum noise reduction goals at the impacted

site, by estimating the cost of the barrier, and by determining the cost per benefited receptor. The NCDOT defines benefited receptors as all receptors, impacted and non-impacted, which, by placement of the noise mitigation measure, receive a minimum noise level reduction of 5 dBA. Only one area was identified as a potential location for noise mitigation in the form of a noise barrier.

For a noise barrier to be considered feasible, it must meet, among other factors, the following conditions:

- Provide a minimum insertion loss of 5 dBA, preferably 8 dBA or more (for receptors directly adjacent to the project)
- Located in an acoustic environment where no other noise sources are present
- Suitable for construction given the topography of the location

Other primary considerations of the reasonableness of noise barrier installation are that it is cost effective per NCDOT Noise Abatement Policy and that development of the impacted structure (residence, business, etc.) occurred after the "date of public knowledge".

The identified noise-impacted area along Alternate # 3 is located on the north side of the East-West Connector between the NC 147 and US 70 interchanges in the vicinity of Rowena Avenue (Figure 2). Based on preliminary studies described in this report, the likely noise abatement measure for this area is a pile and panel concrete wall that benefits five receptors. The wall ranges in height from 10 to 12 feet and is approximately 1,082' long, costing \$188,984 or \$37,800 per receptor (based on \$15.00/ft² per the NCDOT Traffic Noise Abatement Policy). The noise barrier must cross the proposed structure over Rowena Avenue to be effective in achieving the desired noise reduction, resulting in additional costs in structure design and construction. This proposed barrier should be reevaluated during the project's final design phase to determine more accurately the noise impacts and appropriate mitigation measures. As previously stated, the final decision of abatement measures will be made only upon completion of the final design of the project and the public involvement process.

Other Mitigation Measures Considered

The acquisition of property in order to provide buffer zones to minimize noise impacts is not considered to be a feasible noise mitigation measure for this project. The cost to acquire impacted receptors for buffer zones would exceed the abatement threshold allowed cost per benefited receptor. The use of buffer zones to minimize impacts to future sensitive areas is not recommended because this could be accomplished through land use control.

The use of vegetation for noise mitigation is not considered reasonable for this project, due to the substantial amount of right-of-way necessary to make vegetative barriers effective. FHWA research found that a vegetative barrier should be approximately 100' wide to provide a 3-dBA reduction in noise levels. In order to provide a 5-dBA reduction, substantial amounts of additional right-of-way would be required. The cost of

the additional right-of-way and plant sufficient vegetation is estimated to exceed the allowable abatement threshold for benefited receptors. Noise insulation was also considered; however, no public or non-profit institutions were identified that would be eligible for consideration for noise insulation.

"DO NOTHING" ALTERNATIVE

Traffic noise impacts for the "do nothing" or "no-build" alternate was also considered. If the traffic currently using the network of roads in the project area should double within the next twenty years, future noise levels would increase in the range of 2-3 dBA. As previously noted, it is barely possible to detect noise level changes of 2-3 dBA. A 5-dBA change in noise levels is more readily noticed.

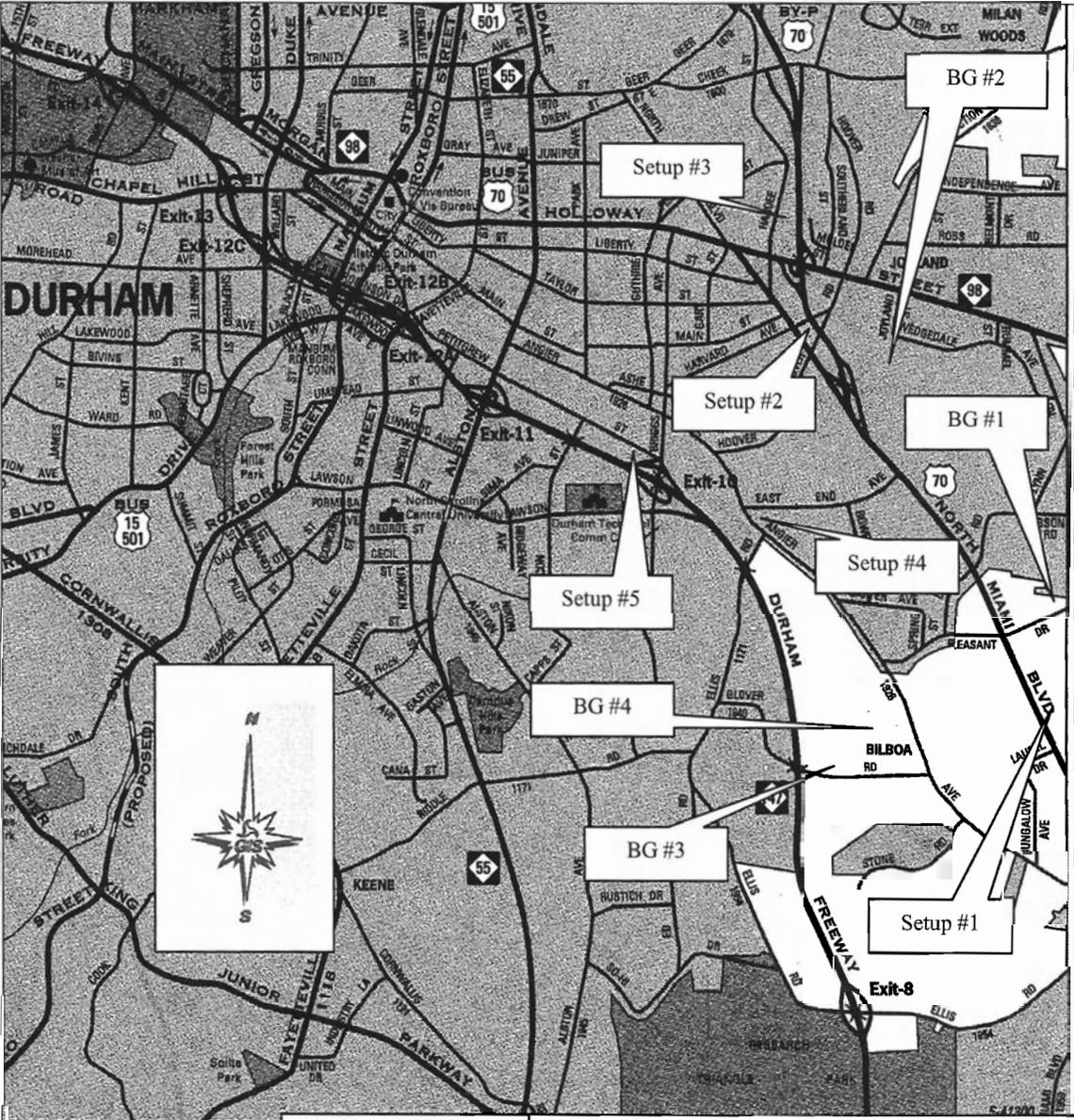
CONSTRUCTION NOISE

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

SUMMARY

Traffic noise impacts are an unavoidable consequence of transportation projects especially in areas where there are no traffic noise sources. All traffic noise impacts were considered for noise mitigation. Based on these preliminary studies for Alternate # 3, traffic noise abatement appears viable for one area on the north side of the East-West Connector near Rowena Avenue, between the proposed NC 147 and US 70 interchanges. This barrier should be reevaluated during the final design phase of the project to determine more accurately the noise impacts and appropriate mitigation measures. This evaluation completes the highway traffic noise requirements of Title 23 CFR Part 772.

**Figure N1
 Project Location & Ambient Measurement Sites
 Proposed East End Connector
 Durham County, TIP U-0071**



	North Carolina Department of Transportation Division of Highways Project Development and Environmental Analysis Traffic Noise Unit
	Durham County Proposed East End Connector TIP U-0071

TABLE N1

HEARING: SOUNDS BOMBARDING US DAILY

140	Shotgun blast, jet 30m away at takeoff	PAIN
	Motor test chamber	HUMAN EAR PAIN THRESHOLD
130	-----	
	Firecrackers	
120	Severe thunder, pneumatic jackhammer	
	Hockey crowd	
	Amplified rock music	UNCOMFORTABLY LOUD
110	-----	
	Textile loom	
100	Subway train, elevated train, farm tractor	
	Power lawn mower, newspaper press	
	Heavy city traffic, noisy factory	LOUD
90	-----	
D	Diesel truck 65 kmph at 15m away	
E	Crowded restaurant, garbage disposal	
C	Average factory, vacuum cleaner	
I	Passenger car 80 kmph at 15m away	MODERATELY LOUD
B	70	-----
E	Quiet typewriter	
L	Singing birds, window air-conditioner	
S	Quiet automobile	
	Normal conversation, average office	QUIET
50	-----	
	Household refrigerator	
	Quiet office	VERY QUIET
40	-----	
	Average home	
30	Dripping faucet	
	Whisper at 1.5m away	
20	Light rainfall, rustle of leaves	
		AVERAGE PERSON'S THRESHOLD OF HEARING
	Whisper	JUST AUDIBLE
10	-----	
0	THRESHOLD FOR ACUTE HEARING	

Sources: World Book, Rand McNally Atlas of the Human Body, Encyclopedia America, "Industrial Noise and Hearing Conversation" by J. B. Olishifski and E. R. Harford (Researched by N. Jane Hunt and published in the Chicago Tribune in an illustrated graphic by Tom Heinz.)

**TABLE N2
NOISE ABATEMENT CRITERIA**

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

Source: Title 23 Code of Federal Regulations (CFR) Part 772, U. S. Department of Transportation, Federal Highway Administration.

CRITERIA FOR SUBSTANTIAL INCREASE HOURLY A-WEIGHTED SOUND LEVEL - DECIBELS (dBA)	
Existing Noise Level in Leq(h)	Increase in dBA from Existing Noise Levels to Future Noise Levels
≤ 50	≥ 15
51	≥ 14
52	≥ 13
53	≥ 12
54	≥ 11
≥ 55	≥ 10

Source: North Carolina Department of Transportation Noise Abatement Policy (09/02/04).

TABLE N3
 AMBIENT NOISE LEVELS (Leq)
 Proposed East End Connector, Durham County, TIP U-0071

SITE	LOCATION	DESCRIPTION	NOISE LEVEL (dBA)
1	US 70 @ Antique Store	Grassy	68.3
2	US 70 South of Holloway Street @ DMV Office	Grassy	68.9
3	US 70 Service Road (South Bound Side) North of Holloway Street)	Grassy	70.7
4	Angier Ave. @ Orange Grove Missionary Church Parking Lot	Paved	63.8
5	East Pettigrew St. @ Duane St. (Haskell's Properties)	Grassy	63.0
BG1	Pleasant Drive North East of US 70	...	59.2
BG2	Springwood Park Apartment Complex	...	48.9
BG3	Glover Road @ Bill's Iron Works	...	56.1
BG4	Jones Circle	...	52.8
Y1	Holloway Street East of US 70	Modeled	69.4
Y2	Holloway Street West of US 70	Modeled	67.2
Y3	NC 147 From Start to Proposed Connector	Modeled	74.7

NOTE: The ambient noise level sites were measured at 50 feet from edge of pavement of the nearest lane of traffic.

TABLE N4
TRAFFIC NOISE EXPOSURES
Proposed East End Connector, Durham County, TIP U-0071
Alternate #1

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 From Start to Proposed Connector										
34	Business	C	US 70	68	-L-	70.0 R	-	-	R/W	-
36	Residence	B	"	66	"	75.0 R	-	-	R/W	-
37	Residence	B	"	68	"	50.0 R	-	-	R/W	-
38	Business	C	"	66	"	70.0 R	-	-	R/W	-
39	Business	C	"	67	"	70.0 R	-	-	R/W	-
40	Church	E	"	66/46	"	100.0 L	-	-	* 75/55	+ 9/9
41	Church	E	"	65/45	"	70.0 R	-	-	R/W	-
43	Church	E	"	60/40	"	190.0 R	-	-	* 71/51	* +11/11
51	Residence	B	"	65	"	140.0 L	-	-	R/W	-
52	Business	C	"	71	"	90.0 L	-	-	R/W	-
53	Residence	B	"	66	"	60.0 R	-	-	R/W	-
54	Residence	B	"	55	"	330.0 R	-	-	R/W	-
55	Residence	B	"	50	"	650.0 R	-	-	R/W	-
55A	Residence	B	"	50	"	1100.0 R	-	-	R/W	-
56	Residence	B	"	51	"	440.0 R	-	-	R/W	-
57	Residence	B	"	50	"	430.0 R	-	-	R/W	-
US 70 Bypass From Proposed Connector to North of Holloway Street										
58	Residence	B	Big Twig I.n.	50	-L-	840.0 R	-	-	54	+ 4
58A	Residence	B	"	50	"	900.0 R	-	-	54	+ 4
58B	Residence	B	"	50	"	950.0 R	-	-	53	+ 3
59	Residence	B	"	50	"	750.0 R	-	-	55	+ 5
60	Residence	B	"	50	"	690.0 R	-	-	56	+ 6
61	Residence	B	"	50	"	640.0 R	-	-	57	+ 7
62	Residence	B	"	50	"	630.0 R	-	-	57	+ 7
63	Residence	B	"	50	"	630.0 R	-	-	57	+ 7
64	Residence	B	"	50	"	630.0 R	-	-	57	+ 7

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
TRAFFIC NOISE EXPOSURES
Proposed East End Connector, Durham County, TIP U-0071
Alternate #1

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 Bypass From Proposed Connector to North of Holloway Street - Continued										
65	Residence	B	Big Twig Ln.	50	-L-	640.0 R	-	-	57	+ 7
66	Residence	B	"	50	"	650.0 R	-	-	57	+ 7
67	Residence	B	"	50	"	660.0 R	-	-	57	+ 7
68	Residence	B	"	50	"	670.0 R	-	-	57	+ 7
69	Residence	B	"	50	"	750.0 R	-	-	55	+ 5
70	Residence	B	"	50	"	750.0 R	-	-	55	+ 5
71	Residence	B	"	50	"	850.0 R	-	-	54	+ 4
72	Business	C	US 70 Bypass	50	"	470.0 R	-	-	61	+ 11
76	Business	C	"	59	"	60.0 L	-	-	R/W	-
77	Business	C	"	58	"	10.0 L	-	-	R/W	-
78	Business	C	"	59	"	0.0 L	-	-	R/W	-
79	Business	C	"	58	"	580.0 L	-	-	58	+ 0
80	Business	C	"	59	"	560.0 L	-	-	59	+ 0
82	Residence	B	Red Sunset	50	"	630.0 R	-	-	57	+ 7
83	Residence	B	"	50	"	530.0 R	-	-	59	+ 9
84	Residence	B	"	50	"	490.0 R	-	-	60	+ 10
85	Residence	B	"	50	"	520.0 R	-	-	59	+ 9
86	Residence	B	"	50	"	580.0 R	-	-	58	+ 8
86A	Residence	B	"	50	"	570.0 R	-	-	58	+ 8
87	Business	C	US 70 Bypass	61	"	240.0 L	-	-	66	+ 5
88	Business	C	"	54	"	90.0 R	-	-	R/W	-
89	Church	E	"	60/40	"	60.0 L	-	-	R/W	-
90	Business	C	"	52	"	200.0 R	-	-	68	* + 16
91	Business	C	"	50	"	340.0 R	-	-	63	+ 13
92	Business	C	"	52	"	260.0 R	-	-	65	* + 13

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #1

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 Bypass From Proposed Connector to North of Holloway Street - Continued										
93	Business	C	US 70 Byp	50	-L-	410.0 R	-	-	62	+ 12
94	Business	C	"	68	"	290.0 R	64.78	68.69	70	+ 2
95	Business	C	"	68	"	380.0 R	62.85	68.69	69	+ 1
96	Business	C	Holloway	64	"	460.0 R	61.30	64.90	66	+ 2
97	Business	C	US 70 Byp	55	"	420.0 R	62.14	69.64	70	* + 15
98	Business	C	"	56	"	360.0 R	-	-	R/W	-
99	Business	C	"	58	"	290.0 R	-	-	R/W	-
100	Business	C	"	59	"	250.0 R	-	-	R/W	-
101	Business	C	"	57	"	320.0 R	-	-	64	+ 7
102	Business	C	"	59	"	250.0 R	-	-	R/W	-
103	Business	C	"	61	"	190.0 R	-	-	68	+ 7
104	Business	C	"	68	"	200.0 L	68.00	67.16	70	+ 2
105	Business	C	"	60	"	230.0 R	-	-	66	+ 6
106	Business	C	"	62	"	180.0 R	-	-	69	+ 7
Proposed Connector From NC 147 to US 70										
150	Residence	B	Hover Rd.	50	-L-	30.0 L	-	-	R/W	-
151	Residence	B	East End	65	"	460.0 R	-	-	65	+ 0
152	Residence	B	"	62	"	420.0 R	-	-	* 66	+ 4
153	Residence	B	"	63	"	380.0 R	-	-	* 67	+ 4
154	Residence	B	"	65	"	330.0 R	-	-	* 69	+ 4
155	Residence	B	"	65	"	280.0 R	-	-	* 71	+ 6
156	Residence	B	"	63	"	220.0 R	-	-	R/W	-
157	Residence	B	"	61	"	180.0 R	-	-	R/W	-
158	Residence	B	"	65	"	150.0 R	-	-	R/W	-
159	Residence	B	Angier Ave.	68	"	20.0 R	-	-	R/W	-
160	Residence	B	"	68	"	0.0 R	-	-	R/W	-

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #1

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
Proposed Connector From NC 147 to US 70 - Continued										
161	Residence	B	East End	66	"	550.0 R	63.96	69.03	* 70	+ 4
162	Residence	B	"	66	"	580.0 R	63.54	69.03	* 70	+ 4
163	Residence	B	"	59	"	600.0 R	-	-	63	+ 4
164	Church	E	"	66/46	"	540.0 R	64.11	69.03	70/50	+ 4/4
165	Residence	B	"	65	"	490.0 R	64.89	67.48	* 69	+ 4
166	Residence	B	"	66	"	450.0 R	65.70	69.03	* 70	+ 4
167	Residence	B	"	66	"	380.0 R	-	-	* 67	+ 1
167	Residence	B	"	66	"	320.0 R	-	-	* 69	+ 3
169	Business	C	Angier Ave.	63	"	130.0 R	-	-	R/W	-
170	Residence	B	"	65	"	190.0 R	-	-	R/W	-
171	Residence	B	"	65	"	230.0 R	-	-	R/W	-
172	Residence	B	"	65	"	470.0 R	-	-	65	+ 0
173	Business	C	"	63	"	10.0 R	-	-	R/W	-
174	Residence	B	"	66	"	100.0 L	-	-	R/W	-
175	Residence	B	"	54	"	570.0 L	-	-	63	+ 9
176	Business	C	Pettigrew	67	"	270.0 R	-	-	* 71	+ 4
177	Business	C	"	63	"	230.0 R	-	-	* 72	+ 9
178	Residence	B	"	54	"	80.0 R	-	-	R/W	-
179	Residence	B	"	61	"	10.0 L	-	-	R/W	-
180	Residence	B	"	61	"	50.0 L	-	-	R/W	-
181	Residence	B	"	61	"	80.0 L	-	-	R/W	-
182	Residence	B	"	52	"	130.0 L	-	-	R/W	-
183	Business	C	"	50	"	250.0 L	-	-	R/W	-
184	Church	E	"	61/41	"	250.0 L	-	-	* 72/52	+ 11/11
185	Business	C	"	54	"	280.0 L	-	-	* 71	* + 17
186	Business	C	"	61	"	630.0 L	-	-	62	+ 1

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #1

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL. DIST(ft)	-L-	-Y-	MAXIMUM	
NC 147 From Start to Proposed Connector										
146	Residence	B	NC 147	67	-L-	220.0 L	-	-	* 69	+ 2
147	Business	C	"	64	"	290.0 L	-	-	66	+ 2
147A	Residence	B	"	64	"	260.0 L	-	-	* 67	+ 3
147B	Residence	B	"	61	"	330.0 L	-	-	65	+ 4
NC 147 From Proposed Connector to NC 55										
187	Business	C	NC 147	61	-L-	330.0 R	-	-	65	+ 4
188	Residence	B	"	64	"	250.0 R	-	-	* 67	+ 3
189	Residence	B	"	71	"	140.0 R	-	-	* 74	+ 3
190	Residence	B	"	67	"	200.0 R	-	-	* 70	+ 3
191	Residence	B	"	65	"	240.0 R	-	-	* 68	+ 3
192	Residence	B	"	65	"	240.0 R	-	-	* 68	+ 3
193	Residence	B	"	68	"	190.0 R	-	-	* 70	+ 2
194	Residence	B	"	71	"	140.0 R	-	-	* 74	+ 3
195	Residence	B	"	67	"	200.0 R	-	-	* 70	+ 3
196	Residence	B	"	69	"	170.0 R	-	-	* 72	+ 3
197	Residence	B	"	69	"	170.0 R	-	-	* 72	+ 3
198	Residence	B	"	68	"	190.0 R	-	-	* 70	+ 2
200	Residence	B	"	68	"	190.0 R	-	-	* 70	+ 2
201	Residence	B	"	66	"	210.0 R	-	-	* 69	+ 3
202	Residence	B	"	64	"	250.0 R	-	-	* 67	+ 3
202A	Residence	B	"	67	"	200.0 L	-	-	* 70	+ 3
203	Residence	B	"	67	"	200.0 L	-	-	* 70	+ 3
204	Residence	B	"	65	"	240.0 L	-	-	* 68	+ 3
205	Residence	B	"	71	"	150.0 L	-	-	* 73	+ 2
206	Residence	B	"	67	"	200.0 L	-	-	R/W	-
207	Residence	B	"	72	"	130.0 L	-	-	* 74	+ 2

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

** Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #1

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY	ROADWAY	LEVEL	NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	INCREASE
NC 147 From Proposed Connector to NC 55 - Continued										
208	Residence	B	NC 147	69	-L-	170.0 L	-	-	* 72	+ 3
209	Residence	B	"	70	"	160.0 L	-	-	* 72	+ 2
210	Residence	B	"	66	"	220.0 L	-	-	R/W	-
211	Residence	B	"	74	"	110.0 L	-	-	* 75	+ 1
212	Residence	B	"	70	"	160.0 L	-	-	* 72	+ 2
213	Residence	B	"	70	"	160.0 L	-	-	* 72	+ 2
214	Residence	B	"	64	"	250.0 L	-	-	* 67	+ 3
215	Residence	B	"	65	"	240.0 L	-	-	* 68	+ 3
216	Residence	B	"	62	"	310.0 L	-	-	65	+ 3
217	Residence	B	"	68	"	190.0 L	-	-	* 70	+ 2
218	Residence	B	"	64	"	250.0 L	-	-	* 67	+ 3
219	Residence	B	"	68	"	180.0 L	-	-	* 71	+ 3
220	Residence	B	"	66	"	220.0 L	-	-	* 69	+ 3
221	Residence	B	"	65	"	230.0 L	-	-	* 68	+ 3
222	Residence	B	"	68	"	190.0 L	-	-	* 70	+ 2
223	Residence	B	"	64	"	250.0 L	-	-	* 67	+ 3
224	Residence	B	"	68	"	190.0 L	-	-	* 70	+ 2
225	Residence	B	"	64	"	250.0 L	-	-	* 67	+ 3

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
TRAFFIC NOISE EXPOSURES
Proposed East End Connector, Durham County, TIP U-0071
Alternate #3

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY	ROADWAY	LEVEL	NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 From Start to Proposed Connector										
31	Business	C	US 70	67	-L-	90.0 L	-	-	R/W	-
32	Business	C	"	68	"	80.0 R	-	-	R/W	-
33	Residence	B	"	67	"	90.0 R	-	-	R/W	-
34	Business	C	"	68	"	70.0 R	-	-	R/W	-
36	Residence	B	"	66	"	100.0 R	-	-	R/W	-
37	Residence	B	"	68	"	80.0 R	-	-	R/W	-
38	Business	C	"	66	"	100.0 R	-	-	R/W	-
39	Business	C	"	67	"	90.0 R	-	-	R/W	-
40	Church	E	"	66/46	"	100.0 L	-	-	* 75/55	+ 9/9
41	Church	E	"	66/46	"	100.0 R	-	-	R/W	-
43	Church	E	"	60/40	"	200.0 R	-	-	70/50	+ 10/10
US 70 Bypass From Proposed Connector to North of Holloway Street										
54	Residence	B	US 70 Byp	55	-L-	100.0 R	-	-	R/W	-
56	Residence	B	"	51	"	410.0 R	-	-	62	+ 11
57	Residence	B	"	50	"	460.0 R	-	-	61	+ 11
72	Residence	B	"	50	"	690.0 R	-	-	56	+ 6
59	Residence	B	Big Twig Ln.	50	"	650.0 L	-	-	57	+ 7
60	Residence	B	"	50	"	610.0 L	-	-	58	+ 8
61	Residence	B	"	50	"	610.0 L	-	-	58	+ 8
62	Residence	B	"	50	"	660.0 L	-	-	57	+ 7
84	Residence	B	Red Sunset Ln.	50	"	830.0 L	-	-	54	+ 4
76	Business	C	US 70 Byp	58	"	350.0 R	-	-	63	+ 5
77	Business	C	"	59	"	210.0 R	-	-	67	+ 8

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
TRAFFIC NOISE EXPOSURES
Proposed East End Connector, Durham County, TIP U-0071
Alternate #3

RECEPTOR INFORMATION		NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE	
ID#	LAND USE (CATEGORY)			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM		
US 70 Bypass From Proposed Connector to North of Holloway Street - Continued										
78	Business	C	US 70 Byp	59	-L-	210.0 R	-	-	67	+ 8
79	Business	C	"	58	"	250.0 R	-	-	65	+ 7
80	Business	C	"	59	"	320.0 R	-	-	64	+ 5
81	Business	C	"	64	"	280.0 R	-	-	65	+ 1
88	Business	C	"	54	"	280.0 R	-	-	65	* + 11
89	Church	E	"	60/40	"	0.0 R	-	-	R/W	-
90	Business	C	"	52	"	290.0 R	-	-	64	+ 12
87	Business	C	"	61	"	290.0 L	-	-	64	+ 3
91	Business	C	"	50	"	420.0 R	-	-	62	+ 12
92	Business	C	"	52	"	300.0 R	-	-	64	+ 12
93	Business	C	"	50	"	420.0 R	-	-	62	+ 12
94	Business	C	"	55	"	250.0 R	65.68	68.03	70	* + 15
95	Business	C	"	53	"	330.0 R	63.70	68.03	69	* + 16
97	Business	C	"	68	"	350.0 R	63.29	68.96	70	+ 2
98	Business	C	"	67	"	310.0 R	64.29	67.88	69	+ 2
99	Business	C	"	69	"	250.0 R	65.68	69.86	R/W	-
100	Business	C	"	68	"	200.0 R	67.83	68.03	R/W	-
101	Business	C	"	55	"	300.0 R	-	-	64	+ 9
102	Business	C	"	58	"	240.0 R	-	-	66	+ 8
103	Business	C	"	59	"	210.0 R	-	-	67	+ 8
104	Business	C	"	67	"	230.0 L	66.35	66.54	69	+ 2
105	Business	C	"	58	"	250.0 R	-	-	65	+ 7
106	Business	C	"	60	"	190.0 R	-	-	68	+ 8

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #3

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY	ROADWAY	LEVEL	NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 Business From Carr Road to Proposed Connector										
52	Business	C	US 70 Bus	71	-L-	50.0 L	-	-	R/W	-
NC 147 From Start to Proposed Connector										
146	Residence	B	NC 147	67	-L-	200.0 L	-	-	R/W	-
147	Residence	B	"	59	"	390.0 L	-	-	63	+ 4
147A	Residence	B	"	64	"	260.0 L	-	-	* 67	+ 3
147B	Residence	B	"	61	"	330.0 L	-	-	65	+ 4
Proposed Connector From NC 147 to US 70										
109	Residence	B	Rowena Ave	53	-L-	590.0 L	-	-	62	+ 9
110	Residence	B	"	53	"	500.0 L	-	-	64	+ 11
111	Residence	B	"	53	"	400.0 L	-	-	* 66	* + 13
112	Residence	B	"	53	"	350.0 L	-	-	* 67	* + 14
113	Residence	B	"	53	"	310.0 L	-	-	* 68	* + 15
114	Residence	B	"	53	"	250.0 L	-	-	* 70	* + 17
115	Residence	B	"	53	"	180.0 L	-	-	* 70	* + 17
116	Residence	B	"	53	"	120.0 L	-	-	R/W	-
117	Residence	B	"	53	"	90.0 L	-	-	R/W	-
118	Residence	B	"	53	"	50.0 L	-	-	R/W	-
119	Residence	B	"	53	"	10.0 L	-	-	R/W	-
120	Residence	B	"	53	"	0.0 L	-	-	R/W	-
121	Residence	B	"	53	"	50.0 L	-	-	R/W	-
122	Residence	B	"	53	"	100.0 R	-	-	R/W	-
123	Residence	B	"	53	"	280.0 R	-	-	63	+ 10
124	Residence	B	"	53	"	440.0 R	-	-	60	+ 7

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #3

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL. DIST(ft)	-L-	-Y-	MAXIMUM	
Proposed Connector From NC 147 to US 70 - Continued										
125	Residence	B	"	53	"	510.0 L	-	-	61	+ 8
126	Residence	B	"	53	"	490.0 L	-	-	62	+ 9
127	Residence	B	"	53	"	330.0 L	-	-	* 66	* + 13
128	Residence	B	"	53	"	310.0 L	-	-	65	* + 12
129	Residence	B	"	53	"	320.0 L	-	-	64	+ 11
130	Residence	B	"	53	"	330.0 L	-	-	64	+ 11
131	Residence	B	"	53	"	350.0 L	-	-	64	+ 11
132	Residence	B	"	53	"	360.0 L	-	-	63	+ 10
133	Residence	B	"	53	"	380.0 L	-	-	63	+ 10
134	Residence	B	"	53	"	380.0 L	-	-	63	+ 10
135	Residence	B	"	53	"	390.0 L	-	-	62	+ 9
136	Residence	B	"	53	"	250.0 L	-	-	62	+ 9
137	Residence	B	"	53	"	190.0 L	-	-	61	+ 8
138	Residence	B	"	53	"	170.0 L	-	-	65	* + 12
139	Residence	B	"	53	"	50.0 L	-	-	R/W	-
140	Residence	B	"	53	"	0.0 L	-	-	R/W	-
141	Residence	B	Angier Ave.	58	"	240.0 L	61.80	60.35	64	+ 6
142	Residence	B	"	58	"	180.0 L	61.60	60.35	64	+ 6
143	Residence	B	"	61	"	110.0 L	-	-	R/W	-
144	Residence	B	"	61	"	90.0 L	-	-	R/W	-
145	Residence	B	"	61	"	0.0 L	-	-	R/W	-

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
TRAFFIC NOISE EXPOSURES
Proposed East End Connector, Durham County, TIP U-0071
Alternate #4

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 From Start to Proposed Connector										
1	Business	C	US 70	64	-L-	130.0 R	-	-	* 74	* + 10
2	Residence	B	"	64	"	130.0 R	-	-	* 74	* + 10
3	Business	C	"	64	"	120.0 R	-	-	R/W	-
3A	Business	C	"	60	"	210.0 R	-	-	70	* + 10
4	Residence	B	"	64	"	130.0 R	-	-	R/W	-
5	Residence	B	"	64	"	130.0 R	-	-	R/W	-
6	Business	C	"	65	"	110.0 R	-	-	R/W	-
7	Business	C	"	65	"	110.0 L	-	-	* 75	* + 10
8	Business	C	"	60	"	200.0 L	-	-	70	* + 10
9	Residence	B	"	61	"	170.0 L	-	-	R/W	-
10	Residence	B	"	59	"	230.0 L	-	-	R/W	-
11	Business	C	"	60	"	190.0 L	-	-	R/W	-
12	Business	C	"	59	"	260.0 L	-	-	68	+ 9
13	Business	C	"	61	"	180.0 L	-	-	R/W	-
14	Business	C	"	65	"	110.0 L	-	-	R/W	-
15	Residence	B	"	64	"	130.0 R	-	-	R/W	-
16	Business	C	"	63	"	140.0 R	-	-	* 74	* + 11
17	Residence	B	Pleasant Drive	59	"	310.0 R	-	-	* 66	+ 7
18	Residence	B	"	59	"	190.0 R	-	-	* 71	* + 12
19	Residence	B	"	59	"	100.0 R	-	-	R/W	-
20	Residence	B	"	59	"	170.0 R	-	-	* 72	* + 13
21	Residence	B	"	59	"	370.0 R	-	-	63	+ 4
22	Residence	B	"	59	"	100.0 R	-	-	R/W	-
23	Residence	B	"	59	"	20.0 R	-	-	R/W	-

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #4

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY	ROADWAY	LEVEL	NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 From Start to Proposed Connector - Continued										
26	Residence	B	Pleasant Drive	59	-L-	100.0 R	-	-	R/W	-
26A	Residence	B	"	59	"	110.0 R	-	-	R/W	-
27	Residence	B	"	59	"	190.0 R	-	-	R/W	-
28	Residence	B	"	59	"	310.0 R	-	-	R/W	-
35	Residence	B	"	59	"	300.0 R	-	-	R/W	-
US 70 From Proposed Connector to North of Holloway Street										
24	Business	C	US 70	68	-L-	340.0 L	-	-	R/W	-
25	Business	C	"	61	"	440.0 L	-	-	R/W	-
30	Business	C	"	61	"	480.0 L	-	-	61	+ 0
36	Residence	B	"	66	"	200.0 L	-	-	* 68	+ 2
37	Residence	B	"	68	"	110.0 L	-	-	* 74	+ 6
38	Business	C	"	66	"	0.0 L	-	-	R/W	-
39	Business	C	"	67	"	0.0 L	-	-	R/W	-
40	Church	E	"	66/46	"	210.0 L	-	-	67/47	+ 1/1
41	Church	E	"	66	"	0.0 L	-	-	R/W	-
43	Church	E	"	60/40	"	170.0 R	-	-	70/50	+ 10/10
42	Apts. 6 DU's	B	Springwood Pk.	49/<40	"	450.0 R	-	-	61/<40	+ 12/0
42A	Apts. 6 DU's	B	"	49/<40	"	470.0 R	-	-	61/<40	+ 12/0
42B	Apts. 6 DU's	B	"	49/<40	"	340.0 R	-	-	63/<40	+ 14/0
42C	Apts. 6 DU's	B	"	49/<40	"	290.0 R	-	-	65/40	+ 16/1
42D	Apts. 6 DU's	B	"	49/<40	"	300.0 R	-	-	64/<40	+ 15/0
53	Residence	B	US 70 Byp	66	"	30.0 L	-	-	R/W	-
54	Residence	B	"	55	"	150.0 R	-	-	R/W	-

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

*** Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
TRAFFIC NOISE EXPOSURES
Proposed East End Connector, Durham County, TIP U-0071
Alternate #4

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 From Proposed Connector to North of Holloway Street - Continued										
55	Residence	B	US 70 Byp	50	-L-	380.0 R	-	-	63	+ 13
56	Residence	B	"	51	"	440.0 R	-	-	62	+ 11
57	Residence	B	"	50	"	470.0 R	-	-	61	+ 11
72	Residence	B	"	50	"	700.0 R	-	-	57	+ 7
59	Residence	B	Big Twig Ln.	50	"	710.0 R	-	-	56	+ 6
60	Residence	B	"	50	"	670.0 R	-	-	57	+ 7
61	Residence	B	"	50	"	650.0 R	-	-	57	+ 7
62	Residence	B	"	50	"	680.0 R	-	-	57	+ 7
84	Residence	B	Red Sunset Ln.	50	"	820.0 R	-	-	55	+ 5
76	Business	C	US 70 Byp	59	"	270.0 R	-	-	65	+ 6
77	Business	C	"	58	"	350.0 R	-	-	63	+ 5
78	Business	C	"	59	"	210.0 R	-	-	67	+ 8
79	Business	C	"	58	"	250.0 L	-	-	66	+ 8
80	Business	C	"	59	"	320.0 L	-	-	64	+ 5
81	Business	C	"	64	"	280.0 L	-	-	65	+ 1
87	Business	C	"	61	"	290.0 L	-	-	65	+ 4
88	Business	C	"	54	"	280.0 R	-	-	65	* + 11
89	Church	E	"	60	"	0.0 R	-	-	R/W	-
90	Business	C	"	52	"	290.0 R	-	-	65	* + 13
91	Business	C	"	50	"	420.0 R	-	-	62	+ 12
92	Business	C	"	52	"	300.0 R	-	-	64	+ 12
93	Business	C	"	50	"	420.0 R	-	-	62	+ 12
94	Business	C	"	68	"	250.0 R	66.18	68.69	70	+ 2

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #4

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY			NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
US 70 From Proposed Connector to North of Holloway Street - Continued										
95	Business	C	US 70 Byp	68	-L-	330.0 R	64.20	68.69	70	+ 2
96	Business	C	Holloway	64	"	410.0 R	62.70	64.90	66	+ 2
97	Business	C	US 70 Byp	68	"	350.0 R	63.79	69.64	70	+ 2
98	Business	C	"	67	"	310.0 R	64.64	67.88	69	+ 2
99	Business	C	"	69	"	250.0 R	66.18	70.55	* 71	+ 2
100	Business	C	"	68	"	200.0 R	68.30	68.69	* 71	+ 3
101	Business	C	"	57	"	300.0 R	-	-	64	+ 7
102	Business	C	"	59	"	240.0 R	-	-	66	+ 7
103	Business	C	"	61	"	210.0 R	-	-	67	+ 6
104	Business	C	"	62	"	230.0 R	-	-	66	+ 4
105	Business	C	"	60	"	250.0 R	-	-	66	+ 6
106	Business	C	"	62	"	190.0 R	-	-	68	+ 6
NC 147 From Start to Proposed Connector										
147A	Residence	B	NC 147	64	-L-	380.0 L	-	-	63	- 1
147B	Residence	B	"	61	"	380.0 L	-	-	63	+ 2
NC 147 North of Proposed Connector										
147D	Residence	B	NC 147	59	-L-	430.0 L	-	-	62	+ 3
147E	Residence	B	"	56	"	600.0 L	-	-	59	+ 3
147F	Residence	B	"	56	"	580.0 L	-	-	59	+ 3
147G	Residence	B	"	56	"	590.0 L	-	-	59	+ 3
147H	Residence	B	"	55	"	630.0 L	-	-	58	+ 3
147I	Residence	B	"	55	"	630.0 L	-	-	58	+ 3
147J	Residence	B	"	56	"	590.0 L	-	-	59	+ 3

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.

"*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N4
 TRAFFIC NOISE EXPOSURES
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #4

RECEPTOR INFORMATION			NEAREST EXISTING ROADWAY	AMBIENT NOISE LEVEL	NEAREST PROPOSED ROADWAY		PREDICTED NOISE LEVELS			NOISE LEVEL INCREASE
ID#	LAND USE	CATEGORY	ROADWAY	LEVEL	NAME	CL DIST(ft)	-L-	-Y-	MAXIMUM	
Proposed Connector From NC 147 to US 70										
109A	Residence	B	Angier Ave.	56	-L-	160.0 L	-	-	R/W	-
110A	Residence	B	"	50	"	390.0 L	-	-	* 67	* + 17
111A	Residence	B	"	50	"	480.0 L	-	-	65	* + 15
112A	Residence	B	"	60	"	320.0 L	69.61	62.30	* 70	* + 10
113A	Residence	B	"	60	"	390.0 L	67.30	62.30	* 68	+ 8
114A	Residence	B	"	50	"	110.0 R	-	-	R/W	-
115A	Residence	B	"	50	"	180.0 R	-	-	R/W	-
116A	Residence	B	"	50	"	150.0 R	-	-	R/W	-
117A	Residence	B	"	50	"	270.0 R	-	-	* 71	* + 21
118A	Residence	B	"	50	"	350.0 R	-	-	* 68	* + 18
119A	Residence	B	"	51	"	370.0 R	-	-	* 67	* + 16
120A	Residence	B	Fisher Drive	50	"	360.0 R	-	-	* 68	* + 18

-L- Denotes proposed roadways's noise level contribution and -Y- denotes contributions from other roadways.
 "*" Denotes a noise impact per 23 CFR Part 772 and Category E noise levels shown as exterior/interior (68/48).

TABLE N5
 FHWA NOISE ABATEMENT CRITERIA SUMMARY
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #1

DESCRIPTION	Leq NOISE LEVELS (dBA)			MAXIMUM CONTOUR DISTANCES		APPROXIMATE # OF IMPACTED RECEPTORS ACCORDING TO TITLE 23 CFR PART 772				
	50ft	100ft	200ft	72 dBA	67 dBA	A	B	C	D	E
1 - US 70 From Start of Project to Proposed Connector	76.9	74.3	69.6	176.2	288.5	0	0	0	0	2
2 - US 70 Bypass From Proposed Connector to North of Holloway Street	76.1	72.3	66.3	139.5	220.1	0	0	3	0	0
7 - NC 147 From Start to Proposed Connector	76.6	73.7	68.0	170.9	274.8	0	10	3	0	1
8 - Proposed Connector From NC 147 to US 70	77.3	75.1	71.6	256.4	400.6	0	2	0	0	0
10 - NC 147 From Proposed Connector to NC 55	76.9	74.4	69.9	212.5	330.2	0	35	0	0	0
TOTALS --->						0	47	6	0	3

1. 50ft, 100ft, and 200ft distances are measured from the center of nearest travel lane.
2. 72 dBA and 67 dBA contour distances are measured from the center of proposed roadway.

TABLE N5
 FHWA NOISE ABATEMENT CRITERIA SUMMARY
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #3

DESCRIPTION	Leq NOISE LEVELS (dBA)			MAXIMUM CONTOUR DISTANCES		APPROXIMATE # OF IMPACTED RECEPTORS ACCORDING TO TITLE 23 CFR PART 772				
	50ft	100ft	200ft	72 dBA	67 dBA	A	B	C	D	E
1 - US 70 From Start of Project to Proposed Connector	76.9	74.3	69.6	176.2	288.5	0	0	0	0	1
2 - US 70 Bypass From Proposed Connector to North of Holloway Street	76.1	72.3	66.3	139.5	220.1	0	0	3	0	0
5 - US 70 Business Form Carr Road to Proposed Connector	65	61.1	53.7	<37.0	40.1	0	0	0	0	0
7 - NC 147 From Start to Proposed Connector	76.6	73.7	68.0	170.9	274.8	0	1	0	0	0
8 - Proposed Connector From NC 147 to US 70	77.3	75.1	71.6	256.4	400.6	0	8	0	0	0
TOTALS --->						0	9	3	0	1

1. 50ft, 100ft, and 200ft distances are measured from the center of nearest travel lane.
 2. 72 dBA and 67 dBA contour distances are measured from the center of proposed roadway.

TABLE N5
 FHWA NOISE ABATEMENT CRITERIA SUMMARY
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #4

DESCRIPTION	Leq NOISE LEVELS (dBA)			MAXIMUM CONTOUR DISTANCES		APPROXIMATE # OF IMPACTED RECEPTORS ACCORDING TO TITLE 23 CFR PART 772				
	50ft	100ft	200ft	72 dBA	67 dBA	A	B	C	D	E
1 - US 70 From Start to Proposed Connector	78.8	76.9	74.3	176.2	288.5	0	5	4	0	0
2 - US 70 Bypass From Proposed Connector to North of Holloway Street	76.4	72.6	66.6	143.2	226.5	0	2	3	0	1
7 - NC 147 From Start to Proposed Connector	76.6	73.7	68.0	170.9	274.8	0	0	0	0	0
9 - NC 147 North of Proposed Connector	76.4	72.6	66.6	143.2	226.5	0	0	0	0	0
8 - Proposed Connector From NC 147 to US 70	77.3	75.1	71.6	256.4	400.6	0	8	0	0	0
TOTALS --->						0	15	7	0	1

1. 50ft, 100ft, and 200ft distances are measured from the center of nearest travel lane.
2. 72 dBA and 67 dBA contour distances are measured from the center of proposed roadway.

TABLE N6
 TRAFFIC NOISE LEVEL INCREASE SUMMARY
 Proposed East End Connector, Durham County, TIP U-0071
 Alternate #1

DESCRIPTION	RECEPTOR EXTERIOR NOISE LEVEL INCREASES							SUBSTANTIAL NOISE LEVEL INCREASE "1"	IMPACTS DUE TO BOTH CRITERIA "2"
	<=0	1-4	5-9	10-14	15-19	20-24	>=25		
1 - US 70 From Start of Project to Proposed Connector	0	0	2	1	0	0	0	1	1
2 - US 70 Bypass From Proposed Connector to North of Holloway Street	2	8	22	5	2	0	0	3	0
7 - NC 147 From Start to Proposed Connector	0	4	0	0	0	0	0	0	0
8 - Proposed Connector From NC 147 to US 70	2	17	3	1	1	0	0	1	1
10 - NC 147 From Proposed Connector to NC 55	0	37	0	0	0	0	0	0	0
TOTALS --->	4	66	27	7	3	0	0	5	2

"1" As defined by only a substantial increase (See bottom of TABLE N2).

"2" As defined by both criteria in TABLE N2.

TABLE N6
TRAFFIC NOISE LEVEL INCREASE SUMMARY
Proposed East End Connector, Durham County, TIP U-0071
Alternate #3

DESCRIPTION	RECEPTOR EXTERIOR NOISE LEVEL INCREASES							SUBSTANTIAL NOISE LEVEL INCREASE "1"	IMPACTS DUE TO BOTH CRITERIA "2"
	<=0	1-4	5-9	10-14	15-19	20-24	>=25		
1 - US 70 From Start of Project to Proposed Connector	0	0	1	1	0	0	0	0	0
2 - US 70 Bypass From Proposed Connector to North of Holloway Street	0	6	15	7	2	0	0	3	0
5 - US 70 Business From Car Road to Proposed Connector	0	0	0	0	0	0	0	0	0
7 - NC 147 From Start to Proposed Connector	0	3	0	0	0	0	0	0	0
8 - Proposed Connector From NC 147 to US 70	0	0	9	13	3	0	0	8	6
TOTALS --->	0	9	25	21	5	0	0	11	6

"1" As defined by only a substantial increase (See bottom of TABLE N2).

"2" As defined by both criteria in TABLE N2.

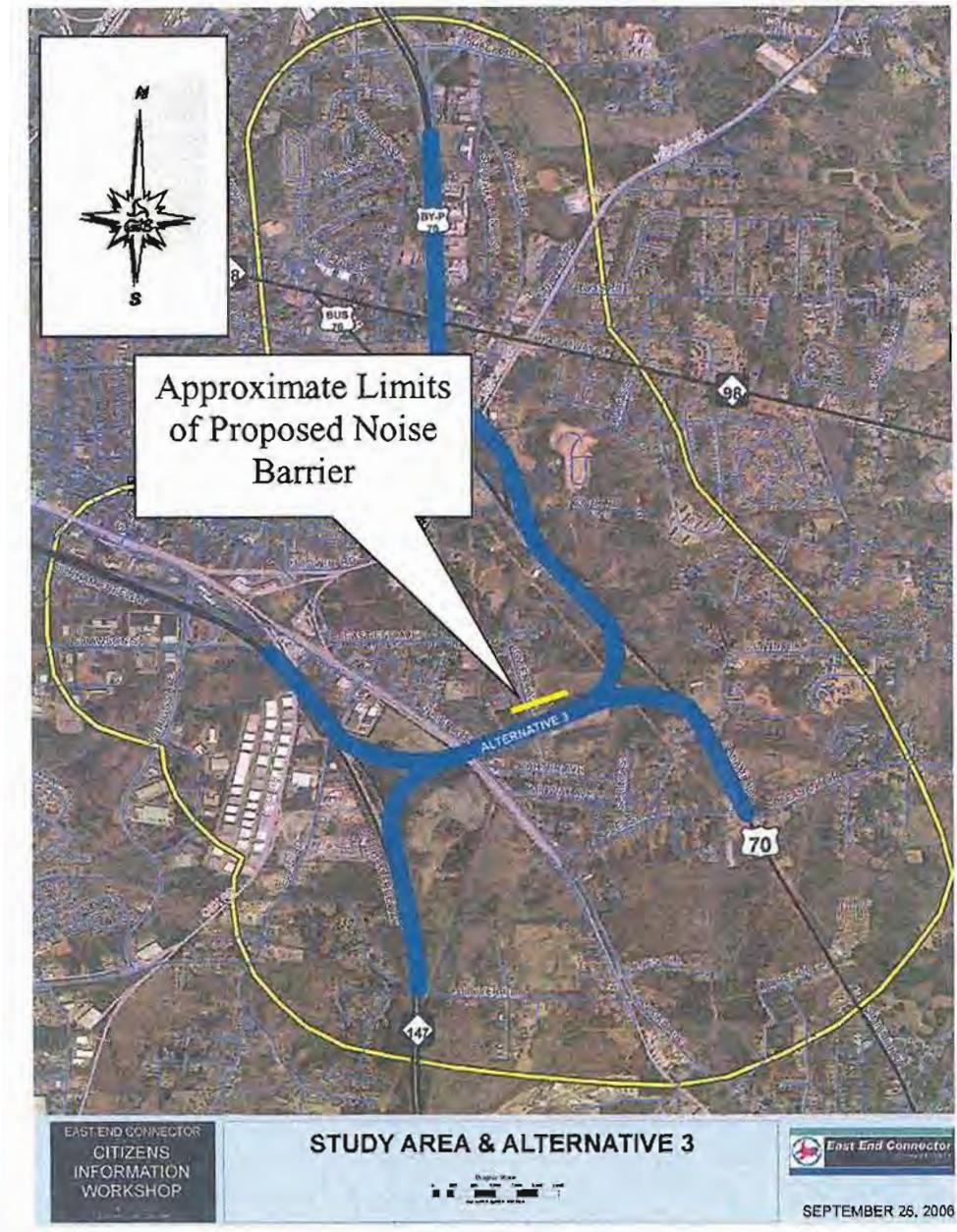
TABLE N6
TRAFFIC NOISE LEVEL INCREASE SUMMARY
Proposed East End Connector, Durham County, TIP U-0071
Alternate #4

DESCRIPTION	RECEPTOR EXTERIOR NOISE LEVEL INCREASES							SUBSTANTIAL NOISE LEVEL INCREASE "1"	IMPACTS DUE TO BOTH CRITERIA "2"
	<=0	1-4	5-9	10-14	15-19	20-24	>=25		
1 - US 70 From Start to Proposed Connector	0	1	2	8	0	0	0	8	6
2 - US 70 Bypass From Proposed Connector to North of Holloway Street	25	18	17	9	0	0	0	2	0
7 - NC 147 From Start of Project to Proposed Connector	1	1	0	0	0	0	0	0	0
9 - NC 147 North of Proposed Connector	0	7	0	0	0	0	0	0	0
8 - Proposed Connector From NC 147 to US 70	0	0	1	1	5	1	0	7	7
TOTALS --->	26	27	20	18	5	1	0	17	13

"1" As defined by only a substantial increase (See bottom of TABLE N2).

"2" As defined by both criteria in TABLE N2.

**Figure N2
 Proposed Noise Barrier on Alternate # 3
 Proposed East End Connector
 Durham County, TIP U-0071**



	North Carolina Department of Transportation Division of Highways Project Development and Environmental Analysis Traffic Noise & Air Quality Section
	Durham County Proposed East End Connector TIP U-0071

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

TRAFFIC NOISE ABATEMENT POLICY

The North Carolina Department of Transportation (NCDOT) Traffic Noise Abatement Policy provides for the evaluation of noise barriers or other mitigation measures (e.g., landscaping) for communities and facilities adversely impacted by traffic noise on proposed state and federal highway projects. NCDOT uses this policy to determine the need for noise abatement and the feasibility and reasonableness of abatement measures. Requests for vegetative screening for aesthetic purposes may be considered under the Highway Landscaping Planting Policy.

NCDOT noise abatement policy applies only to "Type I" projects for state, federal or federal-aid highway projects. NCDOT does not participate in "Type II" projects (retrofitting of existing roads, maintenance projects, guardrail projects, rehabilitation projects, existing facilities, and addition of auxiliary lanes). If an auxiliary lane is added between interchanges to improve operational efficiency and it is 1500 feet in length or longer, it should be considered as a Type I project. The addition of ramps at an interchange will also be considered as a Type I project in this policy.

Type I Projects

Sound barriers may be considered for new construction or reconstruction of highways. New construction is building a highway on a new location. Reconstruction involves physically altering an existing highway. The most common examples of reconstruction projects requiring noise analysis are increasing the number of through-traffic lanes or substantially changing its vertical grade or horizontal alignment. Consideration of noise abatement as part of construction or reconstruction projects is mandatory in accordance with Code of Federal Regulations, Title 23, Part 772 whenever traffic noise impacts are predicted.

PREVENTING NOISE IMPACTS

Information for the Public and Local Officials

To prevent future noise impacts on currently undeveloped lands, the following system will be used:

Public information. During the development stage of a proposed highway project, area residents and local officials will be kept informed about the project. Meetings (both formal and informal) will be held to provide information as well as to gather comments, opinions and concerns from the public and local officials.

Public documents. Environmental documents prepared for the project will contain a list of areas that may be impacted by noise as well as proposals for noise walls and/or other noise abatement measures.

Sound levels are measured in units called decibels (dB). Adjustment for high and low pitched sounds an average person can hear is called "A-weighted levels" or dBA. Highway traffic noise is assessed using dBA measurements. Noise is further described by its average level over time. In noise abatement studies an "hourly equivalent sound level," or Leq(h), is the constant, average sound level that contains the same amount of sound energy over the time period as does the varying levels of actual traffic noise.

NOISE IMPACT DETERMINATION AND ABATEMENT

Future traffic noise levels are determined by traffic volumes projected for the roadway for the "design year" which is approximately 20 years after highway construction begins. Traffic noise abatement for NCDOT highway projects must be considered when traffic noise impacts are created by either of the following two conditions:

The predicted design year noise levels approach or exceed those measurements shown for the appropriate activity category as shown in Figure 1. NCDOT defines "approach" to be within 1 dBA of the Leq(h) value for the activity categories.

Figure 1. Noise Abatement Criteria Hourly A- Weighted Sound Level in Decibels (dBA)		
Activity Category	Leq(h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 (Exterior)	Residences, churches, schools, libraries, hospitals, motels, hotels, parks, picnic and recreation areas, active sports areas and playgrounds
C	72 (Exterior)	Developed lands, properties or activities not included in Categories A or B
D	Not Applicable	Undeveloped lands
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums

OR

5. Noise abatement on non-controlled or partial access control highways usually is not feasible. However, in areas where property owners have agreed to voluntarily relinquish access rights to the highway, noise abatement may be considered.

Reasonableness: Reasonableness is a more subjective measure. This consideration should show that good judgement and common sense were used in making a decision. A finding of reasonableness will include the following:

1. Noise barrier cost - The abatement measure will be constructed at a reasonable allowable cost per benefited receptor (cost effective). This cost per benefited receptor will be less than or equal to the value (V) determined by dividing the number (N) of benefited receptors into the total cost (C) of the barrier system. A benefited receptor is one that experiences a 5 dBA or more reduction in noise levels by the construction of the noise wall. The cost of the barrier system will be based on \$15.00 per square foot for the noise mitigation measure plus any other major items necessary for the construction of the measure. These other items could include cost for structure improvements, additional earthwork, additional right-of-way, etc. The reasonable cost effective amount for an impacted area will be \$35,000 per benefited receptor plus an incremental increase of \$500 per dBA average increase (I) in the predicted exterior noise levels of the impacted receptors of the area.

$$V = C/N \text{ which must be equal to or less than } \$35,000 + \$500(I).$$

I = Increase in predicted exterior noise levels

Examples:

Cost of noise mitigation measure = \$350,000
Number of benefited receptors = 12
 $V = \$350,000/12 = \$29,166$
Projected noise level (72 dBA) – Existing noise level (69 dBA)=I=3 dBA
Cost effective amount = $\$35,000 + \$500(3) = \$36,500$, therefore, a noise mitigation measure **would be considered**.

Cost of noise mitigation measure = \$400,000
Number of benefited receptors = 8
 $V = \$400,000/8 = \$50,000$
Projected noise level (70 dBA) - Existing noise level (65 dBA)=I=5dBA
Cost effective amount = $\$35,000 + \$500(5) = \$37,500$, therefore, a noise mitigation measure **would not be considered**.

2. Noise Wall height and scale – A major consideration of the reasonableness of a noise wall is the visual impact on the adjoining lands. Specifically, a high noise wall alongside low, single-family residences could have a severe adverse visual effect. Considering these factors, the height of the noise wall

With:

of occupants = # of students in a school or # of people in a congregation at church, etc.

of people per residence = 3. (Used in Computer Modeling)

Usage = # of hours used per day/ 24 hours per day

School Example:

Equivalent # of Residents = $500 \text{ students} / 3 * (4 \text{ hrs per day} / 24 \text{ hrs per day}) = 28$

The factors listed above are not intended to be all encompassing. Rather, these are to illustrate some of the factors that should be considered in determining the feasibility and reasonableness of proposed abatement measures.

NOISE WALL CONSTRUCTION, MATERIALS AND AESTHETICS

The type of materials used in construction of noise barriers and other abatement measures should be an engineering decision based on economics, effectiveness and, to a limited degree, visual impacts. Visual impact considerations will ensure that the proposed noise wall meets a basic aesthetic level as well as a basic durability level so that excessive deterioration or corrosion will not occur.

The steel pile and concrete panel wall is NCDOT's standard noise wall however, NCDOT will consider Context Sensitive Solutions (CSS) as long as other criteria are met.

Consideration should be given to providing earth berms for noise abatement purposes on projects that have earth waste and where sufficient right-of-way exists to construct the berm.

Traditional highway construction resources pay for required noise abatement measures. Should a local government request that materials be used that are more costly than those proposed by NCDOT, the requesting entity must assume 100% of the additional cost.

If a local government insists on the provision of a noise abatement measure deemed not reasonable by NCDOT, a noise wall may be installed provided the local government assumes 100% of the costs. These costs include, but are not limited to, preliminary engineering, construction and maintenance. In addition, local governments must ensure that NCDOT's material, design and construction specifications are met.

REVIEW OF POLICY

This policy shall be reviewed in a manner determined by the Board of Transportation at least every five years.

Chapter 23 Code of Federal Regulations

PART 772—PROCEDURES FOR ABATEMENT OF HIGHWAY TRAFFIC NOISE AND CONSTRUCTION NOISE

Authority: 23 U.S.C. 109(h), 109(i); 42 U.S.C. 4331, 4332; sec. 339(b), Pub. L. 104-59, 109 Stat. 568, 605; 49 CFR 1.48(b).

Source: 47 FR 29654, July 8, 1982; 47 FR 33956, Aug. 5, 1982, unless otherwise noted.

§ 772.1 Purpose.

To provide procedures for noise studies and noise abatement measures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to Title 23 U.S.C.

§ 772.3 Noise standards.

The highway traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials in this regulation constitute the noise standards mandated by 23 U.S.C. 109(i). All highway projects which are developed in conformance with this regulation shall be deemed to be in conformance with the Federal Highway Administration (FHWA) noise standards.

§ 772.5 Definitions.

- (a) *Design year*.....The future year used to estimate the probable traffic volume for which a highway is designed. A time 10 to 20 years from the start of construction is usually used.
- (b) *Existing noise levels*.....Noise resulting from the natural and mechanical sources and human activity, considered to be usually present in a particular area.
- (c) *L10*.....The sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration.
- (d) *L10(h)*.....The hourly value of L10.
- (e) *Leq*.....The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period.
- (f) *Leq (h)*.....The hourly value of Leq.
- (g) *Traffic noise impacts*.....Impacts which occur when the predicted traffic noise levels

§ 772.11 Noise abatement.

- (a) In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit.
- (b) In those situations where there are no exterior activities to be affected by the traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, the interior criterion shall be used as the basis of determining noise impacts.
- (c) If a noise impact is identified, the abatement measures listed in §772.13(c) of this chapter must be considered.
- (d) When noise abatement measures are being considered, every reasonable effort shall be made to obtain substantial noise reductions.
- (e) Before adoption of a final environmental impact statement or finding of no significant impact, the highway agency shall identify:
 - (1) Noise abatement measures which are reasonable and feasible and which are likely to be incorporated in the project, and
 - (2) Noise impacts for which no apparent solution is available.
- (f) The views of the impacted residents will be a major consideration in reaching a decision on the reasonableness of abatement measures to be provided.
- (g) The plans and specifications will not be approved by FHWA unless those noise abatement measures which are reasonable and feasible are incorporated into the plans and specifications to reduce or eliminate the noise impact on existing activities, developed lands, or undeveloped lands for which development is planned, designed, and programmed.

§ 772.13 Federal participation.

- (a) Federal funds may be used for noise abatement measures where:
 - (1) A traffic noise impact has been identified,
 - (2) The noise abatement measures will reduce the traffic noise impact, and
 - (3) The overall noise abatement benefits are determined to outweigh the overall adverse social, economic, and environmental effects and the costs of the noise abatement measures.
- (b) For Type II projects, noise abatement measures will only be approved for projects that were approved before November 28, 1995, or are proposed along lands where land development or substantial construction predated the existence of any highway. The granting of a building permit, filing of a plat plan or a similar action must have occurred prior to right-of-way acquisition or construction approval for the original highway. Noise abatement measures will not be approved at locations where such measures were previously determined not to be reasonable and feasible for a Type I project.
- (c) The noise abatement measures listed below may be incorporated in Type I and Type II projects to reduce traffic noise impacts. The costs of such measures may be included in Federal-aid participating project costs with the Federal share being the same as that for the system on which the project is located.

http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html

These documents are available for copying and inspection at the Federal Highway Administration, 400 Seventh Street, SW, Room 3240, Washington, DC 20590, as provided in 49 CFR part 7. These documents are also available on the FHWA's Traffic Noise Model Web site at the following URL:

<http://www.trafficnoisemodel.org/main.html>

- (b) In predicting noise levels and assessing noise impacts, traffic characteristics which will yield the worst hourly traffic noise impact on a regular basis for the design year shall be used.

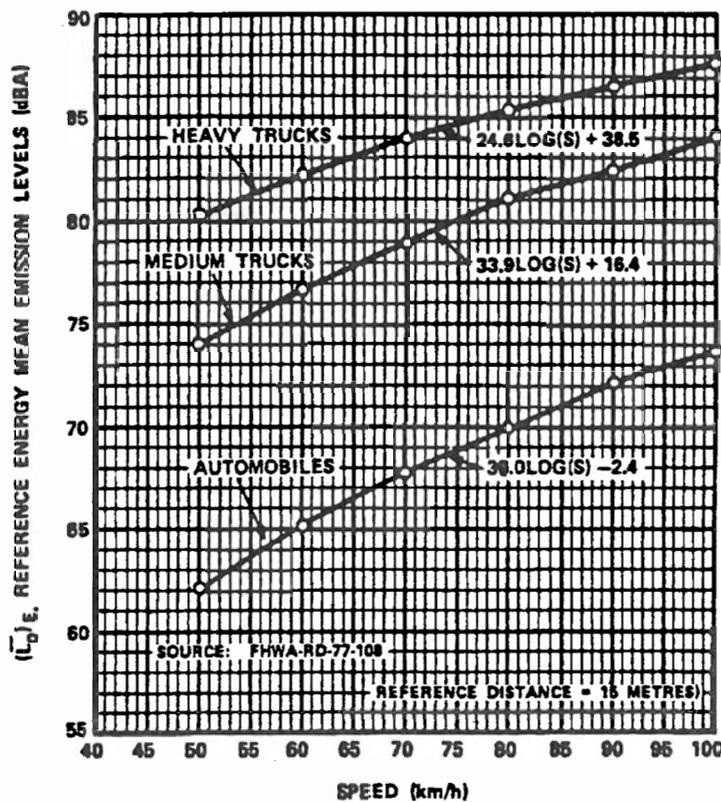
[47 FR 29654, July 8, 1982; 47 FR 33956, Aug. 5, 1982, as amended at 70 FR 16710, Apr. 1, 2005]

§ 772.19 Construction noise.

The following general steps are to be performed for all Types I and II projects:

- (a) Identify land uses or activities which may be affected by noise from construction of the project. The identification is to be performed during the project development studies.
- (b) Determine the measures which are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall include a weighing of the benefits achieved and the overall adverse social, economic and environmental effects and the costs of the abatement measures.
- (c) Incorporate the needed abatement measures in the plans and specifications.

Appendix A to Part 772—National Reference Energy Mean Emission Levels as a Function of Speed



LEGEND:

1. AUTOMOBILES: ALL VEHICLES WITH TWO AXLES AND FOUR WHEELS.
2. MEDIUM TRUCKS: ALL VEHICLES WITH TWO AXLES AND SIX WHEELS.
3. HEAVY TRUCKS: ALL VEHICLES WITH THREE OR MORE AXLES.

National Reference Energy Mean Emission Levels as a Function of Speed

Appendix E
Public Involvement

PUBLIC INVOLVEMENT SUMMARY

TABLE OF CONTENTS

Public Involvement Summary	1
Table 1 Community Meetings	2
Citizens Information Workshop	3
Elected Official Meetings	23
Neighborhood and Small Group Meetings	31

Public Involvement Summary

The purpose of the agency coordination and public involvement program was to involve the general public, local elected officials, and the agencies responsible for overseeing the resources in the project area.

Recognizing that transportation decisions affect citizens, neighborhoods and travel patterns, this project included a proactive public involvement program for disseminating information to the public and for receiving input from the affected community. The public involvement process provided complete information, timely public notices, opportunities for early involvement, and a public decision-making process. Under FHWA joint regulations (23 CFR Part 450) the following goals were met:

- Public involvement opportunities were provided throughout the process.
- Information about issues and processes was distributed in a timely manner to citizens; affected public agencies; local government officials; representatives of transportation agencies; private providers of transportation; other interested parties; and segments of the community affected by transportation plans, programs.
- Public access to technical and policy information used in the development of the alternatives and the selected alignment was provided.
- Adequate public notice of public involvement activities and time for public review and comment at key decision points was provided.
- Responses to public input were prompt during the development of the project.
- Neighborhood meetings were held in areas that encouraged participation by those traditionally underserved such as low-income and minority households.
- The East End Connector public involvement process was reviewed periodically to ensure that the process provided full and open access to all.

Table 1 lists the community meetings held as part of the project.

A computerized mailing list of more than 5,000 names of state, local, and federal environmental regulatory and resource agencies; elected officials; civic and business groups; local government agencies; interested persons; property owners; and renters was continually updated throughout the project. Through a toll-free phone number (800-734-7062) and email address EastEndConnectorProject@rsandh.com, the project team responded to more than 150 calls and over 60 emails. The East End Connector webpage on the NCDOT internet site included project news and updates <http://www.ncdot.org/projects/eastendconnector/>. Three newsletters were prepared, in both English and Spanish, which summarized information and key project decisions.

**Table 1
Community Meetings**

Meeting Type	Date & Time	Location
Citizens Informational Workshops		
Workshop 1	September 26, 2006 4:00 to 7:00 PM	Fellowship Hall, Living Waters Christian Community Church, US 70 at Lynn Road
Workshop 2	January 30, 2007 4:00 to 7:00 PM	Fellowship Hall, Living Waters Christian Community Church, US 70 at Lynn Road
Workshop 3	December 10, 2007 4:00 to 7:00 PM	Fellowship Hall, Orange Grove Missionary Baptist Church, East End Avenue
Elected Officials Meetings		
Durham City-County Joint Planning Committee	June 6, 2006	Durham City Hall
Durham Board of County Commissioners	September 7, 2006	Durham County Commissioners Chambers
Durham City Council	September 7, 2006	Durham City Hall
Durham Board of County Commissioners	January 2, 2007	Durham County Commissioners Chambers
Durham City Council	January 4, 2007	Durham City Hall
Durham City Council	February 7, 2008	Durham City Hall
Neighborhood and Small Group Meetings		
Partners Against Crime Area 1	June 17, 2006	E.D. Mickel Recreation Center
Partners Against Crime Area 4	July 8, 2006	Campus Hills Park Community Center
Partners Against Crime Area 1	October 21, 2006	E.D. Mickel Recreation Center
Hayestown Neighborhood	November 14, 2006	Orange Grove Missionary Baptist Church, East End Avenue
Partners Against Crime Area 1	December 17, 2006	E.D. Mickel Recreation Center
Partners Against Crime Area 1	January 20, 2007	Eastway Elementary School
Interneighborhood Council	January 23, 2007	Durham Herald-Sun building
Ad Hoc Committee Meeting 1	August 9, 2007	Durham City Hall
Ad Hoc Committee Meeting 2	August 27, 2007	Durham City Hall
Ad Hoc Committee Meeting 3	September 19, 2007	Durham City Hall
Ad Hoc Committee Meeting 4	October 10, 2007	Durham City Hall
Ad Hoc Committee Meeting 5	November 7, 2007	Durham City Hall
Ad Hoc Committee Meeting 6	December 5, 2007	Durham City Hall
Ad Hoc Committee Meeting 7	January 30, 2008	Durham City Hall
Ad Hoc Committee Meeting 8	December 10, 2008	Durham City Hall

The following three sections include notes from each of the meetings listed above.

**Citizen Information Workshops
Meeting Notes**

Meeting Notes

Date: September 26, 2006

Subject: TIP No. U-0071 East End Connector
Citizens Information Workshop Number 1

Attendance:

<p>Members of the public 153 citizens signed the meeting roster, it is estimated that between 170 and 180 persons attended the meeting. The sign-in sheet is available</p>	<p>City of Durham staff Mark Ahrendsen, Transportation Manager. Ellen Beckmann, Transportation Planner</p>
<p>NCDOT Ed Lewis, NCDOTOHE Jon Nance, NCDOT Div 5 Wally Bowman, NCDOT Div 5 T.N. Parrott, NCDOT Div 5 Larry T. Williford, NCDOT Locations/Surveys</p>	<p>NCDOT Derrick , PDEA NCDOT Beverly Robinson, PDEA NCDOT James Dunlop, NCDOT Mark Hellman, NCDOT Leonard Scarborough, NCDOT</p>
<p>RS&H Jan Anderson John Boyle Radha Swayamkapala</p>	<p>MA Engineering Burke Evans</p>

Meeting Overview

These notes were taken during the Citizens Information Workshop held at the Living Waters Christian Church Community Room 1104 Lynn Road, Durham. The meeting was held on Tuesday, September 26th, 2006 from 4:00 PM to 7:00 PM.

The meeting was an open house forum; the objective of the workshop was to inform the public about the purpose of the project, introduce the public to the four alternatives and gain feed back/preferences from the public. The meeting was held in two large rooms at the church community center. The front room included a sign-in station and two continuous running PowerPoint presentations. The first presentation introduced the participants to the project study area, the purpose of the proposed project, and the environmental process, and the public involvement process.

The second provided attendees an opportunity to view photos from other neighborhood and community meetings that the project team had previously attended. The second room included two sets of large display maps. These maps included a study area map that was also used to have participants identify where they lived. Each of the other maps depicted one of the

conceptual alternatives being considered for the proposed East End Connector project (4 display boards). A fifth map depicted all four of the conceptual alternatives on one display board.

Meeting attendees were provided a handout that included the project area map, an overview of the project purpose and environmental process, as well as a comment sheet. In addition meeting attendees were given four green and four red sticky dots. They were asked to use these dots to demonstrate which alternatives they liked (green dot) or disliked (red dot). Another area of the meeting room was set-up to give participants an opportunity to show where they live in relationship to the project study area. Almost half of the attendees (71) completed comment cards prior to leaving the meeting.

Where Do You Live?

There were 117 dots placed on this and other display maps that showed the approximate location where persons attending the meeting lived. Approximately half were placed outside the study area and most of these were located in the north east quadrant of the display map. Dots placed inside the study area were distributed to the south of Hoover Road with the majority on East End Avenue.

Comment Sheets

71 comment sheets were turned in during the meeting. The comments sheets included a survey of preferences related to each of the four conceptual alternatives and the no-build alternative. Space was provided to allow participants to explain why they selected one alternative over others. There was also an area where they were asked to explain why they selected an alternative that they least preferred. There was also space to provide general comments.

Survey of Preferences

Attendees were asked to provide their preference regarding each of the five alternatives by checking a box numbered from one through five. Checking a “1” provided the study team with an indication that the alternative was preferred. Checking a five indicated that the attendee did not prefer an alternative. This portion of the comment sheet was analyzed for each of the responders. The analysis is based on the frequency that an attendee selected either a “1” or a “5” as a score for each of the alternatives. This analysis is provided on Table 1 entitled Comment Sheet Frequency of Occurrence Analysis. The following is a summary of this analysis:

- Alternative 1 – Of the 55 people that checked boxes related to Alternative 1, 30 checked the “1” box indicating that it was their favorite. Eight of the persons completing the form checked the “5” box indicating that Alternative 1 was their least favorite.
- Alternative 2 – Of the 53 people that checked boxes related to alternative 2, 18 checked the “5” box, indicating that Alternative 2 was “disliked”. Only nine checked the “1” box indicating that this was their favorite Alternative.
- Alternative 3 – Of the 48 people that checked boxes related to Alternative 3, 21 checked the “5” box, indicating that they “disliked” this alternative. Ten persons checked the “1” box indicating that this was their favorite alternative.

- Alternative 4 – Of the 47 people that checked boxes related to Alternative 4; 17 checked the “5” box indicating that Alternative 4 was “disliked”. Fifteen of the respondents checked the “1” box indicating that this was their preferred alternative.
- Alternative 5 – Of the 35 people that checked boxes for Alternative 5; 22 persons selected the No-Build Alternative as one that they “disliked”. Nine checked the “1” box indicating that it was their preferred alternative.

One attendee provided an interesting comment after checking the No-Build Alternative as their favorite. The comments stated: “Everyone knows that this improvement is needed. It has to be done in a way that has the least impact”.

It should be noted that the information from this comment card does not represent a statistical analysis and is not intended to be used to identify a preferred alternative. There is no relationship between the number of written comments received and the check boxes that were filled out.

Written Comments

Meeting attendees were provided an opportunity to write comments on the comment form. The form provided three questions. The first was to provide comment on an alternative(s) that was preferred; the second was to provide comment on an alternative that was disliked and the third was to provide general comments or questions. There were a total of 148 written comments received from the three questions posed on the comment form. These comments were reviewed and grouped into categories as they related to general issues such as avoiding neighborhood impacts. The next three paragraphs provide a summary of the comments received for each question, by category and broken down to reflect how the comment relates to a particular alternative. All of the comment sheets have been included at the end of this document.

Which Alternative Did You Prefer and Why?

There were a total of 60 written comments submitted for this question. After reviewing the comments they were grouped into six categories. The following is a summary of these comments:

Category 1 – Least Impact on Neighborhoods

Twenty nine persons stated that they preferred an alternative because they perceived the alternative to have the least amount of impact on neighborhoods and/or it was furthest from where they live. Of these 29 comments; 12 stated that they preferred Alternative 1, two persons preferred Alternative 2, five persons preferred Alternative 3, eight persons Alternative 4, one person Alternative five and one comment was not related to an alternative.

Category 2 – Improved Transportation

Eighteen persons stated that they preferred an alternative because it improved transportation coordination with the existing roadways and/or removed “cut-through” traffic from neighborhoods. Of these 18 comments eight were related to Alternative 1, five preferred Alternative 2, two preferred Alternative 3, and one preferred Alternative 4.

There were also two people that made statements about transportation connections without specifying an alternative.

Category 3 Land Ownership

Six persons stated that Alternative 3 was their preferred route because the State or County already owned land in the vicinity of the proposed corridor.

Category 4 – No Build

One person stated that they preferred the No Build Alternative but went on to explain that they realized some type of roadway improvement is needed.

Category 5 – Miscellaneous

Two persons made comments that they wanted more detail, and two others stated that there should be an open forum held for the project and two persons simply wrote in their preferred alternative (Alt 4 and Alt 1).

Which Alternative Did you NOT Like; and why?

There were a total of 58 written comments submitted for the second question on the comment card. These comments were grouped into four categories. The following is a summary of the comments:

Category 1 – No-Build

Four persons stated that they did not like the No-Build alternative stating that Durham needs this road, which they want progress, and that traffic must be moved from central Durham.

Category 2 – Transportation Connectivity

Fifteen comments were received stating that they did not like an alternative because the proposed roadway would not improve transportation connectivity. Several of these comments referenced more than one alternative. Of the 15 comments Alternative 4 was referred to nine times, Alternative 3 was referred to six times, four persons stated this comment as it relates to alternative 2, and 1 each for Alternatives 1 and 5. There was one transportation comment not related to an alternative.

Category 3 – Residential Impacts

Twenty one persons provided comments that could be categorized as disliking an alternative because of the impact on residents and/or neighborhoods. Some of these comments referred to more than one alternative. Of these 21 comments 13 raised this concern related to Alternative 2, seven about Alternative 3, four about alternative 4, and one stated that they disliked Alternative 1 because of neighborhood disruption. There were three other comments not related to any specific alternative.

Category 4 – Miscellaneous

There were nine miscellaneous comments including one comment stating concern over Alternative 4 due to the potential for loss of businesses. Another comment stated that there was a need for detailed information on the project. And others that stated a dislike of an Alternative without providing further comment.

Additional Comments

There were 37 comments written into the “Additional Comments” section of the comment form. These comments were reviewed and categorized into four groups as follows:

Category 1 – Need Additional Detail

Twelve persons provided comments stating that they wanted additional detail regarding the proposed alternatives and/or requested an open forum meeting with neighborhoods.

Category 2 – Transportation Improvement

Ten persons stated that it is important to relieve cut-through traffic including industrial traffic using residential streets within the study area.

Category 3 – Environmental

Twelve persons provided additional comments stating that it is important to preserve environmental features such as streams, to avoid impacting neighborhoods, maintain connectivity (don't disconnect streets), and to not impact residential areas with noise from the road.

Category 4 – Business

There were six comments that could not be classified.

**Table 1
Comment Sheet
Frequency of Occurrence Analysis**

The comment form included a preference survey section which allowed meeting attendees to place a check mark in a box for each alternative. The check would correspond to their preference for or dislike of each of the five alternatives. The analysis of these responses considers the frequency that persons selected an alternative either as their most preferred (score of "1") or most disliked (score of "5"). The following five tables provide the results of an analysis of this data.

ALTERNATIVE 1 SUMMARY						
Scoring was "1" for preferred or "5" for most disliked.						
Persons scoring Alternatives	not scored	1	2	3	4	5
		17	30	6	7	3
NOTES:						
If all respondents had indicated that they preferred an alternative by selecting "1" the alternative would have a score of 71.						
24%	17 of the 71 respondents did not mark any preference box.					
42%	30 of the 71 respondents said they preferred Alt 1.					
11%	8 of the 71 respondents said they did not like Alt 1.					

ALTERNATIVE 2 SUMMARY						
Scoring was "1" for preferred or "5" for most disliked.						
Persons scoring Alternatives	not scored	1	2	3	4	5
		19	9	12	5	8
NOTES:						
If all respondents had indicated that they preferred an alternative by selecting "1" the alternative would have a score of 71.						
27%	19 of the 71 respondents did not mark any preference box.					
13%	9 of the 71 respondents said they preferred Alt 2.					
25%	18 of the 71 respondents said they did not like Alt 2.					

ALTERNATIVE 3 SUMMARY						
Scoring was "1" for preferred or "5" for most disliked.						
Persons scoring Alternatives	not scored	1	2	3	4	5
		24	10	6	6	4
NOTES:						
If all respondents had indicated that they preferred an alternative by selecting "1" the alternative would have a score of 71.						
34%	24 of the 71 respondents did not mark any preference box.					
14%	10 of the 71 respondents said they preferred Alt 3.					
30%	21 of the 71 respondents said they did not like Alt 3.					

**Table 1, continued
Comment Sheet
Frequency of Occurrence Analysis**

ALTERNATIVE 4 SUMMARY						
Scoring was "1" for preferred or "5" for most disliked.						
Persons scoring Alternatives	not scored	1	2	3	4	5
		25	15	5	2	7
NOTES:						
If all respondents had indicated that they preferred an alternative by selecting "1" the alternative would have a score of 71.						
35%	25 of the 71 respondents did not mark any preference box.					
21%	15 of the 71 respondents said they preferred Alt 1.					
24%	17 of the 71 respondents said they did not like Alt 5.					

ALTERNATIVE 5 SUMMARY						
Scoring was "1" for preferred or "5" for most disliked.						
Persons scoring Alternatives	not scored	1	2	3	4	5
		37	9	1	0	2
NOTES:						
If all respondents had indicated that they preferred an alternative by selecting "1" the alternative would have a score of 71.						
52%	37 of the 71 respondents did not mark any preference box.					
13%	9 of the 71 respondents said they preferred Alt 5.					
31%	22 of the 71 respondents said they did not like Alt 5.					

Meeting Notes



Date: January 30, 2008

Subject: TIP No. U-0071 East End Connector
Citizens Information Workshop Number 2

Attendance:

Members of the public 160 citizens signed the meeting roster, it is estimated that between 170 and 180 persons attended the meeting.	City of Durham staff Mark Ahrendsen, Transportation Manager. Ellen Beckmann, Transportation Planner Felix Nwoko
NCDOT Carl Goode, OHE Ed Lewis, OHE Jason Moore, Roadway Design Kevin Moore, Roadway Design	NCDOT Derrick , Weaver PDEA Beverly Robinson, PDEA Mark Hellman, Div 5 Kimberly Hinton, OHE Cheryl Hannah, OHE
RS&H Jan Anderson John Boyle Vince Howard	MA Engineering Burke Evans Chip Hutchens

Meeting Overview

The Citizens Information Workshop was held at the Living Waters Christian Church Community Room 1104 Lynn Road, Durham on Tuesday, January 30th, 2007 from 4:00 PM to 7:00 PM.

The meeting was an open house forum. The purpose of the meeting was to provide information related to each of the alternatives being developed for the project. Members of the project team were available to take comments and answer questions throughout the meeting.

The meeting was held in two large rooms at the church community center. The front room included a sign-in station and two continuous-running PowerPoint presentations. The first presentation provided background information on the project, described the environmental process and provided information about each of the four alternatives. The second presentation was an overview of photos from all previous public involvement meetings.

The main meeting room had two sets of display maps that depicted the four alternatives on aerial photography with property lines displayed. This enabled meeting participants to view the proposed roadway improvements and right of way lines in relationship to the location of homes, businesses, natural features and community facilities in the study area.

Each person entering the meeting room was given a handout. Information in the handout included a description of each alternative, three tables listing project impacts and a comment card. Some comments cards were returned to project team members as attendees left the meeting. All attendees were told that the comment cards could be mailed to the project team.

Comment Card

There were 37 comment cards returned during the meeting. The following is a summary of these cards.

Alternative 1 Comments

There were ten comments regarding Alternative 1. Eight were negative comments that included concerns that this alternative was too complex, would displace too many homes and was too expensive. There were two positive comments that pointed out that the area needs revitalization.

Alternative 2 Comments

There were thirteen comments received about Alternative 2; eleven were negative comments including neighborhood impacts, complexity, cost and impacts on local churches. One comment provided a general assessment that the area needed to be revitalized to improve the quality of life. This comment also mentions that noise should be "low" in surrounding areas. The only positive comment stated that this was the "Next best area".

Alternative 3 Comments

There were twenty eight comments provided about Alternative 3. Two of these comments were not in favor and the other twenty six were in favor of this alternative. The comments received reflected on the lower cost, least impact, and traffic flow. Samples of the comments recorded for Alternative 3 are listed below:

- "The simplest, cheapest, least impact on side roads solution. Please use #3 - the others are too complex and result in too much re-routing of side street traffic."
- "This alternative is the most feasible with the least impact on citizens and environment. Not to mention it doesn't run next to my property! This one has my vote."
- "My choice/less expenses/less impact on woodlands. Less impact on my property."
- "This looks best to me - it seems to impact less people and wetlands"
- "This option seems to be more logical."
- "Based on the numbers, this option seems to be the most feasible."
- "This it the alternative I prefer."
- "This is my choice. Better traffic flow. Least impact on homes and businesses."

Alternative 4 Comments

There were twelve comments related to Alternative 4. There were seven positive comments generally stating that this alternative should be considered or that they were "In favor of this option". An additional positive comment stated that Alternative 4 would improve Hwy 70 for travel toward Raleigh. There were five negative comments including a simple "No", "This one is just stupid" and statements that provided a detailed discussion about the impact this alternative would have on property access and business. These comments are included below:

- "Alternative 4 blocks access to our 10 acre property off Pleasant Dr. Due to geographic configuration, gas and sewer lines no other access is possible. If alternative 4 is chosen, this makes the whole property unusable for housing purposes. In addition this option affects the most right of way by far and is the most impactful in project length."
- I own Parkside 70 shopping center (1020 E. Hwy 70) (12.5 acres @ Pleasant/Hwy 70). This plan would cause my property to be essentially worthless. There is virtually NO access - immediate bankruptcy. Why no access to Hwy 70?

Additional Comments & Questions

There were six additional comments, three of these six comments stated that they preferred the No-Build alternative; one asked if there would be changes west of the intersections where Lynn Road and Pleasant Drive connect to US 70 and one comment thanking the Department for the public forum.

Citizen Survey

The NCDOT Office of Human Environment (OHE) conducted a survey during the Citizens Informational Workshop. OHE Staff administered a one page, five question survey to some of the meeting attendees. There were 30 completed survey forms returned during the meeting. The following is a summary of the responses to questions in this survey:

1. What is your general feeling about this project?

The first question provided responders an opportunity to state, in their own words, their general feeling about the project. The following is a synopsis of question 1:

16 - Persons provided positive responses regarding their feeling toward the project.

3 - Persons stated they did not like the project. Some of the concerns raised about the project related to impacts to homes and cemeteries.

3 - Persons stated they were neutral toward the project.

2. I feel this project will:

There were six choices provided for the second question. The following is a summary of the number of persons that checked a box for these six items:

5 - Felt this project would provide a quicker safer travel route.

0 - Felt it would make it easier to get to their place of employment.

7 - Felt it would be good for the community.

8 - Felt it would provide an alternate route

7 - Felt it would help the larger road network.

Other comments from question 2:

- If Alternative 3 is picked it will provide an alternate route; if Alternative 4 is picked, none of these (statements from question 2) apply because we would lose our property.
- It would take traffic off of Miami Blvd.
- If 2 and 3 are picked beneficial; but will be negative for those within a 5 mile radius.
- Will get trucks and trailers off road (local streets).
- Help congestion near city of Durham
- Better access to I-85
- Provides an alternate route for people living outside my community.
- Think it would help out; but concerned about pollution and other environmental factors.
- It is detrimental to me and my home.
- It would not benefit me or my community.

3. I am concerned about:

There were six choices provided for the third question. The following is a summary of the number of persons that checked a box for these six items:

9 - Were concerned about through traffic in their neighborhood.

7 - Were concerned about traffic at the intersection nearest their home.

1 - Was concerned about bicycle/pedestrian accessibility.

10 - Were concerned about traffic noise.

5 - Were concerned about visual appearance.

11 - Were concerned about the character of the neighborhood changing.

Other comments related to question 3:

- Concerns about losing their property

- The character of the neighborhood “change for the best”.
- It eliminates intersection close to the house.
- Concerned about elderly residents having to move.
- Alternative 2 causing disruption in their neighborhood
- That exits for Alternatives 1 and 2 would be unwieldy
- Concerned about impacts to cemeteries
- Concerned about smog and air pollution.

4. How can NCDOT minimize the impact of this project on the neighborhood?

There were four choices provided for the fourth question. The following is a summary of the number of persons that checked a box for these four items:

- 6 - Through landscaping and trees.
- 13 - Through minimizing impact on the neighborhood.
- 5 - Through adding sidewalks.
- 8 - Through discouraging neighborhood through traffic.

Other comments related to question 4:

- Do away with proposed secondary roads.
- Choose Alternative 4
- Do not build the project
- Choose Alternative 3
- Take the fewest businesses as possible
- Alternative 4 is less invasive.
- Add speed bumps
- Do not impact the cemetery
- Do not put the road in my community

5. Are there any other comments you would like to add?

There were six other comments provided these included:

- There were six comments that stated they like Alternative 3
- A comment raised a concern over the density (land use) increasing in the area with the new roadway.
- One comment raised a concern about the impact on property value.
- Evaluate the traffic patterns for all alternatives
- Add an interchange with Glover Road
- A question regarding what other options do we have? A better alternative that will not impact the community, better service roads to access the new facility.
- A comment that they are not for the project
- A comment that consideration be given to the families that have lived in the area for years.

Meeting Notes



Date: December 10, 2007

Subject: TIP No. U-0071 East End Connector
Citizens Information Workshop Number 3

Attendance:

Members of the public 190 citizens signed the meeting roster, it is estimated that 210 persons attended the meeting.	City of Durham staff Katie Kalb, PE, Director of Public Works Mark Ahrendsen, Transportation Manager Ellen Beckmann, Transportation Planner
NCDOT Derrick Weaver, PDEA Beverly Robinson, PDEA Jason Moore, Roadway Design Kevin Moore, Roadway Design Wally Bowman, Division Engineer Robert Mathes, ROW	NCDOT Ed Lewis, OHE Kimberly Hinton, OHE Shelia Daniel, ROW Nathan Adima, Roadway Design Herman Edwards, Roadway Design
RS&H Jan Anderson Chad Critcher Radha Swayampakala Beth Shelton Tim Witsil	Other Officials Eric Alsmeyer, US ACE Adam Swank, EPA

Meeting Overview

The Citizens Information Workshop was held at the Orange Grove Missionary Baptist Church East End Avenue, Durham on Monday, December 10, 2007 from 4:00 PM to 7:00 PM.

The meeting was an open house forum. The purpose of the meeting was to provide information related to the selected alternative. Members of the project team were available to take comments and answer questions throughout the meeting.

The meeting was held in the large meeting room. A sign-in station and continuous-running PowerPoint presentation were in the entrance hall. The presentation provided background information on the project, described the environmental process and provided information about Alternative 3. A second presentation of an overview of photos from all previous public involvement meetings was displayed in the large meeting hall.

The main meeting room had two sets of maps that depicted the selected alternative on aerial photography with property lines displayed. This enabled meeting participants to view the proposed roadway improvements and right of way lines in relationship to the location of homes, businesses, natural features and community facilities in the study area. Also displayed were three 3-D photo-renderings of the proposed roadway: at the NC 147/East End Connector interchange, the East End Connector over Rowena Avenue and the US 70/East End Connector interchange.

In the main meeting room, a 3-D computer model of the proposed roadway was available and enabled meeting participants to zoom in and see specific areas or properties of interest. In a separate area, a continuously running video showed the model at various angles and drive paths.

Each person entering the meeting room was given a handout. Information included a description of the selected alternative, four tables listing project impacts and a comment card. Some comments cards were returned to project team members as attendees left the meeting. All attendees were told that the comment cards could be mailed to the project team.

Team Comments

The following are comments made to Team members during the open house. Team members contributing comments include: Jason Moore, Kevin Moore, Kimberly Hinton, Mark Ahrendsen, Ellen Beckmann, Jan Anderson, Chad Critcher, Tim Witsil and Beth Shelton.

General Access Questions/Concerns:

- Several residents along Lynn Road were concerned about access to US 70. They appeared to accept the proposed extension as equivalent to current access.
- Randy Pickle expressed concerns that the EEC bridge over the railroad should be long enough to accommodate a collector street extending Pettigrew St from Ellis Rd to Glover Rd and located on the NC 147 side of the railroad.
- Residents wondered if access would be maintained during construction particularly to Angier Avenue and Rowena Avenue.
- Participants wondered how they would access US 70 from East End Avenue.
- Residents of the Lynn Road/Gibson Road area want the right-in right-out maintained even with the service road options. The residents also suggested a third option of extending Lynn Road from Gibson Road to US 70. They also like the idea of being able to turn right onto US 70 at Living Waters Church and left on US 70 at Pleasant Drive along with the elimination of the tee of Lynn Road at Gibson Road.
- A Durham Bicycle and Pedestrian Advisory Committee member expressed concern about the provision of sidewalks on new local roads built as part of the project. He would like to see sidewalks built as part of the Hoover Road extension, East End Avenue extension and Lynn Road extension.

- New traffic movements and access associated with the project was explained to several people.

Individual Property Owner Questions/Concerns:

- An elderly couple who lived in the only remaining residence on the east side of US 70 between Lynn Road and Pleasant Drive were concerned that their home may be taken. They were directed to Robert Mathes Right-of-way agent.
- A resident on Glover Road at NC 147 was told that her home may not be affected by this project but when she asked about future projects, was told that eventually the road would be widened to I-40 but no funding was available at this time.
- A mother and daughter who owned property on Checkerberry Lane wanted the State to purchase their property. They were told that some of the property would be taken but it may not be the entire parcel. They were referred to Mr. Mathes.
- A couple who live at the corner of Rowena Avenue and Checkerberry Lane wanted the property to be taken. They are considering combining the two parcels they own into a single parcel for acquisition.
- The hotel owner at US 70 and NC 98 was concerned about how much of his property would be affected. He was informed that his buildings and pool would more than likely not be affected, but more exact information would be available in the upcoming design public meeting.
- Mr. and Mrs. Lindsley, who operate a business next to the water tower between NC 147 and Ellis Road, wanted the flyover moved forward and shifted off their building. It was discussed whether the building itself could be moved, they didn't think that it could. They were then informed that the request would be considered but that the design constraints would make it difficult to shift the flyover.
- Several persons mentioned the possible connection of Carr Road to the neighborhood east/north with a desire to pave the entire length of Carr Road.
- One individual who is trying to develop property into a gas station at the southwest quadrant of US 70 at Lynn Road is concerned about how the right-in right-out would adversely affect access to the development. He spoke to several project team members.
- Residents at the intersections of East End Avenue at Rowena and Carr Road at US 70 wanted to know how their property would be affected.
- A business owner on Holloway Street before the railroad, currently being affected by construction, wanted to know if more of his property would be affected.
- A resident near Pleasant Road wanted to know if his property value would increase.
- Residents on Big Twig were concerned about the location of the service road on the eastern side of US 70 behind their lots.

- Business owners on the east side of NC 147 between Ellis Road and Briggs Avenue were interested in how the lane addition on NC 147 would affect them.
- A resident at Angier Avenue and Pleasant Drive expressed concern about the current level of through truck traffic on Angier. He says that traffic to downtown Durham often takes Angier Avenue instead of US 70 to avoid the traffic signal at Miami Boulevard and US 70. He expressed concern that the signal at US 70 and Miami Boulevard will not be able to accommodate the additional traffic headed to US 70 or the East End Connector. Also he states that Angier Avenue is in bad condition due to the through truck traffic.
- A resident on Angier Avenue will have approximately half his property affected. The house and a planned garage are outside of the proposed right-of-way.
- A business owner at the corner of NC 98 and the proposed service road was concerned about losing access to NC 98 and the closure of Southerland Street. He was also concerned that more property would be acquired from him along with the property already taken as part of the ongoing construction along NC 98.
- One couple on Gary Street off of Holloway Street would be unaffected by the project.
- The pastor of Church of God and True Holiness on East End Avenue near Rowena Avenue was reassured that his church would not be directly affected by the project.
- A resident who lives on Angier Avenue was told that three houses beyond Commonwealth Avenue would be taken. She may be affected by the proximity of the project.
- Several residents on Hardee Street, Mimosa Avenue and others from the neighborhood off of Holloway Street between Miami Boulevard and Liberty Street were concerned about the project's impacts to their properties. When they learned that the project would not directly affect their land, they were satisfied and left.
- Several residents in the vicinity of Glover Road were satisfied when they learned that their properties would not be affected.

Miscellaneous Question/Concerns:

- One woman who lives behind Orange Grove Missionary Baptist Church praised the Church for cleaning up the neighborhood and was comfortable with the location of the EEC.
- A woman from Calvary Church on US 70 at Lynn Road was told that a retaining wall would be placed in front of the church but that no property would be taken from the church.
- Several people who would have been affected by the other alternatives left happy after it was apparent Alternative 3 was selected.
- Several participants had concerns about noise abatement and eminent domain.

- A Durham resident asked if property owners very near the selected alignment but not directly impacted are compensated for the negative effects of being located near a highway. He thinks that these property owners should receive some compensation for the negative impact on their property values.
- A resident on Checkerberry Lane and residents along Rowena Avenue and Angier Avenue were concerned about noise impacts.
- Several residents asked how much noise would be coming from the interchange and what measures were going to be taken to mitigate noise impacts.

Positive Comments:

- The overall feeling was that the public was generally accepting of the project, wanting it soon, and wanting to know the upcoming processes and dates for them. (Especially when & how R/W acquisition would be handled).
- One positive comment was that the conceptual drawings were the best at showing where the roadway will be and how it will look and the project team was asked if copies would be available.
- Several members of the public praised the meeting set-up and the amount of information available in various formats.
- Also praised was the 3D model's usefulness and how it allowed residents to see how the project would directly impact specific locations.

Comment Cards

There were 17 comment cards returned during the meeting. The following is a summary of these cards.

- Dwight and Kim McEwen noted there was no interchange with Glover Road.
- Several participants wanted Carr Road extended and paved all the way to the subdivision and one participant wanted an on ramp to northbound US 70 to be considered.
- Multiple residents expressed comments similar to: "This is clearly the best alternative for a long-delayed – much needed project. This work should go forward at all reasonable speed – the community needs this new connector ASAP."
- One resident said that it is important to compensate ALL affected neighbors including homeowners near, but not directly in the work area.
- It was suggested by one person that not enough effort was made to contact the public ahead of the meeting. Signs in the neighborhood were suggested.
- The time of the weekday meetings would better serve the working people if it was moved back an hour expressed one person attending the meeting.

- Information on how Alternative 3 and how the frontage road widening connects into Hoover Road and how would it affect the storage and rental property near the intersection was requested.
- One resident expressed concerns about the increase in traffic, the noise associated with this increase and the crash rate with the ramp from I-85 east to US 70 southbound
- How would Calvary Baptist Church be affected?
- An owner at the end of Checkerberry Lane would like to sell the property at a very reasonable rate.
- Service road Option A and B for the Pleasant Road to Lynn Road would be a great benefit to reduce the amount of traffic trying to go down Pleasant Road and Mineral Springs Road .
- Several residents thought the service road Options A and B would affect the movement of neighborhood traffic by placing two intersections very close together and increasing congestion in a congested area. Consider connecting the Lynn Road and Gibson Road intersection to US 70 at Pleasant Drive to ease congestion.

Elected Officials Meetings

Meeting Notes

Meeting Notes



Date: June 6, 2006

Subject: TIP No. U-0071 East End Connector
Durham City-County Joint Planning Committee Meeting

Attendance:

Durham City Council & County Commissioners & Planning Commission Members Cora Cole-McFadden – City Council Don Moffitt – Planning Commission Lewis Cheek – County Commissioner Becky Heron – County Commissioner Mike Woodard – City Council Diane Catotti – City Council	City of Durham staff Mark Ahrendsen, Transportation Manager. Ellen Beckmann, Transportation Planner Frank Duke, Planning director
NCDOT OHE Ed Lewis Misty Hitesman	NCDOT PDEA staff Beverly Robinson Shannon Lasater
RS&H Jan Anderson	

Mark Ahrendsen introduced the study team and Ellen Beckmann followed with a description of the project background. Jan Anderson then presented a brief PowerPoint presentation of the study process and schedule. Copies of the newsletter that was recently mailed out and project schedule were distributed to the Committee.

The first concern of committee members was the community involvement process. They felt that waiting until January for a formal meeting would be too long of a wait. We discussed a two-pronged approach, having both general informational meetings and attending monthly meetings of community organizations to inform the public.

The Committee suggested scheduling the first community workshop in August or September for the general public. The presentation would be similar to the one presented at today's meeting since there would be no new information by that time. Another community workshop is already planned for January 2007 when the results of the alternatives evaluation would be discussed.

The joint committee also indicated that a similar presentation should be scheduled for both the full City Council and County Commissioners meetings.

We then discussed the benefits of small group meetings. The committee thought that the Partners against Crime groups (PAC's) were important groups to visit. After the joint meeting we arranged to make similar presentations to PAC 1 on Saturday, June 17 at 9:30 AM and PAC 4 on Saturday, July 8. These two PAC's include all of the study area.

The Committee indicated that other key groups included the churches in the area, most notably the Orange Grove Missionary Baptist Church. We will contact the pastor to determine the best way of communicating with the religious groups in the community. We will determine whether there are ministerial alliances or interfaith groups whose meetings would be good forums for presentations and to gain feedback. The Committee also discussed issuing a press release, sharing information with Durham One Call, and making public service announcements to inform the public.

We next discussed the project schedule. The officials are concerned that this project move forward at the greatest speed. We emphasized that we are funded for planning, design and right-of-way acquisition but that construction funding is beyond the scope of the 2006-12 TIP.

The presentation ended with a sense of urgency to move the project forward and to have as open a community involvement process as possible.

Meeting Notes



Date: September 7, 2006

Subject: East End Connector Presentation to Durham County Commission
U-0071

On Thursday, September 7, 2006, at 11:30 AM, the U-0071 Team made a presentation to the County Commission. Mr. Mark Ahrendson, City of Durham, introduced the project team: Derrick Weaver, Beverly Robinson and John Nance of NCDOT; Jan Anderson of RS&H; and Mark and Ellen Beckmann from the City of Durham. He emphasized the importance of having support for the project as the TIP issued the day before had allocated \$100 million for the project. He then introduced Jan Anderson, the project's consultant from RS&H, who presented a PowerPoint slide show describing the project and the EIS process. She then described the extensive public involvement process that has already been initiated including mailings of a newsletter and postcard noticed of the September 26 public meeting to 4200 area residents, businesses and community groups, meetings with local community groups and public workshops, the first planned for September 26 at the Church of the Living Waters on US 70 at Lynn Rd.

After the presentation, the County Commissioners voted to add their support of the project to the presentation.

Meeting Notes



Date: September 7, 2006

Subject: East End Connector Presentation to Durham City Council, U-0071

On Thursday, September 7, 2006, at 1:30 PM, the U-0071 Team made a presentation to the Durham City Council. Mr. Mark Ahrendson, City of Durham, introduced the project team: Derrick Weaver, Beverly Robinson and John Nance of NCDOT; Jan Anderson of RS&H; and Mark and Ellen Beckmann from the City of Durham. He emphasized the importance of having support for the project as the TIP issued the day before had allocated \$100 million for the project. He then introduced Jan Anderson, the project's consultant from RS&H, who presented a PowerPoint slide show describing the project and the EIS process. She then described the extensive public involvement process that has already been initiated including mailings of a newsletter and postcard noticed of the September 26 public meeting to 4200 area residents, businesses and community groups, meetings with local community groups and public workshops, the first planned for September 26 at the Church of the Living Waters on US 70 at Lynn Rd.

After the presentation, Council members had the following comments:

- It is important to pay attention to Birchwood Heights on Lynn Rd east of US 70.
- The Crest Street community project as part of the mitigation for the Durham Freeway as a model of how to mitigate for impacts to a community.
- We need to make sure that the elderly are not adversely affected.
- Be sure to address Environmental Justice issues.
- Include public transportation impacts in the alternatives assessment. This seems to mean that we address the effects on bus service. We will also consider the effects on regional rail.

The Council thanked us for our time and we ended the presentation.

Meeting Notes



Date: January 2, 2007

Subject: East End Connector Presentation to Durham County Commission
U-0071

On Tuesday, January 2, 2007, at 10:00 AM, the U-0071 Team made a presentation to the County Commission. Mr. Mark Ahrendson, City of Durham, introduced the project team: Derrick Weaver of NCDOT; Jan Anderson of RS&H; and Mark and Ellen Beckmann from the City of Durham. He described the citizen involvement process that we had conducted including PAC meetings and a community informational workshop. He then introduced Jan Anderson, the project's consultant from RS&H, who presented a PowerPoint slide show describing the project and the EIS process and presenting the alternatives. She informed the Commission that newsletters will be mailed the following week announcing the second Community Informational Workshop on January 30, 2007 at the Church of the Living Waters on US 70 at Lynn Rd.

After the presentation, the County Commissioners had the following comments:

- One commissioner asked if Alternative 3 was the original alignment. We stated that it was closest to the 1982 preferred alternative. She commented that it looked to be the least harmful alternative.
- When asked what the community's concerns were from the first Community Informational workshop, we responded that most questions were about relocation issues- how the process worked and what was property worth in the community.
- A second asked for the boundaries of Hayestown. He commented that it appeared that Alternative 3 missed the neighborhood.
- Another wanted to know which churches were taken in Alternative 2- Zion Temple and Bible Gospel churches near Angier Avenue and Commonwealth Street.
- Another commissioner wanted to know when the roadway would open and was interested in being able to finally drive on the road. We told her the project should be completed around 2015.
- The response to another question about the costs exceeded the TIP allocation was that the TIP was an estimate and actual costs can vary. Higher costs could delay the project until funding is available.
- The Commission would like the Team to report after the Community Informational Workshop on the community's responses to the alternatives.

Meeting Notes



Date: January 4, 2007

Subject: East End Connector Presentation to Durham City Council
U-0071

On Thursday, January 4, 2007, at 2:00 PM, the U-0071 Team made a presentation to the City Council. Mr. Mark Ahrendson, City of Durham, introduced the project team: Beverly Robinson of NCDOT; Jan Anderson of RS&H; and Mark and Ellen Beckmann from the City of Durham. He reminded Council that we had appeared before them in September to initiate the process and since then had met with PAC1 and PAC4 neighborhood groups and held a Citizens Informational Workshop in September 2006. He then introduced Jan Anderson, the project's consultant from RS&H, who presented a PowerPoint slide show describing the project, the EIS process and presented the four alternative alignments. She then described the extensive public involvement process that has already been initiated and informed Council that a newsletter inviting the public to the second public meeting would be in the mail next week. The second workshop is planned for January 30 at the Church of the Living Waters on US 70 at Lynn Rd.

After the presentation, Council members had the following comments:

- 1) Council was concerned that the Team was not responding to citizens' issues, especially in the PAC1 area.
- 2) Another Council member is concerned that those most affected by the alternatives plans may not know to come to the workshop on January 30. We indicated that the newsletter mailed to 4500 area residents provided that information.
- 3) The mayor is concerned about environmental justice and wanted information about EJ before he could make a determination. The Team will provide demographics of the area to the City.
- 4) City Council decided to hold their own "public hearing" on the project to assure that citizens' concerns are heard. NCDOT will provide maps of the alternatives and a copy of the PowerPoint presentation for Durham to use if they wish. City Council is considering holding the public hearing on February 5 at the regular council meeting and then vote February 8 on whether to endorse an alternative.

Meeting Notes



Date: February 7, 2008

Subject: East End Connector Presentation to Durham City Council
U-0071

The Team presented the results of the third Community Informational Workshop to City Council, reporting on the community's response to the selection of Alternative 3 as the preferred alternative. The Team was able to report that the community appeared to accept the project as the least harmful. City Council commended the project Team on its community involvement effort and continued to support the proposed project.

**Neighborhood and Small Groups
Meeting Notes**

Meeting Notes

Date: June 17, 2006

Subject: TIP No. U-0071 East End Connector
PAC 1 (Partners Against Crime) Meeting

Attendance:

<p>Partners Against Crime (PAC) 1 Thomas Poole/Alvis Aikens – Co-Chairs 35 members of the community were also in attendance, sign-in sheet attached.</p>	<p>City of Durham staff Mark Ahrendsen, Transportation Manager. Ellen Beckmann, Transportation Planner</p>
<p>NCDOT OHE Misty Hitesman</p>	<p>NCDOT PDEA staff Derrick Weaver</p>
<p>RS&H Jan Anderson John Boyle</p>	

These notes were taken during the Partners Against Crime community meeting held Saturday, June 17, 2006 at 9:30 am. The meeting opened with a benediction and brief introductions by Mr. Thomas Poole, PAC Co-Chair. He introduced the representatives from the City and State and explained that the meeting would include a presentation on the East End Connector project and an opportunity to ask questions related to the impacts this project will have on neighborhoods and businesses in PAC1. The meeting was attended by approximately 35 neighborhood residents.

Jan Anderson introduced herself and John Boyle as the consultants working for the State to develop the environmental document for the project. She proceeded to present a PowerPoint slide show that provided an overview of the project stressing that although the project has been around for 25 years this is the beginning of the process and thus no decisions have been made related to a specific location for the improvement. She explained that the study process identifies impacts and attempts to minimize these impacts.

Derrick Weaver, NCDOT PDEA, stated that this project was moving forward at this time because the City of Durham has made it a number one priority and had requested the DOT to review environmental documents plans for the project.

Members of the community provided comments and expressed the following issues related to the project:

- Displacement of residents is a major issue in this community. There have been a number of transportation projects in the area, including the regional rail project that impact residents of PAC1.
- There is a desire to understand the decision making process; specifically, who will make the final decision on building or not building the project.

- The people who benefit from this project do not live in the neighborhoods that the project will run through.
- Issues of impact to disadvantaged neighborhoods are important to the community.
- The PAC1 residents would like to understand the source of funding for this project.
- There is concern that the project will displace residents, increase neighborhood traffic and noise, and only benefit people living outside the neighborhood.
- The residents want to make sure that the culture of the community is also looked at in the study.

The PAC1 Co-Chairs stated that it was critical for this group to stay informed about this project. They established an East End Connector Sub-committee that would monitor and report on this project to the full PAC1 group and requested that NCDOT and City of Durham representatives provide the group with quarterly updates through the end of this year and that they will want to set a reporting schedule for next year.

Mark Ahrendsen provided closing remarks related to the project. He stated that the City Transportation Department is working with the NCDOT to put this project together. The Durham City Council has established this project as the number one priority because it is a project that improves the overall transportation for the community. The city staff is committed to maintaining an open, transparent process and will work with neighborhoods to establish a proactive outreach process.

Alvis Aikens, Co-Chair thanked the presenters and continued with the PAC1 meeting agenda. The East End Connector portion of the meeting concluded at approximately 10:45 am.

Meeting Notes



Date: July 8, 2006

Subject: TIP No. U-0071 East End Connector
PAC 4 (Partners Against Crime) Meeting

Attendance:

Partners Against Crime (PAC) 4 About 40 members of the community were in attendance. Sign-in sheet is attached	City of Durham staff Mark Ahrendsen, Transportation Manager. Ellen Beckmann, Transportation Planner
NCDOT OHE Ed Lewis	NCDOT PDEA staff Beverly Robinson
RS&H Jan Anderson John Boyle	

These notes were taken during the Partners Against Crime District 4 community meeting held at the Campus Hills Park Community Center on Saturday, July 8, 2006 at 10:00 am. The meeting opened with a benediction and brief introductions by Barbara Lofton, PAC Meeting Leader. She immediately introduced Jan Anderson to present a PowerPoint slide show that provided an overview of the project stressing that although the project has been around for 25 years this is the beginning of the process and thus no decisions have been made related to a specific location for the improvement. She explained that the study process identifies impacts and attempts to minimize these impacts. After about a 20-minute presentation, the floor was open for questions. Since there were no questions or comments, the presentation ended at 10:45 AM.

Meeting Notes



Date: October 21, 2006

Subject: TIP No. U-0071 East End Connector
PAC 1 (Partners Against Crime) Meeting Saturday - October 21, 2006

Attendance:

Partners Against Crime (PAC) 1 Thomas Poole Co-Chair Alvis Aikens Co-Chair 25 members of the community were also in attendance, sign-in sheet attached.	City of Durham staff Ellen Beckmann, Transportation Planner
NCDOT PDEA staff Derrick Weaver	RS&H Jan Anderson John Boyle

These notes were taken during the Partners Against Crime community meeting held Saturday, October 21, 2006 at 9:30 am held at the E. D. Mickle Community Center on Alston Avenue in Durham. The meeting opened with a benediction and brief introductions by Mr. Thomas Poole, PAC Co-Chair. The East End Connector presentation was moved to the second agenda item.

Jan Anderson introduced herself, Derrick Weaver with the NCDOT, Ellen Beckmann with the Durham MPO, and John Boyle; that she and John Boyle are with RS&H, the consultant working for the State to develop the environmental document for the project. The presentation began with the introductory PowerPoint presentation followed by an overview of the activities that took place during the September 26th Citizens Information Workshop (CIW). This included a briefing of the number of people that attended and the comments received. It was noted that some of the PAC1 attendees had also attended the CIW meeting.

Members of PAC1 group provided comments and made suggestions regarding the project. A summary of these comments has been included with these notes:

- A request was made that NCDOT hold a meeting with the PAC1 group to explain the process and programs for relocation. The PAC1 member made it clear that this information must be provided now and not two weeks prior to the start of property acquisition. This must occur before the end of this year.
- Derrick Weaver responded stating that a Right-of-Way Agent would be brought to the next PAC1 meeting.
- There was a comment that the group needs detailed information and a time-line for the project.
- There was a concern raised that the state needs to realize that people from the neighborhood that get displaced have known each other for 20 or more years. When

they are relocated they are separated from these long time friends and neighbors. It is important to understand that this is not just relocation.

- Another comment was raised stating that politics and property value play into the relocation process.
- A request was made for the Department to leave the maps behind to give the PAC1 group time to review and discuss the material on their own. The PAC1 group wanted to meet to discuss this without outside persons involved. The Team left the composite map showing the four alternatives for PAC 1 review.
- A concern was raised that this roadway may provide a situation where a strip club could be brought into the neighborhood and that this is not needed in East Durham.
- A PAC member asked – What would happen if the people say they don't want this project?
- Derrick Weaver responded by stating that this project is being developed by the state because the City and MPO asked that it be built. If the City Council tells the state to hold-off; then the state will hold-off. So it is best to voice issues to the City Council.
- Derrick Weaver also stated that the project team is developing detailed information and will be presenting this information to everyone. Comments we receive will be presented to the City and MPO.
- An audience member explained that this PAC1 meeting included community leaders representing other citizens' groups, not just a group of individual citizens. That is why this body needs input prior to the end of the year. The PAC1 group is willing to hold meetings as necessary to learn about this project and teach the project team about the community it is impacting and that this project also affects other PACs. It is extremely important to recognize the importance of these bodies. The project Team made arrangements to make presentations to the organization of PAC leaders and to the Inter-neighborhood Council in January.
- A motion was made stating that PAC1 should meet as soon as possible to discuss this project (it was implied that there would not be non-PAC members invited to this meeting). This motion passed and a meeting was scheduled for Saturday, November 4, 2006 10:00 AM.
- At the next regularly scheduled PAC 1 meeting on Saturday November 21, 2006 NCDOT will bring ROW persons to discuss the relocation process.

Meeting Notes



Date: November 14, 2006
Subject: TIP No. U-0071 East End Connector
NEIGHBORHOOD MEETING

Attendance:

Members of the public 22 citizens signed the meeting roster, it is estimated that 30 persons attended the meeting. The sign-in sheet is attached	
NCDOT Ed Lewis, NCDOTOHE Kimberly Hinton, NCDOTHE	NCDOT Beverly Robinson, PDEA NCDOT Leonard Scarborough, NCDOT
RS&H Jan Anderson John Boyle	City of Durham staff Mark Ahrendsen, Transportation Manager. Ellen Beckmann, Transportation Planner

Meeting Overview

These notes were taken during the Neighborhood meeting held at the Orange Grove Missionary Baptist Church located at 555 East End Avenue, Durham, NC. The meeting started at 4:00 PM and ended at 8:00 PM.

The meeting was an open forum that included a five minute introductory/background presentation and then the floor was open to questions and comments. Questions and comments were recorded on a large tablet and included the following:

Question – Mangum Blvd does the same thing as the proposed East End Connector, why do we need the project?

Answer – Roadways like Mangum do not have the ability to carry the volume of traffic that is expected to be using the East End Connector project. Mangum street is a minor arterial street that runs through residential neighborhoods. It would have major impacts on neighborhoods if it was expanded to carry a large volume of traffic.

Question – If Alternative 2 goes through my home, what real estate factor will be used to purchase it?

Answer – If the roadway goes through a home, the home will be bought at market rate value. The State will also pay for moving expenses. This information is explained in a brochure that was handed out at the sign-in table. Also, the owner can obtain a second appraisal and can also sue for damages.

Question – What if only a portion of the lot is needed?

Answer – There will be an appraisal to consider market value before and after the lot is split and the owner is paid the difference.

Question – What is the road going to look like?

Answer - It will be a freeway with 60 mph speed limit, limited access by interchanges and it will have bridges over the railroad and residential streets. Similar to NC 147.

Question – Will there be noise barriers?

Answer – A noise study is a part of the environmental process; barriers will be installed at locations where noise impacts need to be reduced.

Will there be landscaping?

Answer - Yes, a portion of the construction budget for the project will be set aside for landscaping.

Question – What if the roadway comes too close to the home but it is not taken?

Answer – the State will consider paying damages in certain instances.

Question – What is the purpose of having the roadway alternatives located so close to town?

Answer – The intent of the proposed project is to serve Durham, so two of the alternatives are closer to town. All four are being studied equally at this time.

Comment – Have you thought about the people that will be taken by this project? They are elderly and it is difficult for them to move out.

Answer – Yes, this is one of the factors considered.

Meeting Notes



Date: December 17, 2006

Subject: TIP No. U-0071 East End Connector
PAC 1 (Partners Against Crime) Meeting Saturday

Attendance:

Partners Against Crime (PAC) 1 Thomas Poole PAC 1 Co-Chair Approximately 25-30 neighborhood members were also in attendance. There was no sign-in sheet for this meeting	City of Durham staff Mark Ahrendsen, City of Durham Felix Nwoko, City of Durham
NCDOT staff Beverly Robinson, PDEA Leonard Scarborough, Division Right of Way Agent	

These notes were developed by John Boyle after the meeting through a phone conversation with Beverly Robinson.

The purpose of the meeting was to provide members of the PAC 1 group with information about the processes and procedures related to NCDOT right-of-way acquisition. Informational brochures were handed out and Leonard Scarborough answered questions from the audience.

Many of the questions were requests for specific information; such as how much DOT will pay for a home? This is information that cannot be provided. There was a request made for the NCDOT to review the relocation costs related to similar homes from previous projects and provide that to the PAC1 group. It was explained that this information cannot be provided to.

There was a request for a follow-up meeting in January 2007 to continue discussions about the project.

This represented the end of this agenda topic for the PAC 1 group.

Meeting Notes



Date: January 20, 2007

Subject: U-0071 PAC 1 Meeting
January 20, 2007

The project Team attended the PAC 1 meeting at the Eastway School on Saturday, January 20, 2007, to present information on the East End Connector Alternatives Analysis. Ms. Beverly Robinson, NCDOT project manager, introduced the study team and Jan Anderson, RS&H, conducted the PowerPoint presentation. The presentation described the environmental review process, described the alternatives studied and summarized the impacts of each plan. She then opened the floor for questions. Approximately 75 people attended the presentation which lasted about two hours. The following is a summary of the community's comments.

- A renter was concerned that the only way he learned of the meeting was from one of his neighbors. We responded that we are making an effort to reach renters but that it was difficult. By reaching out to neighborhood groups such as the PACs and local churches, we hope to do a better job reaching all members of the community.
- In response to a request for more detail about the plans, Ms. Anderson described the alternatives and summarized the impacts of each in greater detail.
- To clarify the process, Ms. Anderson went through the schedule, indicating that meeting dates coincided with key decision points. She emphasized that the final selection of a plan would occur after the fall Public Hearing on the draft EIS document [S/C...EA].
- Another participant asked for a better description of the impacts on the natural environment. Ms. Anderson emphasized that there are few impacts to the natural environment because there is little undisturbed natural environment in the area.
- With respect to air and noise analysis, that will be done for the alternatives selected to be brought forward from this point. The Team will also analyze the visual impacts of the project for selected alternatives.
- Will the Alston /avenue and the East End Connector be built at the same time? Alston Avenue will be built in the next several years and will be completed before the East End Connector is begun.
- There is concern that the process is taking too long. Community members want to know which plan will be chosen and who will be affected.
- There is concern that those affected be treated fairly. The Team emphasized that relocation agents will work with those affected to resettle them in alternative housing.

Meeting Notes

Date: January 23, 2007

Subject: U-0071 Inter-neighborhood Council Meeting

The project Team attended the Durham Inter-neighborhood Council meeting at the Durham Herald-Tribune building at 7:00 PM on Tuesday, January 23, 2007. The purpose of the meeting was to present information on the East End Connector Alternatives Analysis. Ms. Beverly Robinson, NCDOT project manager, introduced the study team and Jan Anderson, RS&H, conducted the PowerPoint presentation. The presentation described the environmental review process, described the alternatives studied and summarized the impacts of each plan. She then opened the floor for questions. Approximately 25 people attended the presentation which lasted about two hours. The following is a summary of the community's comments.

- One participant asked about how much traffic would be diverted from other local streets. The Team described how 25,000 ADT would be diverted from downtown streets and another 25,000 ADT from streets in East Durham.
- Another participant expressed concern that a bicyclist was killed on a downtown street and that diverting through traffic away from those streets is important to the community.
- Another participant asked about common elements among the four plans. We described the improvements along Holloway Street and US 70 that were similar.
- When asked about affording the project, the Team explained that costs are important but would more likely determine how soon the project is built.
- The team clarified that with Alternative 4, there would be full control of access along US 70 beyond Pleasant Drive.
- Another was interested in whether the land for Alternative 4 would be cheaper because it's mostly undeveloped.
- Will noise walls be included in the study and when? Where noise walls are needed will be determined during the next phase of the study and final decisions about installing them will be part of mitigation after the final alternative is selected.

Meeting Notes



Date: August 9, 2007

Subject: East End Connector Ad Hoc Committee Meeting 1
August 9, 2007

Members of the Ad Hoc Committee

Newman Aguiar	Vivian McCoy
Alvis Aikens	Barry Ragin
Arvis Bridges-Epps	William Thomas
John W. Lee, Sr.	Sylvester Williams

The first meeting of the Ad Hoc Committee was held in the Transportation Conference Room (4th Floor) of Durham City Hall on Thursday, August 9, 2007.

The meeting was opened with introductions followed by a discussion of the purpose of the Ad Hoc Committee- to provide input into the selected alternative ensuring that impacts are kept to a minimum. Ground rules for discussion were presented.

A PowerPoint presentation summarizing the effort to date was shown followed by a discussion of community concerns. The following concerns were expressed:

- A list of concerns were presented to the Team (attached). Responses will be prepared for the next meeting.
- In response to a question about the need for the project, the Team reviewed the future traffic volume needs and safety considerations that would be addressed by the proposed project.
- In response to the question about an environmental analysis, the Team explained that physical, human and natural environmental impacts are analyzed in the document being prepared. The status of work to identify the preferred alternative was then reviewed.
- The Team presented the project schedule to respond to questions about how the study will proceed.
- Concerns about community outreach were discussed, especially how to reach renters. The Team will prepare information about what has been accomplished to date and future efforts for the next meeting.
- With respect to the funding shortfall, the Team indicated that about half of the funding is in place and the remainder will come from future budget allocations.
- Concerns about the right-of-way process were expressed. A right-of-way agent will be present at the next meeting to discuss the process for purchasing property, businesses and homes.

The next Ad Hoc Committee meeting was scheduled for Monday, August 27, 2007 at 5:30 PM in the 4th floor Transportation Conference Room. The meeting was adjourned at 7:15 PM.

Meeting Notes



Date: August 27, 2007

Subject: East End Connector Ad Hoc Committee Meeting 2

Members of the Ad Hoc Committee

Newman Aguiar	Vivian McCoy
Alvis Aikens	Barry Ragin
Arvis Bridges-Epps	William Thomas
John W. Lee, Sr.	Sylvester Williams

The second meeting of the Ad Hoc Committee was held in the Ground Floor Conference Room A, Durham City Hall on Thursday, August 27, 2007.

The meeting was opened with a review and acceptance of the meeting minutes from the previous meeting. The following items were discussed:

- 1) Two photographic renderings of the East End Connector were presented- looking east on Rowena Avenue at Checkerberry Lane and looking east on Angier Avenue at Commonwealth Avenue. The committee requested more detailed renderings. After a discussion, it was decided that the Team would present examples of 3-D visualizations for another project so that the committee could decide if the method was appropriate for presenting the project.
- 2) When asked if there were any questions about the responses to information included in their documents, no clarification was requested.
- 3) With respect to community outreach, the Team announced that Newsletter 3 was mailed last week to 4500 names on the mailing list plus an additional 200 to the “resident” of parcels directly affected by the project. The purpose of the double mailing for these addresses was to ensure that renters were notified. A notebook containing records of every community meeting, email and telephone correspondence was presented and other outreach activities were discussed. One recommendation was to schedule a community informational workshop before the end of 2007 to present current information. That meeting could present Alternative 3 at a larger scale, the photo renderings and the 3D visualization. Information about right-of-way requirements would be available to participants.
- 4) Questions about property acquisition were answered. There are four reasons for a property to be fully acquired: if all of the property is needed for the project, if only part of the property is needed and the remaining parcel is unusable, for loss of access to a property, or for loss of private utilities (e.g. a well field or septic system). Only NCDOT determines if a property is a full acquisition. The owner does not have a choice.
- 5) A discussion about the project purpose referred to the letter invitation sent to committee members. The letter defines the committee’s purpose as “to begin to identify specific concerns associated with Alternative 3 and discuss measures to address these concerns.”

- 6) A request to invite the Chamber of Commerce to a meeting to discuss the economic development aspects of the project was tabled for further discussion at a later date.
- 7) For the next meeting the committee requested a full discussion of noise policy, the noise impacts of the project and where noise walls are needed; information about 3D visualization methods and whether a citizens workshop should be scheduled before the end of the year.

The next Ad Hoc Committee meeting was scheduled for Wednesday, September 19, 2007 at 5:30 PM. The meeting was adjourned at 7: 00 PM.

Meeting Notes



Date: September 19, 2007

Subject: East End Connector Ad Hoc Committee Meeting 3

Members of the Ad Hoc Committee

Newman Aguiar	Vivian McCoy
Alvis Aikens	Barry Ragin
Arvis Bridges-Epps	William Thomas
John W. Lee, Sr.	Sylvester Williams

The Third meeting of the Ad Hoc Committee was held in the Transportation Conference Room, Durham City Hall on Wednesday, September 19, 2007.

The meeting was opened with a review and acceptance of the meeting minutes from the previous meeting. The following items were discussed:

- 1) The committee reviewed the procedures for property acquisition with Mr. Robert Mathes, NCDOT Right-of-way office. He answered questions about relocations. He assured the committee that relocation assistance would be available to provide comparable replacement housing to those affected. The City has established a list of volunteer organizations that will provide free professional help. The list includes realtors and appraisers. Mr. Mathes assured the committee that relocates do not have to take less than they currently have. Mr. Mathes distributed pamphlets on Relocation Assistance and frequently asked questions about Right-of-way Acquisition.
- 2) Mr. Greg Smith presented the noise impact analysis, summarizing the process used and indicating that a noise wall is needed on Rowena Avenue across the bridge. The committee was concerned about the appearance of the wall and ways to upgrade the wall treatment were discussed. NCDOT usually provides a post-and-panel type of construction. Upgrades to a brick surface would be extra and could be paid by other funds not yet identified. The I-85 brick upgrade was funded by the Durham-Chapel Hill-Carrboro MPO and approximately doubled the cost of that wall. The committee should make a formal request if they would like to consider upgrading the wall surface or if there are other locations that should be considered for noise walls.
- 3) With respect to community outreach, the Team announced that Newsletter 3 has been mailed and that we are receiving inquiries on the hot line for current information.
- 4) A presentation of the 3D renderings was made and the committee decided that it was appropriate for presentations to the public to get a better understanding of the project.
- 5) For the next meeting the committee requested a presentation of the economic development opportunities generated by the project and a report from the UNC Study of

the Social Impacts of the East End Connector project on Hayestown. We will discuss a date and an agenda for a citizens workshop before the end of the year.

The next Ad Hoc Committee meeting was scheduled for Wednesday, October 10, 2007 at 5:30 PM. The meeting was adjourned at 7: 40 PM.

Meeting Notes



Date: October 10, 2007

Subject: East End Connector Ad Hoc Committee Meeting Notes

Members of the Ad Hoc Committee

Newman Aguiar	Vivian McCoy
Alvis Aikens	Barry Ragin
Arvis Bridges-Epps	William Thomas
John W. Lee, Sr.	Sylvester Williams

Mark Ahrendson opened the meeting at 5:30. The minutes of the previous meeting were accepted without comment.

- 1) Alan DeLisle, City of Durham Economic Development Department, discussed economic development activities related to the East End Connector. As an introduction, he noted that the City has a Work Force Development program that sets goals for a certain proportion of the work force on a municipal project to be done by Durham residents. Although EEC is a State project, the City will recommend similar goals for the construction of the freeway.
 - 2) With respect to economic development, the flow of transportation and access to land is extremely important to successful development. There is a preference for as many access points as possible along a corridor.
 - 3) The area east of US 70 and along NC 98 is important for economic development. The development community is already looking in this area for growth.
 - 4) The EEC with the Northern Durham Freeway will facilitate development in east Durham. There has already been investment in the corridor in anticipation of the road being built.
 - 5) Alvis Aikens requested written responses to his emailed questions. He'd like to know if the EEC will affect the tax base in District 1.
 - 6) With respect to the rail system, TTA plans for stations at Alston Avenue and at IBM. That plan is unfunded and is in the process of being reviewed.
 - 7) The Committee requested a presentation of traffic impacts of the project for the next meeting. For example, Holloway Street and Miami Boulevard are important congested corridors. NCDOT will make a traffic analysis presentation at the next Ad Hoc meeting.
 - 8) With respect to the Hayestown Study, NCDOT stated that the department prepares its own Community Impact Assessment Report independent of the Hayestown Study. The Hayestown report was prepared as a student project independent of the NCDOT study.
 - 9) The Social Impact Analysis Study was presented by Eric Landfreid and Melissa Norton. The study was prepared with the Northeast Central Durham Leadership Committee for a class on environmental justice and inequalities of class.
-

- 10) Eric emphasized that the report is a test study but not the actual results. He then summarized the demographic characteristics of the study area selected for this study. Melissa presented the results of a community impact survey of 19 people.
- 11) For Community Outreach, the Community Informational Workshop is tentatively scheduled for Monday, December 10th. The following locations will be called: #1 Eastway Elementary School, 4:00 – 7:00 pm. #2 YA Smith Elementary, 4:00 – 7:00 pm.
- 12) The next Ad Hoc meeting is scheduled for November 7th from 5:30 – 7:00 pm. The agenda will include: Traffic Presentation; Local Access.

Meeting Notes



Date: November 7, 2007

Subject: East End Connector Ad Hoc Committee Meeting Notes

Members of the Ad Hoc Committee

Newman Aguiar	Vivian McCoy
Alvis Aikens	Barry Ragin
Arvis Bridges-Epps	William Thomas
John W. Lee, Sr.	Sylvester Williams

1. Mark Ahrendson opened the meeting at 5:30. The minutes of the previous meeting were accepted with one comment. Pastor Williams requested that item 10 be revised to read that 19 households were interviewed rather than 19 people. We will add the following quotation from the report in place of the sentence: The study “received fourteen completed surveys, five through [the] initial focus group meeting and nine others from resident volunteers.
2. Jan Anderson, RS&H, reviewed the local access and circulation plan to ensure that all understood the proposed changes in access due to the proposed roadway.
3. Ms. Anderson then updated the Community Outreach effort, describing the telephone calls and emails she has received. The Community Informational Workshop is scheduled for Monday, December 10th at the Orange Grove Missionary Baptist Church from 4:00 to 7:00 PM. Other venues contacted were either not available at that time or considered less appealing locations. She informed the committee that a 3D animation was being prepared and would be available for the meeting. We will give a preview of the presentation at the next Ad Hoc committee meeting.
4. Radha Swayampakala, RS&H traffic engineer, presented the traffic forecasting methodology and travel analysis report results for the project and responded to comments. Copies of the travel analysis report were available for those present.
5. The next Ad Hoc meeting is scheduled for December 5th from 5:30 – 7:00 pm. The agenda will include: a preview of the 3D model and additional information about the Dec 10 workshop. The Committee will also hold a discussion of further business for the committee after the Dec 10 workshop.

Meeting Notes

Date: December 5, 2007

Subject: East End Connector Ad Hoc Committee Meeting Notes

Members of the Ad Hoc Committee

Newman Aguiar	Vivian McCoy
Alvis Aikens	Barry Ragin
Arvis Bridges-Epps	William Thomas
John W. Lee, Sr.	Sylvester Williams

1. Mark Ahrendson opened the meeting at 5:30. The minutes of the previous meeting were accepted without comment.
2. Ms. Anderson then updated the Community Outreach effort, describing the telephone calls and emails she has received. The Community Informational Workshop is scheduled for Monday, December 10th at the Orange Grove Missionary Baptist Church from 4:00 to 7:00 PM. She gave a preview of the 3D animation, emphasizing that it was a work in progress. The final product would be ready for the workshop on Dec. 10.
3. Ms. Anderson also presented recent changes to Alternative 3 made during value engineering review: a) The Rowena Avenue extension was eliminated and replaced with an extension of East End Avenue at US 70 to link directly with Miami Blvd; b) The Carr Rd northbound exit ramp was relocated closer to US 70; c) The northbound NC 147/ East End Connector diverge was redesigned to have a left-hand diverge for NC 147; and d) two alternative options were developed for a service road on the east side of US 70 between Lynn Rd and Pleasant Drive.
4. Under other issues and concerns, Alvis Aikens requested that the responses to his email questions on economic development impacts be sent to all committee members. He also asked for clarification about the project's score on the Durham-Chapel Hill-Carrboro Metropolitan Planning Agency's list of projects. The City will respond if he needs further clarification.
5. The next Ad Hoc meeting is scheduled for January 30, 2008 from 5:30 – 7:00 pm. The agenda will include: a review of the Dec 10 workshop.

Meeting Notes



Date: January 30, 2008

Subject: East End Connector Ad Hoc Committee Meeting Notes

Members of the Ad Hoc Committee

Newman Aguiar	Vivian McCoy
Alvis Aikens	Barry Ragin
Arvis Bridges-Epps	William Thomas
John W. Lee, Sr.	Sylvester Williams

At the seventh Ad Hoc Committee meeting, the committee reviewed the recommended mitigation measures for the proposed project that would be presented at the February 7, 2008 City Council meeting. The committee has discussed the following topics related to the project:

- Community outreach
- Right-of-way acquisition
- Relocation procedures
- Noise impacts
- Local traffic and connectivity
- Bicycle and pedestrian issues
- Economic development impacts
- Environmental justice

The Ad Hoc Committee provided input to NCDOT on the development of outreach materials for the December 10, 2007 Community Informational Workshop. In addition, Ad Hoc Committee members have helped spread information about the project through their community contacts and organizations. The committee will develop and prioritize its final recommendations over the course of their next meetings. Some of the mitigation measures being considered are listed below.

Impact: Purchase of homes and businesses

Mitigation Option: Ensure adequate compensation for property. Ensure that residents and businesses understand the process and receive real estate and legal assistance. Ensure that residences and businesses receive notification early, have adequate time to relocate, and receive compensation for moving and relocation costs.

Responsible Agency: Compensation will be provided by NCDOT. Increased notification and outreach may be provided by NCDOT and/or the City of Durham.

Impact: Purchase of rental properties

Mitigation Option: Ensure that tenants are notified early and have adequate time to relocate. Ensure that tenants receive compensation for moving and relocation costs.

Responsible Agency: Compensation will be provided by NCDOT. Increased notification and outreach may be provided by NCDOT and/or the City of Durham.

Impact: Noise impacts

Mitigation Option: Contract more or larger noise walls in addition to the one wall required by NCDOT's noise policy. Retrofit buildings to be more sound-proof. Potential areas of concern:

- Homes south of the EEC on Rowena Avenue
- Apartments west of US 70 and north of Holloway St./NC 98
- Calvary Baptist Church at US 70 and Lynn Rd.

Responsible Agency: Funding for noise walls or retrofitting may be provided by NCDOT, DCHC, MPO, and/or the City of Durham

Impact: Appearance of noise walls

Mitigation Option: Upgrade noise wall materials to ensure that it is visually appealing both from the road and from the adjacent parcels.

Responsible Agency: DCHC MPO and/or the City of Durham would need to provide funding to upgrade the materials.

Impact: Workforce and economic development:

Mitigation Option: Include a workforce development goal to hire construction employees from Durham.

Responsible Agency: Encourage NCDOT to include this in construction contracts. The City of Durham Office of Economic and Workforce Development can offer assistance.

Impact: Through traffic in residential neighborhoods

Mitigation Option: Ensure that the rerouting or connectivity of local streets does not encourage increased through traffic in residential areas. Traffic from future developments should also be considered. Enforce prohibitions on through traffic. Potential areas of concern: East End Ave.; Rowena Ave.; Angier Ave.; Pleasant Dr.; Lynn Rd.; and Carr Rd.

Responsible Agency: NCDOT included local street rerouting and connectivity in the project's design. The City of Durham is responsible for enforcing through traffic prohibitions. Future development would be considered by the City of Durham.

Impact: Local connectivity

Mitigation Option: Ensure that local street connections are replaced or enhanced by the project. Potential areas of concern: East End Ave. to US 70; Carr Rd. to US 70; and Lynn Rd. to US 70

Responsible Agency: NCDOT included local street connectivity in the project's design.

Impact: Bicycle and pedestrian connectivity and safety

Mitigation Option: Include sidewalks, crosswalks, and/or bike lanes on local streets included in or near the project. Potential areas of concern: NC 98/Holloway St.; Miami Blvd.; East End Ave. extension; Hoover Rd. extension; Lynn Rd. extension; Carr Rd. extension; and Pleasant Dr. at US 70.

Responsible Agency: NCDOT should consider including bicycle and pedestrian facilities in the project's design as appropriate. Funding could be provided by NCDOT, DCHC MPO, and/or the City of Durham.

Impact: Emergency Vehicle Response Time

Mitigation Option: Ensure that emergency service providers can maintain acceptable response times and service levels during construction and after the project is complete.

Responsible Agency: The Durham Police and Fire Departments will review plans to assess the impact on emergency vehicle response times. Any concerns would be addressed by NCDOT in the project's design and construction plans.

**Appendix F
Public Hearing Transcript**

Public Hearing is scheduled for a later date.

A copy of the transcript will be included in later version of the EA.