S-48 (Columbia Avenue) Corridor Improvement Project
Lexington County, South Carolina

Environmental Assessment

Submitted Pursuant to 42 U.S.C 4332(2)(c) by the
U.S. Department of Transportation
Federal Highway Administration
and the
S.C. Department of Transportation
Environmental Services Office

December 13, 2016
Date of Approval

Edward W. Fierson
S.C. Department of Transportation

DECEMBER 14, 2016
Date of Approval

J. Shane Belcher
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Project ID P042383

Date: 12/01/2016	SCDOT NEPA ENVIRONMENTAL COMMITMENTS FORM	

Project ID :	42383	County :	Lexington	District :	District 1	Doc Type:	EA	Total # of Commitments:	9

Project Name: S-48 (Columbia Avenue) Corridor Improvement Project

The Environmental Commitment **Contractor Responsible** measures listed below **are to be included in the contract and must be implemented**. It is the responsibility of the Program Manager to make sure the Environmental Commitment **SCDOT Responsible** measures are adhered to. If there are questions regarding the commitments listed please contact:

CONTACT NAME: Ms. Jennifer Necker, P.E. **PHONE #:** (803) 737-7829

ENVIRONMENTAL COMMITMENTS FOR THE PROJECT

Water Quality	Page 51	Responsibility:	SCDOT

The contractor will be required to minimize possible water quality impacts through implementation of construction BMPs, reflecting policies contained in 23 CFR 650B and the Department's Supplemental Specifications on Seeding and Erosion Control Measures (Latest Edition). Other measures including seeding, silt fences, sediment basins, etc. as appropriate will be implemented during construction to minimize impacts to Water Quality.

Stormwater	Page 51	Responsibility:	SCDOT

Stormwater control measures, both during construction and post-construction, are required for SCDOT projects with land disturbance and/or constructed in the vicinity of 303(d), TMDL, ORW, tidal, and other sensitive waters in accordance with the SCDOT's MS4 Permit. The selected contractor would be required to minimize potential stormwater impacts through implementation of construction best management practices, reflecting policies contained in 23 CFR 650 B and SCDOT's Supplemental Specifications on Seed and Erosion Control Measures (latest edition).

Individual Permit	Page 51	Responsibility:	SCDOT

Impacts to jurisdictional waters will be permitted under a Department of the Army Section 404 permit from the U.S. Army Corps of Engineers. Based on preliminary design, it is anticipated that the proposed project would be permitted under an Individual Army Corps of Engineers Permit (IP). SCDOT will provide the Army Corps with information regarding any proposed demolition activities during the Section 404 permitting process. The required mitigation for this project will be determined through consultation with the USACE and other resource agencies.

Project ID : 42383	SCDOT NEPA ENVIRONMENTAL COMMITMENTS FORM	SCDOT ENVIRONMENTAL SERVICES

ENVIRONMENTAL COMMITMENTS FOR THE PROJECT

Cultural Resources Page 61 Responsibility: CONTRACTOR

The contractor and subcontractors must notify their workers to watch for the presence of any prehistoric or historic remains, including but not limited to arrowheads, pottery, ceramics,flakes, bones, graves, gravestones, or brick concentrations during the construction phase of the project, if any such remains are encountered, the Resident Construction Engineer (RCE) will be immediately notified and all work in the vicinity of the discovered materials and site work shall cease until the SCDOT Archaeologist directs otherwise.

Non-Standard Commitment Responsibility: SCDOT

Cultural Resources - Mt. Horeb Lutheran Cemetery Page 61

SCDOT archaeological staff will monitor construction activities adjacent to the Mt. Horeb Lutheran Cemetery (U/63/0891) to ensure that no unmarked burials or other archaeological resources are impacted.

USTs/Hazardous Materials Page 64 Responsibility: SCDOT

If avoidance of hazardous materials is not a viable alternative and soils that appear to be contaminated are encountered during construction, the South Carolina Department of Health and Environmental Control (SCDHEC) will be informed. Hazardous materials will be tested and removed and/or treated in accordance with the United States Environmental Protection Agency and the SCDHEC requirements, if necessary.

Project ID : 42383	SCDOT NEPA ENVIRONMENTAL COMMITMENTS FORM	SCDOT ENVIRONMENTAL SERVICES

ENVIRONMENTAL COMMITMENTS FOR THE PROJECT

Noise	Page 68	Responsibility:	SCDOT

SCDOT will inform local planning officials of future, generalized noise levels expected to occur in the project vicinity after FHWA has made a final decision on the Environmental document.

Displacements	Page 73	Responsibility:	SCDOT

The SCDOT will acquire all new right-of-way and process any relocations in compliance with the Uniform Relocation Assistance and Real Property Acquisition policies Ace of 1970, as amended (42 U.S. C. 4601 et seq.). The purpose of these regulations is to ensure that owners of real property to be acquired for Federal and federally-assisted projects are treated fairly and consistently, to encourage and expedite acquisition by agreements with such owner, to minimize litigation and relieve congestion in the courts, and to promote public confidence in Federal and federally-assisted land acquisition programs.

Migratory Bird Treaty Act (all bridge and box culvert projects)	Responsibility:	CONTRACTOR

The federal Migratory Bird Treaty Act, 16 USC § 703-711, states that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not.

The Department will comply with the Migratory Bird Treaty Act of 1918 in regard to the avoidance of taking of individual migratory birds and the destruction of their active nests. Prior to construction/demolition of the bridges the Resident Construction Engineer (RCE) will coordinate with SCDOT Environmental Services Compliance Office to determine if there are any active nests on the bridge. After this coordination, it will be determined whether construction/demolition can begin. After construction/demolition has begun, measures can be taken to prevent birds from nesting, such as screens, noise producers, and deterrents etc. If during construction or demolition a nest is observed on the bridge that was not discovered during the biological surveys, the contractor will cease work and immediately notify the RCE, who will contact SCDOT Environmental Services Compliance Office. SCDOT biologists will determine whether the nest is active and the species utilizing the nest. After this coordination, it will be determined whether construction/demolition can resume or whether a temporary moratorium will be put into effect. All costs for determining the need for, the placing of deterrents, and applying of all special actions including, but not limited to, removing nests and any costs associated with conducting work in compliance with the Migratory Bird Treaty Act as stated herein will not be paid for separately but will be considered to have been included with other items of work.

TABLE OF CONTENTS

1.0 Purpose and Need 1
1.1 Introduction 1
1.2 What is the Existing Project Corridor? 1
1.3 What is the Primary Purpose of the Proposed Project? 3
1.4 Why is the Project Needed? 3
1.5 What Funding is Available for the Project? 4
2.0 Alternatives 4
2.1 What Alternatives Were Considered for the Mainline of Columbia Avenue? 4
2.2 What I-26 Interchange Alternatives Were Considered? 28
2.3 What is the Project Preferred Alternative? 33
3.0 Existing Conditions and Probable Impacts on the Environment 40
3.1 Land Use 40
3.2 Farmlands 42
3.3 Waters of the U.S. 44
3.4 Water Quality 50
3.5 What permits are required? 51
3.6 Protected Species 52
3.7 Floodplains 54
3.8 Air Quality 54
3.9 Cultural Resources 61
3.10 Section 4(f) and Section 6(f) Resources 63
3.11 Wild and Scenic Rivers 64
3.12 Hazardous Waste and Material Sites 64
3.13 Traffic Noise Analysis 66
3.14 Social and Economic 71
3.15 Environmental Justice 72
3.16 Relocations 75
3.17 Indirect and Cumulative Impacts 75
4.0 Agency Coordination and Public Involvement 82
4.1 Agency Coordination 82
4.2 Public Involvement 83

FIGURES

Figure 1-1: Project Location Map 2
Figure 2-1: Node Path Map 7
Figure 2-2: Alternatives Considered for Further Consideration 18
Figure 2-3: Alternatives 9 and 30 20
Figure 2-4: Alternatives 18 and 22 21
Figure 2-5: Alternative 9 23
Figure 2-6: Alternative 9A (Preferred Alternative) 24
Figure 2-7: Alternative 18 25
Figure 2-8: Alternative 18 A 25
Figure 2-9: Alternative 25 26
Figure 2-10: Dual Roundabout Interchange 29
Figure 2-11: Alternative 2 – Partial Cloverleaf Interchange 30
Figure 2-12: Alternative 3 – Diverging Diamond Interchange 31
Figure 2-13 A: Preferred Alternative 34
Figure 2-13 B: Preferred Alternative 35
Figure 2-13 C: Preferred Alternative 36
Figure 2-13 D: Preferred Alternative 37
Figure 2-13 E: Preferred Alternative 38
Figure 2-13 F: Preferred Alternative 39
Figure 3-1: Future Land Use 42
Figure 3-2: Farmlands 43
Figure 3-3: Waters of the U.S. 46
Figure 3-4: Waters of the U.S. 47
Figure 3-5: Waters of the U.S. 48
Figure 3-6: Hazardous Waste and Materials Sites 65
Figure 3-7: Traffic Noise Impacts 69
Figure 3-8: U.S Census Block Limits 73

TABLES

Table 1-1: Columbia Avenue Arterial Level of Service Analysis 4
Table 2-1: Node Path Description 8
Table 2-2: Alternatives Eliminated From Further Consideration 16
Table 2-3: Alternatives Considered for Further Evaluation 17
Table 2-4: Alternative Eliminated From Further Consideration 22
Table 2-5: Mainline Alternative Comparison Matrix 27
Table 2-6: Interchange Alternative Comparison Matrix 32
Table 3-1: Existing Land Use Summary 40
Table 3-2: Characteristics and Anticipated Impacts to Wetlands 45
Table 3-3: Characteristics and Anticipated Impacts to Tributaries 49
Table 3-4: Characteristics and Anticipated Impacts to Ponds 49
Table 3-5: Listed Species In Lexington County 53
Table 3-6: Attainment Classifications and Definitions 55
Table 3-7: Vehicle Miles Traveled 56
Table 3-8: Estimated GHG Operations and Fuel Cycle Emissions, CO2e 59
Table 3-9: Annualized Energy Use (mmBTUs), Per Year Over 25 Years 60
Table 3-10: Annual GHG Emissions (MT CO2e), Per Year Over 25 Years 60
Table 3-11: Sites of Potential Environmental Concern 66
Table 3-12: Noise Abatement Criteria (NAC) 68
Table 3-13: Traffic Noise Impacts 70
Table 3-14: Population Data 74

APPENDICES

Appendix A: Planning-Level Traffic Analyses
Appendix B: Interchange Modification Report (IMR)
Appendix C: Farmland Impact Conversion Rating Form
Appendix D: Natural Resources Technical Memorandum (NRTM)
Appendix E: SCDHEC Watershed and Water Quality Information Reports
Appendix F: Biological Assessment
Appendix G: Greenhouse Gases Analysis Assumptions
Appendix H: Cultural Resources Surveys and Concurrence Documents
Appendix I: Phase I Environmental Site Assessment
Appendix J: Traffic Noise Analysis
Appendix K: Agency Correspondence
Appendix L: Public Involvement Materials
First Public Involvement Meeting
Second Public Involvement Meeting

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

The South Carolina Department of Transportation (SCDOT), in partnership with Lexington County and the Columbia Area Transportation Study (COATS), proposes to improve the S-48 (Columbia Avenue) corridor (Project Corridor) from Interstate 26 (I-26) to U.S. Route 76 (Chapin Road) in Lexington County, South Carolina; please see **Figure 1-1** for a Location Map of the Project Corridor. The SCDOT has entered into a Local Public Agency Administrator (LPAA) agreement with Lexington County to manage the project.

The project, as proposed, would result in certain modifications to the human and natural environment. The SCDOT has not identified impacts that would result in the preparation of an Environmental Impact Statement (EIS), therefore the project meets the criteria under 23 CFR 771.115(c) for processing as an Environmental Assessment (EA). Specific environmental studies were conducted in the early stages of project development and are discussed in **Chapter 3** of this document. These studies and an understanding of the project's scope of work were considered in the decision for this level of documentation and are appended by reference to this document.

1.2 WHAT IS THE EXISTING PROJECT CORRIDOR?

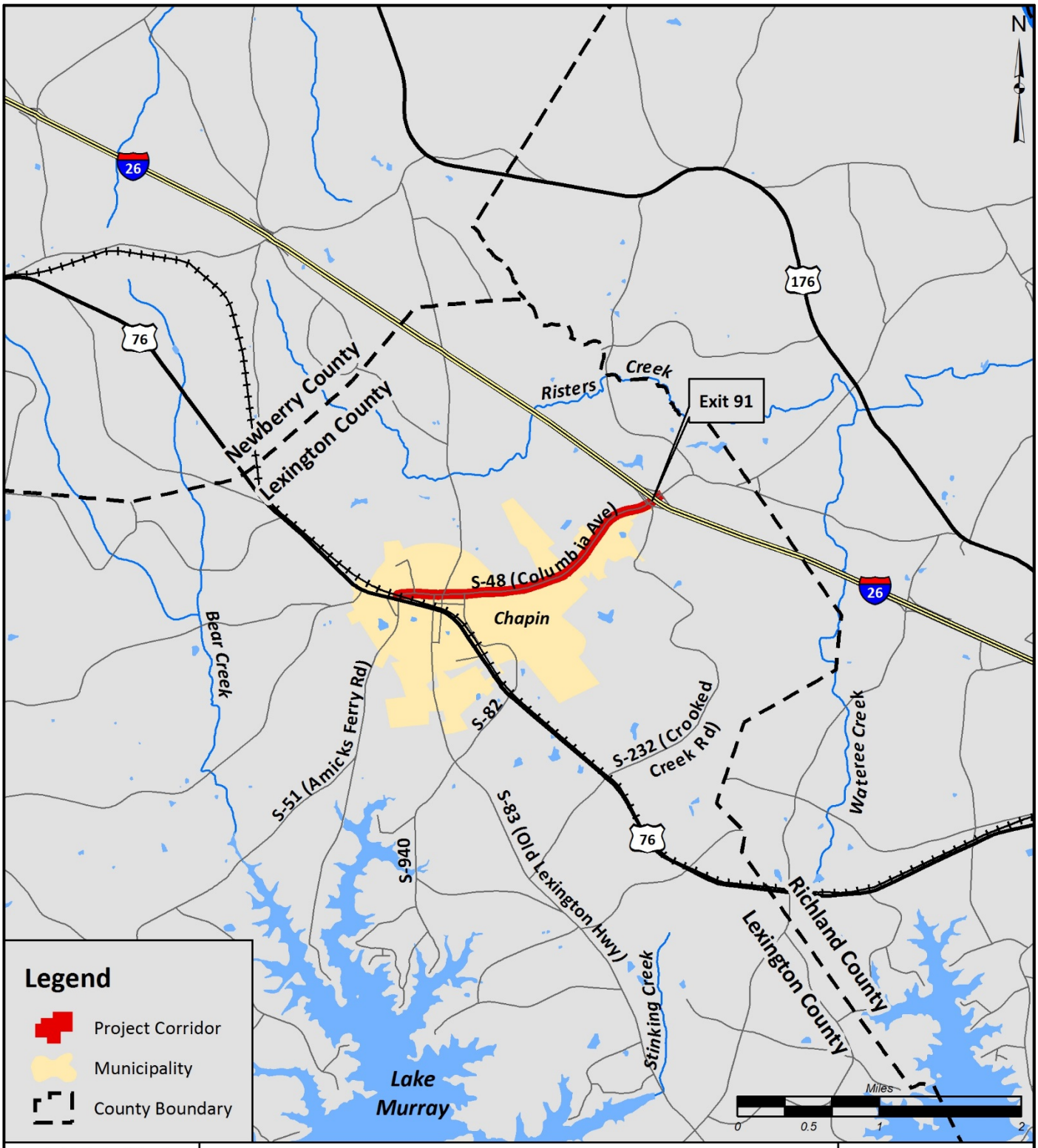
The Project Corridor is approximately two (2) miles in total length and is comprised of both forestland and developed areas. The western portion of the Project Corridor, located between U.S. Highway 76 (Chapin Road) and Ellett Road, is primarily comprised of established commercial and residential development. Chapin High School is located immediately east of Ellett Road and south of Columbia Avenue. East of Chapin High School, the Project Corridor primarily consists of undeveloped forestland with sparse residential and commercial development. Furthermore, the eastern portion of the Project Corridor is primarily comprised of commercial development in the vicinity of the I-26 interchange.

View of Columbia Avenue near East Boundary Street

Within the Project Corridor, Columbia Avenue consists of two travel lanes, one in each direction, minimal paved shoulders, and grassed shoulders with an open ditch for stormwater collection and conveyance. The intersection of Columbia Avenue and Chapin Road is controlled by traffic signals. All other intersections within the Project Corridor are not signalized.

Existing improvements within the Project Corridor provide a two-way, left-turn lane (TWLTL) in the vicinity of Chapin High School, from Ellett Road to a point approximately 600 feet west of Woodthrush Road. A dedicated right-turn into Chapin High School is also provided from Columbia Avenue. Sidewalks are also provided along one side of Columbia Avenue between US 76 (Chapin Road) and Chapin High School. The posted speed limit throughout the Project Corridor is 35 miles per hour (mph). The existing right-of-way (R/W) varies from 50 feet to 66 feet in total width.

FIGURE 1-1: PROJECT LOCATION MAP



SCDOT South Carolina Department of Transportation
Mead & Hunt

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS
LEXINGTON COUNTY, SOUTH CAROLINA

FIGURE 1-1
LOCATION MAP

1.3 What is the Primary Purpose of the Proposed Project?

The Project Corridor serves as the primary access to I-26 for residents of Chapin and the growing residential areas south of Chapin and along Lake Murray. The Project Corridor also provides access to Chapin High School, as well as businesses and residences located along Columbia Avenue. The purpose of the project is to improve traffic congestion along the Columbia Avenue corridor between I-26 and U.S. Highway 76 (Chapin Road).

1.4 Why is the Project Needed?

The transportation planning process for the Central Midlands Council of Government (CMCOG) identified a need for congestion mitigation in the 2006 preparation of the S-48 Columbia Avenue Corridor Study. The study presented congestion in the corridor during peak commuter hours, a lack of parallel routes, and "bottleneck" conditions as primary transportation issues within the Project Corridor.

Existing traffic volume data has been collected throughout the Project Corridor. An SCDOT approved growth rate of 1.25% was also used to anticipate future traffic volumes. Additionally, a traffic study was prepared for two (2) proposed developments adjacent to the Project Corridor. These developments, Chapin Technology Park and Chapin Commerce Village Development, are significant in size and are anticipated to increase traffic volumes within the Project Corridor. The anticipated traffic generated by these developments was included into the anticipated traffic in the year 2040. The 2040 design year is based on an anticipated construction completion date of 2020.

One method of measuring roadway congestion is analyzing the level of service (LOS) of the roadway. The Transportation Research Board's Highway Capacity Manual expresses a roadway's LOS by using a letter scale from "A" to "F". The letter "A" represents the best roadway travel conditions with no delays or congestion while the letter "F" represents a significant operational breakdown with extensive delays and heavy congestion. According to SCDOT design guidelines, it is desirable to provide a LOS "C" or better on primary routes.

To determine the LOS of the Project Corridor, the existing conditions were analyzed using Highway Capacity Software (HCS). This analysis determined Columbia Avenue currently operates at a LOS E (eastbound and westbound). Future no-build conditions were evaluated with a detailed SYNCHRO model of nine (9) intersections along Columbia Avenue. Without implementing any future improvements other than the installation of traffic signals, the eastbound LOS would decrease to a LOS F in the AM peak hour in the year 2040. Average speeds during this time could be as slow as 5.3 miles per hour (mph), as shown in Table 1-1. Similarly, the westbound traffic along Columbia Avenue would also function at an LOS F in the PM peak hour, with average speeds as low as 6.7 mph.

TABLE 1-1: COLUMBIA AVENUE ARTERIAL LEVEL OF SERVICE ANALYSIS

	Eastbound Columbia Avenue				Westbound Columbia Avenue			
	Arterial Speed (mph)		Arterial LOS		Arterial Speed (mph)		Arterial LOS	
	AM	PM	AM	PM	AM	PM	AM	PM
2040 No-Build	5.3	15.2	F	D	18.2	6.7	C	F

Source: S-48 (Columbia Avenue) Corridor Improvement Project - Arterial Level of Service Analysis – July 2016 by AECOM (**Appendix A**)

1.5 WHAT FUNDING IS AVAILABLE FOR THE PROJECT?

The proposed project is consistent with the COATS *2035 Long Range Transportation Plan*, and lists the Columbia Avenue Project as a Prioritized Road Widening Project. The project is also included as a system upgrade in SCDOT's Statewide Transportation Improvement Program (STIP) for Lexington County[1]. The STIP covers all federally funded transportation improvements for which funding has been approved and that are expected to be undertaken in the six-year period the STIP covers. The fiscally-constrained STIP currently includes approximately $13,000,000 for preliminary design services, right-of-way acquisition, and project construction through 2019. The total estimated cost through construction is $43,125,000[2].

The Central Midlands Council of Governments (CMCOG) is the designated Metropolitan Planning Organization (MPO) responsible for carrying out the urban transportation planning process for COATS. The CMCOG is currently reviewing their planning documents and intends to recommend additional funds for the proposed project. Once endorsed, the CMCOG will revise the Transportation Improvement Plan (TIP) to reflect complete funding for the project. The STIP will be subsequently revised to reflect this funding. Full funding is reasonably anticipated to be available for its completion, prior to a final NEPA decision by the Federal Highway Administration (FHWA).

2.0 ALTERNATIVES

The consultant team, in partnership with Lexington County and the SCDOT, have developed several potential solutions that will improve the Project Corridor. These solutions, or alternatives, were developed for the mainline of Columbia Avenue and the I-26 interchange.

2.1 WHAT ALTERNATIVES WERE CONSIDERED FOR THE MAINLINE OF COLUMBIA AVENUE?

Alternatives considered for the mainline of Columbia Avenue consist of the No-Build Alternative, Transportation Systems Management Alternative, Build Alternatives considered, but eliminated, and the Reasonable Alternatives. The alternatives were compared against one another to determine which best met the purpose and need with the least impacts to the surrounding environment.

[1] STIP 2017-2022, 10/03/2016. System Upgrade – Urban. Page 4. S-48 (Columbia Avenue) line item. Referenced on October 5, 2016 at: http://www.dot.state.sc.us/inside/pdfs/STIP/2017-2022_HighwayProgram.pdf
[2] Design Field Review Cost Estimate. Prepared by Mead & Hunt, Inc. August 31, 2016.

2.1.1 What is the No-Build Alternative?

The No-Build Alternative consists of making no improvements to the Project Corridor or the surrounding area. This alternative would not require any right-of-way acquisition, utility relocation or construction funds. In addition, the No-Build Alternative would not cause impacts to environmental resources and would not cause short term traffic disruption. However, the No-Build Alternative would not improve the Level of Service along the Project Corridor, and would therefore not satisfy the project's intended purpose and need. Due to the inability to improve traffic congestion within the Project Corridor, the No-Build Alternative was eliminated from further consideration. However, the No-Build was retained as a baseline for applicable comparison and evaluation.

2.1.2 What is the Transportation Systems Management Alternative?

The Transportation Systems Management Alternative includes low-cost strategies aimed at improving the existing transportation network without resorting to major widening projects or construction of new roadways. Transportation Systems Management can integrate multiple techniques to collectively increase safety, efficiency and capacity for the overall transportation system. Examples of low-cost Transportation Systems Management strategies include:

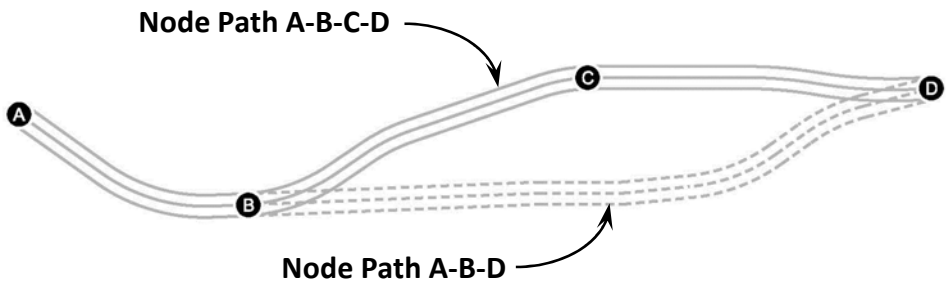
- Traffic signal optimization
- Intelligent transportation systems (ITS)
- Access management
- Resurfacing roads
- Signing and lane marking improvements
- Ramp lengthening

Traffic volumes collected for the project reveal that portions of Columbia Avenue are currently over capacity and are projected to increase significantly in the future. Traffic studies also indicate that traffic volumes are an element in the congestion within the Project Corridor. Transportation Systems Management strategies are not designed to accommodate a significant increase in traffic. Without addressing the future traffic expectations, the Transportation Systems Management Alternative would not relieve congestion within the Project Corridor to a satisfactory LOS, and therefore would not satisfy the purpose and need of the project. Due to these factors, this alternative is eliminated from further consideration.

2.1.3 What are the Mainline Build Alternatives and How Were They Developed?

Multiple build alternatives were developed to improve the mainline of Columbia Avenue. Each of these alternatives was developed to provide motorists a less congested route through the Project Corridor. These alternatives include improvements to existing roadways, new location roadways, and combinations of existing and new location roadways. The methodology used to develop these alternatives consisted of a network of node paths within the vicinity of the Project Corridor.

A node is a point within a network of lines at which lines intersect, branch, or terminate. A series of nodes, or a node path, represents an alternative. The following illustration is an example of four nodes that connect to form two (2) separate node paths. Both node paths shown originate at Node A and terminate at Node D; however, each route is unique.



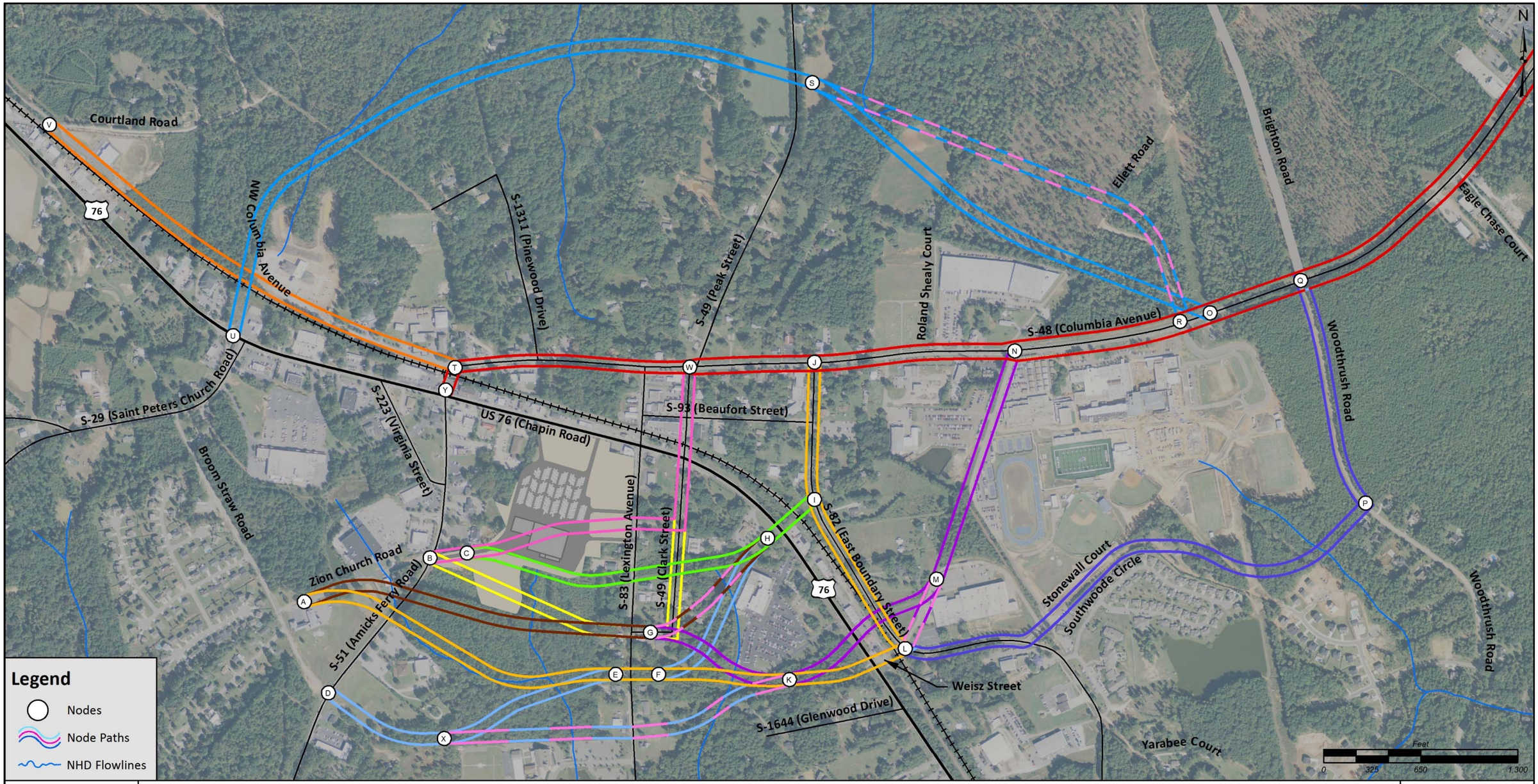
A total of 25 nodes were established within the vicinity of the Project Corridor, including six (6) western terminus nodes, eighteen (18) interior nodes, and one (1) eastern terminus node. The eastern terminus node (Node Q) of the mainline alternatives is located at the intersection of Columbia Avenue and Woodthrush Road; however, the proposed improvements from Woodthrush Road east to the I-26 interchange would be identical for each alternative. Based on the location of these nodes, 31 alternatives were developed.

Each of the 31 alternatives considered during this alternatives analysis incorporate three (3) proposed typical sections. These include a five-lane urban roadway, a five-lane rural roadway, and a three-lane roadway. A description and the limits of each typical section used in this analysis is listed below:

- Five-lane Urban (Curb and Gutter Section): A five-lane urban roadway would consist of four (4) travelways, two (2) in each direction, a TWLTL/planted median, vertical curb and gutter, and a closed drainage system for stormwater collection and conveyance. For this analysis, the anticipated corridor of a five-lane urban roadway extends 45 feet from the proposed centerline, 90 feet in total width. A five-lane urban roadway was utilized for analysis from Node W to Node N, along S-48 (Columbia Avenue).
- Five-lane Rural (Ditch Section): A five-lane rural roadway would consist of four (4) travelways, two (2) in each direction, a TWLTL/planted median, and an open ditch for stormwater collection and conveyance. For this analysis, the anticipated corridor of a five-lane rural roadway extends 65 feet from the proposed centerline, 130 feet in total width. A five-lane rural roadway was utilized for analysis from Node N to I-26, along S-48 (Columbia Avenue).
- Three-lane Roadway: A three-lane roadway would consist of two (2) travelways, one (1) in each direction, and a planted/raised median. For this analysis, the anticipated corridor of a three-lane roadway extends 36.5 feet from the proposed centerline, 75 feet in total width. A three-lane roadway was utilized for analysis from Node Y to Node W along S-48 (Columbia Avenue), all roads intersecting S-48 (Columbia Avenue), and all new location roadways. Access to any proposed new roadways would not be fully controlled; however, raised medians would be incorporated into the design, limiting left-turn access to portions of the roadway.

Please see **Figure 2-1** for a Node Path Map. **Table 2-1** also lists the 31 alternatives considered for the proposed project and the identifying characteristics of each node path.

FIGURE 2-1: NODE PATH MAP



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS
LEXINGTON COUNTY, SOUTH CAROLINA

FIGURE 2-1
NODE PATH MAP

TABLE 2-1: NODE PATH DESCRIPTION

Alternative	Node Path	Node Path Description
1	V-T-Q	Originates on Courtland Road, east of the CSX Railroad. Provides a new location roadway to NW Columbia Avenue. Improves NW Columbia Avenue. Improves Columbia Avenue from US 76 (Chapin Road) to I-26.
2	U-S-O-Q	Originates on US 76 (Chapin Road), north of S-29 (Saint Peters Church Road). Provides a new location roadway north of the Town of Chapin. New location terminates near Chapin High School. Improves Columbia Avenue from Chapin High School to I-26.
3	U-S-R-Q	Originates on US 76 (Chapin Road), north of S-29 (Saint Peters Church Road). Provides a new location roadway north of the Town of Chapin. New location terminates near Chapin High School. Improves Columbia Avenue from Chapin High School to I-26.
4	B-C-W-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-49 (Clark Street). Utilizes a portion of S-49 (Clark Street). Improves Columbia Avenue from S-49 (Clark Street) to I-26.
5	B-C-H-I-J-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.
6	A-G-H-I-J-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.
7	A-G-K-M-N-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
8	A-G-K-L-M-N-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
9	A-G-K-L-I-J-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.

Alternative	Node Path	Node Path Description
10	A-G-K-L-P-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Utilizes a portion of Stonewall Court. Provides new location to Woodthrush Road. Utilizes a portion of Woodthrush Road. Improves Columbia Avenue from Woodthrush Road to I-26.
11	A-E-F-H-I-J-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.
12	A-E-F-K-M-N-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
13	A-E-F-K-L-I-J-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.
14	A-E-F-K-L-M-N-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
15	A-E-F-K-L-P-Q	Originates on Zion Church Road, east of Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Utilizes a portion of Stonewall Court. Provides new location to Woodthrush Road. Utilizes a portion of Woodthrush Road. Improves Columbia Avenue from Woodthrush Road to I-26.
16	D-X-E-F-H-I-J-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.
17	D-X-E-F-K-M-N-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
18	D-X-E-F-K-L-I-J-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.

Alternative	Node Path	Node Path Description
19	D-X-E-F-K-L-M-N-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
20	D-X-E-F-K-L-P-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Utilizes a portion of Stonewall Court. Provides new location to Woodthrush Road. Utilizes a portion of Woodthrush Road. Improves Columbia Avenue from Woodthrush Road to I-26.
21	D-X-K-M-N-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
22	D-X-K-L-I-J-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.
23	D-X-K-L-M-N-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
24	D-X-K-L-P-Q	Originates on S-51 (Amicks Ferry Road) at Broom Straw Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Utilizes a portion of Stonewall Court. Provides new location to Woodthrush Road. Utilizes a portion of Woodthrush Road. Improves Columbia Avenue from Woodthrush Road to I-26.
25	Y-T-Q	Improves Columbia Avenue from US 76 (Chapin Road) to I-26.
26	B-G-W-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-49 (Clark Street). Utilizes all of S-49 (Clark Street). Improves Columbia Avenue from S-49 (Clark Street) to I-26.
27	B-G-H-I-J-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.

Alternative	Node Path	Node Path Description
28	B-G-K-M-N-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
29	B-G-K-L-M-N-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-82 (East Boundary Street). Provides a new location roadway north to Columbia Avenue. New location terminates at Ellett Road. Improves Columbia Avenue from Ellett Road to I-26.
30	B-G-K-L-I-J-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Improves Columbia Avenue from S-82 (East Boundary Street) to I-26.
31	B-G-K-L-P-Q	Originates on S-51 (Amicks Ferry Road) at Zion Church Road. Provides a new location roadway east to S-82 (East Boundary Street). Utilizes a portion of S-82 (East Boundary Street). Utilizes a portion of Stonewall Court. Provides new location to Woodthrush Road. Utilizes a portion of Woodthrush Road. Improves Columbia Avenue from Woodthrush Road to I-26.

2.1.3.1 WHY WERE SOME OF THE ORIGINAL ALTERNATIVES ELIMINATED?

Coordination with Lexington County, the SCDOT, and area residents identified multiple elements to consider during the elimination of alternatives. Elements identified during this analysis include the potential inability to satisfy SCDOT minimum design criteria, significant impacts to the natural environment, and community impacts. **Sections 2.1.3.1.1 through 2.1.3.1.3** identify and describe key elements identified. **Table 2-2** includes a comprehensive summary of findings and rationale for the elimination of alternatives.

2.1.3.1.1 ROADWAY/RAILROAD DESIGN CRITERIA

The *South Carolina Highway Design Manual* (HDM) provides uniform design practices for the design of roadway projects in South Carolina. The SCDOT encourages engineering designers to meet all criteria and practices presented in the HDM, while fulfilling the SCDOT's operational and safety requirements.

The initial development of alternatives included conceptual horizontal and vertical geometric design criteria and consideration of the practices outlined in the HDM. Subsequent site reviews of each alternative revealed two (2) node paths that would not meet minimum design criteria based on specific site conditions. One (1) of these would not meet the minimum intersection spacing outlined in the HDM; see **Section 2.1.3.1.1.1** for complete details. The other would result in steep roadway hills that exceed the maximum allowable grade; see **Section 2.1.3.1.1.2** for more details.

The initial development of alternatives also included the potential need for an additional railroad crossing to satisfy the project. CSX Transportation, Inc. (CSXT) currently operates a single-track railroad which parallels the north side of Chapin Road throughout the majority of the Town limits. A total of ten (10) alternatives would

require an additional railroad crossing. Additional documentation and HDM design criteria was evaluated to determine specific measures required to establish a new railroad crossing; see **Section 2.1.3.1.1.3** for complete details.

2.1.3.1.1.1 Intersection Spacing

The HDM suggests avoiding short distances between intersections because they tend to impede traffic operations. Furthermore, the HDM states that urban intersections should be a minimum of 500 feet apart to operate efficiently, and in general, should be at least 500 to 700 feet apart. Alternative 1 would introduce a new intersection at Node V, immediately east of the CSXT railroad on Courtland Road. This potential intersection would be approximately 275 feet from the existing intersection of Chapin Road and Courtland Road; thereby, not meeting the minimum design criteria outlined in the HDM. In addition, these two (2) intersections would be separated only by the CSXT railroad, which would further complicate traffic operations and increase potential safety concerns. These traffic operation and safety concerns have been identified as key elements of Alternative 1 to consider during the elimination of alternatives.

2.1.3.1.1.2 Grade-Separated Railroad Crossing Clearance

A grade-separated railroad crossing is an overpass or underpass of a railroad. One (1) node path would require a grade-separated crossing due to the existing topography in the area of the crossing. Node Path U-S would extend a roadway from the intersection of Chapin Road and Saint Peter's Church Road north across the CSXT railroad. The existing railroad at this location is approximately ten (10) feet below the adjacent terrain; therefore, a grade-separated overpass would be necessary to allow motoring traffic to cross the railroad. Node Path U-S is contained within two (2) alternatives, including Alternatives 2 and 3.

The HDM also provides specific design criteria for grade-separated railroad crossings, including minimum horizontal and vertical clearances required for safe operation of the railroad. The HDM states the vertical clearance must be a minimum of 23 feet between the existing railroad and the lowest point of the bridge structure. The potential railroad crossing of Node Path U-S would be located approximately 310 feet from the existing intersection of Chapin Road and Saint Peter's Church Road. Based on the proximity of this intersection to the railroad crossing, the roadway approaches of the potential overpass would exceed the maximum allowable grade necessary to achieve adequate minimum vertical clearance of the railroad. Increasing the vertical grade above the desired design criteria would result in reduced sight distance at the intersection and increased safety concerns. These safety concerns have been identified as key elements in the elimination of alternatives.

2.1.3.1.1.3 New At-Grade Railroad Crossing

An at-grade railroad crossing is a crossing that does not include an overpass or underpass. Five (5) at-grade public roadway crossings of the CSXT Railroad are currently provided within the vicinity of the Project Corridor, including crossings of Columbia Avenue, Lexington Avenue, Clark Street, Weisz Street (near the location of Node L), and Courtland Road (near the location of Node V).

Multiple alternatives developed during the initial planning for the project include an additional at-grade railroad crossing at Node Path H-I or K-M; therefore, further analysis was conducted to determine the feasibility of an additional at-grade crossing within the vicinity of the Project Corridor. CSXT provides documentation related to "Public Road Crossing Openings and Closures" in the *Public Project Information For Construction and*

Improvement Projects That May Involve the Railroad[3]. This document states that CSXT "requires that the community identify the closure of three (3) or more comparable active public at-grade crossings" before agreeing to the establishment of a new crossing.

According to SCDOT's *Interactive Traffic Count Map*, the existing Columbia Avenue, Lexington Avenue, and Clark Street crossings accounted for a total of approximately 20,000 VPD in 2015. The closure of these crossings would have a significant adverse effect on the traffic movements within the Town of Chapin; therefore, the establishment of an additional railroad crossing has been considered when determining alternatives for elimination. A total of ten (10) alternatives contain Node Path H-I or K-M, including Alternatives 5, 6, 7, 11, 12, 16, 17, 21, 27, and 28).

2.1.3.1.2 Impacts to Natural Resources

Each alternative was assessed for impacts to streams and other tributaries. Geographic information system (GIS) data, obtained from the U.S. Geological Survey (USGS) National Hydrography Data (NHD), was used to identify streams within the project vicinity. The NHD provides digital vector datasets of surface water systems, or flowlines, which typically represent blue-line streams on USGS Topography Maps. Based on these flowlines, each alternative was assessed to estimate potential impacts to streams.

Based on USGS NHD data, the majority of alternatives would result in less than 400 feet of stream impact; however, five (5) alternatives would impact over 700 feet of streams. These five (5) alternatives (Alternatives 11, 12, 13, 14, and 15) each include the Node Path A-E. Based on the goal to minimize impacts to the natural environment and the associated permitting requirements, potential stream impacts have been identified as a key element for consideration.

2.1.3.1.3 Community Impacts

Community impacts are the effects a transportation project would cause to a community and its quality of life. These types of impacts include the acquisition or disruption of existing community resources and/or the potential to conflict with proposed developments within the community. Existing community resources within the Town of Chapin were identified, and each alternative was evaluated for potential impacts to the community. This evaluation determined that several alternatives have the potential to impact community resources, including a public high school (**Section 2.1.3.1.3.1**) and a community church (**Section 2.1.3.1.3.2**).

The proposed project was also introduced at a Public Information Meeting on November 6th, 2014. Through public input, three (3) proposed developments were identified within the community which would be impacted by proposed alternatives; see **Sections 2.1.3.1.3.3** through **2.1.3.1.3.5**. Complete details of public comments derived from the Public Information Meetings can be found in **Chapter 4 - Agency Coordination and Public Involvement**.

2.1.3.1.3.1 Dissection of Chapin High School Property

Chapin High School is located in the central portion of the Project Corridor, south of Columbia Avenue, opposite Ellett Road. Multiple alternatives developed during the initial planning for the project included a new location

[3] CSX Transportation, Inc. Public Project Information For Construction and Improvement Projects That May Involve the Railroad. Last Revised April 8, 2015. Available at: https://www.csx.com/index.cfm/library/files/about-us/property/public-project-manual/

roadway (Node Path M-N) immediately west of the school. Further evaluation of the school property revealed a new student parking area west of the Node Path M-N. If constructed, a new location roadway at this location would dissect the parking area from the main school grounds, forcing students and staff to cross the roadway. Due to the safety concerns associated with pedestrians crossing a multi-lane roadway to access the school, the dissection of Chapin High School Property has been identified as a key element for consideration of alternatives. A total of ten (10) alternatives contain Node Path M-N, including Alternatives 7, 8, 12, 14, 17, 19, 21, 23, 28, and 29.

2.1.3.1.3.2 Chapin Methodist Church

Christ's Church and House of Prayer currently occupies a property owned by the Trustees of Chapin Methodist Church near the intersection of Clark Street and Lexington Avenue, in the immediate vicinity of Node G. This property is identified by the SC Institute of Archaeology and Anthropology (SCIAA) and the SC Department of Archives and History (SCDAH) as Chapin Methodist Church. According to the SCIAA-SCDAH Archsite website, the Chapin Methodist Church includes two (2) structures built in 1892 and 1936. These resources were evaluated by SC State Historic Preservation Office (SHPO) in 1992 and were deemed not eligible for the National Register of Historic Places (NRHP). However not eligible for the NRHP, this property and its structures are an important community resource to preserve the history of the Town of Chapin. If constructed, each alternative utilizing Node G would require the acquisition of a portion of the church property and potentially impact the property's structures. Therefore, the property identified as Chapin Methodist Church has been identified as a key element during the comparison of alternatives. A total of eleven alternatives would impact this community resource, including Alternatives 6, 7, 8, 9, 10, 26, 27, 28, 29, 30, and 31 .

2.1.3.1.3.3 Our Lady Of the Lake Catholic Church

Our Lady of the Lake Catholic Church is located at 195 Amicks Ferry Road, immediately north of Node D. The church diocese has recently acquired the adjacent property to the south of the existing church and has prepared a master plan for the property. The master plan includes an additional sanctuary, associated parking areas, a residential dwelling for the church priest, and expansion of the existing cemetery. The Town of Chapin's Architectural Review Board has approved these plans and construction of the sanctuary is currently underway.

If constructed, Node Path D-X would directly impact the new church property and a number of the proposed elements of their master plan. Due to the impacts a new location roadway would have on the church property, its parishioners, and the citizens of the Town of Chapin, the proposed development has been identified as a key element during the comparison of alternatives. A total of nine (9) alternatives could impact the church, including Alternatives 16, 17, 18, 19, 20, 21, 22, 23, and 24.

2.1.3.1.3.4 Chapin Crossing

A Publix Super Market, and multiple associated outparcels, is currently under construction on the property located southeast of the intersection of Chapin Road and Lexington Avenue. This development, known as Chapin Crossing, includes a 46,000 square foot super market, retail stores, parking areas, and stormwater detention ponds. Portions of each of these aspects of the development would be directly impacted by Alternative 4. Due to the impact this alternative would have on the citizens and economic growth of Chapin; the proposed development has been identified as a key element for consideration.

2.1.3.1.3.5 CHAPIN TECHNOLOGY PARK MIXED USE COMMUNITY

Lexington County is in the process of developing a 220-acre business and technology park, known as the Chapin Technology Park (CTP), within the vicinity of the Project Corridor. The CTP will be located primarily north of Columbia Avenue, opposite Chapin High School. A private developer is also planning a 200-acre residential and commercial complex adjacent to the CTP in an effort to establish a "work-live-play" mixed use community. Approximately 60 acres of the development is planned on the western portion of the CTP, and includes approximately 200 residential lots. Construction of this development has recently begun and parcels are currently being developed. This community would be impacted by Alternatives 2 and 3.

If constructed, Alternative 2 would impact sixteen (16) residential parcels of this development. Alternative 3 would further dissect the development, and impact 21 residential parcels and five (5) parcels identified as commercial, multi-family or residential. Due to the impacts Alternatives 2 and 3 would have on the development and the overall mixed use community, the proposed development has been identified as a key element for consideration.

2.1.3.2 WHAT ALTERNATIVES WERE ELIMINATED IN THIS ANALYSIS?

Findings from the analysis of alternatives has resulted in the elimination of 21 alternatives from consideration based on the potential inability to satisfy SCDOT minimum design criteria, significant impacts to the natural environment, and community impacts.

Table 2-2 includes a comprehensive summary of findings and rationale for the elimination of alternatives.

TABLE 2-2: ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Alternative		Roadway/Railroad Design Concerns		Natural Resources		Community Impacts				Reason for Elimination
No.	Node Path	Inability to Meet Minimum Design Criteria	At-Grade Railroad Crossing	Stream Impacts Greater than 700 Feet	Dissection of Chapin High School	Chapin Methodist Church	Our Lady of the Lake Church	Chapin Crossing Development	Proposed Residential Development	
1	V-T-Q	✓								Eliminated due to the inability to meet minimum design criteria
2	U-S-O-Q	✓							✓	Eliminated due to the potential to not satisfy minimum design criteria and potential impacts to the Proposed Residential Development
3	U-S-R-Q	✓							✓	Eliminated due to the potential to not satisfy minimum design criteria, and potential impacts to the Proposed Residential Development
4	B-C-W-Q							✓		Eliminated due to the potential impacts to the proposed Chapin Crossing Development
5	B-C-H-I-J-Q		✓							Eliminated due to the need for an additional at-grade railroad crossing
6	A-G-H-I-J-Q		✓			✓				Eliminated due to the need for an additional at-grade railroad crossing and potential impacts to Chapin Methodist Church
7	A-G-K-M-N-Q		✓		✓	✓				Eliminated due to the need for an additional at-grade railroad crossing, the dissection of Chapin High School property, and potential impacts to Chapin Methodist Church
8	A-G-K-L-M-N-Q				✓	✓				Eliminated due to the dissection of Chapin High School property and potential impacts to Chapin Methodist Church
9	A-G-K-L-I-J-Q					✓				**Not Eliminated**
10	A-G-K-L-P-Q					✓				**Not Eliminated**
11	A-E-F-H-I-J-Q		✓	✓						Eliminated due to the need for an additional at-grade railroad crossing and the potential impacts to streams
12	A-E-F-K-M-N-Q		✓	✓	✓					Eliminated due to the need for an additional at-grade railroad crossing, the potential impacts to streams, and the dissection of Chapin High School property
13	A-E-F-K-L-I-J-Q			✓						Eliminated due to the potential impacts to streams
14	A-E-F-K-L-M-N-Q			✓	✓					Eliminated due to the potential impacts to streams and the dissection of Chapin High School property
15	A-E-F-K-L-P-Q			✓						Eliminated due to the potential impacts to streams
16	D-X-E-F-H-I-J-Q		✓				✓			Eliminated due to the need for an additional at-grade railroad crossing, and impacts to Our Lady of the Lake Church
17	D-X-E-F-K-M-N-Q		✓		✓		✓			Eliminated due to the need for an additional at-grad railroad crossing, the dissection of Chapin High School property, and impacts to Our Lady of the Lake Church
18	D-X-E-F-K-L-I-J-Q						✓			**Not Eliminated**
19	D-X-E-F-K-L-M-N-Q				✓		✓			Eliminated due to the dissection of Chapin High School property, and impacts to Our Lady of the Lake Church
20	D-X-E-F-K-L-P-Q						✓			**Not Eliminated**
21	D-X-K-M-N-Q		✓		✓		✓			Eliminated due to the dissection of Chapin High School property, the need for an additional at-grade railroad crossing, and impacts to Our Lady of the Lake Church
22	D-X-K-L-I-J-Q						✓			**Not Eliminated**
23	D-X-K-L-M-N-Q				✓		✓			Eliminated due to the dissection of Chapin High School property, and impacts to Our Lady of the Lake Church
24	D-X-K-L-P-Q						✓			**Not Eliminated**
25	Y-T-Q									**Not Eliminated**
26	B-G-W-Q					✓				**Not Eliminated**
27	B-G-H-I-J-Q		✓			✓				Eliminated due to the need for an additional at-grade railroad crossing and potential impacts to Chapin Methodist Church
28	B-G-K-M-N-Q		✓		✓	✓				Eliminated due to the dissection of Chapin High School property, the need for an additional at-grade railroad crossing, and potential impacts to Chapin Methodist Church
29	B-G-K-L-M-N-Q				✓	✓				Eliminated due to the dissection of Chapin High School property and potential impacts to Chapin Methodist Church
30	B-G-K-L-I-J-Q					✓				**Not Eliminated**
31	B-G-K-L-P-Q					✓				**Not Eliminated**

2.1.3.3 What Alternatives Were Carried Forward?

A total of ten (10) alternatives remain for future consideration in the evaluation process, and are further evaluated in this section. **Table 2-3** and **Figure 2-2** identify these remaining alternatives.

Table 2-3: Alternatives Considered for Further Evaluation

Alternative	Node Path
9	A-G-K-L-I-J-Q
10	A-G-K-L-P-Q
18	D-X-E-F-K-L-I-J-Q
20	D-X-E-F-K-L-P-Q
22	D-X-K-L-I-J-Q
24	D-X-K-L-P-Q
25	Y-T-Q
26	B-G-W-Q
30	B-G-K-L-I-J-Q
31	B-G-K-L-P-Q

2.1.3.4 What Additional Analysis Was Completed?

In an effort to determine which of the remaining alternatives would be reasonable to satisfy the purpose and need of the project, the project team conducted a detailed analysis of additional engineering and environmental elements. These include a future traffic analysis of the Project Corridor and an evaluation of potential impacts to the human and natural environment. **Sections 2.1.3.4.1 through 2.1.3.4.4** identify and describe the evaluation of these elements. **Table 2-4** includes a comprehensive summary of findings and rationale for the elimination of additional alternatives.

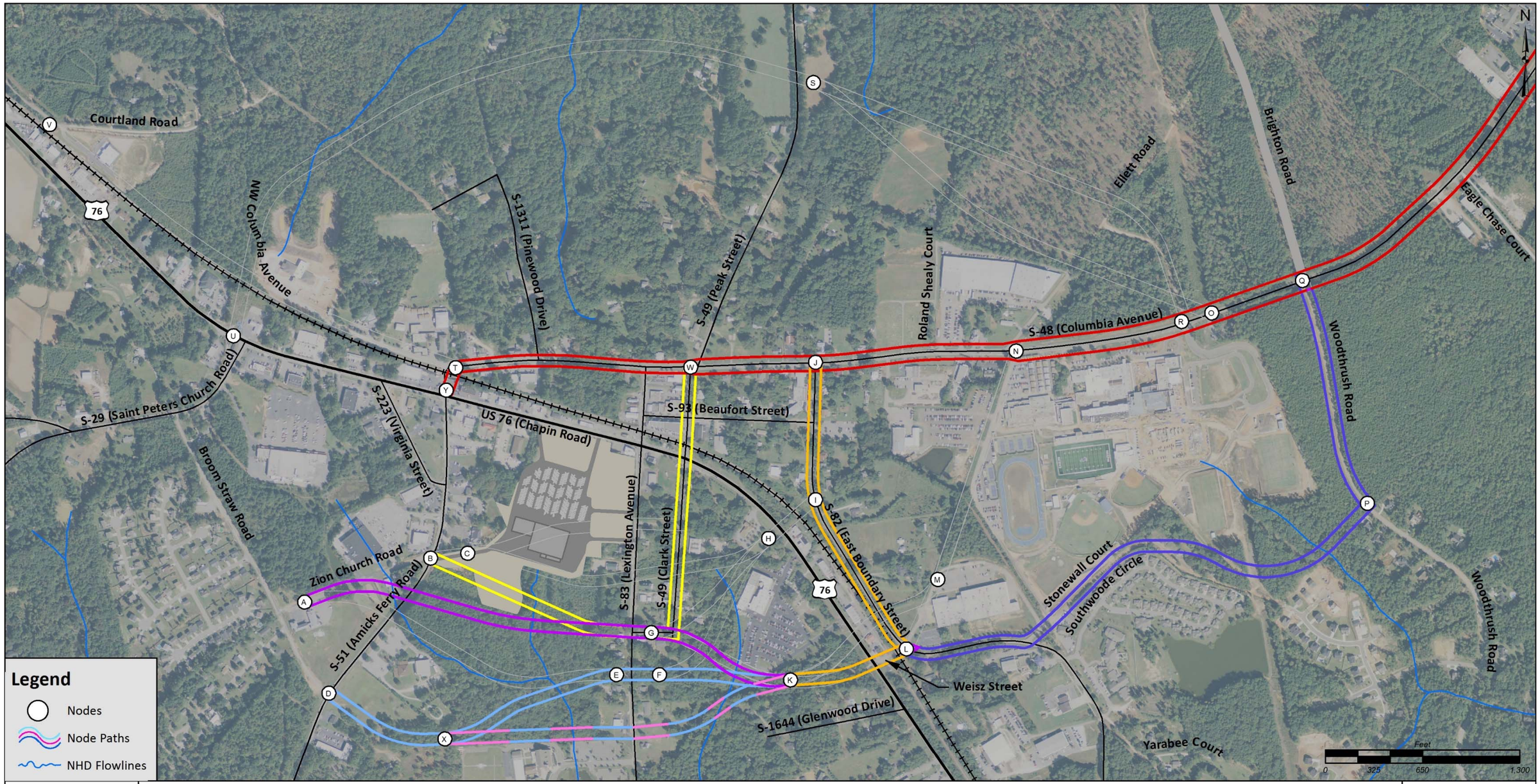
2.1.3.4.1 Future Traffic

In its planning applications, SCDOT uses roadway characteristics, Average Daily Traffic (ADT) volumes, and volume to capacity (v/c) ratios to determine the Level of Service (LOS) of a roadway with a given ADT. This methodology was applied to the ten (10) remaining alternatives to estimate the efficiency of traffic operations 25 years in the future.

As discussed in **Section 1.4**, the Transportation Research Board's Highway Capacity Manual expresses a roadway's LOS by using a letter scale from "A" to "F". The letter "A" represents the best roadway travel conditions with no delays or congestion while the letter "F" represents a significant operational breakdown with extensive delays and heavy congestion. According to SCDOT design guidelines, it is desirable to provide a LOS "C" or better on primary routes.

The traffic analysis conducted during this evaluation was used to determine the LOS along Columbia Avenue for each alternative in the year 2040. The results of this study also provide an LOS of the traffic travelling along each alternative in the year 2040. **Table 2-4** summarizes the findings of this analysis. A copy of the complete analysis is included in a memorandum dated April 2, 2015 in **Appendix A**.

FIGURE 2-2: ALTERNATIVES CONSIDERED FOR FURTHER CONSIDERATION



SCDOT South Carolina Department of Transportation
Mead & Hunt

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS
LEXINGTON COUNTY, SOUTH CAROLINA

FIGURE 2-2
ALTERNATIVES CONSIDERED FOR FURTHER CONSIDERATION

The traffic study determined that Alternatives 10, 20, 24, and 31 would result in a LOS "D" along Columbia Avenue by the year 2040. Based on the desire of SCDOT to provide a LOS "C" or better, these four (4) alternatives would not provide a satisfactory LOS and would therefore not meet the project's purpose and need.

2.1.3.4.2 Potential Impacts to Waters of the U.S.

Waters of the U.S. including wetlands, streams, and other waterbodies are protected by Section 404 of the Clean Water Act (CWA); therefore, impacts to these waters require authorization from the U.S. Army Corps of Engineers (USACE) through the Section 404 permitting process. For a Section 404 permit to be issued, all relevant portions of the Section 404(B)(1) guidelines must be addressed, including a complete analysis of practicable alternatives. Additionally, the alternatives analysis must identify and recommend the least damaging practicable alternative (LEDPA) that would meet the overall project purpose.

Pursuant to Section 404(B)(1) guidelines, a delineation of waters of the U.S. was conducted for each of the remaining ten (10) alternatives in accordance with USACE protocols. Following the delineation, potential impacts to waters of the U.S. were quantified for each alternative using identical design criteria. Potential impacts for each alternative are summarized in **Table 2-4**.

Please see **Section 3.3 - Waters of the U.S.** for more information related to waters of the U.S. and potential impacts resulting from the Preferred Alternative. The final determination of impacts to waters of the U.S. will be made during final design and permitting stage.

The potential impacts to streams range among alternatives from no impact to impacts greater than 400 linear feet (lf). An alternative which would result in higher stream impacts, when compared to an alternative with a similar alignment, would be considering a more environmentally damaging alternative. Alternatives 10, 20, 24, and 31 would result in the greatest impacts to streams. Based on the SCDOT's goals to minimize impacts to the environment and remain consistent with Section 404(B)(1) guidelines, the extent of stream impacts was considered during the further elimination of alternatives.

2.1.3.4.3 Relocations

Each of the alternatives would require the acquisition of property to complete the project. Residential homes and commercial buildings located within the estimated right-of-way (ROW) for the project is considered a potential relocation. Each of the remaining alternatives was evaluated utilizing survey-grade mapping and high resolution aerial photography to determine the number of potential relocations that would be required under each alternative scenario. Potential relocations for each alternative are summarized in **Table 2-4**.

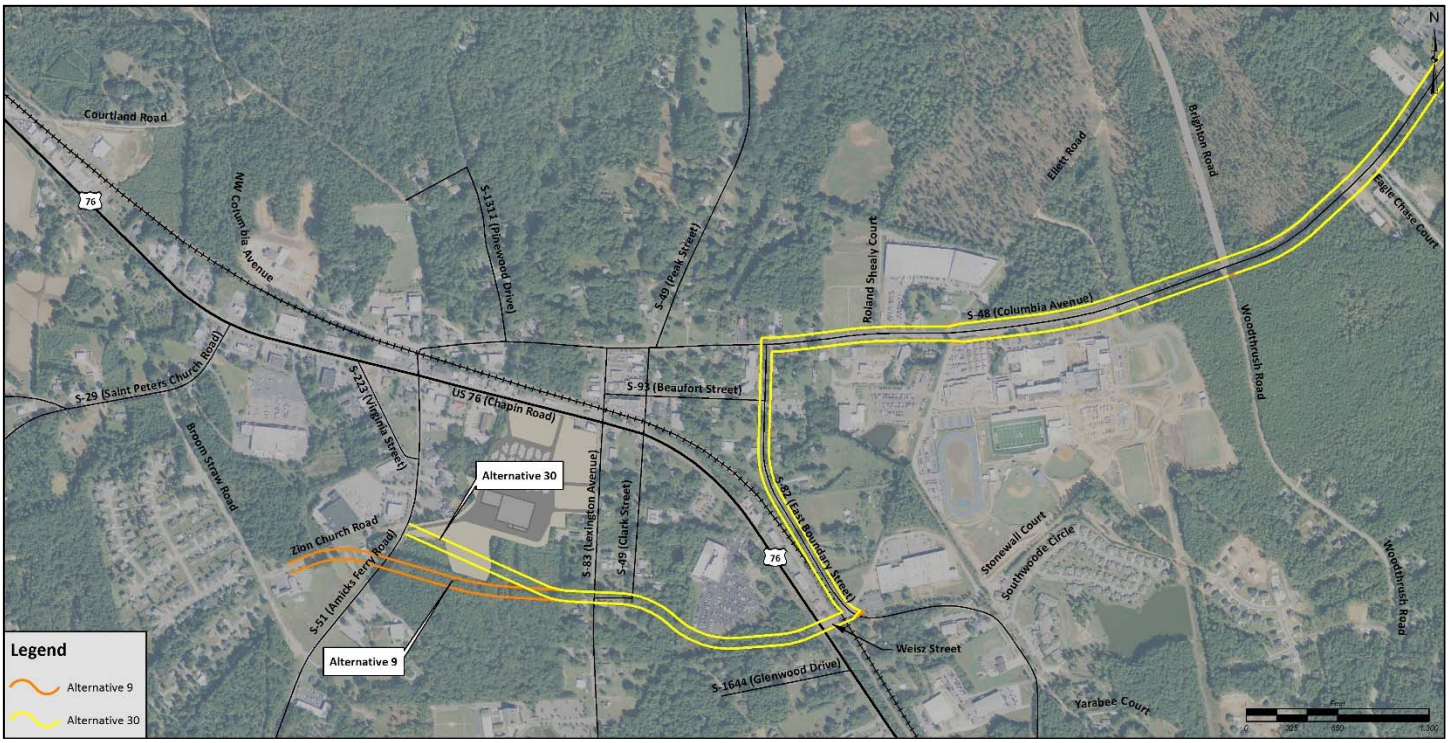
The total number of potential relocations ranges from a minimum of three (3) to a maximum of 20 among alternatives. Specifically, Alternative 26 would result in the greatest number of relocations and twice as many as other alternatives. As it is the goal of the SCDOT to minimize impacts to the citizens of Chapin, the total number of potential relocations was considered when determining Reasonable Alternatives.

2.1.3.4.4 Similar Alignments Among Alternatives

Several alternatives share common elements within the Town of Chapin. These alternatives were reviewed further to evaluate their similarities and the potential impacts of each.

Alternatives 9 and 30 utilize very similar alignments, as depicted in **Figure 2-3** below. Both alternatives originate near the intersection of Amick's Ferry Road and Zion Church Road and each use the same corridor east of Lexington Avenue.

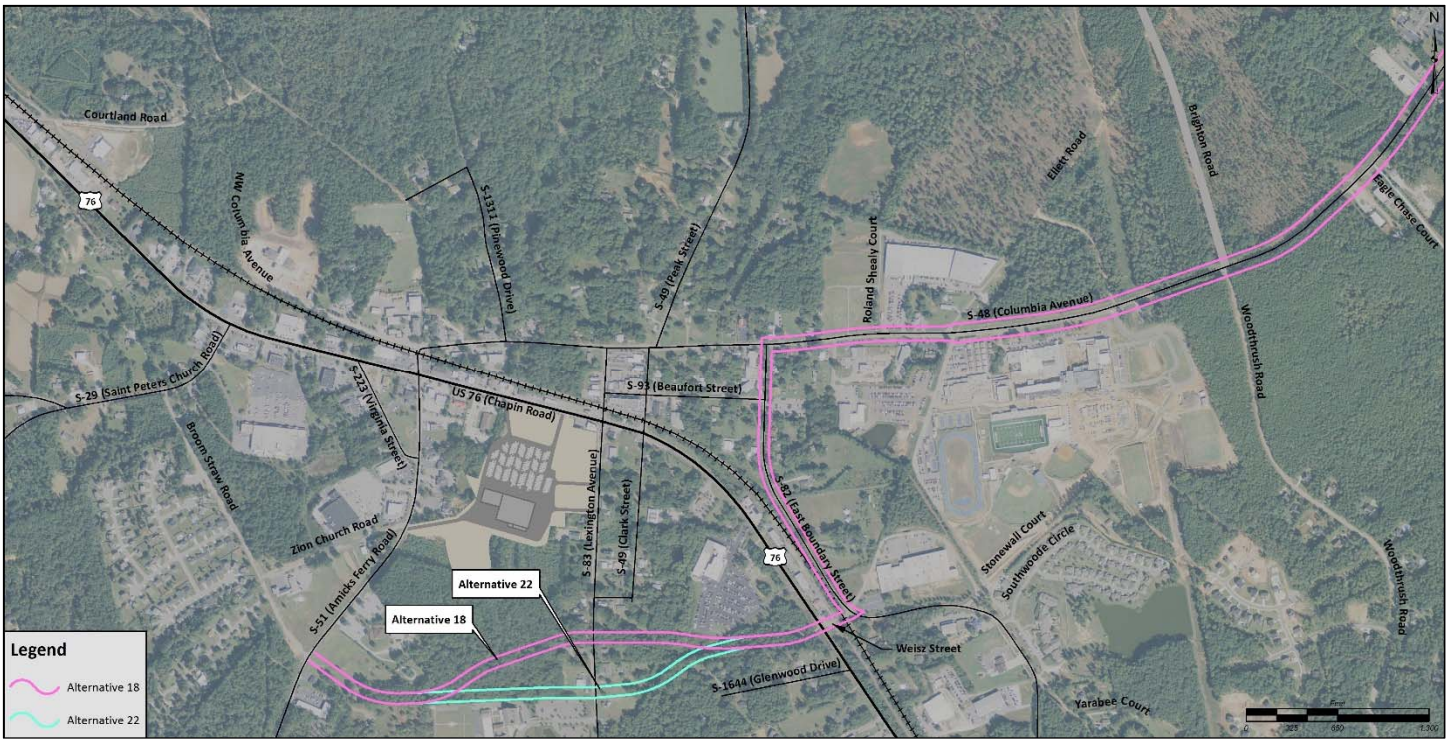
FIGURE 2-3: ALTERNATIVES 9 AND 30



Furthermore, Alternatives 9 and 30 would have the same effect on traffic along Columbia Avenue, see **Table 2-4**. The primary differences between the alternatives is the operation efficiency of the alternatives and their impact on streams. Alternative 9 would have a slightly lower volume-to-capacity ratio, meaning it would operate with less congestion. Additionally, Alternative 9 would result in 21 less feet of stream impact. These factors were considered in the selection of Reasonable Alternatives.

Alternatives 18 and 22 also utilize very similar alignments, as depicted in **Figure 2-4**. Both alternatives originate at the intersection of Amick's Ferry Road and Broom Straw Road and each use the same corridor east of Chapin Road. Furthermore, Alternatives 18 and 22 would have the same effect on traffic along Columbia Avenue. The primary differences between the alternatives is the operation efficiency of the alternatives and their number of potential relocations. Alternative 18 would operate with slightly less congestion and would result in one (1) less relocation. These factors were considered in the selection of Reasonable Alternatives.

FIGURE 2-4: ALTERNATIVES 18 AND 22



2.1.4 WHAT ARE THE REASONABLE MAINLINE ALTERNATIVES?

Findings from the analysis of alternatives has resulted in the elimination of 7 additional alternatives based on their inability to meet the project's intended purpose and need, impacts to the Waters of the U.S., and/or potential relocations. **Table 2-4** includes a comprehensive summary of findings and rationale for the elimination of alternatives.

Based on these findings, Alternatives 9, 18, and 25 were considered Reasonable Alternatives and presented to the public at a Public Information Meeting on July 23rd, 2015.

Through formal comments and informal communication during the Public Information Meeting, the public expressed concern for the potential relocations at the intersection of Columbia Avenue and East Boundary Street incorporated into Alternatives 9 and 18. The public stated that this area was viewed by local residents as the unofficial entrance to the Town of Chapin and impacting the buildings at this intersection may damage what was commonly referred to as the "character of Chapin". Complete details of public comments derived from the Public Information Meetings can be found in **Chapter 4 – Agency Coordination and Public Involvement**.

Based on the public's concern, the project team evaluated a modification to Alternatives 9 and 18, which would both impact the intersection. The alternatives, referred to hereafter at Alternative 9A and Alternative 18A, would avoid impacts to buildings at the intersection of Columbia Avenue and East Boundary Street by establishing a new location roadway approximately 500 feet east of East Boundary Street. These additional alternatives were evaluated under the criteria outlined in **Sections 2.1.3.1 and 2.1.3.4** and were deemed to be Reasonable Alternatives.

TABLE 2-4: ALTERNATIVE ELIMINATED FROM FURTHER CONSIDERATION

Alternative	Future Traffic				Waters of the U.S.			Potential Relocations	Reason for Elimination
	Along Alternative		Along Columbia Avenue		Wetland Impact (acre)	Stream Impact (lf)	Pond Impact (acre)		
	Volume/ Capacity	LOS	Volume/ Capacity	LOS					
9	0.718	B	0.856	C	-	157	0.18	10	**Not Eliminated**
10	0.637	B	1.078	D	0.14	288	0.18	6	**Eliminated due to the inability to meet the project intended Purpose and Need, with a projected LOS "D" along Columbia Avenue, and greater impacts to Waters of the U.S.**
18	0.727	B	0.850	C	-	274	0.23	8	**Not Eliminated**
20	0.648	B	1.069	D	0.14	405	0.23	3	**Eliminated due to the inability to meet the project intended Purpose and Need, with a projected LOS "D" along Columbia Avenue, and greater impacts to Waters of the U.S.**
22	0.748	B	0.850	C	-	278	0.05	9	**Determined to be functionally similar to Alternative 18, and eliminated based on its lower operational efficiency and greater number of potential relocations than Alternative 18.**
24	0.670	B	1.069	D	0.14	409	0.05	4	**Eliminated due to the inability to meet the project intended Purpose and Need, with a projected LOS "D" along Columbia Avenue, and greater impacts to Waters of the U.S.**
25	0.825	C	0.825	C	-	-	-	11	**Not Eliminated**
26	0.795	C	0.788	C	-	97	-	20	**Eliminated due to the number of potential relocations**
30	0.723	B	0.856	C	-	178	0.18	10	**Determined to be functionally similar to Alternative 9, and eliminated based on its lower operational efficiency and greater stream impacts than Alternative 9.**
31	0.636	B	1.078	D	0.14	309	0.18	5	**Eliminated due to the inability to meet the project intended Purpose and Need, with a projected LOS "D" along Columbia Avenue, and greater impacts to Waters of the U.S.**

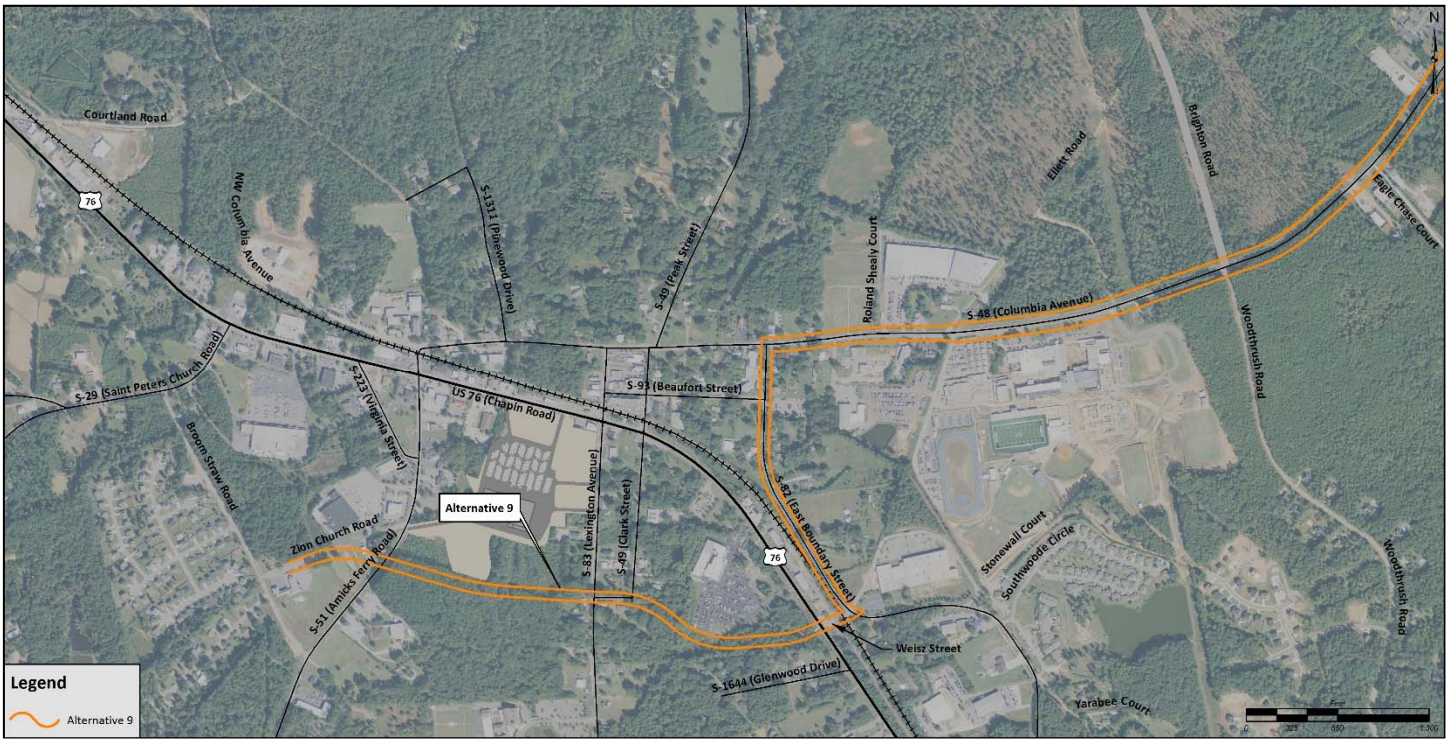
A total of five (5) alternatives have been determined to be Reasonable Mainline Alternatives (Alternatives 9, 9A, 18, 18A, and 25). A description of each Reasonable Alternative is included in **Sections 2.1.4.1 through 2.1.4.5**.

A Mainline Alternative Comparison Matrix was developed to compare and evaluate each alternative's potential impact on the surrounding human and natural environment; see **Table 2-5**. The potential impacts for each alternative are included in the matrix. The matrix also includes data and comparative information on each alternative's ability to meet the purpose and need of the proposed project.

2.1.4.1 ALTERNATIVE 9

Alternative 9 would utilize a combination of new location roadways and existing roadways to establish an alternative route through the Town of Chapin, as shown in **Figure 2-5**.

FIGURE 2-5: ALTERNATIVE 9



This alternative would create a new location roadway extending from Zion Church Road to Chapin Road (US 76), improve the existing railroad crossing on Weisz Street, and improve East Boundary Street north to Columbia Avenue. Columbia Avenue would also be improved to five (5) lanes from East Boundary Street to the I-26 interchange.

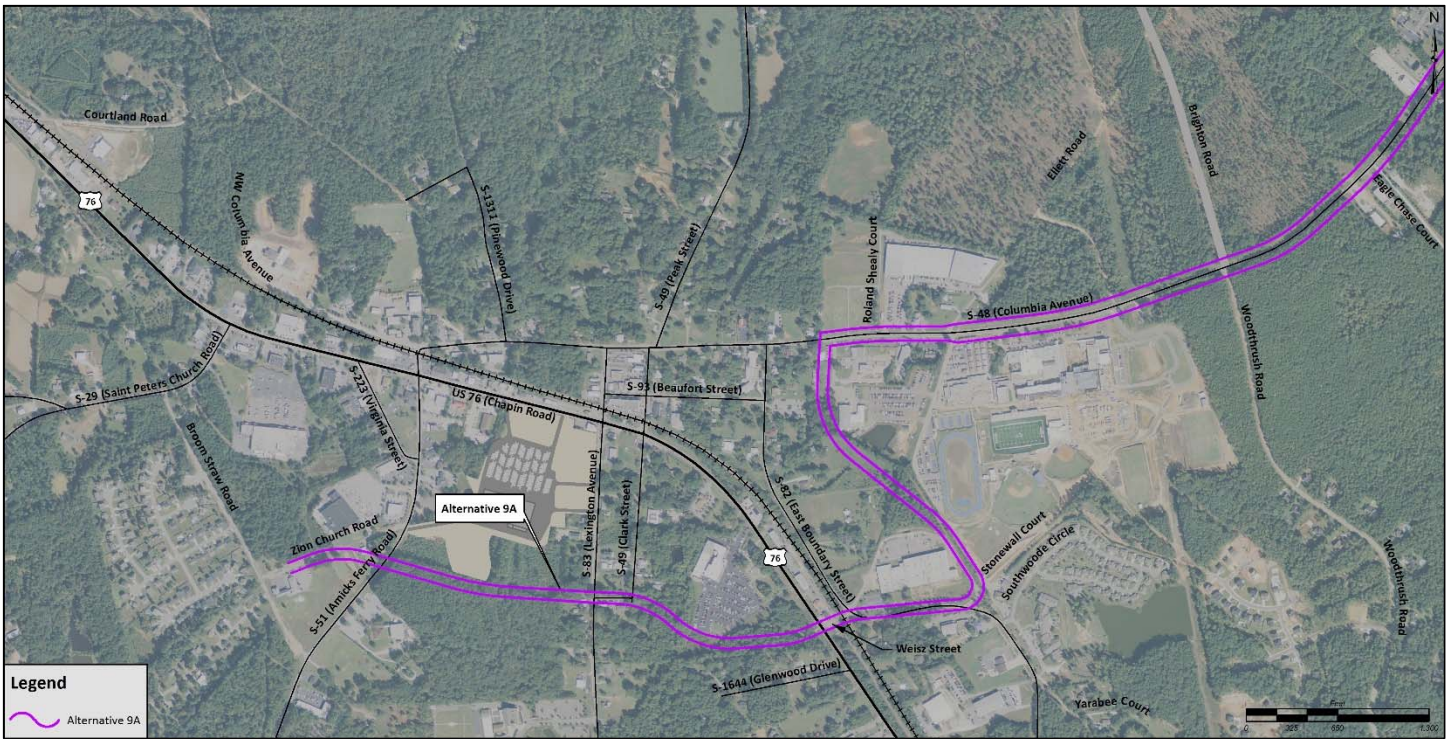
Of the Reasonable Alternatives, Alternative 9 would impact the greatest number of residential parcels and total parcels. This alternative would also result in among the highest number of relocations and stream impacts. Based on the potential impacts to local residents and business, Alternative 9 is not the Preferred Alternative.

2.1.4.2 ALTERNATIVE 9A (PREFERRED ALTERNATIVE)

Alternative 9A would use the same new location alignment as Alternative 9 west of East Boundary Street. However, Alternative 9A would establish a new location roadway roughly parallel to East Boundary Street and intersection with Columbia Avenue approximately 500 feet east of East Boundary Street. Alternative 9A is shown in **Figure 2-6** below. Alternative 9A would also improve Columbia Avenue to five (5) lanes from the new intersection to the I-26 interchange.

Alternative 9A would impact the fewest number of commercial parcels and result in the fewest number of relocations. Alternative 9A is also among the Reasonable Alternatives with the least impact to streams and other waters of the U.S.

FIGURE 2-6: ALTERNATIVE 9A (PREFERRED ALTERNATIVE)



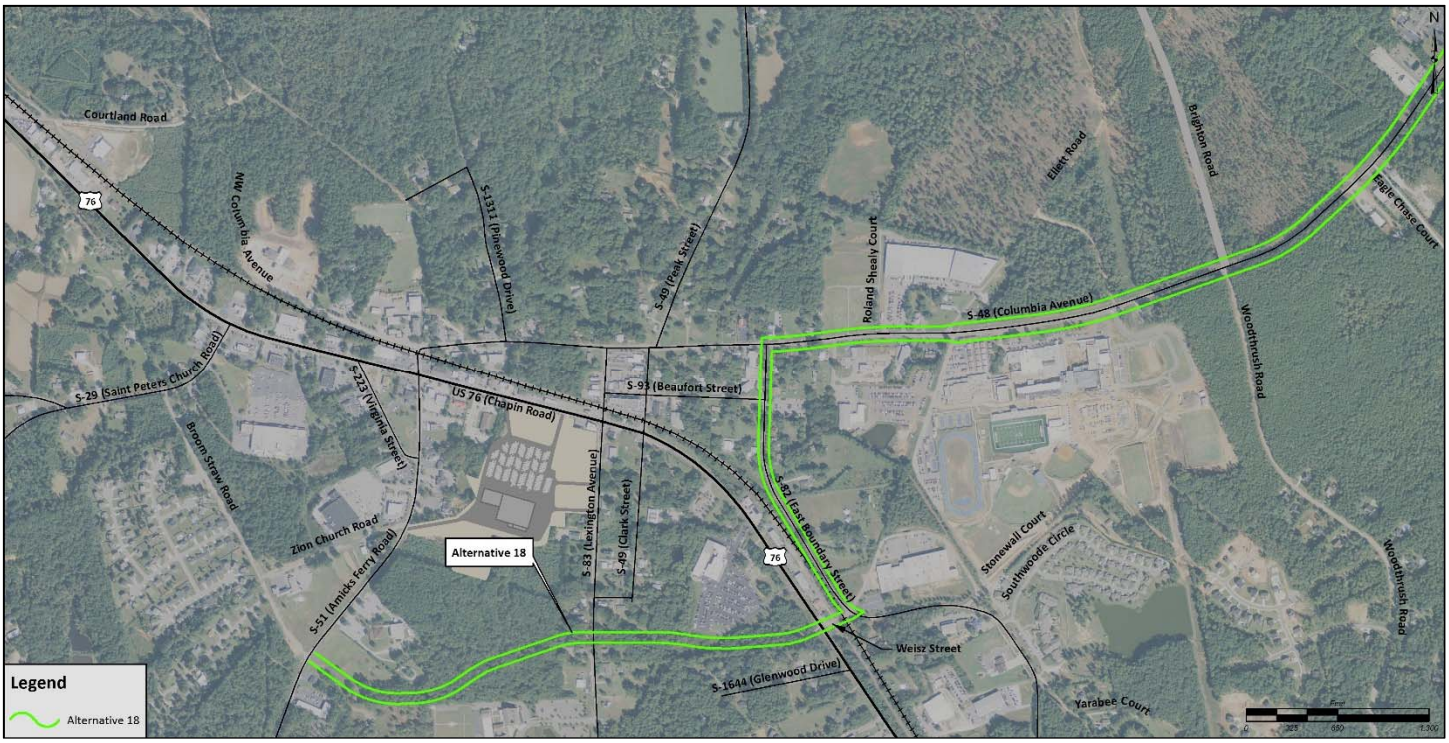
Alternative 9A is the Preferred Alternative because it meets the Purpose and Need of the proposed project and minimizes impacts to both the human and natural environments.

2.1.4.3 ALTERNATIVE 18

Alternative 18 would also utilize a combination of new location roadways and existing roadways to establish an alternative route from Amick's Ferry Road to Columbia Avenue. This alternative would create a new location roadway south of Alternatives 9 and 9A. From Chapin Road, Alternative 18 would follow the same alignment as Alternative 9, as shown in **Figure 2-7**. This alternative would improve Columbia Avenue to five (5) lanes from East Boundary Street to the I-26 interchange.

Of the Reasonable Alternatives, Alternative 18 would result in the most relocations and have the greatest impact to streams. Based on these impacts, Alternative 18 is not the Preferred Alternative.

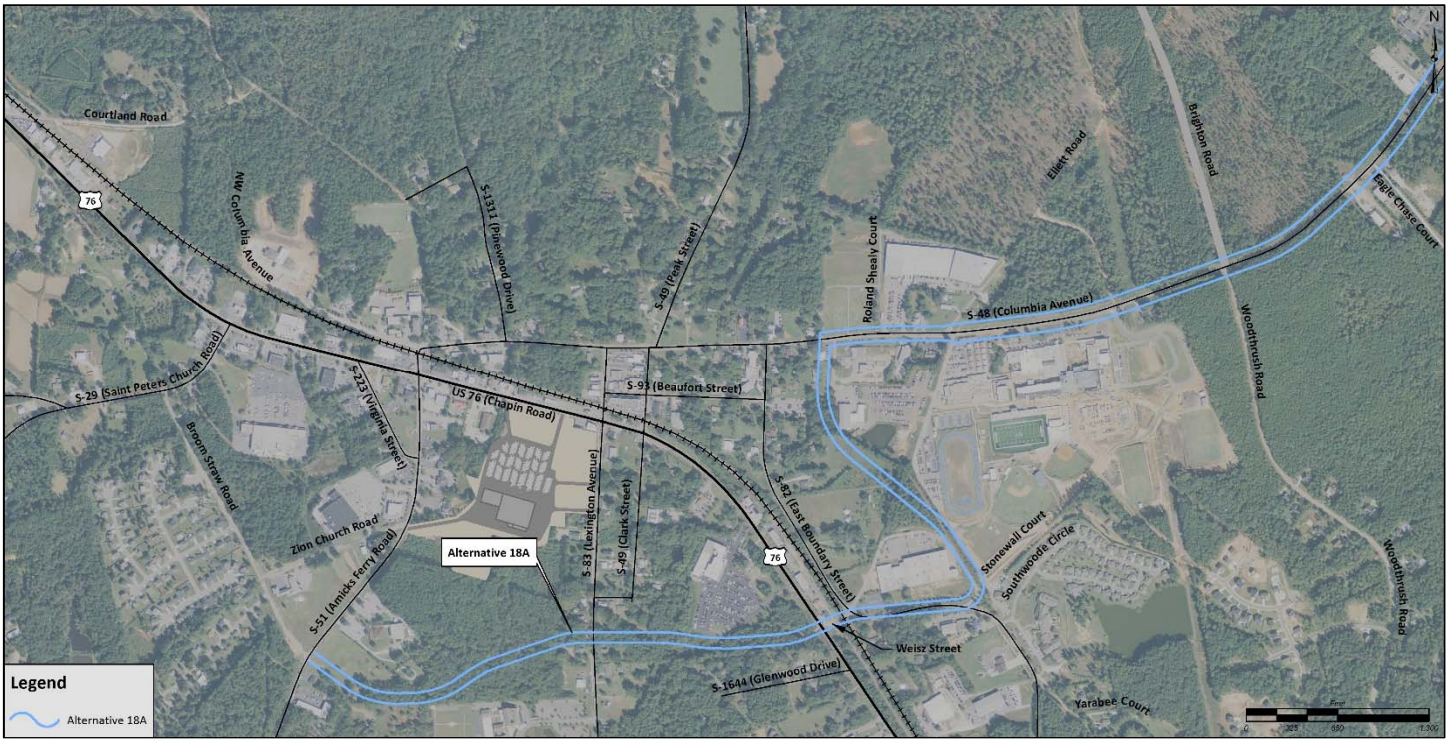
FIGURE 2-7: ALTERNATIVE 18



2.1.4.4 ALTERNATIVE 18A

Alternative 18A would mimic Alternative 18 west of Chapin Road and use the same new location roadway at Alternative 9A east of East Boundary Street, as shown in **Figure 2-8**. Alternative 18A would also improve Columbia Avenue to five (5) lanes from the new intersection to the I-26 interchange.

FIGURE 2-8: ALTERNATIVE 18 A

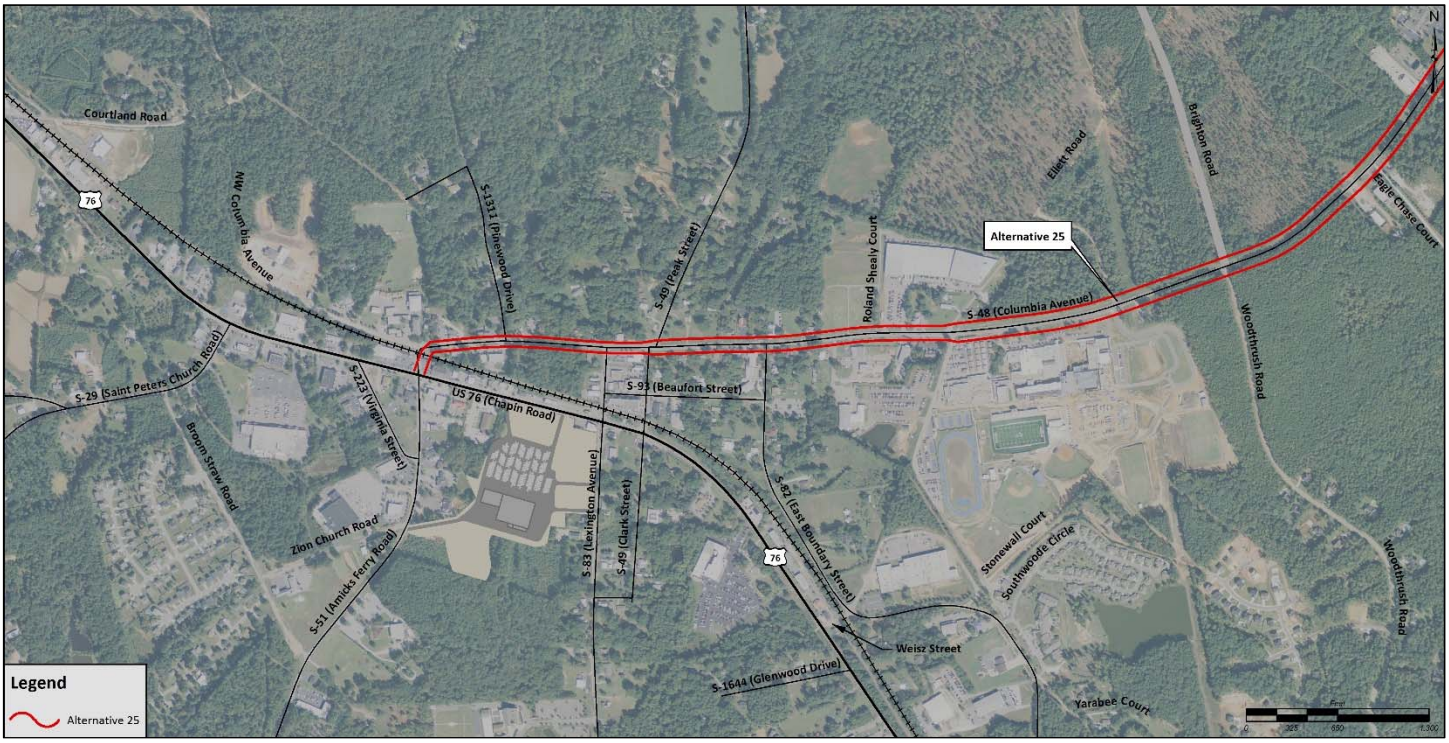


Of the Reasonable Alternatives, Alternative 18A would impact the fewest number of total parcels; however, it would require the greatest amount of property acquisition. This alternative has among the most impact to streams and would create the most new roadway of the Reasonable Alternatives. Based on the potential impacts to property and natural resources, Alternative 18A is not the Preferred Alternative.

2.1.4.5 ALTERNATIVE 25

Alternative 25 would improve Columbia Avenue from Chapin Road to its interchange at I-26. The roadway would be improved to three (3) lanes between Chapin Road and Lexington Avenue and transition to five (5) lanes east of the Lexington Avenue intersection (**Figure 2-9**).

FIGURE 2-9: ALTERNATIVE 25



Alternative 25 would require the least amount of new property and result in the least impact to streams. However, this alternative would impact among the highest number of parcels and result in the 2nd most number of relocations. Alternative 25 would also impact one (1) historic structure. The circa 1892 Folk Victorian style cottage located at 222 Columbia Avenue has been identified as a resource eligible for the NRHP and would be impacted by Alternative 25.

Alternative 25 would also result in a less efficient route through the Project Corridor than other alternatives. While each alternative would result in a LOS of C along Columbia Avenue, each of the other alternatives would provide a route from Amick's Ferry Road to I-26 with a LOS B; thereby providing a less congested route through Chapin. Based on these considerations, Alternative 25 is not the Preferred Alternative.

TABLE 2-5: MAINLINE ALTERNATIVE COMPARISON MATRIX

Category	Alternatives				
	Alt. 9	Alt 9A (Preferred)	Alt. 18	Alt. 18A	Alt. 25
Property Impacts					
Residential Right-of-Way (acres)	5.63	6.25	3.29	3.92	1.39
Commercial Right-of-Way (acres)	5.83	8.37	9.02	11.46	4.1
Total Right-of-Way (acres)	11.46	14.62	12.31	15.38	5.49
Total Number of Commercial Parcels	25	22	28	22	29
Total Number of Residential Parcels	28	19	21	12	20
Total Number of Parcels	53	41	49	34	49
Potential Relocations*	9	2	11	4	9
Environmental Impacts					
Streams (linear feet) *	188	173	288	273	0
Wetlands (acre) *	0.00	0.00	0.00	0.00	0.00
Floodplains (acres)	0.00	0.00	0.00	0.00	0.00
Threatened and Endangered Species	No	No	No	No	No
Historical / Cultural Resources[4]	0	0	0	0	1
Section 4(f) / 6(f) Resources	No	No	No	No	No
Potential Hazardous Material Sites[5]	1	1	1	1	0
Environment Justice / Title VI	No	No	No	No	No
Noise Receptors (Impacted)	27	23	29	25	20
Roadway and Traffic Information					
Number of New Intersections	3	4	1	2	0
Remove or Close Existing Intersection	Yes (1)	Yes (2)	Yes (1)	Yes (2)	No
Proposed LOS on Columbia Avenue - 2040	C	C	C	C	C
Proposed LOS on Alternative - 2040	B	B	B	B	C
Length of 3 Lane Section (linear feet)	5,887	7,291	6,092	7,549	1,808
Length of 5 Lane Section (linear feet)	3,269	2,864	3,269	2,864	4,093
Total Length of Roadway (miles)	1.73	1.92	1.77	1.97	1.12
Cost					
Estimated Right-of-Way ($)	5,108,000	4,505,000	4,580,000	6,203,000	3,879,000
Estimated Construction w/ Contingency ($)	16,240,000	16,540,000	16,330,000	16,650,000	15,370,000
Estimated Environmental Mitigation ($)	141,000	129,750	216,000	204,750	0
Total Estimated Mainline Cost ($)	21,489,000	21,174,750	21,126,000	23,057,750	19,249,000

* Impacts include minor design revisions conducted during the evaluation of Reasonable Alternatives

[4] New South Associates, Inc. Addendum: *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements*. October 17, 2016.
[5] Mead & Hunt, Inc. *Phase I Environmental Site Assessment.* Columbia Avenue (S-48) Corridor Improvement Project. May 26, 2016.

2.2 What I-26 Interchange Alternatives Were Considered?

Alternatives considered for the interchange of I-26 at Columbia Avenue consist of the No-Build Alternative and three (3) build alternatives. An Interchange Modification Report (IMR)[6] was prepared to evaluate each build interchange alternative to determine which best met the purpose and need with the least impacts to the surrounding environment. A copy of the IMR can be found in **Appendix B**.

2.2.1 What is the No-Build Alternative?

The No-Build Alternative for the Columbia Avenue interchange with I-26 is the same as for the mainline of Columbia Avenue. It represents the existing conditions and provides no changes to those conditions. While no impacts to the surrounding environment would occur as a result, the No-Build Alternative would not address the existing congestion within the Project Corridor and would therefore not satisfy the purpose and need of the project. The No-Build Alternative would also not address the projected future traffic around the interchange.

2.2.2 What are the Build Alternatives?

The build alternatives developed for the project include a Dual Roundabout Interchange, a Partial Cloverleaf Interchange, and a Diverging Diamond Interchange. Each of these interchange alternatives share some common features. The safety at the interchange will be improved by providing on and off ramps that separate the interstate traffic from local traffic. The interchange would also be brought into compliance with current safety and design standards by limiting access to adjacent businesses in close proximity to the interchange, as defined by SCDOT's Access and Roadside Management Standards Manual. Each alternative would also be designed to accommodate future widening of I-26 up to eight (8) lanes.

Crooked Creek Road currently terminates at the eastbound entrance ramp to I-26. In order to meeting current SCDOT standards, each alternative would terminate Crooked Creek Road prior to the I-26 ramp. A new location roadway would relocate traffic from Crooked Creek Road north to Columbia Avenue, approximately 1,000 feet west of the interchange. This terminus location was selected based on its compliance with interchange/intersection spacing requirements and its ability to avoid relocating any local businesses in the vicinity of the interchange.

Each alternative would also change access to several businesses near the interchange. There is currently a gas station/convenience store and two (2) restaurants located in the northwest quadrant of the interchange. Current safety and design standards require the elimination of full access to these properties from Columbia Avenue. Each alternative would establish a new location roadway to provide full access to these businesses from the rear and/or side of their property. Additionally, a gas station/convenience store and a furniture store are currently located in the southwest quadrant of the interchange. Each alternative would limit access to the gas station/convenience store to eastbound traffic only and provide access to the furniture store from this new entrance located along Crooked Creek Road.

One structure would also be relocated by each alternative. The relocation is an outbuilding of a lumber company, located approximately 1,000 feet west of the existing interchange, and is used to store building materials. Additionally, each alternative would require the acquisition of right-of-way from one (1) potential hazardous

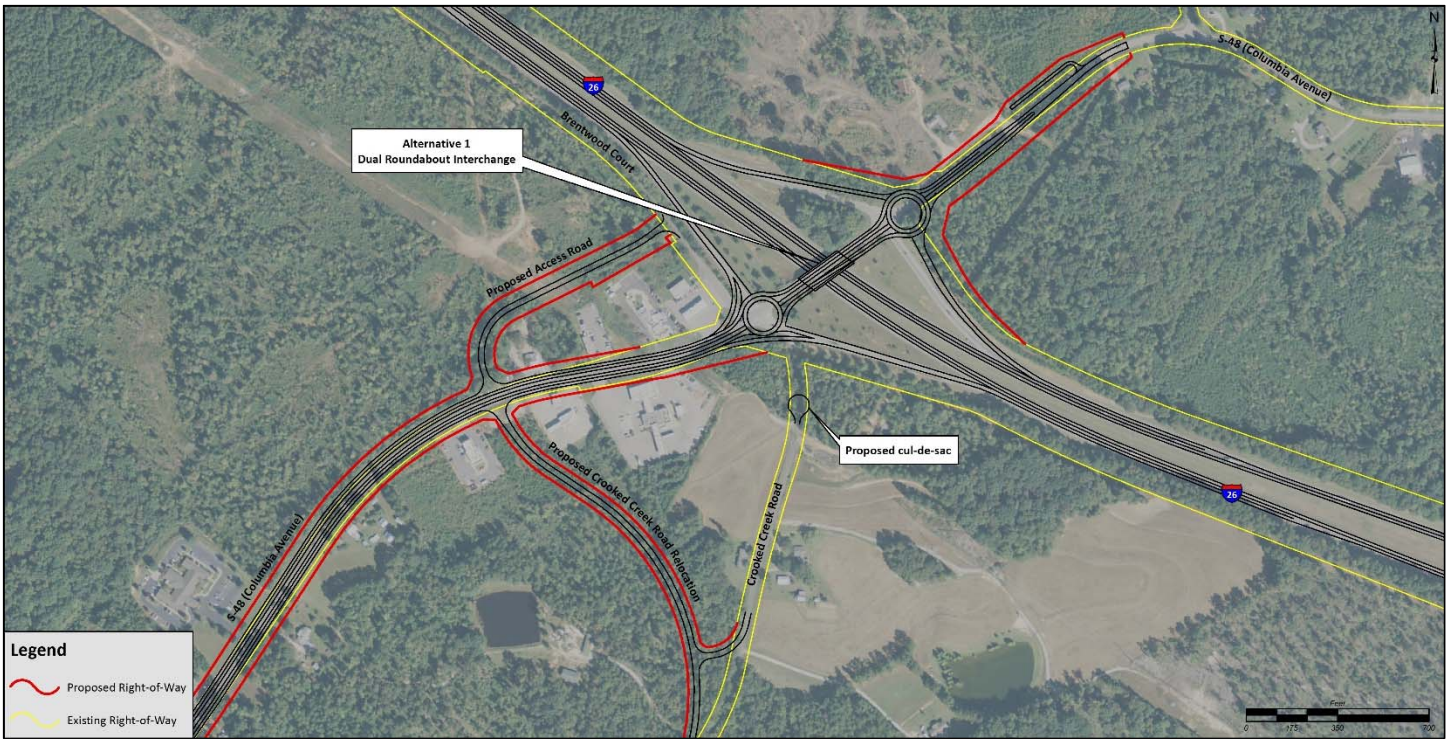
[6] AECOM. *Interchange Modification Report.* I-26 at S-48 (Columbia Avenue) Interchange Improvements. November 2016.

material site. According to the data provided by Environmental Data Resources, Inc. (EDR), a leaking underground storage tank associated with the Pitt Stop 7 site (648 Columbia Avenue) was confirmed in 2008. The site was issued a No Further Action notice from the S.C. Department of Health and Environmental Control (SCDHEC) in 2010 and is currently listed as awaiting funding.

2.2.3 What Alternatives Were Considered, But Eliminated?

The Dual Roundabout interchange (Alternative 1) would construct a new interchange that includes a roundabout at either end of the I-26 overpass (**Figure 2-10**). A roundabout is a circular intersection in which traffic flows in one direction around a center island. This type of interchange allows traffic to flow through an interchange without the need for traffic signals.

Figure 2-10: Dual Roundabout Interchange



Traffic studies conducted for the IMR (**Appendix B**) indicate that Alternative 1 would operate at LOS F during afternoon peak traffic hour; therefore, the IMR determined that it should not be considered a viable alternative. Due to the inability to provide an acceptable LOS for future motorist, the Dual Roundabout Interchange would not meet the project's intended purpose and need; therefore, Interchange Alternative 1 was eliminated from further consideration.

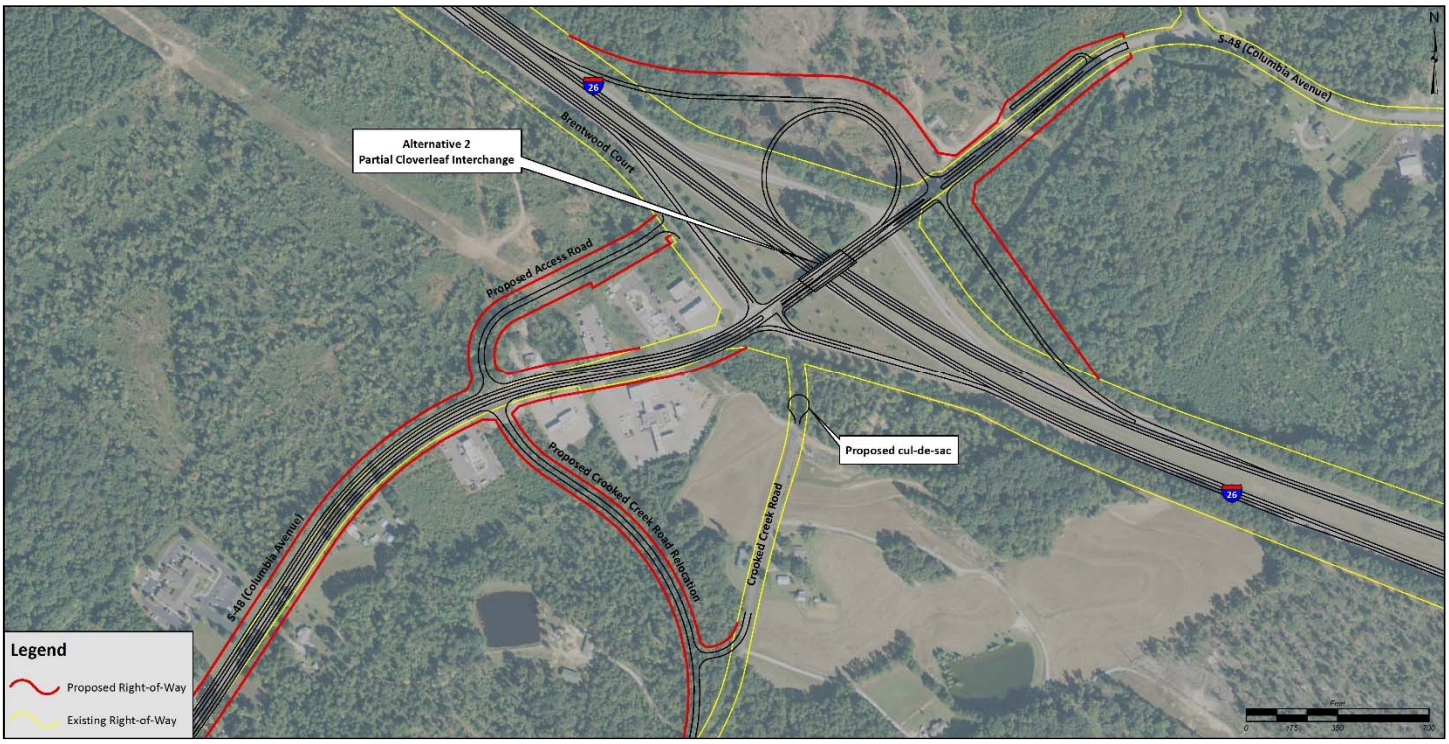
2.2.4 What are the Reasonable Interchange Alternatives?

The results of the IMR determined that the Partial Cloverleaf Interchange (Alternative 2) and the Diverging Diamond Interchange (Alternative 3) would operate at LOS C or better; therefore, Alternatives 2 and 3 are Reasonable Alternatives. An Interchange Alternative Comparison Matrix was developed to compare and evaluate each alternative; see **Table 2-6**. The potential impacts to the surrounding environment for each alternative is included in this matrix. The matrix also includes data and comparative information on each alternative's ability to meet the purpose and need of the proposed project.

2.2.4.1 ALTERNATIVE 2 – PARTIAL CLOVERLEAF INTERCHANGE

Alternative 2 consists of a new interchange with a cloverleaf ramp in the northeast quadrant of the interchange (**Figure 2-11**). This alternative would replace the I-26 overpass bridge on its existing alignment and improve the eastbound I-26 on and off ramps in nearly the same location. The westbound on and off ramps would be shifted slightly eastwardly to accommodate the new cloverleaf.

FIGURE 2-11: ALTERNATIVE 2 – PARTIAL CLOVERLEAF INTERCHANGE



The partial cloverleaf interchange would allow for peak traffic flows to navigate the interchange more freely than the existing condition. In the morning peak hour traffic, eastbound Columbia Avenue traffic turns right onto the eastbound I-26 entrance ramp, similar to the existing condition. In the afternoon, westbound I-26 traffic would utilize the cloverleaf to merge onto westbound Columbia Avenue without a signalized intersection. This movement would eliminate the need for a traffic signal and result in a more efficient traffic flow.

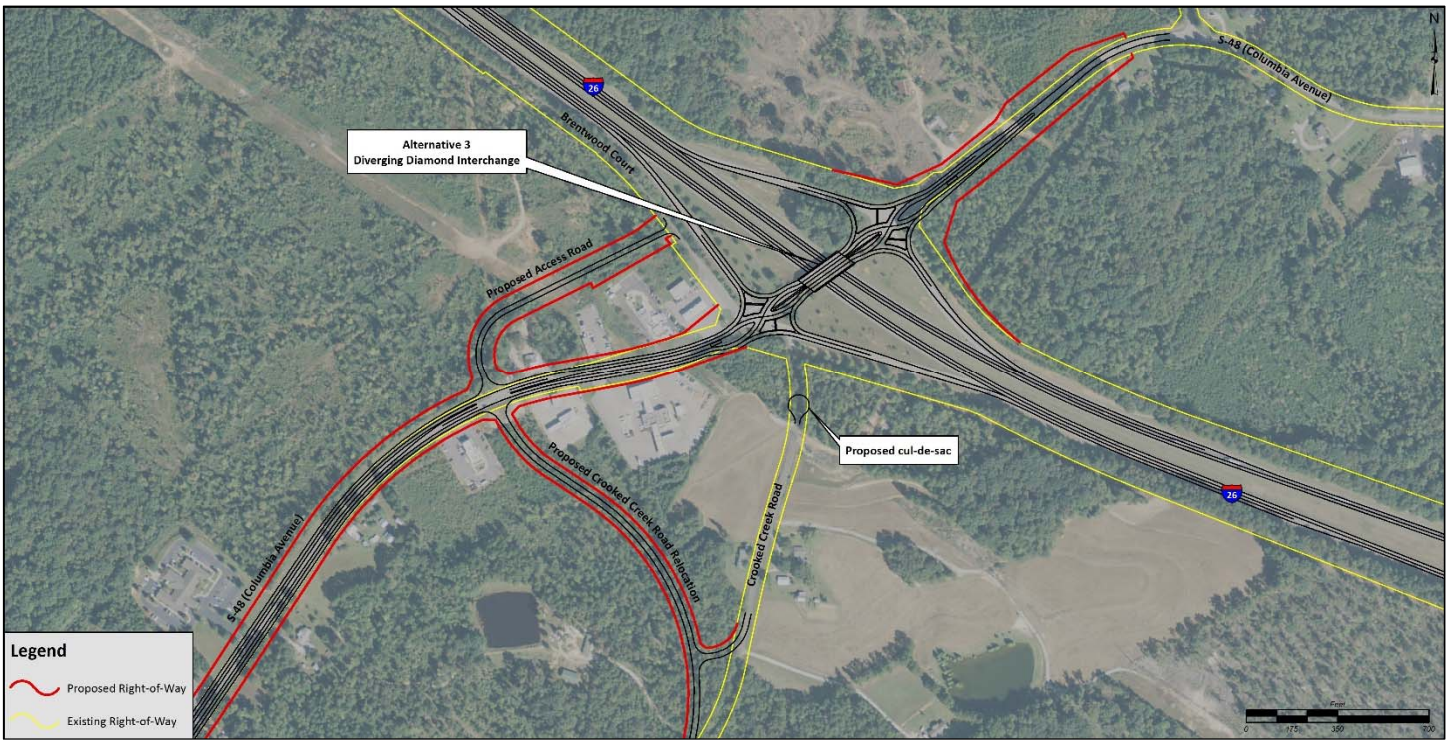
According to traffic studies included in the IMR (**Appendix B**), Alternative 2 would provide the best LOS of the Reasonable Alternatives for eastbound traffic. This alternative would impact slightly fewer parcels than Alternative 3; however, it would require more than twice as much additional right-of-way. The Partial Cloverleaf Interchange would also have greater impacts to waters of the U.S. and would cost more to construct. Due to the impacts this alternative would have on the surrounding human and natural environment, Alternative 2 is not the Preferred Interchange Alternative.

2.2.4.2 ALTERNATIVE 3 – DIVERGING DIAMOND INTERCHANGE (PREFERRED ALTERNATIVE)

Alternative 3 would replace the existing I-26 on and off ramps with new diagonal ramps in a diverging diamond configuration (**Figure 2-12**). Columbia Avenue would be configured to allow traffic to cross to the opposite side of the road (the driver's left side) and transition back again between new traffic signals on each side of I-26. The

diverging diamond interchange would replace the I-26 overpass bridge on its existing alignment and include diverging diamond intersections near the same location as the existing on and off ramp intersections.

FIGURE 2-12: ALTERNATIVE 3 – DIVERGING DIAMOND INTERCHANGE



Alternative 3 would provide an acceptable LOS overall and is projected to operate at a similar LOS as Alternative 2 for westbound traffic (see IMR in **Appendix B**). The major traffic flow during the morning peak hour is eastbound along Columbia Avenue to eastbound I-26. Alternative 3 would allow this traffic a free-flow movement to access eastbound I-26, similar to what drivers currently experience. While traffic studies indicate the eastbound traffic would operate at LOS C, the major movement in the morning peak hour traffic from Columbia Avenue onto I-26 would flow freely at an LOS A.

The diverging diamond interchange would require the less right-of-way than Alternative 2 and would result in less impacts to streams and wetlands. The Diverging Diamond Interchange would also cost less to construct. This alternative would, however, impact two (2) additional parcels. These parcels are located in the northwest quadrant of the interchange and include one additional (1) potential hazardous material site. According to the Phase I Environmental Site Assessment prepared for the project, leaking underground storage tanks associated with this site, the Corner Pantry 132 (661 Columbia Avenue), were confirmed in 1986 and 2008. A "No Further Action" notice has not been issued for either release and the site is currently recommended for a risk assessment.

Alternative 3, the diverging diamond interchange, was selected as the Preferred Interchange Alternative because it meets the Purpose and Need of the proposed project and is the least damaging alternative to the human and natural environment.

TABLE 2-6: INTERCHANGE ALTERNATIVE COMPARISON MATRIX

Category	Alternatives	
	Alternative 2 Partial Cloverleaf	**Alternative 3 - Diverging Diamond (Preferred)**
Property Impacts		
Residential Right-of-Way (acres)	0	0
Commercial Right-of-Way (acres)	18.2	8.4
Total Right-of-Way (acres)	18.2	8.4
Total Parcels Impacted	15	17
Potential Relocations	1	1
Environmental Impacts		
Streams (linear feet) *	460	210
Wetlands (acre) *	0.21	0.14
Floodplains (acres)	0.00	0.00
Threatened and Endangered Species	No	No
Historical / Cultural Resources[7]	0	0
Section 4(f) / 6(f) Resources	0	0
Potential Hazardous Material Sites[8]	1	2
Environment Justice / Title VI	No	No
Noise Receptors	0	0
Roadway and Traffic Information		
I-26 Eastbound Ramps at S-48 LOS (AM / PM) – 2040 [9]	A / A	C / C
S-48 at I-26 WB Off Ramp LOS (AM / PM) – 2040 [10]	B / C	B / B
Estimated Bridge Length & Width	195' L x 79' W	183' L x 112' W
Cost		
Estimated Right-of-Way Cost ($)	4,960,000	4,600,000
Estimated Bridge Cost ($)	4,947,000	4,696,000
Estimated Construction w/ Contingency ($)	12,632,000	12,963,000
Estimated Environmental Mitigation Cost ($)	351,000	162,500
Total Interchange Cost ($)	22,890,000	22,421,500

[7] New South Associates, Inc. Addendum: *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements*. October 17, 2016.
[8] Mead & Hunt, Inc. *Phase I Environmental Site Assessment.* Columbia Avenue (S-48) Corridor Improvement Project. May 26, 2016.
[9] AECOM. *Interchange Modification Report.* I-26 at S-48 (Columbia Avenue) Interchange Improvements. November 2016.
[10] Ibid.

2.3 What is the Project Preferred Alternative?

The Mainline Alternative 9A along with Interchange Alternative 3 comprise the Preferred Alternative for the project.

As depicted in **Figures 2-13 A** through **2-13 F**, the Preferred Alternative would include the construction of a 1.3 mile, three (3) lane, new location roadway to serve as an alternative route through the Town of Chapin. This new route would originate on Amicks Ferry Road, extend east to the intersection of East Boundary Street and Stonewall Court, and then north to Columbia Avenue. Portions of Clark Street, Weisz Street, and East Boundary Street would also be improved along the route. The existing railroad crossing at Weisz Street would also be upgraded to current standards. The project would construct a new intersection where the new roadway intersects Columbia Avenue, approximately 420 feet east of East Boundary Street. Columbia Avenue would be improved to five (5) lanes from this intersection east to the I-26 interchange. Finally, a designated left turn lane would be placed on Columbia Avenue for westbound traffic to turn onto Lexington Avenue. The total project length would be approximately 2.9 miles.

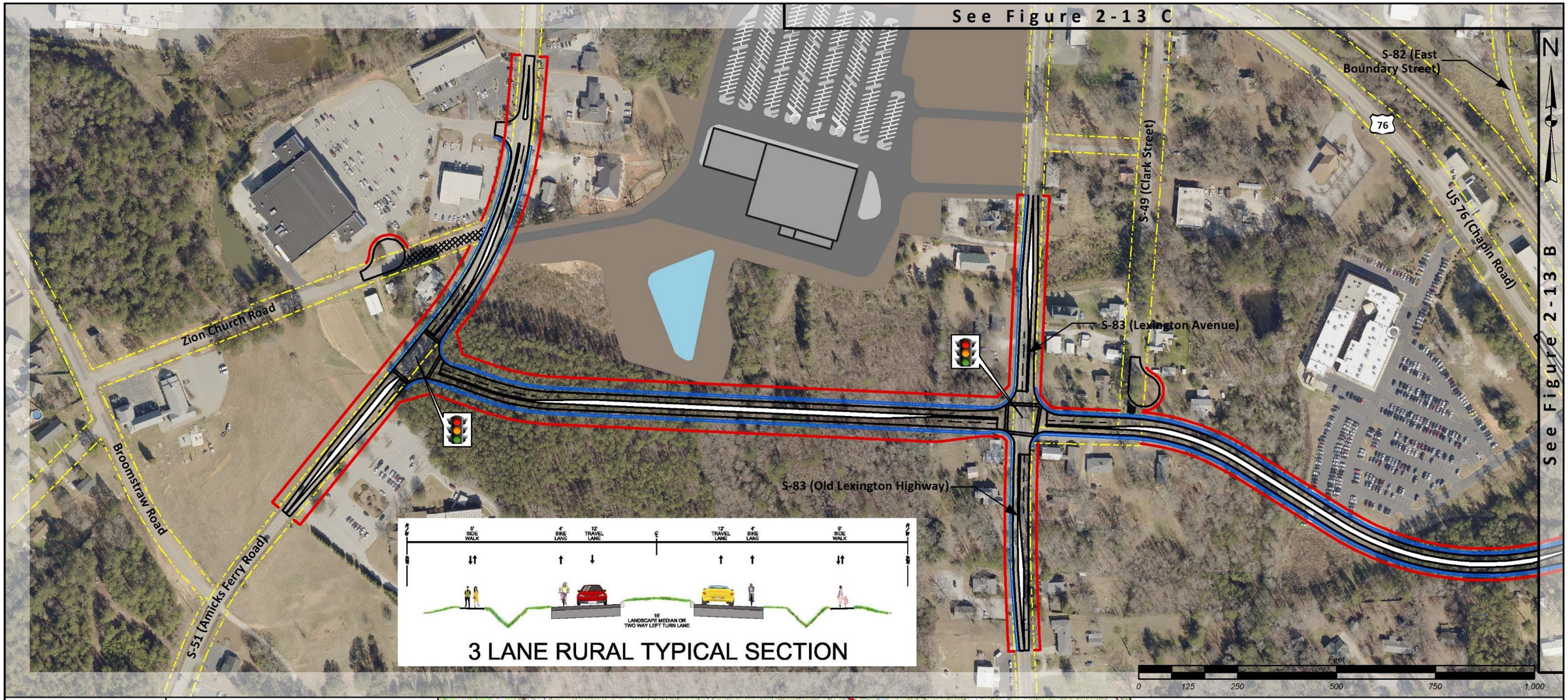
The new roadway would improve roadway connectivity throughout Chapin and would allow the closure of several intersections in the vicinity of the project. At the intersection of Zion Church Road and Amicks Ferry Road, Zion Church Road would become a cul-de-sac. Another cul-de-sac would be constructed at the southern end of Clark Street, near its intersection with the new roadway. The intersection of East Boundary Street and Columbia Avenue would also be modified. Access to East Boundary Street would be limited to eastbound traffic from Columbia Avenue only. Left turns onto East Boundary Street would no longer be allowed.

The Preferred Alternative would replace the existing I-26 interchange at Columbia Avenue with a new diverging diamond interchange. The existing roadways in the vicinity of the interchange would also be upgraded to meet SCDOT's current design and safety standards. Crooked Creek Road would be terminated prior to its intersection with the I-26 entrance ramp. This traffic would be rerouted with a new location roadway from Crooked Creek Road north to Columbia Avenue. A new location roadway would also be constructed in the northwest quadrant of the interchange to maintain access to businesses in the area.

The project would also address roadway deficiencies and provide facilities for bicyclist and pedestrians for improved multi-modal forms of transportation. All intersections within the project limits would also receive upgrades to include designated turn lanes and adequate storage.

The Preferred Alternative will continue to have the design improved to further reduce potential impacts to the human and natural environment. **Chapter 3 – Existing Conditions and Probable Impacts on the Environment**, describes the specific impacts to be anticipated and what measures to mitigate those impacts will be implemented.

FIGURE 2-13 A: PREFERRED ALTERNATIVE



Mead & Hunt
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Lexington, SC 29072
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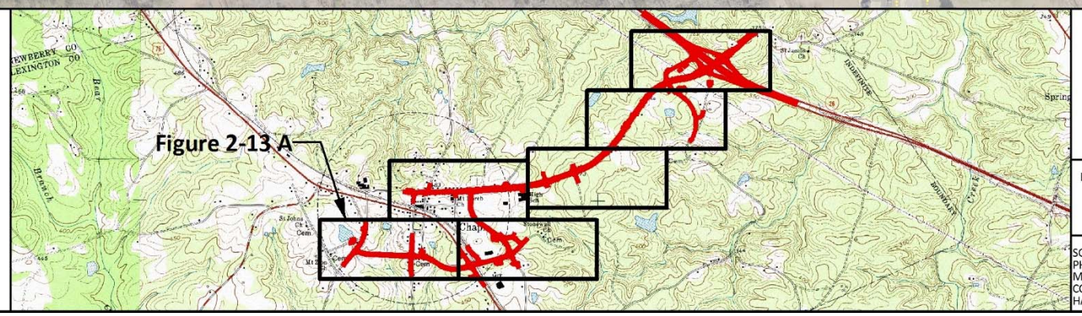
www.meadhunt.com

Legend

- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Travelway
- Proposed Sidewalk
- Proposed Bridge
- Pavement Removal
- Proposed Raised/Painted Median
- Proposed Traffic Signal



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT PROJECT: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE: HIGH RESOLUTION AERIAL PHOTOGRAPHY [INDEPENDENT MAPPING CONSULTANTS (2015)]. CONSTRUCTION OF CHAPIN CROSSING HAS BEEN APPROXIMATED AS 11/2016.

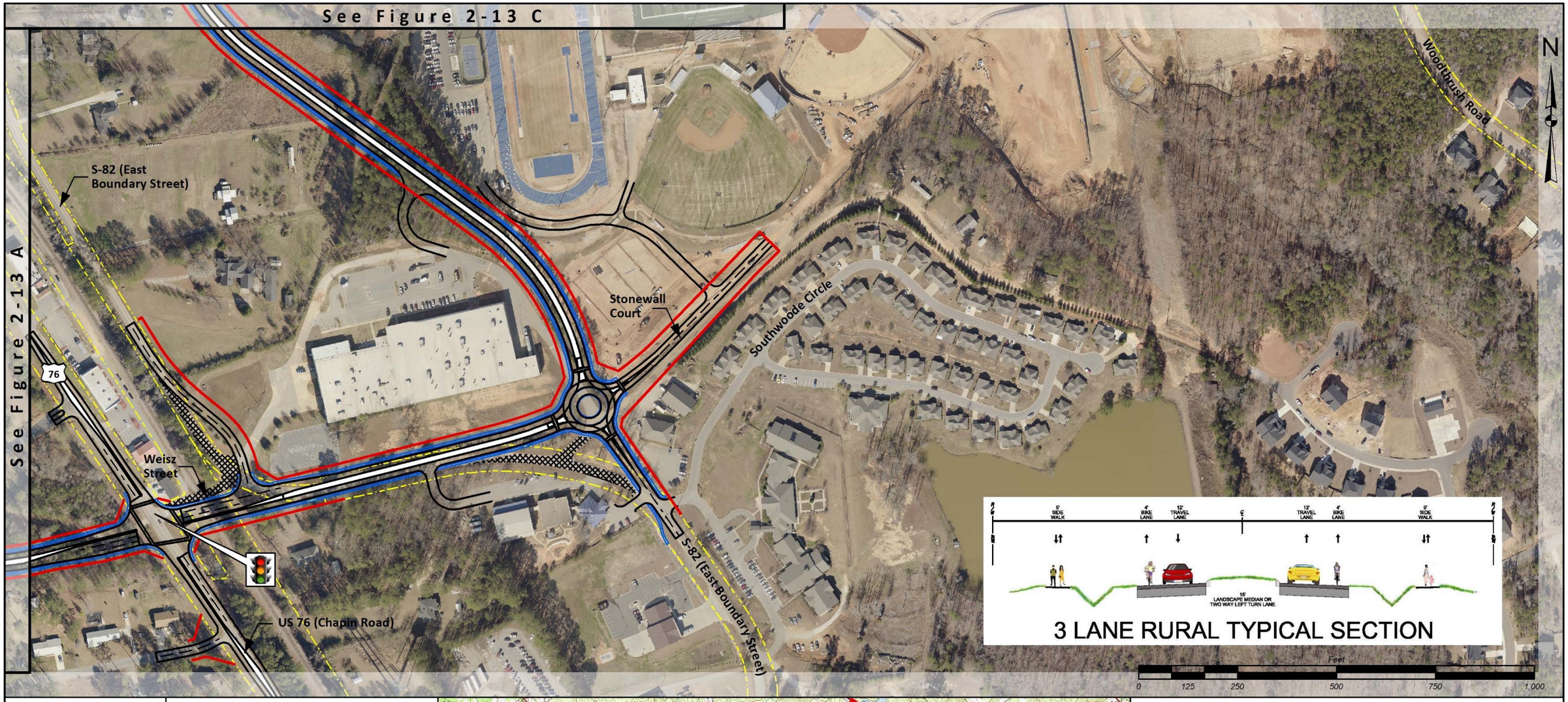
DRAWN BY: MTD
QA/QC BY: MBS

DATE: NOVEMBER 25, 2016

FIGURE 2-13 A

PREFERRED ALTERNATIVE

FIGURE 2-13 B: PREFERRED ALTERNATIVE



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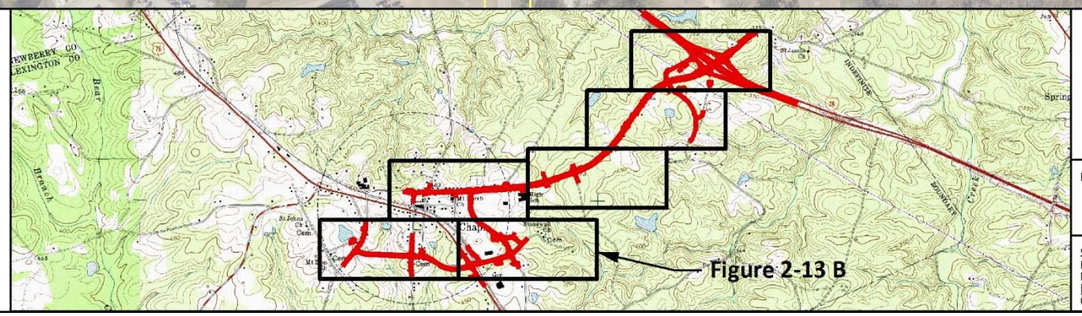
Legend

- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Travelway
- Proposed Sidewalk
- Proposed Bridge
- Pavement Removal
- Proposed Raised/Painted Median
- Proposed Traffic Signal



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT PROJECT: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
HIGH RESOLUTION AERIAL PHOTOGRAPHY
[INDEPENDENT MAPPING CONSULTANTS (2015)]

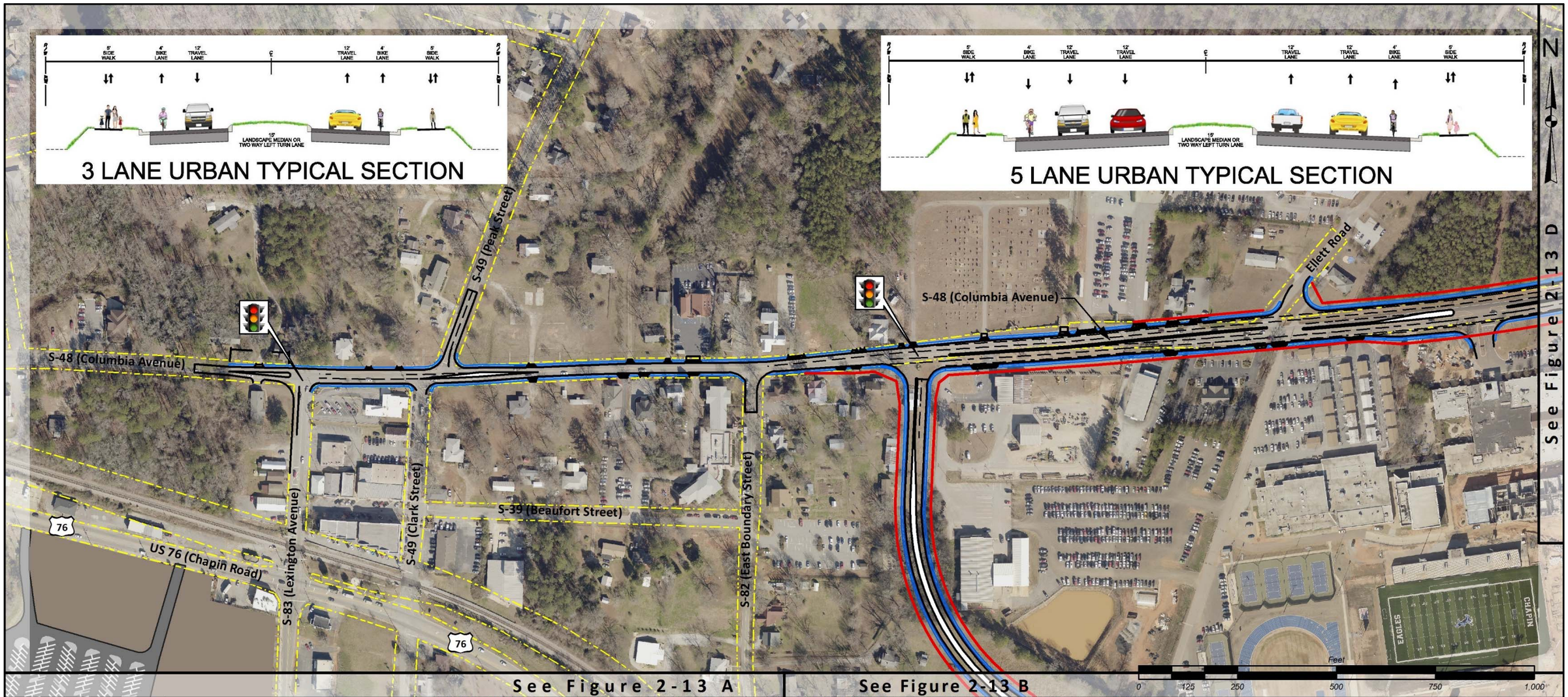
DRAWN BY: MTD
QA/QC BY: MBS

DATE: NOVEMBER 25, 2016

FIGURE 2-13 B

PREFERRED ALTERNATIVE

FIGURE 2-13 C: PREFERRED ALTERNATIVE



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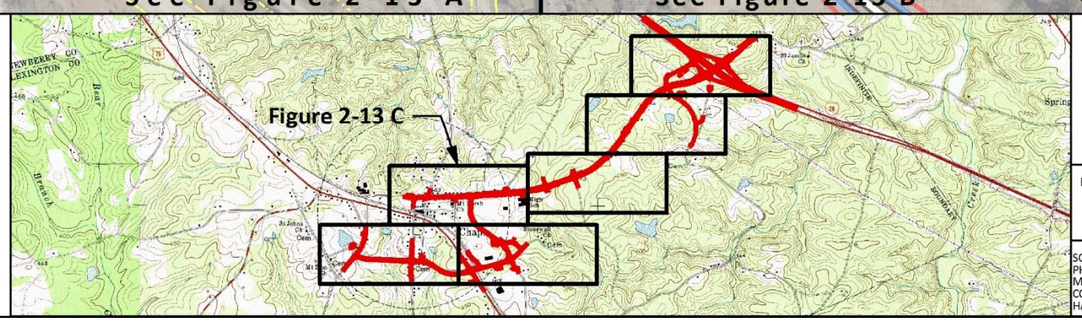

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT PROJECT: P042383

PRODUCED FOR:
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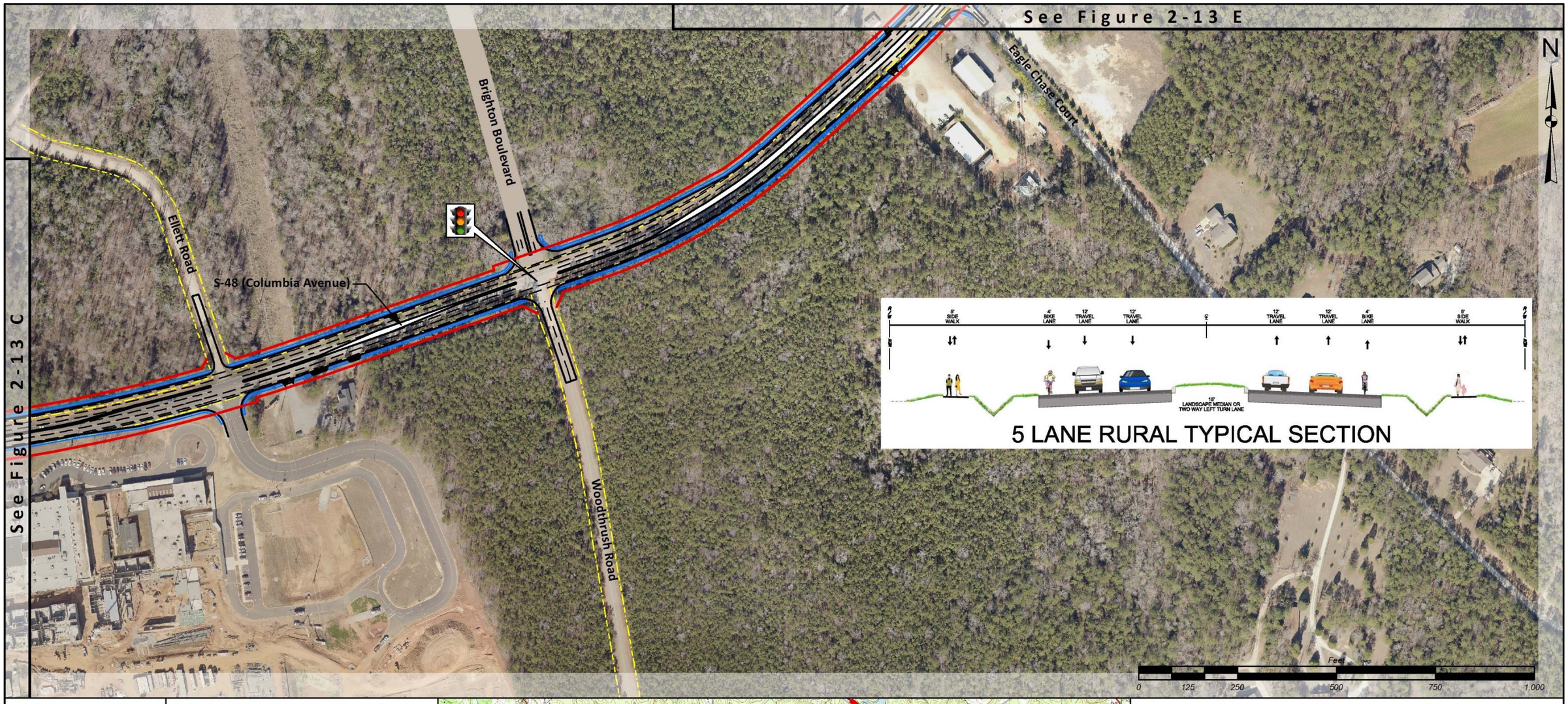
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE: HIGH RESOLUTION AERIAL PHOTOGRAPHY (INDEPENDENT MAPPING CONSULTANTS (2015)). CONSTRUCTION OF CHAPIN CROSSING HAS BEEN APPROXIMATED AS 11/2016.

DRAWN BY: MTD
QA/QC BY: MBS
DATE: NOVEMBER 25, 2016

FIGURE 2-13 C
PREFERRED ALTERNATIVE

FIGURE 2-13 D: PREFERRED ALTERNATIVE



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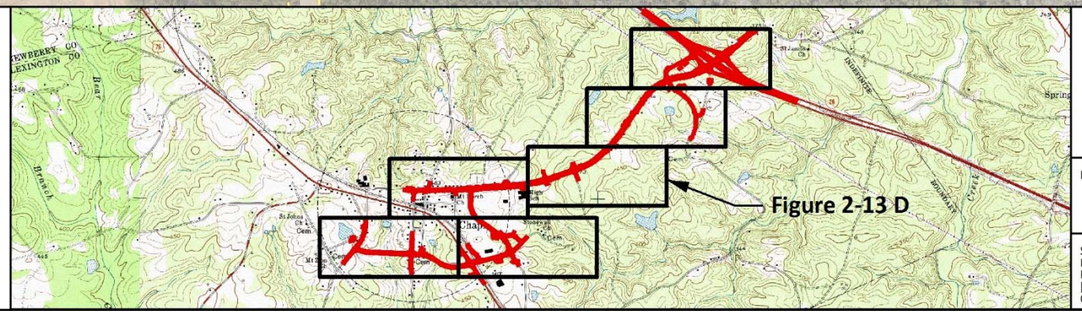

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

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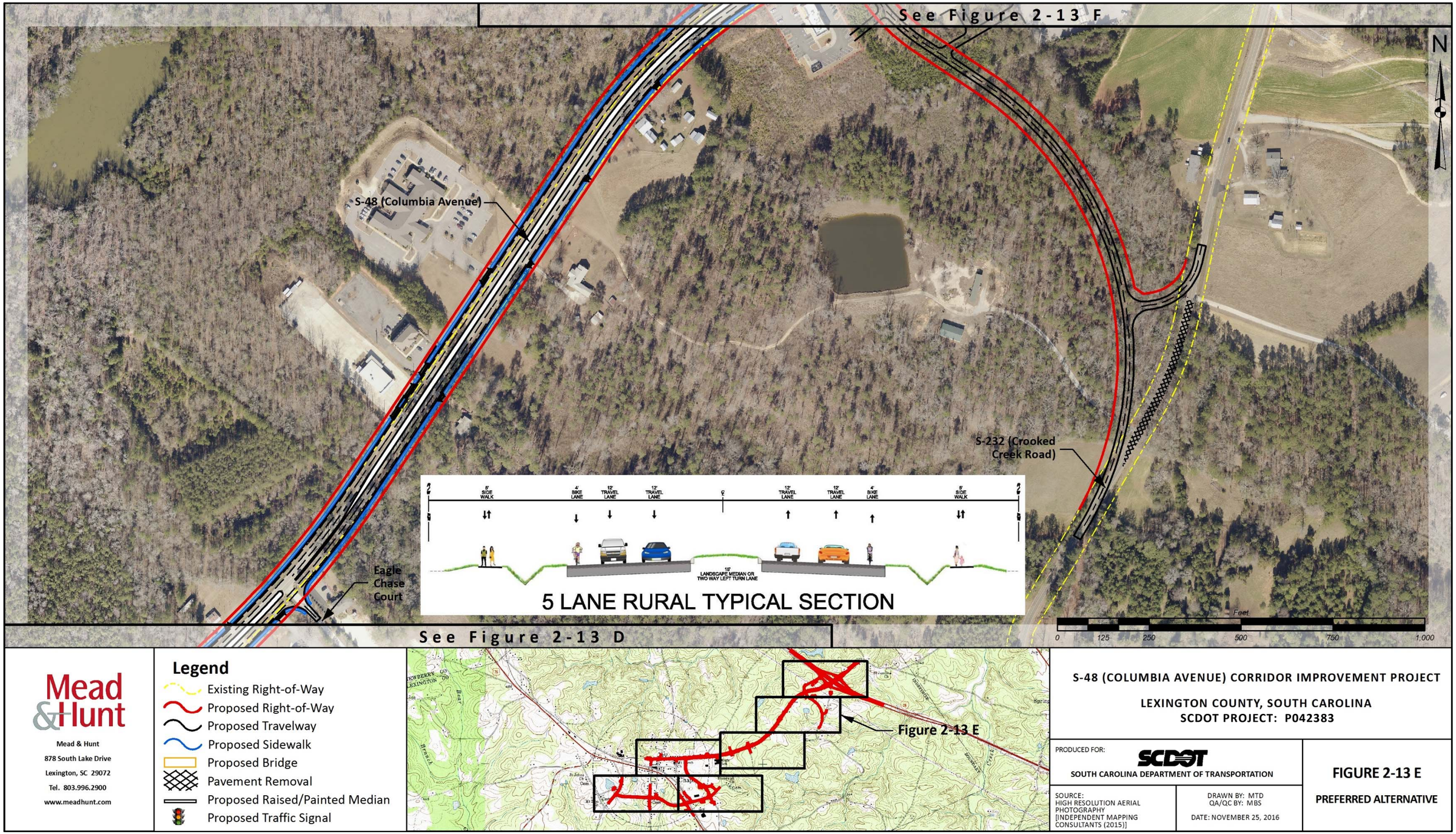
FIGURE 2-13 D

PREFERRED ALTERNATIVE

FIGURE 2-13 E: PREFERRED ALTERNATIVE



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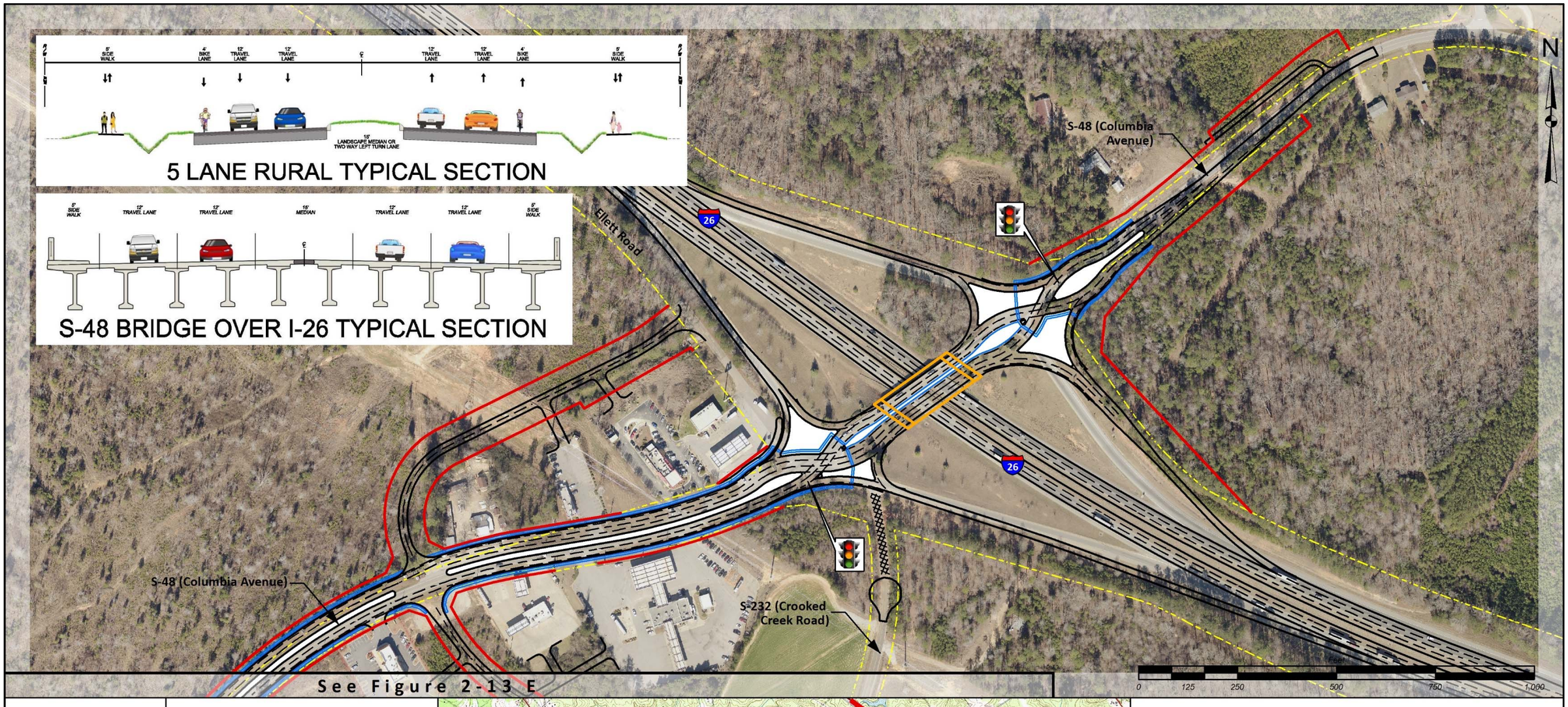
DATE: NOVEMBER 25, 2016

FIGURE 2-13 E

PREFERRED ALTERNATIVE

FIGURE 2-13 F: PREFERRED ALTERNATIVE



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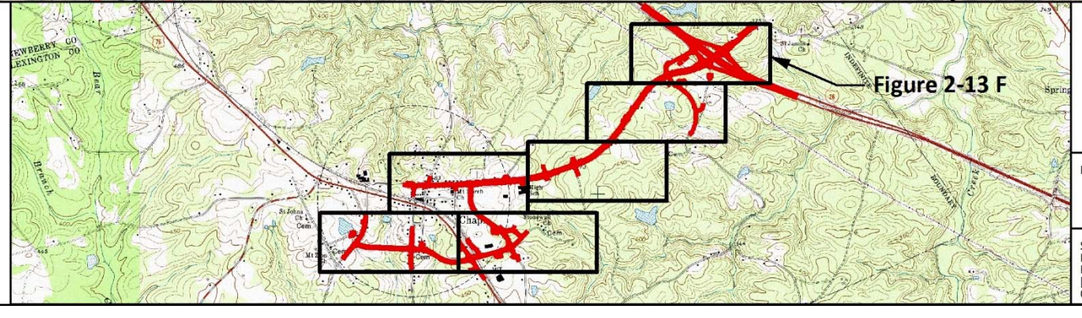

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT PROJECT: P042383

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[INDEPENDENT MAPPING CONSULTANTS (2015)]

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QA/QC BY: MBS

DATE: NOVEMBER 25, 2016

FIGURE 2-13 F

PREFERRED ALTERNATIVE

3.0 EXISTING CONDITIONS AND PROBABLE IMPACTS ON THE ENVIRONMENT

This chapter includes a description of the existing conditions within the project study area and a discussion of the probable impacts (beneficial and adverse) the Preferred Alternative would have on the human and natural environment. Overall, the project's environmental impacts are not expected to be adverse. Mitigation measures for potential project impacts are also discussed in this chapter, where appropriate. The following sections provide a brief overview of the environmental findings.

3.1 LAND USE

The proposed project is located in the Town of Chapin, South Carolina. Once rural, this town of 1,500 has become a suburb of Columbia, South Carolina's capital and largest city. Chapin is located in Lexington County, approximately 25 miles northwest of Columbia.

Lexington County is located in the central portion of South Carolina and the sixth-most populated county in the state. According to 2010 Census estimates, Lexington County has approximately 282,000 residents and has nearly doubled in population since 1980.[11] Lexington County also saw a 25 percent increase in population between 2000 and 2010. The state of South Carolina, in comparison, saw a fifteen (15) percent increase during this same period. According to the South Carolina Revenue and Fiscal Affairs Office, Lexington County is expected to have 333,200 residents by 2030. [12]

3.1.1 WHAT IS THE EXISTING LAND USE IN THE VICINITY OF THE PROJECT?

The Town of Chapin contains approximately 1,145 acres of land within its municipal limits. According to the Town of Chapin's Comprehensive Plan, adopted on November 1, 2011, a large percentage (approximately 40%) of the total acreage of the town is vacant or unimproved. Table 3-1 summarizes the land use in the vicinity of the project.

TABLE 3-1: EXISTING LAND USE SUMMARY

Land Use	Town of Chapin[1]		Project Study Area[2]	
	Area (acres)	Percent	Area (acres)	Percent
Commercial	145.16	12.67%	20.38	14.60%
Industrial	35.15	3.07%	4.82	3.45%
Public/Institutional	157.62	13.76%	52.47*	37.60%*
Residential	348.27	30.40%	12.95	9.28%
Vacant/Undeveloped	459.36	40.10%	48.95	35.07%
Total	**1,145.56**	**100%**	**139.57**	**100%**

[1] Source: Town of Chapin Comprehensive Plan – November 1, 2011
[2] Source: Lexington County Parcel Data – May 12, 2014
* Includes existing rights-of-way

[11] U.S. Census Bureau. 2016. Available at: http://quickfacts.census.gov

[12] SC Department of Employment & Workforce. Community Profile, Lexington County. 2016. Available at: https://lmi.dew.sc.gov/lmi%20site/Documents/CommunityProfiles/04000063.pdf

Land use within the project study area is primarily comprised of undeveloped forestland, roadway and utility rights-of-way (R/Ws), agricultural lands, and sparse residential and commercial development. In general, land use patterns decrease in density from west to east along Columbia Avenue. The majority of existing development occurs west of Woodthrush Road and in the immediate vicinity of the I-26 interchange with Columbia Avenue, as shown in **Figure 3-1**.

Two (2) developments are currently under construction within the vicinity of the project. These developments are known as Chapin Crossing and Chapin Technology Park, and are described in **Sections 2.1.3.1.3.4** and **2.1.3.1.3.5**, respectively.

Chapin Crossing is converting approximately 25 acres of previously industrial, commercial, and residential properties into a Publix Super Market and multiple associated outparcels. The property is located southeast of the intersection of Chapin Road and Lexington Avenue.

The Chapin Technology Park (CTP) is currently developing approximately 220 acres of undeveloped forestland into a business and technology park. The CTP will be located primarily north of Columbia Avenue, opposite Chapin High School. A private developer is also planning a 200-acre residential and commercial complex adjacent to the CTP in an effort to establish a "work-live-play" mixed use community. This property is also currently undeveloped forestland.

3.1.2 Local Planning Documents

Several local planning documents contribute to the land use planning in the vicinity of the proposed project. A brief description of these is listed below.

Town of Chapin Comprehensive Plan [13]

The Town of Chapin Comprehensive Plan was adopted in 2011 and was developed to serve as a general policy guide for town officials and citizens to use in planning for future growth and development in and around the town of Chapin. The land use element of the document presents an inventory of existing land use, a description of current zoning practices, a future land use concept, and a goals and objectives section. The Town of Chapin Comprehensive Plan also identifies the Columbia Avenue project as an important component of future transportation plans.

Lexington County Comprehensive Plan [14]

The Lexington County Comprehensive Plan was developed in 2009 and identifies Columbia Avenue as a major collector that is nearing or over capacity. The plan also identifies a desire to provide facilities for bike and pedestrian usage.

Columbia Area Transportation Study Long Range Transportation Plan (COATS)[15]

The COATS *2035 Long Range Transportation Plan* (LRTP) was adopted in 2009 and proposes transportation improvements that are needed to accommodate increasing demands on roadway networks and identifies key corridors where growth is projected. The document identifies the Columbia Avenue project as a necessary

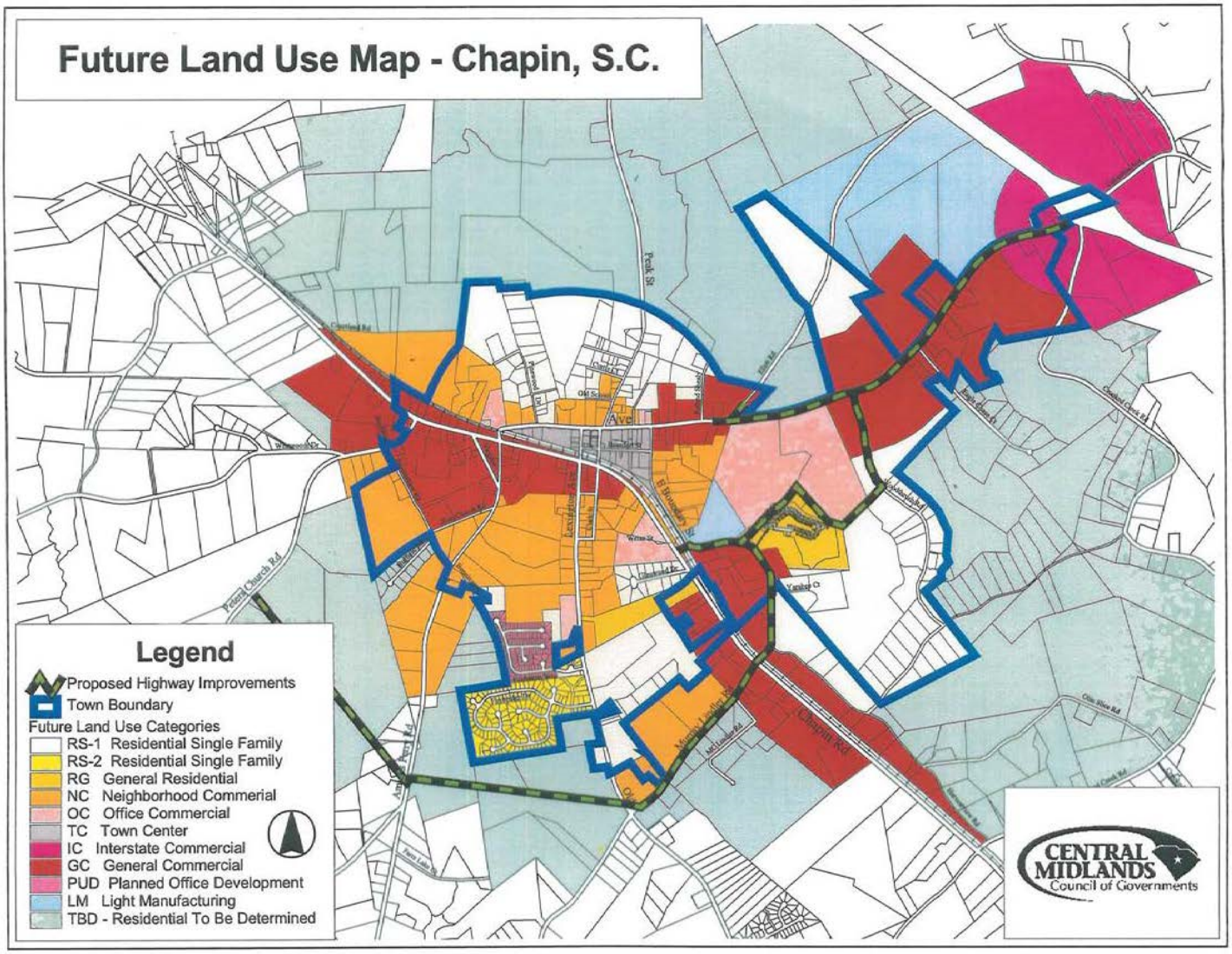
[13] Town of Chapin Comprehensive Plan. 2011. Available at http://www.chapinsc.com/DocumentCenter/View/109
[14] Lexington County Comprehensive Plan. 2009. Available at http://www.lex-co.sc.gov
[15] COATS 2035 Long Range Transportation Plan. 2009. Available at: http://centralmidlands.org/about/transportation-planning.html

component of land use and transportation plans and has included it on their prioritized list of roadway improvements.

3.1.3 What is the Anticipated Future Land Use in the Vicinity of the Project?

Based on the Future Land Use Map included in the Town of Chapin's Zoning Ordinance (**Figure 3-1**), significant commercial development is anticipated along Columbia Avenue and throughout the vicinity of the project.

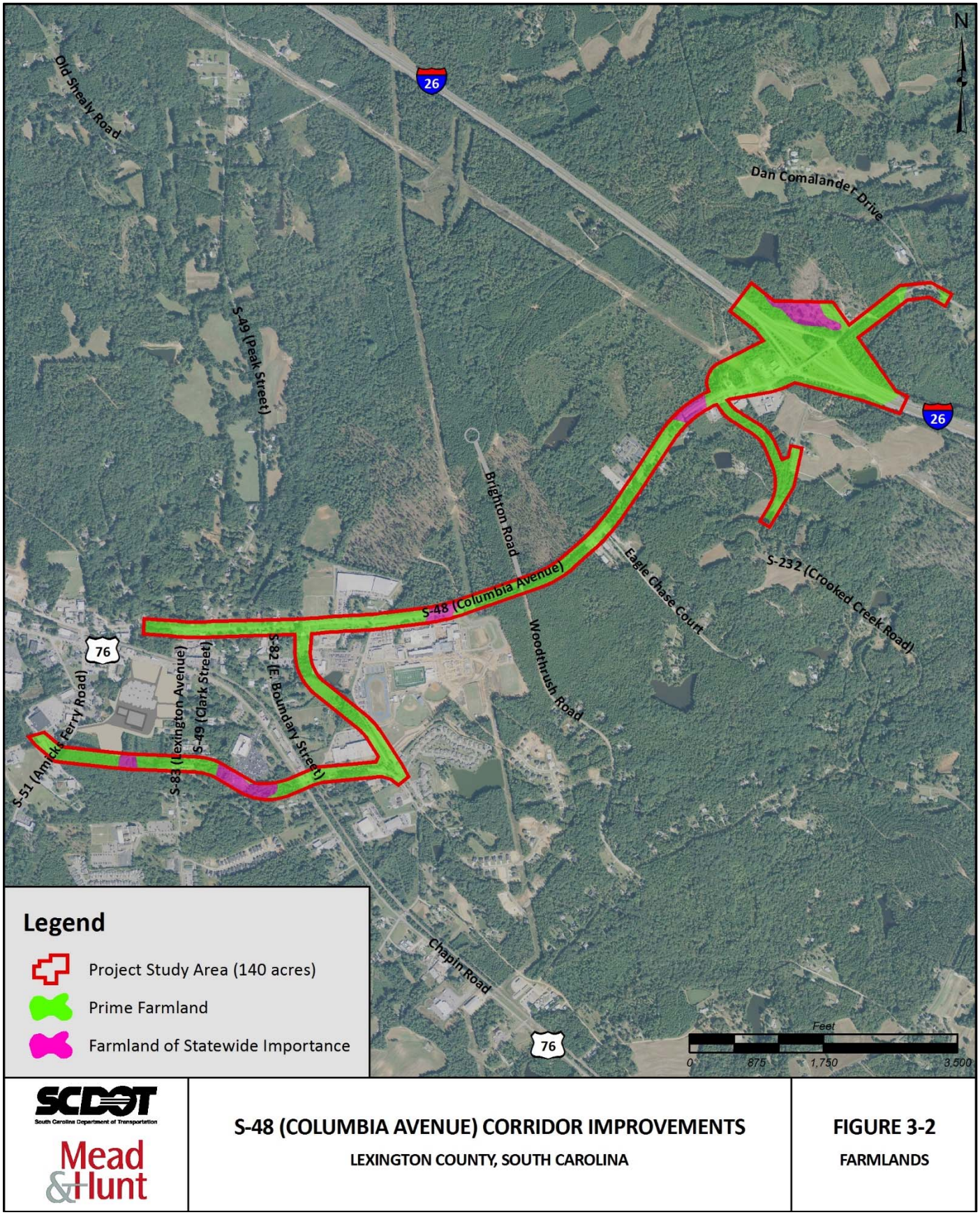
Figure 3-1: Future Land Use



3.2 Farmlands

The Farmland Protection Policy Act (FPPA) of 1981 requires evaluation of farmland conversions to nonagricultural uses. Pursuant to 7 CFR § 658.3(c), the FPPA is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland. Farmland can be prime farmland, unique farmland, or farmland of statewide or local importance. Prime farmland soils are those that have characteristics favorable for economic production of sustained high yields of crops. These soils may or may not be presently used as cropland.

FIGURE 3-2: FARMLANDS



The project study area is comprised of approximately 140 acres of land within Lexington County. Of these acres, 123 acres are prime farmland and thirteen (13) acres are farmland of statewide importance. Together, they account for 98 percent of land within the project study area. No unique farmland soil types exist within the project study area. The majority of the farmland soils within the project study area are currently developed, as shown on Figure 3-2. Areas of undeveloped land with farmland soils are primarily located southwest of US 76 and the area east of I-26. Based on the Future Land Use Map included in the Town of Chapin's Zoning Ordinance (Figure 3-1), these areas are planned for commercial uses.

Construction of the Preferred Alternative would result in the direct conversion of a total of 48.1 acres of farmland soils. In accordance with the FPPA, a Farmland Impact Conversion Rating Form for Corridor Type Projects (NRCS-CPA-106) was completed for the Preferred Alternative. The purpose of the Farmland Impact Conversion Rating Form is to help identify and approximate the amount of farmland that would be converted by the Preferred Alternative.

Two (2) values were determined using the Farmland Impact Conversion Rating Forms, including the Relative Value and the Total Corridor Assessment value. The Relative Value is the relative value of farmland to be converted by the Preferred Alternative, on a scale of zero to 100 points. The Total Corridor Assessment value is on a scale of zero to 160 points, and pertains to the land use, the availability of farm support services, investments in existing farms, and the amount of farmland that would be converted to nonagricultural use due to the construction of the Preferred Alternative. Sites receiving highest scores, up to a maximum of 260, are considered most suitable for protection while those with lowest scores are considered least suitable. Sites receiving scores less than 160 are to be given minimal consideration for protection.

The proposed project received a Total Corridor Assessment score of 126, assuming a Relative Value of 100. Since this Total Corridor Assessment score is under the 160-point threshold described above, neither consideration of alternative sites nor additional studies for the study area are required under the Act. The Farmland Impact Conversion Rating Form can be found in **Appendix C** .

3.3 Waters of the U.S.

3.3.1 What are Waters of the U.S.?

Waters of the U.S. are defined by 33 CFR 328.3(b) and protected by Section 404 of the Clean Water Act (33 U.S.C. 1344), which is administered and enforced in South Carolina by the U.S. Army Corps of Engineers (USACE), Charleston District. The term "waters of the U.S." is defined in 33 CFR Part 328 as:

All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

1. All interstate waters including interstate wetlands;
2. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
3. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
4. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
5. Which are used or could be used for industrial purpose by industries in interstate commerce;

6. All impoundments of waters otherwise defined as waters of the United States under the definition;
7. Tributaries of waters identified in paragraphs 1 – 4 above;
8. The territorial seas; and
9. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in 1 – 6 above.

Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands are defined in the field as areas that display positive evidence of three environmental parameters including dominance of hydrophytic vegetation, wetland hydrology, and hydric soils.

Streams, or tributaries, are defined as seasonal or perennial. Seasonal tributaries flow at least three (3) months a year, but do not have constant flow. Perennial tributaries flow year-round.

The boundaries of waters of the U.S. were delineated on August 31st and November 18th, 2015. Wetlands in the project study area were determined using the Routine On-Site Determination Method as defined in the Corps of Engineers Wetland Delineation Manual and the Eastern Mountains and Piedmont Region Supplement to the Manual. The boundaries of delineated waters within the project area were flagged (delineated) in the field at that time. Furthermore, delineated waters were located using a handheld Global Positioning System (GPS) unit. Jurisdictional determination and verification of delineated boundaries of waters of the U.S. by the USACE is pending.

A total of three (3) wetland communities, seven (7) streams, and four (4) ponds/waters were identified within the project area during site reviews, as listed in Tables 3-2 through 3-4. Additional information about waters of the U.S. is included in the Natural Resources Technical Memorandum (NRTM) in (**Appendix D**). The location of these features can be found on Figures 3-3 through 3-5.

3.3.2 What Impacts are Anticipated to Waters of the U.S.?

The Preferred Alternative would impact a total of four (4) tributaries, comprising 383-linear feet (lf) of impact. These include a portion of Tributaries 1, 2, 3, and 5. The project would also impact 0.385 acre of Wetland 1 and 0.182 acre of delineated ponds. During final design, measures will be evaluated to further avoid and minimize impacts to Waters of the U.S.

Table 3-2: Characteristics and Anticipated Impacts to Wetlands

Wetland ID	Wetland Type	Figure	Area in PSA (ac.)	Anticipated Impact (ac.)
Freshwater Wetland 1	Forested	3-5	0.472 ac.	0.385 ac.
Freshwater Wetland 2	Forested	3-5	0.023 ac.	-
Freshwater Wetland 3	Forested	3-5	0.043 ac.	-
Total			**0.538 acre**	**0.385 acre**

Source: NRTM for S-48 (Columbia Avenue) Corridor Improvement Project – May 2016 by Mead & Hunt (**Appendix D**)

FIGURE 3-3: WATERS OF THE U.S.

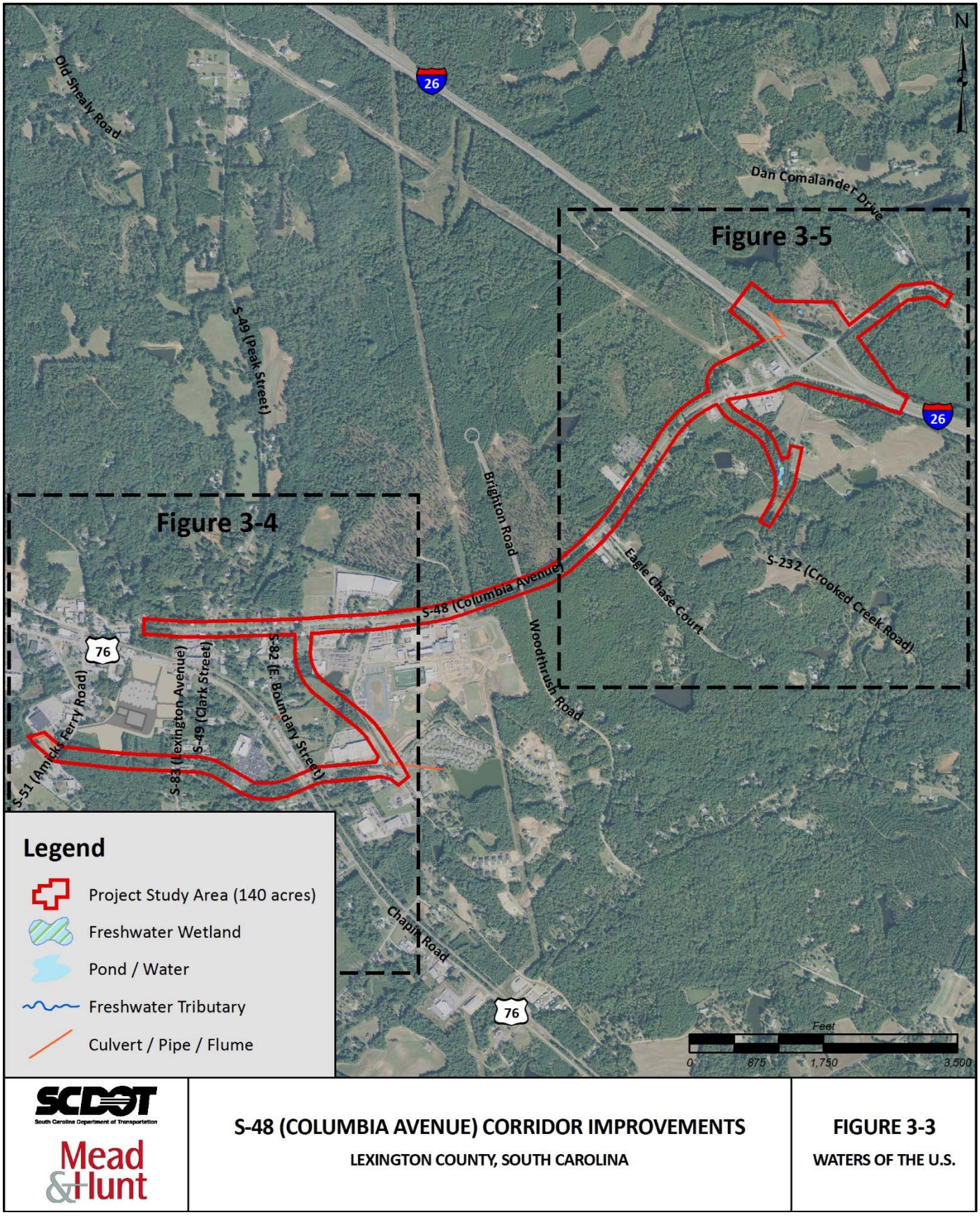
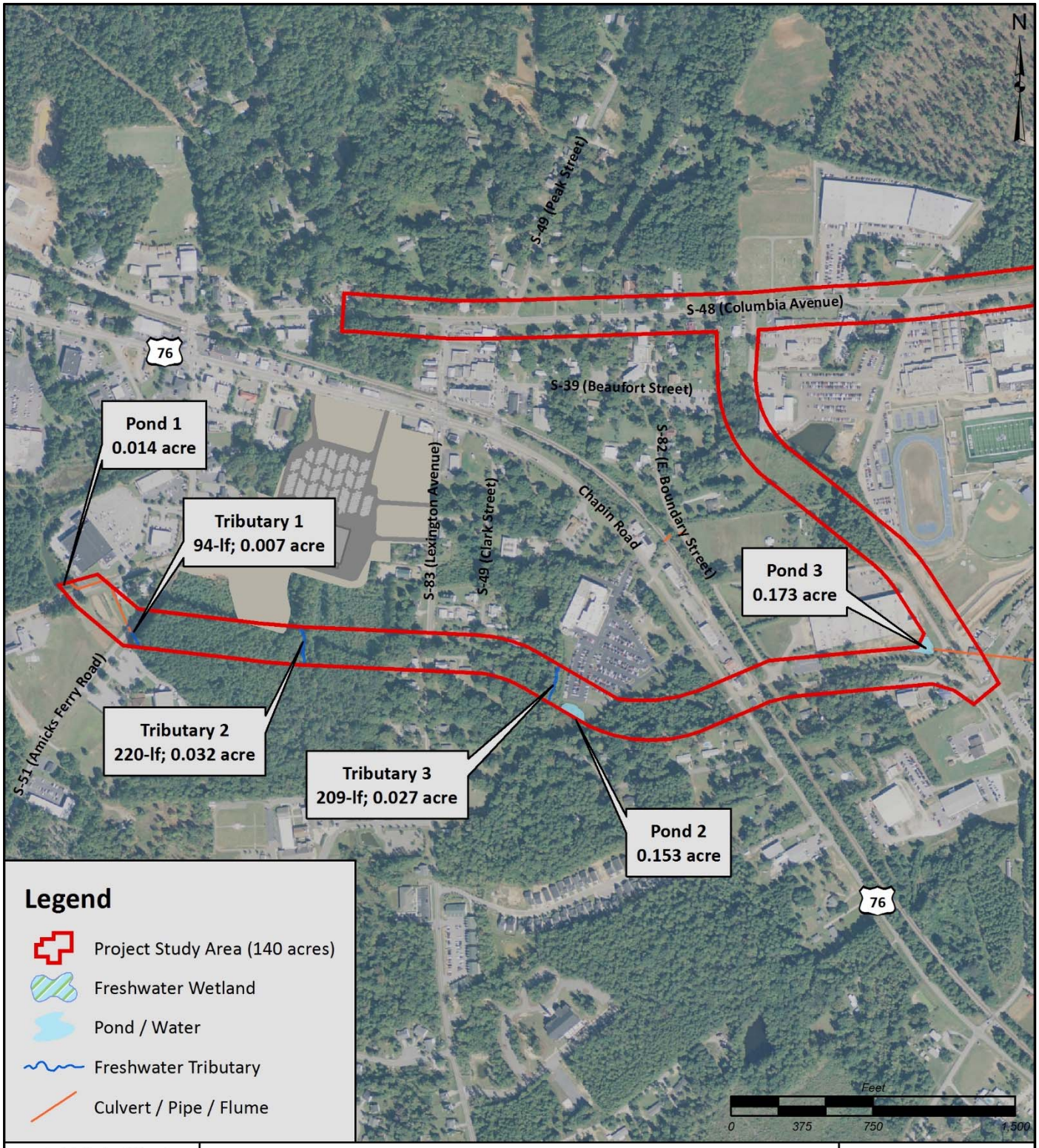


FIGURE 3-4: WATERS OF THE U.S.



SCDOT South Carolina Department of Transportation
Mead & Hunt

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS
LEXINGTON COUNTY, SOUTH CAROLINA

FIGURE 3-4
WATERS OF THE U.S.

FIGURE 3-5: WATERS OF THE U.S.

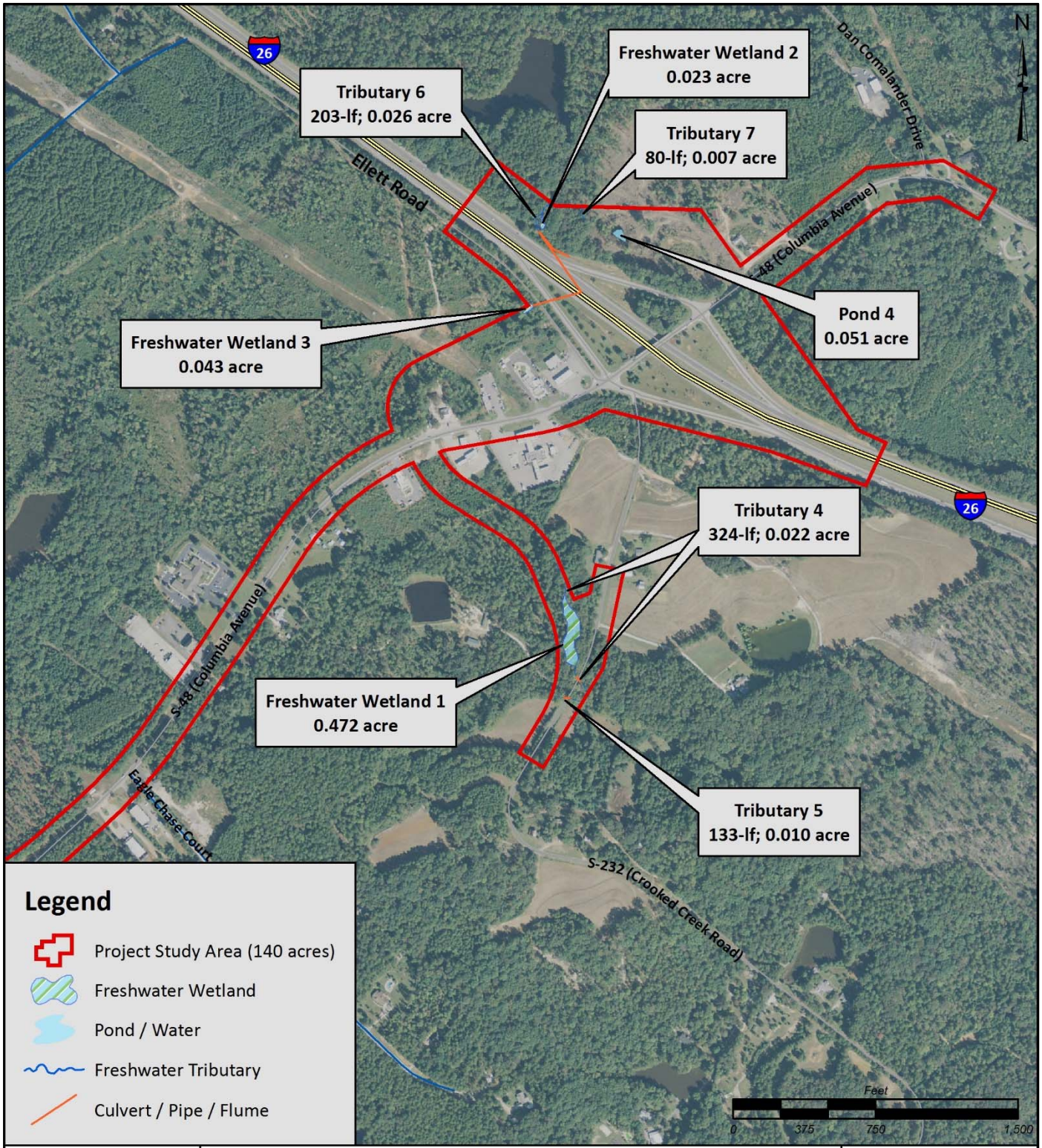


TABLE 3-3: CHARACTERISTICS AND ANTICIPATED IMPACTS TO TRIBUTARIES

Stream ID	Figure	Intermittent [lf (acre)]	Perennial [lf (acre)]	Total [lf (acre)]	Anticipated Impact [lf (acre)]
Tributary 1	3-4	94-lf (0.007 ac)	-	94-lf (0.007 ac.)	55-lf (0.004 ac.)
Tributary 2	3-4	-	220-lf (0.032 ac)	220-lf (0.032 ac)	131-lf (0.019 ac.)
Tributary 3	3-4	-	209-lf (0.027 ac)	209-lf (0.027 ac)	141-lf (0.020 ac.)
Tributary 4	3-5	191-lf (0.013 ac)	133-lf (0.009 ac)	324-lf (0.022 ac)	-
Tributary 5	3-5	-	133-lf (0.010 ac)	133-lf (0.010 ac)	56-lf (0.003 ac.)
Tributary 6	3-5	124-lf (0.015 ac)	79-lf (0.011 ac)	203-lf (0.026 ac)	-
Tributary 7	3-5	80-lf (0.007 ac)	-	80-lf (0.007 ac)	-
Totals		**489-lf (0.042 ac)**	**774-lf (0.089 ac)**	**1,263-lf (0.131 ac)**	**383-lf (0.046 ac.)**

Source: NRTM for S-48 (Columbia Avenue) Corridor Improvement Project – May 2016 by Mead & Hunt (**Appendix D**)

TABLE 3-4: CHARACTERISTICS AND ANTICIPATED IMPACTS TO PONDS

Pond ID	Figure	Area (ac.)	Anticipated Impact (ac.)
Pond 1	3-4	0.014	-
Pond 2	3-4	0.153	0.025
Pond 3	3-4	0.173	0.157
Pond 4	3-5	0.051	-
Total		**0.391 acre**	**0.182 acre**

Source: NRTM for S-48 (Columbia Avenue) Corridor Improvement Project – May 2016 by Mead & Hunt (**Appendix D**)

3.3.3 HOW WOULD THE PROPOSED IMPACTS BE MITIGATED?

Compensatory mitigation is normally required to offset unavoidable losses of waters of the U.S. The Council on Environmental Quality (CEQ) has defined mitigation in 40 CFR Part 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. Three (3) general types of mitigation include avoidance, minimization and compensatory mitigation.

Avoidance can be achieved through the construction of bridges or by shifting roadway segments to avoid impacts to waterbodies. Impacts can be minimized by increasing roadway fill slopes and/or reducing the length of pipes/culverts within streams. Compensatory mitigation consists usually of the restoration of existing degraded wetlands or waters, or the creation of wetlands/waters of equal or greater value than those to be impacted. This type of mitigation is only undertaken after avoidance and minimization actions are exhausted and should be undertaken, when practicable, in areas near the impact site (i.e., on-site compensatory mitigation). The USACE typically requires compensatory mitigation for any wetland impacts for which a Section 404 permit application is submitted.

It is anticipated that compensatory mitigation for permanent project impacts will be attained through the purchase of mitigation credits from a USACE-approved mitigation bank. Specific mitigation requirements will be established during the Section 404/401 permitting process.

3.4 Water Quality

3.4.1 What Watersheds May Be Impacted?

The proposed project spans two River Basins, as defined by the SC Department of Health and Environmental Control (SCDHEC). Portions of the project situated west of East Boundary Street are located within the Saluda River Basin. The remainder of the PSA is located within the Broad River Basin.

The Saluda River Basin is subdivided into eighteen (18) watersheds, or hydrologic units, within South Carolina. Of these, the western portion of the PSA is located in the Saluda River/Lake Murray Watershed (HUC 03050109-13). Watershed 03050109-13 is located in Newberry, Saluda, Lexington, and Richland Counties and consists primarily of the Saluda River and its tributaries from the Lake Murray headwaters to the dam. Within the PSA, the Saluda River/Lake Murray Watershed encompasses Tributaries 1 through 3, and Ponds 1 and 2.

Within South Carolina, the Broad River Basin is subdivided into 27 watersheds. The eastern portion of the PSA is located in the Broad River/Crane Creek Watershed (HUC 03050106-07). Watershed 03050106-07 is located in Newberry, Fairfield, and Richland Counties and consists primarily of the Broad River and its tributaries from the Parr Shoals dam to its confluence with the Saluda River. Within the PSA, the Broad River/Crane Creek Watershed encompasses Tributaries 4 through 7, Freshwater Wetlands 1 through 3, Ponds 3 and 4.

3.4.2 Are there any existing water quality impairments in the project area?

SCDHEC works with the U.S. Environmental Protection Agency (EPA) to create and revise water quality standards across the state of South Carolina. Water quality standards are established to protect and improve the quality of the surface waters for use as drinking water, wildlife habitat, and recreation uses. To monitor the quality of surface waters, SCDHEC implements and monitors over 1,000 water-quality monitoring stations across the state. Surface water within the limits of the proposed project drains to two (2) of these monitoring stations.

The western portion of the PSA, located within the Saluda River Basin, drains to Station RL-09087. Station RL-09087 is located in the lower section of Lake Murray, approximately seven (7) aerial miles south of the PSA. The eastern portion of the PSA, located within the Broad River Basin, drains to Station B-801. Station B-801 is located on Wateree Creek at S-698 (Wash Lever Road), approximately four (4) aerial miles east of the PSA.

In accordance with Section 303(d) of the 1972 Federal Clean Water Act (CWA), SCDHEC evaluates water bodies identified as impaired for appropriate inclusion on the Section 303(d) list. The 303(d) list is a State list of waters that are not meeting water quality standards or have impaired uses. The 303(d) list targets water bodies that do not meet water quality standards set for the state for water quality management, as well as identifying the cause(s) of the impairment and the designated classifications.

Once a waterbody is included on the 303(d) list of impaired waters, a Total Maximum Daily Load (TMDL) must be developed within two to thirteen (13) years of initial listing. A TMDL is the amount of a single pollutant (e.g., bacteria, nutrients, metals) that can enter a waterbody on a daily basis and still meet water quality standards set forth by the State.

According to SCDHEC's Watershed and Water Quality Information, provided by an online query in March 2016, Station B-801 is impaired based on macroinvertebrate community data (BIO). In addition, a TMDL for fecal

coliform has been established within HUC 03050106, as stated in the Basinwide Watershed Water Quality Assessment Report for the Broad River Basin (SCDHEC, 2007). Station RL-09087 is not impaired for any parameters assessed at the site. Please see **Appendix E** for a copy of the SCDHEC Watershed and Water Quality Information Reports.

3.4.3 Would the Project Directly Impact Water Quality?

Increased pavement would result in an increase in run-off to the surface waters adjacent to the project. This run-off would contain sediments and other contaminants from motor vehicles. During construction activities, temporary siltation may occur in adjacent waters and erosion will be increased. However, the proposed project is not anticipated to contribute to these impairments or have long term impacts on water quality within the project's watersheds.

3.4.4 How Would These Impacts Be Mitigated?

SCDOT will follow the guidance contained in Engineering Directive Memorandum (Number 23), dated March 10, 2009, regarding procedures to be followed in order to ensure compliance with S.C. Code of 72-400, Standards for Stormwater Management and Sediment Reduction. It is recommended that the contractor minimize construction impacts through implementation of construction best management practices, reflecting policies contained in 23 CFR 650 B and S.C. Code of Regulations 72-400. Exposed areas may be stabilized by following SCDOT's Supplemental Technical Specification for Seeding (SCDOT Designation SC-M-810 (11-08).

Due to the existing water quality impairments and approved TMDL within the project watershed, SCDHEC may require additional water quality protection and stormwater treatment measures during and after construction. Specific mitigation requirements for impacts to water quality will be established during the Section 404/401 permitting process.

3.5 What permits are required?

A Clean Water Act Section 404 permit is required for impacts to waters of the U.S., including wetlands. Section 404 is administered by the U.S. Army Corps of Engineers (USACE). Depending on the type and extent of waters of the U.S., including wetlands, to be impacted, Section 404 permitting requirements can range from activities that are considered exempt or preauthorized to those requiring pre-construction notification (PCN) for a Nationwide Permit (NWP) or Individual Permit (IP) from the USACE. For South Carolina Department of Transportation (SCDOT) projects, a USACE General Permit (GP) may be applicable. SCDOT GP's are currently authorized for seven (7) purposes, including Road Widening (SAC 2015-1280), Intersection Improvements (SAC 2015-1281), Bridge Replacements (SAC 2015-1282), Roadway Improvements (SAC 2015-1283), Roadway Maintenance (SAC 2015-1284), Pipes and Culverts (SAC 2015-1285), and Cleaning and Repairing Outfalls and Ditches (SAC 2015-1286).

Based on preliminary design, it is anticipated that an IP would be necessary for the project. During final design, further measures to avoid and minimize impacts; this may reduce impacts to Waters of the U.S. below the threshold of a NWP.

In addition to the Section 404 permit, SCDHEC must grant, deny, or waive a Water Quality Certification (WQC), in accordance with Section 401 of the Clean Water Act. Waters considered by SCDHEC to be sensitive may also

require additional consideration during the 401 WQC process. These include, but are not limited to, Outstanding Resource Waters (ORW), Shellfish Harvesting Waters (SFH), trout waters, areas draining to waters included on the 303(d) list of impaired waters, and areas draining to waters with an approved TMDL. Depending on the type of impairments, extent of the project, and other factors, SCDHEC may require additional water quality protection and stormwater treatment measures during and after construction. Additional information regarding water quality can be found in **Section 3.4 - Water Quality**.

3.6 Protected Species

Protected species are plants and animals that are afforded protection by state and/or federal regulations due to the concern for their long-term survival. The Federal Endangered Species Act (ESA) of 1973, as amended, is the federal regulatory tool that serves to administer permits, implement recovery plans, and monitor protected species. The United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA-NMFS) administer the ESA and establish a list of projected species. Species with the federal classification of Endangered (E) or Threatened (T), or Threatened due to Similarity of Appearance (T [S/A]) are protected under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). In addition to federal regulations, animal species that are on the South Carolina state protected species list receive protection under the South Carolina Nongame and Endangered Species Conservation Act.

Listed animals are protected from being taken and being traded or sold. A “take” is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Listed plants are protected if they are located on federal lands, or if a federal actions are involved, including federal permits. Because of the federal nexus of the proposed project, consultation with USFWS and/or NOAA-NMFS would be required under Section 7 of the ESA, as amended (16 U.S.C. 1531-1534) for actions that “may affect” federally classified endangered and threatened species.

3.6.1 What Species Are Protected in Lexington County?

A search of the USFWS database provided existing information concerning the potential occurrence of threatened or endangered species within Lexington County. This database identifies three (3) federally threatened or endangered species known to occur or to have formerly occurred in Lexington County, as listed in Table 3-5 (USFWS, 2015). Please note: Table 3-5 also includes thirteen (13) At-Risk Species and the bald eagle (*Haliaeetus leucocephalus*). The bald eagle is no longer protected under the ESA, but is afforded protection through the Bald and Golden Eagle Protection Act (BGEPA) of 1940.

The South Carolina Department of Natural Resources (SCDNR) Rare, Threatened and Endangered Species Inventory database, updated June 11, 2014, was also reviewed for information regarding species with state endangered or threatened status. No additional species are currently listed as state threatened or endangered. Environmental scientists performed literature and field reviews to determine the likelihood of protected species within the project area and the potential for project-related impacts. The list of protected species known to occur in Lexington County was reviewed, and field reviews were conducted within the PSA on July 29th through July 31st, 2015 (refer to the Biological Assessment in **Appendix F**). Areas that matched the descriptions of preferred habitat for protected species were classified as protected species habitat and were surveyed for the presence of protected species.

TABLE 3-5: LISTED SPECIES IN LEXINGTON COUNTY

Protected Species		Protection	
Common Name	**Scientific Name**	**Federal**	**State**
Bird Species			
American wood stork	*Mycteria americana*	T	-
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	T
Red-cockaded woodpecker	*Picoides borealis*	E	E
Fish Species			
Americal eel	*Anguilla rostrata*	ARS	-
Blueback herring	*Alosa aestivalis*	ARS	-
Robust redhorse	*Moxostoma robustum*	ARS	-
Mammal Species			
Tri-colored bat	*Perimyotis subflavus*	ARS	-
Mollusk Species			
Savannah Lilliput	*Toxolasma pullus*	ARS	-
Plant Species			
Bog spicebush	*Perimyotis subflavus*	ARS	-
Carolina-birds-in-a-nest	*Macbridea caroliniana*	ARS	-
Ciliate-leaf tickseed	*Coreopsis integrifolia*	ARS	-
Long Beach seedbox	*Ludwigia brevipes*	ARS	-
Smooth coneflower	*Echinacea laevigata*	E	-
Spathulate seedbox	*Ludwigia spathulata*	ARS	-
Wire-leaved dropseed	*Sporobolus teretifolius*	ARS	-
Reptile Species			
Southern hognose snake	*Heterdon simus*	ARS	-
Spotted turtle	*Clemmys guttata*	ARS	-

BGEPA = Bald and Golden Eagle Protection Act, E = Endangered, T = Threatened, ARS = At Risk Species
Source: USFWS, 2016

The SCDNR South Carolina Heritage Trust (SCHT) Geographic Database of Rare and Endangered Species was also reviewed to determine the presence of known populations of protected species within the vicinity of the project. According to the SCHT, no known populations of protected species are located within one (1) of the proposed project.

3.6.2 WILL ANY PROTECTED SPECIES BE IMPACTED BY THE PROJECT?

Based on the literature and field reviews, it is determined that the project will have a biological conclusion of 'no effect' on American wood stork, bald eagle, red-cockaded woodpecker, and smooth coneflower.

At-Risk Species (ARS) do not currently receive legal protection from the ESA; therefore, a biological conclusion for these species is not provided. In the event additional species are listed as federally threatened or

endangered prior to the construction of the project, SCDOT will consult with USFWS on the results of the surveys performed, if necessary, and will follow any USFWS regulations/requirements resulting from that consultation.

3.7 Floodplains

Floodplains are low-lying areas adjacent to rivers, streams, and other waterbodies that are susceptible to inundation during rain events. These areas provide important functions in the natural environment such as providing storage for flood waters, protecting the surrounding environment from erosion, and providing habitat for wildlife. As such, agencies are required to take actions that reduce the risk of impacts to floodplains and their associated floodway, or main channel of flow.

Floodplain and floodway protection is required under several federal, state, and local laws, including Executive Order 11988, entitled "Floodplain Management," which requires federal agencies to avoid making modifications to and supporting development in floodplains wherever practical. Floodplains subject to inundation by the one-percent-annual-chance (100-year) flood event are regulated by the Federal Emergency Management Agency (FEMA).

FEMA publishes maps which depict areas of regulated floodplains and floodways. The Flood Insurance Rate Map (FIRM) is the most common of these flood maps. The location of the proposed project is found on FIRM Map Number 45063C0040 G, effective 02/09/2000.

According to this FIRM mapping, the Preferred Alternative will not cross or encroach on FEMA-regulated floodplains; therefore, no impacts to regulated floodplains are necessary to complete the project.

3.8 Air Quality

The proposed project was evaluated for consistency with state and federal air quality goals and was found to be in compliance with regulatory standards. The following provides details regarding the analysis and findings.

3.8.1 What Air Quality Pollutants are Analyzed?

The US Environmental Protection Agency (USEPA) is responsible for enforcing the Clean Air Act (CAA) and setting National Ambient Air Quality Standards (NAAQS) for pollutants and air toxics considered harmful to public health and the environment. In South Carolina, the SCDHEC is responsible for implementation of the CAA and ensures compliance with NAAQS.

The CAA and its amendments require that air quality in every state meet health-based NAAQS. The NAAQS have been established for six (6) air pollutants, referred to as "criteria" pollutants. These include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), particulate matter (PM10 and PM2.5), ozone (O3) and sulfur dioxide (SO2).

Geographic areas of the state are monitored and compared to the standards set forth by the NAAQS. Based on the findings, each area is given a designation. The designation of an area is made on a pollutant-by-pollutant basis. The EPA's current designations are shown in Table 3-6.

TABLE 3-6: ATTAINMENT CLASSIFICATIONS AND DEFINITIONS

Attainment	Unclassified	Maintenance	Nonattainment
Area is in compliance with the NAAQS.	Area has insufficient data to make determination and are treated as being in attainment.	Area once classified as nonattainment but has since demonstrated attainment of the NAAQS.	Area is not in compliance with the NAAQS.

Source: USEPA, 2010

In nonattainment areas, regional goals for achieving attainment of the NAAQS are developed by the SCDHEC and documented in the State Implementation Plan (SIP). The SCDHEC must also continue to revise the SIP to ensure that the standards are attained and maintained. The only nonattainment area in South Carolina is York County, which is part of the Charlotte-Gastonia-Rock Hill-NC-SC nonattainment area for the 2008 Ozone NAAQS.

Lexington County is currently in attainment for all "criteria" pollutants; therefore, transportation control measures (TCMs) are not required to maintain the area's air quality. The proposed project is not anticipated to create any adverse effects on the air quality of this attainment area.

3.8.2 WHAT OTHER AIR QUALITY CONCERNS WERE CONSIDERED?

In addition to the criteria pollutants, USEPA also regulates air toxics. Most air toxics originate from human made sources such as highway vehicles, airplanes, factories, or refineries. However, USEPA did not establish NAAQS for air toxics.

The EPA has assessed a list of 188 air toxics and identified a group of 93 compounds emitted from mobile sources, known as Mobile Source Air Toxics (MSATs). Some MSATs 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.

In addition, EPA identified seven (7) compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA). These are acrolein, benzene, formaldehyde, 1,3-butadiene, diesel exhaust (DE), naphthalene, and polycyclic organic matter (POM). While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

On October 18, 2016, the FHWA issued a revised interim guidance update regarding MSAT in a NEPA analysis to include the EPA Motor Vehicle Emissions Simulator (MOVES) emission model along with updated research on air toxic emissions from mobile sources. The guidance includes three categories and criteria for analyzing MSATs in NEPA documents:

1. No meaningful MSAT effects,
2. Low potential MSAT effects, and
3. High potential MSAT effects.

A qualitative analysis is recommended for projects that meet the low potential MSAT effects criteria while a quantitative analysis is recommended for projects with a higher potential for MSAT effects criteria. This project was analyzed as a Tier 2 project. Tier 2 projects are described as those that serve to improve operations without adding substantial new capacity or without creating a facility that is likely to significantly increase emissions, and design year traffic is projected to be less than 140,000 to 150,000 AADT.

For each alternative in this EA, the amount of MSAT emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. As shown in Table 3-7, the VMT estimated for each of the build alternatives is slightly higher than that for the No-Build Alternative, because the additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. This increase in VMT would lead to higher MSAT emissions for the Preferred Alternative along the widened portion of Columbia Avenue, along with a corresponding decrease in MSAT emissions due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Because the estimated VMT under each of the alternatives are nearly the same (less than 10% variance), it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives.

TABLE 3-7: VEHICLE MILES TRAVELED

	No-Build	Alternative 9	Alternative 9A (Preferred)	Alternative 18	Alternative 18A	Alternative 25
Daily VMT – 2040	38,900	42,200	41,200	42,400	41,000	38,900
Annual VMT – 2040	14,198,500	15,403,000	15,038,000	15,476,000	14,965,000	14,198,500
Variance to No-Build	8.48%	5.91%	9.00%	5.40%	0.00%	8.48%

Source: S-48 (Columbia Avenue) Corridor Improvement Project – Alternative Selection – April 2015 by AECOM (**Appendix A**)

Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

The additional travel lanes contemplated as part of the build 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 for the Preferred Alternative would likely be most pronounced along the widened portion of Columbia Avenue, west of Woodthrush Road, where development density is greatest. However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, when a highway is widened, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No-Build Alternative, but this could be offset due to

increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. 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.

3.8.3 Incomplete or Unavailable Information

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the CAA and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects."[16] Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by the Health Effect Institute (HEI)[17]. As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in

[16] U.S. Environmental Protection Agency, *Integrated Risk Information System*, http://www.epa.gov/iris

[17] The Health Effects Institute, *Mobile-Source Air Toxics: A critical review of the literature on exposure and health effects*, http://pubs.healtheffects.org/getfile.php?u=395, November 2007

particular for diesel PM. EPA[18] and HEI[19] have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the CAA to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than one in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than one in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

3.8.4 Greenhouse Gas Emissions and Climate Change

Greenhouse gases (GHGs) are those that trap heat in the atmosphere of the Earth, and include carbon dioxide, methane, nitrous oxide, and fluorinated gases.[20] According to the U.S. Environmental Protection Agency (USEPA), the most common of the GHGs is carbon dioxide (CO_2), which accounted for almost 81% of all U.S. GHG emissions due to human activities in 2014. The combustion of fossil fuels, land use changes, as well as some industrial processes are the main emission generators of greenhouse gases.[21] In 2014, the transportation sector was responsible for almost 27% of the CO_2 emissions in the US.[22] Because GHGs trap heat in the

[18] U.S. Environmental Protection Agency, *Basic Information – Risk Assessment Portal*, http://www.epa.gov/risk/basicinformation.htm#g, July 31, 2012

[19] The Health Effects Institute, Mobile-Source Air Toxics: A critical review of the literature on exposure and health effects, http://pubs.healtheffects.org/getfile.php?u=395, November 2007

[20] USEPA, "GHG Overview," https://www.epa.gov/ghgemissions/overview-greenhouse-gases. (Last accessed 11/28/16).

[21] Ibid.

[22] USEPA, "Greenhouse Gas Inventory Data Explorer," https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/#allsectors/allgas/econsect/current. (Last accessed 11/28/16).

atmosphere, the outcome has been a warming of the Earth's temperature, which has led to a change in the climate of the Earth, resulting in more extreme weather events, melting of glaciers, and sea level rise.[23]

On August 2, 2016, the Council on Environmental Quality (CEQ) issued *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*. While this guidance does not legally require agencies to mitigate for impacts to the climate due to GHG emissions, it does direct agencies to disclose the potential amounts of GHG being released due to the agency's action, as well as the agency's influence on climate change.

3.8.4.1 GHG Analysis

For this project, the operations, fuel cycle, and construction/maintenance emissions were estimated. A GHG Analysis was completed for the No-build Alternative and the Reasonable Alternatives, and included the emissions from constructions, operations, and fuel cycle. Operations and fuel cycle emissions were determined for the No-build, Reasonable, and Preferred Alternatives using lookup tables from the Motor Vehicle Emission Simulator (MOVES2014a) provided by the FHWA. The assumptions used for this analysis can be found in **Appendix G**. The results of the analysis are shown below in Table 3-8. The amount of CO2e emitted would be expected to decrease with the advent of better technologies between now and 2040, as noted in the table.

Table 3-8: Estimated GHG Operations and Fuel Cycle Emissions, CO2e

Year	Metric Tons of CO2e/year
2015 Existing Condition	7,468
2040 No Build Alt	6,783
2040 Reasonable Alt 9	9,002
2040 Preferred Alt 9A	8,939
2040 Reasonable Alt 18	8,939
2040 Reasonable Alt 18A	8,780
2040 Reasonable Alt 25	6,783

To determine the construction and maintenance emissions over the lifespan of the project, the FHWA's Infrastructure Carbon Estimator (ICE) Tool was used. The ICE Tool can be used to create estimates of energy usage and GHG emissions for a life-cycle of a project, including construction/rehabilitation and routine maintenance. However, it should be noted that this tool is not appropriate to inform engineering analysis and pavement selection.[24] The assumptions used for the ICE Tool are included in **Appendix G**. The results below in the tables include both annualized energy use (Table 3-9) and annual GHG emissions (Table 3-10), per year over the 25-year analysis cycle (2042), and include both unmitigated and mitigated scenarios.

[23] USEPA, "Climate Change Basic Information," https://www.epa.gov/climatechange/climate-change-basic-information. (Last accessed 11/28/16).
[24] FHWA, "Infrastructure Carbon Estimator Final Report and User's Guide," September 2014, https://www.fhwa.dot.gov/environment/climate_change/mitigation/tools/carbon_estimator/users_guide/page00.cfm. (Last accessed 11/28/16.)

TABLE 3-9: ANNUALIZED ENERGY USE (MMBTUS), PER YEAR OVER 25 YEARS

	Unmitigated						Mitigated					
	Roadway – New Construction	Roadway-Rehabilitation	Roadway - Total	Bridges	Rail, Bus, Bicycle, and Pedestrian	Total	Roadway – New Construction	Roadway-Rehabilitation	Roadway - Total	Bridges	Rail, Bus, Bicycle, and Pedestrian	Total
Upstream Energy												
Materials	2,396	719	3,115	65	163	**3,343**	2,396	600	2,996	65	163	**3,224**
Direct Energy												
Construction Equipment	892	84	976	170	31	**1,177**	892	70	962	-	31	**993**
Routine Maintenance						**126**						**126**
Total	**3,288**	**803**	**4,091**	**235**	**194**	**4,646**	**3,288**	**670**	**3,958**	**65**	**194**	**4,343**

TABLE 3-10: ANNUAL GHG EMISSIONS (MT CO2E), PER YEAR OVER 25 YEARS

	Unmitigated						Mitigated					
	Roadway – New Construction	Roadway-Rehabilitation	Roadway - Total	Bridges	Rail, Bus, Bicycle, and Pedestrian	Total	Roadway – New Construction	Roadway-Rehabilitation	Roadway - Total	Bridges	Rail, Bus, Bicycle, and Pedestrian	Total
Upstream Emissions												
Materials	152	41	193	6	9	**208**	152	35	187	6	9	**202**
Direct Emissions												
Construction Equipment	65	6	71	1	2	**74**	65	5	70	1	2	**73**
Routine Maintenance						**9**						**9**
Total	**217**	**47**	**264**	**7**	**11**	**291**	**217**	**40**	**257**	**7**	**11**	**284**

3.8.4.2 Climate Change's Impact on the Proposed Project

Climate change is not likely to impact the proposed project, as it is not located in a coastal area or in a floodplain area that would be susceptible to sea level rise. Thus, no resiliency measures have been incorporated into the Preferred Alternative at this time.

3.8.5 Air Quality Summary

The proposed project was evaluated for consistency with state and federal air quality goals and was found to be in compliance with regulatory standards and consistent with the SIP.

Lexington County is currently in attainment for all "criteria" pollutants; therefore, transportation control measures (TCMs) are not required to maintain the area's air quality. The proposed project is not anticipated to create any adverse effects on the air quality of this attainment area.

The proposed project would be classified as a Tier 2 project with Low Potential MSAT Effects. Therefore, this project required a qualitative analysis of MSAT emissions relative to the Build Alternative. Based on this analysis, it is anticipated that the project will have no appreciable impact on regional MSAT levels. It is acknowledged that the project may result in increased exposure to MSAT emissions in certain locations. Additionally, climate change is not likely to impact the proposed project.

3.9 Cultural Resources

Cultural resources may include archeological sites, historic buildings and structures, battlefields, and any site that may be deemed historically significant. Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, requires federal agencies to consider the effects of their actions on historic properties that are determined to be eligible for the National Register of Historic Places (NRHP). The NRHP defines eligible cultural resources as buildings, structures, objects, sites, and districts that have integrity of location, design, setting, materials, workmanship, feeling, and association. A resource may be eligible for the NRHP under one (1) or more of the following criteria.

- Criterion A: Association with events that have significantly contributed to the broad patterns of history;
- Criterion B: Association with persons significant in the past;
- Criterion C: Possession of the distinctive characteristics of a type, period, or method of construction; exemplification of the work of a master architect, engineer, or artist; embodiment of high artistic values; or evidence of a significant and discernible entity whose components may lack distinction on their own; and
- Criterion D: Ability to yield information significant to prehistory or history.

3.9.1 How Were Cultural Resources Identified?

A cultural resources survey of the project corridor was completed to identify significant archaeological and historic architectural resources in its Area of Potential Effect (APE). The findings of this survey were documented in the *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements*[25] and the *Addendum: Cultural*

[25] New South Associates, Inc., *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements*, September 28, 2016

Resources Survey of S-48 (Columbia Avenue) Improvements[26]. A copy of these documents in included in **Appendix H**.

The APE includes areas of new right-of-way, which could be directly impacted, as well as areas within visual or auditory effect, typically 300 feet beyond the right-of-way. For the archaeological survey, all areas of direct effect were examined, including new and existing right-of-way along the Project Corridor. For the historic architectural resources survey, the entire APE was examined.

Background research was conducted prior to field surveys. This research did not indicate any previously recorded archaeological resources inside the project APE. One recorded historic architectural resource, U/63/0089, representing a twentieth-century church, is in the project's APE. This resource was previously determined not eligible for the NRHP. The SHPO also determined that a historic district, the Chapin Commercial Historic District, is eligible for inclusion on the NRHP. This district is eligible for listing at the local level of significance in the area for commerce (Criterion A). The Chapin Commercial Historic District incorporates a collection of nine (9) buildings with frontage on Clark Street, Beaufort Street, Lexington Avenue, and Chapin Road.

3.9.2 What Cultural Resources Were Identified During Surveys?

The archaeological survey identified two sites. Site 38LX661 comprises the archaeological component of a 1930s house with outbuildings. Site 38LX662 contains a twentieth-century barnyard with agricultural structures. Both sites are recommended not eligible for the NRHP and do not warrant further preservation.

The historic architectural surveys recorded and evaluated a total of 44 resources. Nine (9) of these resources may contribute to the Chapin Commercial Historic District, and were therefore recommended to be eligible for the NRHP. Two resources were recommended eligible for the NRHP. These include the Mt. Horeb Lutheran Cemetery (U/63/0891) and a circa 1892 Folk Victorian style cottage (U/63/0953). The Mt. Horeb Lutheran Cemetery is twentieth-century burial ground, located on Columbia Avenue, associated with the Mt. Horeb Lutheran Church. This resource was recommended eligible for the NRHP due to its local significance (Criterion A) and a stone wall along its street-side suggests architectural significance (Criterion C). Resource U/63/0953 is a currently vacant structure located along Columbia Avenue and is recommended as eligible for inclusion on the NRHP under Criterion C for architecture on the local level of significance

The other 33 of the 44 resources lack qualities of significance that would qualify them for NRHP listing under Criteria A, B, or C. Additionally, most have been altered in ways that detract from their historical appearance and use, and they generally lack aspects of integrity. These 33 resources therefore do not require further preservation.

3.9.3 Would the Project Impact Any Cultural Resources?

Minor roadway improvements would be necessary along Lexington Avenue, which dissects the Chapin Commercial Historic District. These improvements would take place within the existing SCDOT right-of-way and are limited to resurfacing and restriping; therefore, there would be no effect to the historic district. Furthermore,

[26] New South Associates, Inc., Addendum: *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements*, October 17, 2016

no architectural resources within the district will be impacted; therefore, the project would not have an adverse effect on these NRHP eligible resources.

Neither the Mt. Horeb Lutheran Cemetery (U/63/0891) nor Resource U/63/0953 would be impacted by the proposed project. No right-of-way would be acquired from these properties and no construction would take place beyond the existing SCDOT right-of-way. Additionally, SCDOT archaeological staff will monitor construction activities adjacent to the Mt. Horeb Lutheran Cemetery (U/63/0891) to ensure that no unmarked burials or other archaeological resources are impacted.

These findings, opinions, and avoidance measures were coordinated with SHPO, the Catawba Indian Nation Tribal Historic Preservation Office (CIN-THPO), the Eastern Band of the Cherokee Indians (EBCI), and the United Keetoowah Band of Cherokee Indians (UKBCI). Concurrence documents received from SHPO and CIN-THPO are included in **Appendix H**. No response was received from the EBCI or the UKBCI.

The contractor and subcontractors will notify their workers to watch for the presence of any prehistoric or historic remains, including but not limited to arrowheads, pottery, ceramics, flakes, bones, graves, gravestones, or brick concentrations during the construction phase of the project, if any such remains are encountered, the Resident Construction Engineer (RCE) will be immediately notified and all work in the vicinity of the discovered materials and site work shall cease until the SCDOT Archaeologist directs otherwise.

3.10 Section 4(f) and Section 6(f) Resources

Section 4(f) of the Department of Transportation Act of 1966 requires that no publicly-owned lands may be used without first examining all practical measures to avoid such use. This protection extends to publicly-owned parks, recreational lands, wildlife and waterfowl refuges, and historic sites that are on or eligible for the National Register of Historic Places (NRHP).

The Land and Water Conservation Fund Act (LWCFA) of 1965, as amended, allows state and local governments to obtain grants for acquiring or improving parks and recreation areas. Section 6(f) of this Act prohibits the conversion of property acquired or developed with these grants to a non-recreational purpose without the approval of the Department of the Interior's National Park Service (NPS).

3.10.1 What Section 4(f) and Section 6(f) Resources are Located in the Study Area?

No public parks, recreations lands, wildlife and waterfowl refuges, or LWCFA funding areas are located within the project study area.

Historic properties are considered a Section 4(f) resource if they are eligible for or listed on the NRHP. A total of ten (10) resources were identified and were recommended eligible for the NRHP; therefore, each of these resources is considered a Section 4(f) resource. The Chapin Commercial Historic District is also a Section 4(f) resource based on its NRHP eligibility. No other Section 4(f) or Section 6(f) resources have been identified in the study area.

3.10.2 Would Any Section 4(f) and Section 6(f) Resources be Impacted by the Project?

Measures have been incorporated into the project's planning and design to avoid impacts to Section (4) resources. No Section 6(f) resources are located within the project area; therefore, no Section 4(f) or Section 6(f) resources would be impacted by the proposed project.

3.11 Wild and Scenic Rivers

The Wild and Scenic Rivers Act (16 U.S.C. 1271-1287) of 1968 requires that selected rivers which possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, be preserved in free-flowing condition, and that they and their immediate environments be protected.

There are no designated Wild and Scenic Rivers; streams on the Nationwide Rivers Inventory or their tributaries; or unique or important aquatic habitats within or near to the Project Corridor. Therefore, evaluation under the Wild and Scenic Rivers Act is not required for the proposed project.

3.12 Hazardous Waste and Material Sites

Hazardous waste and material sites are regulated by the Resource Conservation and Recovery Act (RCRA), as amended, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, and the Superfund Amendments and Reauthorization Act of 1986 (SARA). Potential hazardous material sites include landfills, dumps, pits, lagoons, salvage yards, and industrial sites, as well as above and below ground storage tanks.

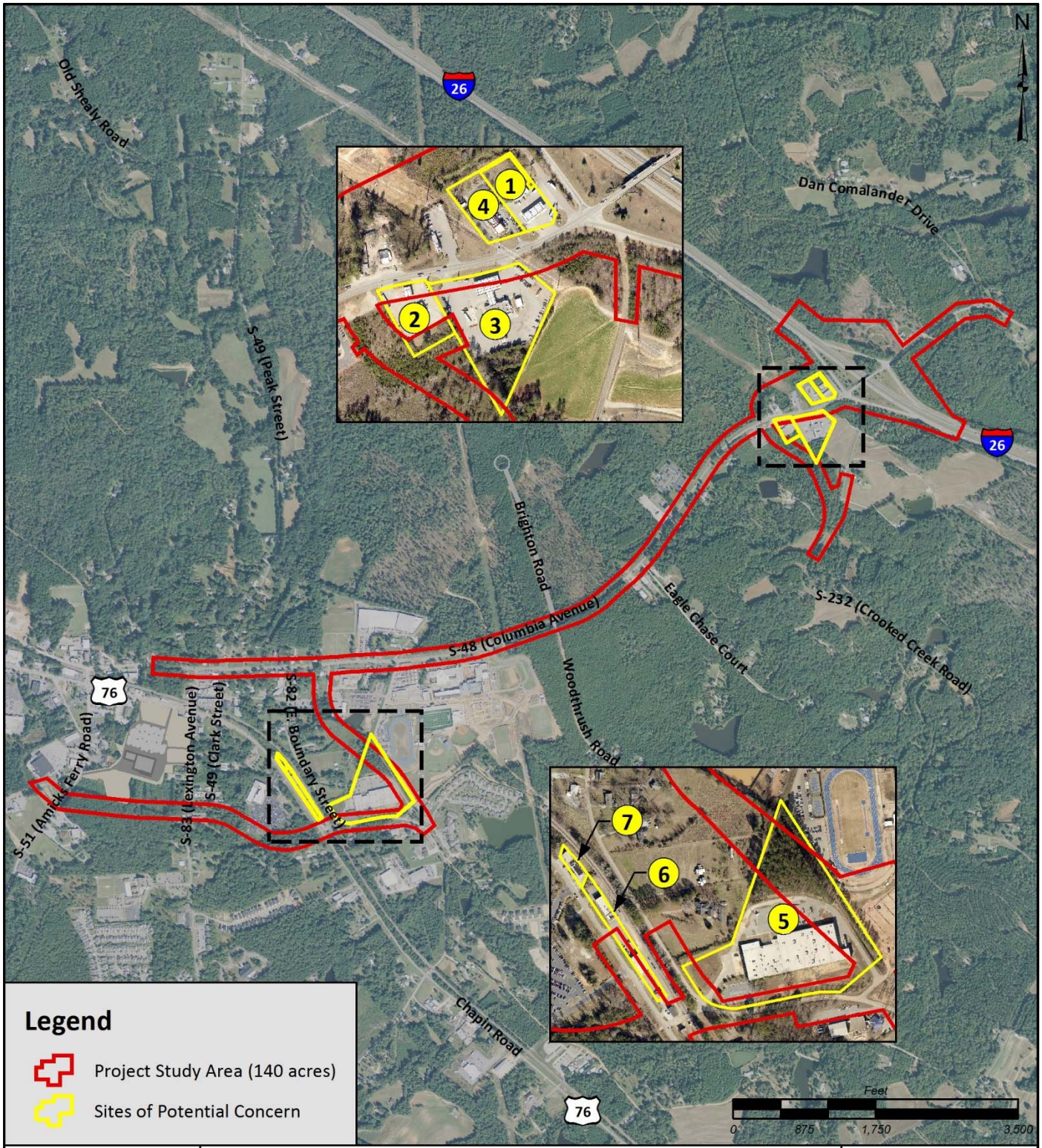
Service/gas stations are one of the most common generators of potential hazardous material sites. As older underground storage tanks (USTs) deteriorate, they pose a threat to leak and contaminate surrounding soil and groundwater with gasoline and other petroleum products. The SCDHEC maintains a database of these potential contamination sites and regulates activities associated with the monitoring and/or remediation of a leaking underground storage tank (LUST). The SCDHEC may also issue a letter of "no further action" for sites that no longer show evidence of contaminants present at the site or that have been remediated in accordance with applicable laws.

A Phase 1 Environmental Site Assessment (ESA) was conducted using the American Society for Testing and Materials (ASTM) E 1527-13, Standard Practice for Environmental Site Assessments: Phase I ESA Process. The purpose of the Phase I ESA is to identify, pursuant to ASTM E 1527-13, *recognized environmental conditions* (RECs) in connection with the proposed project's study area. ASTM defines the term *recognized environmental condition* as the presence or likely presence of hazardous substances or petroleum products on the property under conditions that are indicative of an existing release, a past release, or a material threat of a release of hazardous substances or petroleum products into the structures on the property or into the ground, groundwater, or surface water of the site.

3.12.1 Are There Any Potentially Contaminated Sites Located Within the Study Area?

Five (5) sites within the project study area were identified in the Phase I ESA as sites of potential environmental concern. Two (2) additional sites, located outside the project study area, were also documented in the Phase I ESA (**Appendix I**). Each site is depicted on **Figure 3-6**, and included in Table 3-11.

FIGURE 3-6: HAZARDOUS WASTE AND MATERIALS SITES



Of the seven (7) potential contamination sites, three (3) represent RECs and it is recommended that the portions of the Project Corridor located adjacent to these sites be evaluated for subsurface contamination.

TABLE 3-11: SITES OF POTENTIAL ENVIRONMENTAL CONCERN

Site	Facility Name / Location	Potential Concern	Status	Area of Property Necessary
1	Corner Pantry 132 (661 Columbia Ave.)	Leaking Underground Storage Tank / Groundwater Contamination	REC / Conduct Assessment	0.07 acre
2	Pitt Stop 7 (648 Columbia Ave.)	Leaking Underground Storage Tank	REC / Awaiting Funding	0.06 acre
3	Rainbow Gas Garden 12 (650 Columbia Ave.)	Spill of 20 gallons of diesel fuel	Not a REC	0.02 acre
4	Fuel Tank (659 Columbia Ave.)	Spill of 15 gallons of gasoline	Not a REC	-
5	Signode Packaging (300 East Boundary St.)	Multiple Databases, including SHWS (equivalent of a state Superfund facility)	REC / Conduct Assessment	3.27 acres
6	Union Concrete Plant (912 Chapin Rd.)	Leaking Underground Storage Tank	Not a REC	-
7	S&S Garage (930 Chapin Rd.)	Leaking Underground Storage Tank	Not a REC	-

Source: Phase I ESA for Columbia Avenue (S-48) Corridor Improvements – May 2016 by Mead & Hunt (**Appendix I**)

3.12.2 WOULD THE PREFERRED ALTERNATIVE IMPACT POTENTIALLY CONTAMINATED SITES?

The Preferred Alternative would require the acquisition of property identified as sites of environmental concern and/or potentially contaminated sites, as included in Table 3-11. Construction activities within contaminated sites have the potential for construction workers to come into contact with contaminated soils, and can pose health risks. Further assessment of sites directly impacted by the project may be warranted during the development of the project's final design.

It is the SCDOT's policy to avoid the acquisition of underground storage tanks and other hazardous materials, if possible. If avoidance is not a viable alternative, tanks and other hazardous materials will be tested and removed and/or treated in accordance with the USEPA and SCDHEC requirements. Cost of necessary remedial actions would be considered during the right-of-way appraisal and acquisition process.

3.13 TRAFFIC NOISE ANALYSIS

Traffic noise is unwanted or excessive sound produced by vehicles travelling on roadways. Many factors can affect traffic noise, including the proximity of the traffic to adjacent development, the volume of traffic, the number of trucks, and the condition of the roadway.

In accordance with 23 CFR 772, and as implemented by SCDOT's Traffic Noise Abatement Policy (September, 2014), a traffic noise analysis is required for proposed transportation projects that will construct a highway on new location or physically alter an existing highway, which will significantly change either the horizontal or vertical alignment of the road or increase the number of through-traffic lanes.

3.13.1 How is Traffic Noise Determined?

The intensity of noise is expressed in units of decibels (dB). Because the sensitivity of human hearing varies with frequency, a weighting unit of measure is commonly used that places a greater emphasis on the human range of hearing. This unit of measure is referred to as the weighted-A decibel, or dBA. For someone with normal hearing, a change of three (3) dBA in sound level is barely detectable. A five (5) dBA change is a "noticeable" change, and a ten (10) dBA increase is typically perceived as a doubling in the loudness.

The FHWA Traffic Noise Model (TNM version 2.5) was used to calculate existing noise levels and predict future design year noise levels. To ensure the model is accurate, existing noise measurements were taken in the vicinity of the project and compared to the TNM. Existing noise measurements were taken at seven (7) monitoring sites, as shown on **Figure 3-7**. If results from the TNM are within three (3) dBA of the measurements collected in the field, the model is considered valid to calculate noise levels for the proposed project.

For the Columbia Avenue project, the difference between the calculated and field measured noise levels was three (3) dBA or less at six (6) of the seven (7) sites measured. Site 7 did not provide an acceptable dBA difference between the noise model and field-collected noise level. This may be attributed to deteriorating weather conditions during the field measurements, including high wind gusts. However, Site 6 compares to Site 7 in road geometry, traffic conditions, distance from the roadway, and calculated noise levels. Site 6 existing noise measures slightly higher than Site 7 due to higher traffic volumes. Therefore, it can be assumed that the model provided in TNM for the project area around Site 7 is sound and accurate, and that the substantial difference between the field-measured dBA and the modeled dBA is due to the weather conditions at the time of the measurements.

3.13.2 How is a Traffic Noise Impact Predicted?

Pursuant to 23 CFR Part 772 and SCDOT's Traffic Noise Abatement Policy, a traffic noise impact occurs when either:

1) The predicted highway traffic noise levels approach, meaning within one (1) dBA, or exceed the noise abatement criteria (NAC) for the applicable activity category shown in Table 3-12.
2) The predicted highway traffic noise levels substantially exceed existing highway traffic noise levels by greater than, or equal to, fifteen (15) decibels (dBA).

TABLE 3-12: NOISE ABATEMENT CRITERIA (NAC)

Activity Category	Activity Leq(h)	Evaluation Location	Activity Description
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	Residential
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	-	-	Undeveloped lands that are not permitted.

Source: FHWA, 23 Part 772

3.13.3 ARE TRAFFIC NOISE IMPACTS PREDICTED?

The noise assessment indicates that seven (7) receptors are impacted by noise in the existing condition. A total of 24 receptors would be impacted in the No-Build Alternative for the design year (2040), as shown in Table 3-13. These include thirteen (13) residential properties, Christ's Church and House of Prayer, Mt. Horeb Lutheran Church (8 receptors), and the Mt. Horeb Lutheran Cemetery.

Impacts among Reasonable Alternatives ranged between 20 and 29 impacted receivers, based on the various alternatives analyzed, as shown in Table 3-13. Specifically, the Preferred Alternative would impact 23 of the 309 receivers modeled for the design year (2040). The majority of these impacts are as a result of approaching or exceeding the NAC for the category shown in Table 3-12. Only one (1) impact for the design year (2040) Preferred Alternative was a result of a substantial increase, as defined in the SCDOT Noise Policy.

The No-Build Alternative and the Preferred Alternative would result in impacts to receptors 13, 14 ,15, 75, 83, 95, 98, 101, 106, 107, 109, and 112. The Preferred Alternative would impact three (3) additional residential receptors not impacted by the 2040 No-Build Alternative. Two (2) of these receptors, 108 and 130, would approach or exceed the NAC for Category B. These properties are identified as 242 Columbia Avenue and 1201 Crooked Creek Road. The property located at 322 Clark Street (receptor 17) would by impacted as the result of a substantial increase in noise. **Figure 3-7** depicts the location of each receptor impacted by the Preferred Alternative. Please refer to the Traffic Noise Analysis[27] in **Appendix J** for complete details.

[27] AECOM, *Traffic Noise Analysis for the Columbia Avenue Project (S-48), Lexington County, South Carolina*, September 2016

FIGURE 3-7: TRAFFIC NOISE IMPACTS

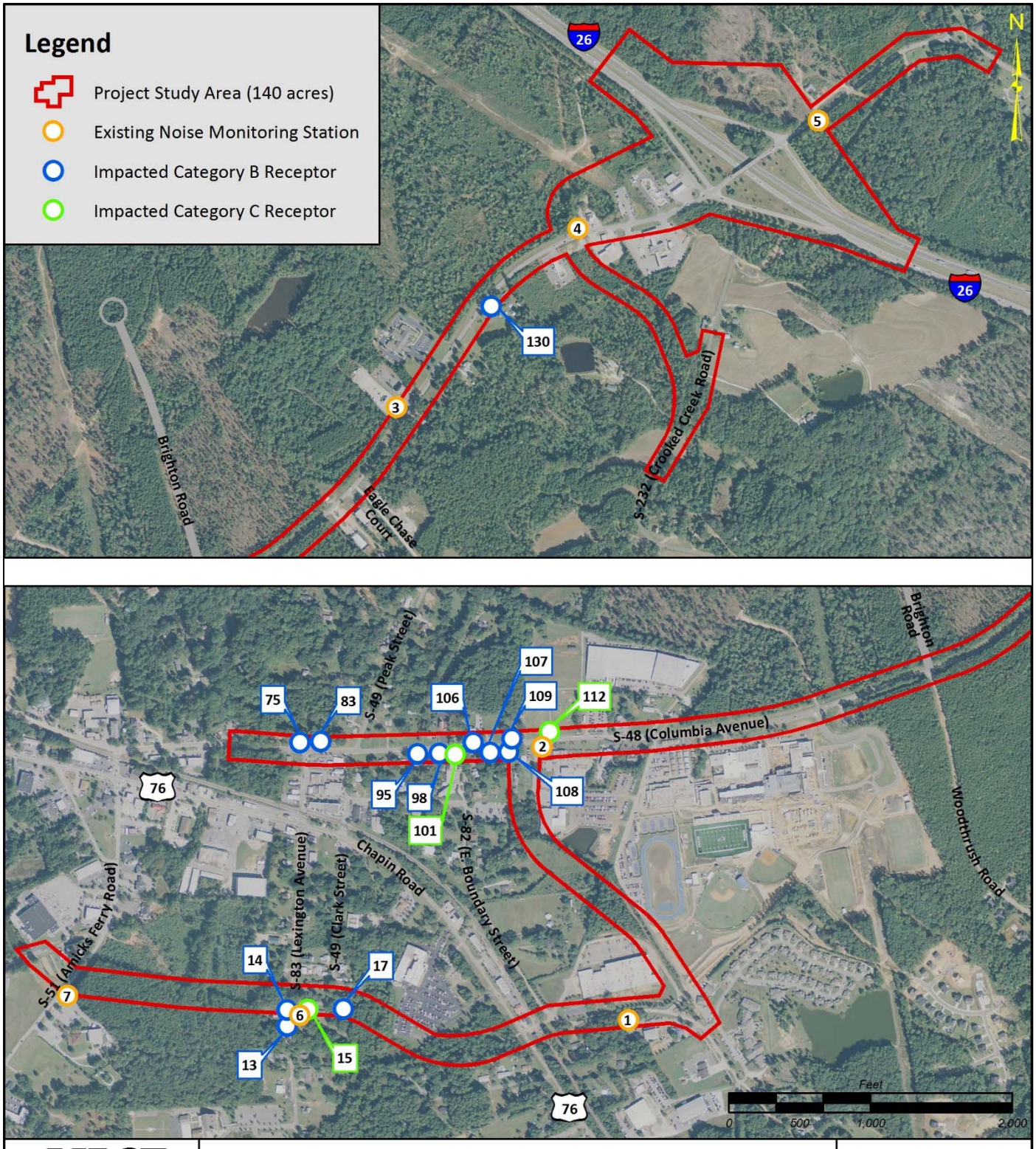


TABLE 3-13: TRAFFIC NOISE IMPACTS

Alternative	Number of Receptors	Number of Impacted Receivers Approaching or Exceeding NAC Threshold							Substantial Noise Level Increase	Both Types of Impact	Total Impacts
		A	B	C	D	E	F	G			
2015 Existing Conditions	360	0	6	1	0	0	0	0	N/A	0	7
2040 No-Build Alternative	360	0	13	11	0	0	0	0	0	0	24
Alternative 9	279	0	15	11	0	0	0	0	1	0	27
Alternative 9A (Preferred)	309	0	11	11	0	0	0	0	1	0	23
Alternative 18	296	0	18	11	0	0	0	0	0	0	29
Alternative 18A	327	0	14	11	0	0	0	0	0	0	25
Alternative 25	235	0	11	9	0	0	0	0	0	0	20

Source: Traffic Noise Analysis Report for the Columbia Avenue Project (S-48) – November 2016 by AECOM (**Appendix J**)

3.13.4 COULD TRAFFIC NOISE IMPACTS BE MITIGATED?

If traffic noise impacts are predicted, the FHWA and SCDOT require that feasible and reasonable noise abatement measures be considered and evaluated for each Build Alternative. For this assessment, acoustic feasibility means that a noise reduction of at least 5 dBA must be achieved for 75% of impacted receivers. Seven (7) engineering and design considerations must also be achieved to meet the engineering feasibility criteria. These considerations include topography, safety, drainage, utilities, maintenance, access, and wall height. Reasonableness is the consideration as to whether noise abatement measures should be implemented.

Noise abatement measures were evaluated for the project but were found not to be acoustically feasible since it would not provide at least a 5 dBA noise reduction to impacted receivers. This is due to the number of required access breaks to residents and businesses directly from the Columbia Avenue. Providing noise barriers between the access points would most likely prove to be ineffective due to the frequent breaks the barriers would be required to maintain. As a general rule, an opening of 40 feet in a 400-foot wall will make the wall ineffective.

Therefore, additional detailed study of potential mitigation measures shall not be necessary subsequent to selection of the final design of this project unless modifications to presently considered alignments occur, additional alignments are considered, or changes to Design Year 2040 traffic volumes are predicted. This analysis completes the traffic noise requirements of the Title 23 CFR Part 772 and SCDOT Traffic Noise Abatement Policy. SCDOT will inform local planning officials of future, generalized noise levels expected to occur in the project vicinity after FHWA has made a final decision on the Environmental document.

3.13.5 WILL THERE BE TEMPORARY NOISE IMPACTS DURING CONSTRUCTION?

The major construction elements of this project are expected to be earth removal, hauling, grading, paving, and pile driving. General construction noise impacts, such as temporary speech interference for passers-by and those individuals living or working near the project, can be expected during construction. However, considering the relatively short-term nature of construction noise and the likely limitation of construction to daytime hours, these impacts are not expected to be substantial. The contractor would be required to comply with applicable local noise ordinances and Occupational Safety and Health Administration (OSHA) regulations concerning noise attenuation devices on construction equipment.

3.14 Social and Economic

Transportation projects, even when minor, have the potential to effect community cohesiveness, community gathering places, community centers, schools, or other local facilities. These potential effects may be considered a social and/or economic impact.

Lexington County is located in the central portion of South Carolina and the sixth-most populated county in the state. As discussed in **Section 3.1 - Land Use**, Lexington County has approximately 282,000 residents and has nearly doubled in population since 1980. Lexington County also saw a 25 percent increase in population between 2000 and 2010. The state of South Carolina, in comparison, saw a fifteen (15) percent increase during this same period. The County is expected to have 333,200 residents by 2030. [28]

3.14.1 What are the Employment Characteristics of the Area?

Total unemployment in Lexington County is 4.8%, lower than both South Carolina (6.0%) and the United States (5.3%). The top employment sectors in Lexington County are Retail Trade (14.1%) and Health Care/Social Assistance (13.8%). [29]

Specifically, the proposed project is located in the Town of Chapin, South Carolina. Once rural, this town of 1,500 has become a suburb of Columbia, approximately 25 miles southeast of the project. Most employers in Chapin are small offices, restaurants, and commercial providers. One large office is located west of Chapin Road, immediately north of the proposed project. According to the company's website, the company employs over 1,200 people and is headquartered in Chapin. The company's facility in Chapin include approximately 65,000 square feet of office space on 14.7 acres of land and parking for approximately 450 vehicles.

The project would require a minor amount of right-of-way from this property, totaling approximately 1.4 acres. The new roadway proposed by the project would extend along the southern portion of the property and would require the acquisition of approximately seventeen (17) parking spaces. No buildings or other structures on the property would be impacted. Existing access to the property would be maintained. Additionally, the new roadway would provide employees an alternate route to work and may provide a third access from the rear of the property.

3.14.2 What Community Facilities are Near the Project?

A variety of community facilities are found within the project study area. The majority of these are located along Amick's Ferry Road, Lexington Avenue, Chapin Road, and Columbia Avenue and include Our Lady of the Lake Catholic Church, Food Lion grocery store, Lakeside Dentistry, First Citizen's Bank, Inez's Child Care Center, Publix supermarket, Christ's Church and House of Prayer, Abner Montessori School, a Lexington County Fire Station, Generations Senior Care, Chapin High School, Mt. Horeb Lutheran Church, Wells Fargo Bank, and TD Bank. Minor changes to the access to these facilities may be changed by the project; however, the project is not expected to impact community facilities or services. Additionally, emergency services will be maintained throughout construction.

[28] SC Department of Employment & Workforce. Community Profile, Lexington County. 2016. Available at: https://lmi.dew.sc.gov/lmi%20site/Documents/CommunityProfiles/04000063.pdf
[29] Ibid.

3.14.3 Would the Project Impact Economy in the Area?

As stated in **Section 3.14.1**, most businesses in the Town of Chapin are small offices, restaurants, and commercial providers. A large number of these are located along Columbia Avenue near its intersection with Chapin Road. The primary purpose of the project is to reduce congestion along Columbia Avenue, including areas of higher-density retail. Reducing the amount of traffic along the roadway would also reduce the exposure of stores to drive-by shoppers. The impact to these stores is not anticipated to be significant or adversely impact the local economy. Additionally, improvements to bicycle and pedestrian facilities, as well as improved roadways, may promote increased retail shopping; thus, improving the local economy.

The project also proposes to improve the existing I-26 interchange at Columbia Avenue and upgrade the surrounding roadways to meet SCDOT's current design and safety standards. Current standards require that access to properties located in the immediate vicinity of the interchange be limited or eliminated from Columbia Avenue. This would impact seven (7) businesses on the west side of the interchange, including a gas station, McDonald's restaurant, and Waffle House restaurant on the north side of Columbia Avenue and two (2) gas stations, a Bojangles restaurant, and the newly constructed Chapin Furniture store on the south side of the roadway. Access to each of these businesses would be maintained during and after construction.

To maintain access to the businesses on the north side of Columbia Avenue, a new location roadway would be constructed north of the businesses and access would be provided from the rear of each property. The relocated Crooked Creek Road would provide access to the businesses on the south side of Columbia Avenue. While access to these businesses would change, the impact to the businesses is not anticipated to be significant or adversely impact the local economy.

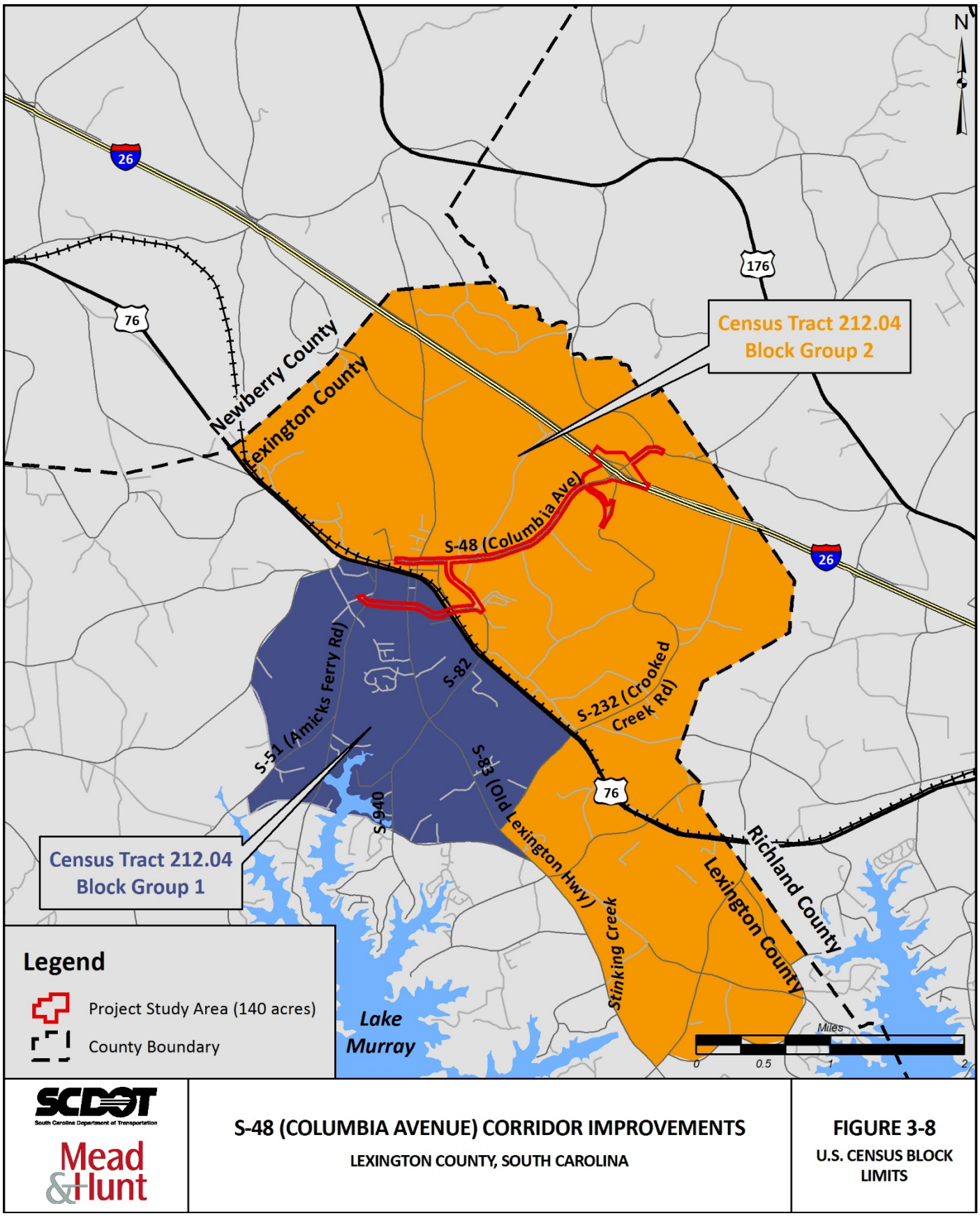
3.15 Environmental Justice

Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, directs agencies to ensure that affected communities have full and fair participation in the transportation decision-making process and to prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

Disproportionately high and adverse effects on minority and low income populations are defined as adverse effects that are predominantly borne by a minority population and/or low-income population, or will be suffered by a minority population and/or low income population and are appreciably more severe or greater in magnitude than the adverse effects that will be suffered by the nonminority population and/or non-low-income population.

Data from the U.S. Census Bureau was collected and the EPA's EJScreen tool was searched to determine if there were concentrations of minority persons and low-income persons living in the vicinity of the project, as summarized in Table 3-14. The project study area lies within 2010 US Census Tract 212.04 and extends across two (2) Census Block Groups, as shown in **Figure 3-8**.

FIGURE 3-8: U.S CENSUS BLOCK LIMITS



3.15.1 What is a Minority Population?

For purposes of this evaluation, a minority population includes all races that are not "white alone" as defined by the U.S. Census Bureau, within a census block group. A minority population that meets the criteria for Environmental Justice is defined as one in which either the number of minorities living in a single block group comprises 50 percent or more of the total block group population, or the total percentage of minorities living within a single block group is ten (10) or more percentage points greater than the percentage of minorities living in the whole county.

Current American Community Survey (ACS) data from the U.S. Census Bureau indicates the percentage of minorities living in the vicinity of the project is less than 50 percent and less than the percentage of minorities in Lexington County, as shown in Table 3-14. The EPA's EJScreen tool[30] confirms these findings; therefore, this population does not meet the criteria for Environmental Justice on the basis of minority.

3.15.2 What is Considered a Low-Income Population?

A low-income population is a group of individuals that are living below the poverty line, as defined by the U.S. Census Bureau. A low-income population that meets the criteria for Environmental Justice is defined as one in which either the number of individuals living in poverty in a single block group comprises 25 percent or more of the total block group population, or the total percentage of individuals living in poverty within a single block group is five percentage points (or more) greater than the percentage of individuals living in poverty in the whole county.

Current ACS data shows the percentage of individuals living below poverty in the vicinity of the project is low, 4.30% and 3.67% (Table 3-14). The EPA's EJScreen tool[31] indicates even fewer (1.80%) individuals at or below poverty; therefore, this population does not meet the criteria for Environmental Justice on the basis of low income.

Table 3-14: Population Data

Census Geography	Total Population	Minority Population		Total Population Living Below Poverty		Median Income
Tract 212.04 Block Group 1	1,666	299	17.95%	73	4.30%	$51,250
Tract 212.04 Block Group 2	1,720	50	2.91%	63	3.67%	$50,572
Lexington County	266,575	51,095	19.16%	34,860	13.08%	$52,062
South Carolina	4,679,602	1,535,456	32.81%	820,308	17.53%	$42,580

Source: American Community Survey (ACS) 5-Year Summary Data 2008-2013, Tables B02001e2 (Minority Population), C17002e2, C17002e3 (Ratio of Income to Poverty Level in Past 12 Months), and B19013e1 (Median Income for Past 12 Months, Adjusted for 2013 Inflation Dollars)

[30] U.S. Environmental Protection Agency. Environmental Justice Screening and Mapping Tool. Available at: https://ejscreen.epa.gov/mapper/index.html?wherestr=chapin%2C+sc
[31] Ibid.

3.15.3 Would Any Minority or Low-Income Populations Be Affected?

Based on the absence of notable minority and low-income populations, the project is not expected to have disproportionately high and adverse impacts on low-income or minority populations.

3.16 Relocations

The Preferred Alternative would require the acquisition of approximately 23 acres of new right-of-way. This acquisition may also require the relocation of four (4) buildings, including one (1) business, one (1) residence, and two (2) outbuildings.

The business identified as a potential relocation was previously occupied by a used car dealership, but is no longer in business. The residential relocation is also currently vacant. Neither relocation would require special relocation measures, or impact elderly, handicapped, or minorities. Damages to property will be assessed during the right of way appraisal process.

Potential relocations are based on preliminary design. As project design advances and final construction plans are completed, further measures to avoid and minimize impacts will occur, which may lower the number of total anticipated relocations.

The SCDOT will acquire all new right-of-way and process any relocations in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. The purpose of these regulations is to ensure that owners of real property to be acquired for Federal and federally-assisted projects are treated fairly and consistently, to encourage and expedite acquisition by agreements with such owner, to minimize litigation and relieve congestion in the courts, and to promote public confidence in Federal and federally-assisted land acquisition programs. As is the policy of the SCDOT, in response to the non-discrimination requirements in Title VI of the Civil Rights Act of 1964, the relocation advisory assistance shall be provided to all eligible persons without discrimination.

3.17 Indirect and Cumulative Impacts

The FHWA's and other federal agencies' responsibility to consider direct, indirect, and cumulative impacts in the NEPA process was established in the CEQ Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR 1500 – 1508). The CEQ regulations define the impacts and effects that must be addressed and considered by federal agencies in satisfying the requirements of the NEPA process. The CEQ regulations note three impact categories: direct, indirect, and cumulative. These are defined as follows:

Direct impacts – caused by the action and occur at the same time and place. (Sec 1508.8)

Indirect impacts – caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. (Sec. 1508.8)

Cumulative impacts – results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. (Sec 1508.7)

The following indirect and cumulative impact analysis follows the eight-step process as described in National Cooperative Highway Research Program's report entitled *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects*.

3.17.1 Indirect Impacts

Step 1 – Study Area Boundaries

The project study area boundaries for the project extend include the following:

- A portion of primarily undeveloped land, originating near the intersection of Amick's Ferry Road and Zion Church Road and extending east to the intersection of East Boundary Street and Stonewall Court;
- A portion of primarily undeveloped land, originating near the intersection of East Boundary Street and Stonewall Court and extending northwest to Columbia Avenue, approximately 400 feet east of its intersection with East Boundary Street;
- Approximately 2.3 miles of Columbia Avenue, from Pinewoods Drive to a point approximately 350 east of Dan Comalander Drive;
- Approximately one mile of I-26, generally centered on the interchange with Columbia Avenue, and approximately 50 acres of the surrounding area associated with the interchange;
- Approximately 1,100 feet of Crooked Creek Road, located 1,500 feet southwest of the I-26 interchange with Columbia Avenue; and a portion of primarily undeveloped land, originating at Crooked Creek Road and extending northwest to Columbia Avenue, approximately 1,200 feet west of I-26.

These boundaries also include intersections of adjacent side roads.

Step 2 – Study Area Communities Trends and Goals

The Preferred Alternative extends for a length of approximately 2.9 miles through a developing portion of Lexington County. The land contained within the project study area encompasses approximately 140 acres and is primarily comprised of undeveloped forestland, roadway and utility rights-of-way (R/Ws), agricultural lands, and sparse residential and commercial development. In general, land use patterns decrease in density from west to east along Columbia Avenue. The majority of existing development occurs west of Woodthrush Road and in the immediate vicinity of the I-26 interchange with Columbia Avenue. Due to the proximity to Lake Murray and the City of Columbia, the project area is generally considered a desirable area for growth.

Baseline conditions within the study area were evaluated to identify trends and community goals. An understanding of the area's transportation and land use planning goals provide a useful platform to assess the proposed project's potential for indirect impacts.

The Town of Chapin Comprehensive Plan, issued in 2011, documents an analysis of long-term growth trends in the area and identifies the amount of development that can be expected to occur within the area. The COATS

LRTP proposes transportation improvements that are needed to accommodate increasing demands on roadway networks and identifies key corridors where growth is projected. Both of these documents identify Columbia Avenue as a necessary component of land use and transportation plans. Additional detail is provided in **Section 3.1 - Land Use**.

The proposed project is not expected to change existing land use or change the timing or density of development in the area. The project is not known to be in conflict with any plan, existing land use or zoning regulation. Therefore, the overall trends and goals of surrounding communities would not be negatively affected by the proposed project.

Step 3 – Inventory Notable Features

The project study area contains notable human and natural environment features including waters of the U.S., water quality impairments and community resources, which were inventoried and described in the following technical memoranda and/or sections of this EA:

- Natural Resources Technical Memorandum (**Appendix D**)
- **Section 3.3 - Waters of the U.S.**
- **Section 3.4 - Water Quality**
- **Section 3.14 - Social and Economic**
- **Section 3.16 - Relocations**

Data obtained during the project development process was used to assess potential indirect impacts to these resources based on location, proximity to the project, and relationship to the project.

Step 4 – Identify Impact Causing Activities of the Proposed Action

The Preferred Alternative would construct a 1.3 mile, three (3) lane, new location roadway to serve as an alternative route through the Town of Chapin. This new route would originate on Amicks Ferry Road, extend east to the intersection of East Boundary Street and Stonewall Court, and then north to Columbia Avenue. Columbia Avenue would also be improved to five (5) lanes from Lexington Avenue east to the I-26 interchange.

Examples of indirect impacts that could potentially occur from the project would be an increase in commercial development that depend upon proximity to main roadways and increased business patronage due to improved access from the roadway improvements. Similarly, residential development could be intensified due to the benefits of enhanced mobility and safety provided by the improvements.

The improvements provided by the proposed project could provide a sufficient condition for the intensification of development already occurring or planned. Due to the undeveloped portions of the project study area, there are opportunities for future development. However, since the study area is planned to remain suburban, the opportunity for project-caused intensification of development already occurring is likely to be modest.

Steps 5-6 – Identify and Analyze Potential Impacts

Waters of the U.S.

The natural resources assessment included a detailed review of biological features within the study area, including descriptions of water resources such as Waters of the U.S. (**Section 4.5 - Waters of the U.S.**). In

addition, probable direct impacts resulting from the proposed project were also evaluated. A total of seven (7) streams, four (4) ponds, and three (3) wetlands were identified within the project study area.

The Preferred Alternative design minimizes direct impacts to streams and wetlands. It is possible that intensification of development in the area may result in construction that would require filling of Waters of the U.S. However, any development resulting in impacts to Waters of the U.S. would be required to conduct a comprehensive alternative analysis and obtain a Section 404 permit from the USACE prior to construction.

WATER QUALITY

Indirect impacts to water quality would be related to the addition of impervious surface to the area. Motor vehicles are a major source for roadway pollutants, and research demonstrates that pollutant concentrations are expected to increase with increased traffic volumes. The addition of new roadways and the widening of existing roadways would increase the volume of roadway runoff and increase the surface area for the accumulation of particulate matter. Roadway runoff is dependent upon numerous variables, and therefore the specific impacts are both site-and event-specific.

Construction of the Preferred Alternative will increase the amount of impervious surface and the amount of stormwater discharge. Direct impacts of the project on water quality, and direct impacts of any future development in the project area, would be permitted by the US Army Corps of Engineers in accordance with Section 404 and Section 401 of the Clean Water Act.

COMMUNITY

The project area can be described as suburban residential with areas of commercial development and undeveloped areas. There are some community facilities located within the project study area, including a few churches, a grocery store, medical providers, banks, child care centers, a fire station, an assisted living facility, and a high school. There are no hospitals, police stations, libraries or parks located within the project study area. Two (2) developments are currently under construction within the vicinity of the project. These developments are known as Chapin Crossing and Chapin Technology Park, and are described in **Sections 2.1.3.1.3.4** and **2.1.3.1.3.5**, respectively.

Chapin Crossing is a 25-acre development that includes a Publix Super Market and multiple associated outparcels. The Chapin Technology Park (CTP) is currently developing a 220-acre business and technology park. A private developer is also planning a 200-acre residential and commercial complex adjacent to the CTP in an effort to establish a “work-live-play” mixed use community.

Based on preliminary design, the proposed project would require the acquisition of approximately 23 acres of new right-of-way and the relocation of one (1) business, one (1) residence, and two (2) outbuildings (**Section 3.16 - Relocations**). Future Land Use mapping included in the Town of Chapin’s Zoning Ordinance (**Figure 3-1**) indicates land use throughout the Project Corridor is planned for commercial development; therefore, the proposed project is not expected to change existing land use or change the timing or density of development in the area.

STEP 7 – EVALUATE ANALYSIS RESULTS

Both qualitative and quantitative methods were used in evaluating the potential indirect effects of the project on the resources of concern. These methods included field surveys, internet research, and input from communities and agencies. Environmental impacts from the proposed project, when added to past, present, and reasonably foreseeable future projects, would result in indirect impacts to environmental resources of concern. However, given the above considerations, they are not likely to be adverse.

WATERS OF THE U.S.

Some portions of wetlands and streams would be converted as a result of the proposed project and the subsequent maintenance; however, the overall ecosystem would still provide adequate wetland and wildlife functions (**Section 3.5 - Waters of the U.S.**).

WATER QUALITY

Roadway runoff would be remediated by appropriate best management practices during construction (**Section 3.4 - Water Quality**). Direct impacts of the project on water quality, and direct impacts of any future development in the project area, would be permitted by the US Army Corps of Engineers in accordance with Section 404 and Section 401 of the Clean Water Act. Therefore, indirect effects of the project on water quality are not anticipated.

COMMUNITY

As discussed previously, the proposed project is consistent with local land use and transportation plans. The project is not being proposed to initiate any economic development plans, nor to serve any particular development, but rather to accommodate them. The proposed project is not anticipated to alter current or already planned future land use plans. It is anticipated that development will continue within the area. Unforeseen changes in the public and/or private land use patterns could affect the characteristics of the area in the future. However, given that there are no explicit economic development purposes for the proposed project, nor is the proposed project being constructed to serve any specific new developments, land uses are not expected to change as a result of the project (**Section 3.14 - Social and Economic**).

STEP 8 - ASSESS CONSEQUENCES AND DEVELOP MITIGATION

Based on the existing land use in the area and future land use strategies for growth, the likelihood of this project leading to induced growth is low. Development is expected to continue; however, the project itself is not expected to produce a major increase in that development. Some development in the project impact area has been approved and/or initiated and is not conditional upon improvements to Columbia Avenue or the surrounding road network. The potential of the proposed project to indirectly affect notable resources will be mitigated by the measures described throughout this EA. See additional details contained in **Sections 3.1 - Land Use, 3.4 - Water Quality, 3.5 - Waters of the U.S., 3.14 - Social and Economic,** and **3.16 - Relocations**.

3.17.2 CUMULATIVE IMPACTS

Cumulative impacts are impacts on the environment that result from the incremental impact of the action to resources resulting from past, present, and reasonably foreseeable future actions regardless of who sponsors the action. The Council on Environmental Quality (CEQ) developed Guidance for *Preparers of Cumulative Impact Analysis: Approach and Guidance* (2005) which includes an eight step process for preparing cumulative impact assessments. This cumulative impact analysis followed this eight step guidance.

Four (4) resources were identified for study as part of the Cumulative Impact Analysis. The identification of these resources took into consideration input received during the agency coordination and public involvement process.

Step 1 – Identification of Resources

The cumulative impact analysis focuses on land use, water quality, Waters of the U.S., and community.

Step 2 – Study Area

Cumulative impacts to resources of concern are analyzed within particular geographic and temporal bounds. This allows for the appropriate context to be developed for each resource. Study area boundaries are developed through consideration of input received during the agency coordination and public involvement process. The primary study area for this project is the same as Step 2 of **Section 3.17.1 - Indirect Impacts**. Waters of the U.S. and water quality resources are studied within the context of the Saluda River and Broad River basins.

Step 3 – Current Health and Context of the Affected Resources

Waters of the U.S.

The proposed project spans two (2) watersheds. The western portion of the project lies within the Saluda River/Lake Murray watershed, part of the larger Saluda River Basin. The eastern portion of the project in located in the Broad River/Crane Creek watershed, included in the Broad River basin. The SCDOT has concerns about cumulative impacts to wetlands, streams and open waters in the study area and the surrounding watershed. However, it is generally agreed that the overall amount of waters in the area that will be impacted is minor compared to the size of the overall watersheds and River Basins in which the project is located.

Water Quality

The project will increase the impervious surface area and amount of roadway runoff; therefore, water quality is another resource of importance that will be impacted by the project. The eastern portion of the project drains to impaired waters. By utilizing the SCDOT's BMPs and mitigation measures stated in **Section 3.4 - Water Quality** of this EA, the quality and function of the waters in the watershed are not expected to deteriorate significantly from their present state.

Land Use/Community

As previously stated, the project area can be described as suburban residential with areas of commercial development and undeveloped areas. There are some community facilities located within the project study area, including a few churches, a grocery store, medical providers, banks, child care centers, a fire station, an assisted living facility, and a high school. There are no hospitals, police stations, libraries or parks located within the project study area. Two (2) developments are currently under construction within the vicinity of the project. These developments are known as Chapin Crossing (Publix Super Market and outparcels) and Chapin Technology Park, and are described in **Sections 2.1.3.1.3.4** and **2.1.3.1.3.5**, respectively. The proposed project, in combination with other past, present and future actions, is not expected to have a cumulative effect on land use patterns or community character.

Step 4 – Identify Direct and Indirect Impacts of the Proposed Project that Might Contribute to a Cumulative Impact

Waters of the U.S.

Based on the final design of the project, the project would impact a total of four (4) streams, totaling 383-lf of impact. The project would also require clearing and fill impacts to two (2) ponds and one (1) wetland, totaling

0.567 acre of impact. The potential cumulative impacts to wetlands and streams would include induced development and change in land use. However, as previously noted, neither of these is expected as result of this project.

Water Quality

Roadways have the potential to impact water quality through roadway runoff, which may contain elevated levels of suspended solids, heavy metals, aromatic hydrocarbons, oil and grease, nutrients, and other pollutants. Many of these pollutants are generated from motor vehicles through the emission and deposition of exhaust and discharge of fluids and solids during normal automobile operation. Indirect impacts would be associated with the addition of impervious surface to the existing conditions. The proposed project would increase the roadway pavement width which would increase surface area for the accumulation of particulate matter and increase the volume of runoff. Stormwater control measures, including the SCDOT's BMPs, would be required during construction.

Community

As previously stated, the potential indirect impact to community resources would include induced growth and development.

Step 5 - Other Reasonably Foreseeable Actions

As stated earlier, two (2) developments are currently under construction within the vicinity of the project, known as Chapin Crossing (Publix Super Market and outparcels) and Chapin Technology Park; however, these developments are not as a result of the project. The SCDOT is currently planning a widening of I-26 which would cross the eastern portion of the project study area. This interstate widening project is not associated with the S-48 (Columbia Avenue) Corridor Improvement Project, nor is it planned in response to the Columbia Avenue project.

Steps 6-7 – Assess Potential Cumulative Impacts and Report Results

Waters of the U.S.

Impacts to Waters of the U.S. resulting from the proposed project, when added to past, present, and reasonably foreseeable future projects, would result in cumulative impacts to waters of the U.S. As previously mentioned, various measures were developed to avoid and/or minimize impacts to these features, with a net result of 383-lf of streams and 0.567 acre of wetlands/waters being impacted. The potential indirect impact to streams and wetlands would include intensification of development in the area that result in the alteration or degradation of adjacent wetlands. However, as stated earlier, none of these are expected to occur given the limited scope of the project.

Water Quality

Roadway runoff would be remediated by the implementation of the appropriate best management practices during construction (**Section 3.4 - Water Quality**). Direct impacts of the project on water quality, and direct impacts of any future development in the project area, would be permitted by the US Army Corps of Engineers in accordance with Section 404 and Section 401 of the Clean Water Act. Therefore, cumulative effects of the project on water quality are not anticipated.

LAND USE/COMMUNITY

No significant adverse effect on public facilities, community resources, or services is expected as a result of the proposed project; nor is the proposed project expected to adversely affect the social environment or local economy. The acquisition of approximately 23 acres of new right-of-way and the relocation of one (1) business, one (1) residence, and two (2) outbuildings (**Section 3.16 - Relocations**) would be conducted in accordance with SCDOT Policy and the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 910646 as amended by 100-17, 49 CFR Part 24. Therefore, cumulative effects of the project on the community are not anticipated.

STEP 8 - ASSESS THE NEED FOR MITIGATION

The potential of the proposed project to cumulatively affect notable resources will be mitigated by the measures described throughout this EA. See additional details contained in **Sections 3.1 - Land Use, 3.4 - Water Quality, 3.5 - Waters of the U.S., 3.14 - Social and Economic,** and **3.16 - Relocations**. During the development of the Preferred Alternative, measures were incorporated to avoid and/or minimize impacts to area resources to the extent practicable.

4.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

This project was coordinated with appropriate federal, state, and local agencies and the public. This chapter describes the agency coordination and public involvement that has taken place for the proposed project. Planned future public involvement activities and agency coordination are also discussed. Agency correspondence is provided in **Appendix K** and public involvement materials are provided in **Appendix L**.

4.1 AGENCY COORDINATION

4.1.1 LETTER OF INTENT

A Letter of Intent (LOI) was sent to federal and state resource agencies and local representatives on August 28, 2014 to request comments on the proposed project. A copy of the LOI, contact list and responses received are included in **Appendix K**.

- SCDHEC, Bureau of Water noted that a Sediment Management and Sediment Control Permit would be necessary for any non-point discharges. The Bureau of Water also stated that the placement of fill into jurisdictional waters would require a compliance with Sections 401 and 404 of the Clean Water Act, including permitting, and that a Construction in Navigable Waters Permit would be required for all construction in navigable waters.
- SCDHEC, Bureau of Air Quality noted that only two criteria pollutants, ozone and particulate matter 2.5, of the NAAQS are of concern in South Carolina. The project area meets the 2012 particulate matter 2.5 standards and is in compliance with the 2008 ozone standard. The Bureau of Air also stated an asbestos survey and a project license were also noted as potential requirements prior to the removal of any structures.
- SC House Representative Nathan Ballentine asked if a copy of the LOI could be posted on his website and asked if details of the specific improvements could be shared. The SCDOT responded to Representative Ballentine to explain that various alternatives were being developed and public meetings would provide details regarding the proposed improvements as they are available.

4.1.2 Meetings and Coordination

An Agency Coordination Effort (ACE) meeting was held on November 12, 2015. Mead & Hunt representatives presented information related to the purpose and need, preliminary alternatives, the recommended preferred alternative, and potential impacts of the proposed project. A copy of the ACE meeting Agenda and Fact Sheet for the project are included in **Appendix K**.

4.2 Public Involvement

4.2.1 Public Information Meetings

The South Carolina Department of Transportation (SCDOT), in partnership with Lexington County and the FHWA, conducted two (2) Public Information Meetings (PIMs).

First Public Information Meeting

The first PIM was held on Thursday, November 6, 2014 from 5:00 p.m. to 7:00 p.m. at the Chapin Town Hall. The purpose of the meeting was to provide information related to the proposed project and to solicit input from area residents, businesses, and commuters of the corridor. A post card announcing the PIM was sent to citizens in the project area prior to the meeting. The PIM was also announced in the newspaper and on SCDOT signs in the project area.

No formal presentation was given during this meeting. The meeting's drop-in format provided the public with an opportunity for one-on-one discussions with project representatives from Lexington County and SCDOT. Several displays were located around the room showing preliminary alternatives and typical sections associated with the alternatives. Comment sheets were available for participants to provide written comments at the meeting, or to be mailed, emailed, or faxed to Lexington County after the meeting.

A total of 109 citizens signed in at the PIM. Participants included residents, business owners, local government employees and officials, as well as church representatives. Twenty (20) meeting participants submitted written comments by November 21, 2014.

Written comments received are included in **Appendix L**. The most frequent comment expressed by citizens in their written comments was related to alternative preferences. A total of fifteen (15) references were made in favor of the southern alternatives presented at the meeting. Two (2) comments showed preference toward a northern bypass alternative, and one (1) comment preferred the widening of Columbia Avenue only. Some of the other comments submitted included a request to align Peak Street and Clark Street, information related to proposed developments in Chapin, and concern for impacts to local churches. Public input also identified three (3) proposed developments within the community which would be impacted by proposed alternatives; see **Sections 2.1.3.1.3.3** through **2.1.3.1.3.5**.

Second Public Information Meeting

The second PIM was held on Thursday, July 23, 2015 from 5:00 p.m. to 7:00 p.m. at the Chapin Town Hall. The purpose of the meeting was again to provide information related to the proposed project and to solicit input from area residents, businesses, and commuters of the corridor. A post card announcing the PIM was sent to citizens in the project area prior to the meeting. The PIM was also announced in the newspaper and on SCDOT signs in the project area.

No formal presentation was given during the PIM. The second meeting was also a drop-in format to provide the public with an opportunity for one-on-one discussions with project representatives. Several displays were located around the room showing three (3) reasonable mainline alternatives, three (3) interchange alternatives, typical sections, and the preliminary impacts associated with each alternative. Comment sheets were available for participants to provide written comments at the meeting, or to be mailed, emailed, or faxed to Lexington County after the meeting.

A total of 137 individuals attended the second PIM and 44 written comments were received by August 7, 2015.

Written comments received are included in **Appendix L**. Similar to the first PIM, the most frequent comment expressed on comment forms was related to a specific alternative preferences. A total of fourteen (14) comments were in favor of Mainline Alternative 18, seven (7) comments favored Alternative 9, and four (4) comments showed a preference to widening Columbia Avenue. Opposition to a specific Mainline Alternative was also expressed in some comments; however, none of the Alternatives received more than four (4) opposed remarks.

As discussed in **Section 2.1.4**, public input also expressed concern for the potential relocations at the intersection of Columbia Avenue and East Boundary Street incorporated into Alternatives 9 and 18. The public stated that this area was viewed by local residents as the unofficial entrance to the Town of Chapin and impacting the buildings at this intersection may damage what was commonly referred to as the “character of Chapin”. Through this public input, the project team developed Alternatives 9A and 18A to avoid impacts to buildings at this intersection.

Comments were also received regarding Interchange Alternative preferences. A total of sixteen (16) comments favored the Dual Roundabout Interchange, fifteen (15) showed a preference for the Partial Cloverleaf, and six (6) preferred the Diverging Diamond. Opposition towards the Diverging Diamond was greatest, receiving four (4) comments.