COMPLETE 540

Triangle Expressway Southeast Extension

Draft

Environmental Impact Statement

Complete 540 - Triangle Expressway Southeast Extension

October 2015

U.S. Department of Transportation Federal Highway Administration

NORTH CAROLINA Turnpike Authority

FHWA-EIS-15-02-D
Federal Highway Administration
North Carolina Division

Complete 540 Triangle Expressway Southeast Extension
Wake and Johnston Counties, North Carolina

STIP Project Nos. R-2721, R-2828, and R-2829
State Project Nos. 6.401078, 6.401079, and 6.401080
Federal Aid Project Nos. STP-0540(19), STP-0540(20), and STP-0540(21)
WBS Nos. 37673.1.TA2, 35516.1.TA2, and 35517.1.TA1

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to the National Environmental Policy Act, 42 USC 4332 (2)(c) and 49 USC 303
by the US Department of Transportation, Federal Highway Administration,
and the North Carolina Department of Transportation

Cooperating Agency: US Army Corps of Engineers

10/30/2015
Date of Approval

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

11/2/2015
Date of Approval

for Edward T. Parker
Assistant Division Administrator,
Federal Highway Administration

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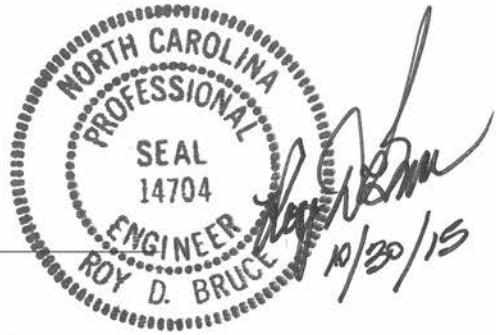
Document prepared by H. W. Lochner, Inc.

10/30/15
Date

Roy D. Bruce, P.E.
Project Manager, H. W. Lochner, Inc.



For the North Carolina Department of Transportation

10/30/15
Date

Eric Midkiff, P.E.
Project Development Section Head
North Carolina Department of Transportation

PROJECT COMMITMENTS

Complete 540 Triangle Expressway Southeast Extension
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This "Green Sheet" identifies the project commitments made to avoid, minimize, or mitigate project impacts beyond those required to comply with applicable federal and state requirements and regulations.

During the National Environmental Policy Act (NEPA) process, commitments are made to avoid, minimize, or mitigate project impacts. Commitments result from public comment or through the requirements of, or agreements with, environmental resource and regulatory agencies.

In addition to compliance with applicable federal and state requirements and regulations, such as Section 404 Individual Permit Conditions, Nationwide Permit Conditions, Regional Conditions, and State Consistency Conditions; North Carolina Department of Transportation (NCDOT) Guidelines for Best Management Practices for the Protection of Surface Waters; General Certification Conditions and Section 401 Conditions of Certification, and the Endangered Species Act, the following table lists special project commitments that have been agreed to by the North Carolina Department of Transportation (NCDOT).

Item	Resource	Draft EIS Section	Applicable DSA	Project Commitment	Project Stage
1	Historic Architectural Resources	Pages 75-78 & Appendix B	DSAs 1-5	NCDOT will coordinate with the NC Historic Preservation Office and the property owner(s) relative to potential retaining wall design to eliminate the need for permanent easement or right of way from the Panther Branch School, if one of these DSAs is selected as the Preferred Alternative.	Final Design
2	Historic Architectural Resources	Pages 75-78 & Appendix B	DSAs 6-7	NCDOT will coordinate with the NC Historic Preservation Office and property owner(s) relative to potential noise issues and mitigation relative to the Mount Auburn School), if one of these DSAs is selected as the Preferred Alternative.	Final Design

PROJECT COMMITMENTS (continued)

3	Historic Architectural Resources	Pages 75-78 & Appendix B	DSAs 8-17	NCDOT will coordinate with the NC Historic Preservation Office and the property owner(s) relative to potential curb and parking reduction relative to Britt's Store, if one of these DSAs is selected as the Preferred Alternative.	Final Design
4	Historic Archaeological Resources	Page 77	All DSAs	NCDOT will conduct an archaeological survey of the Preferred Alternative and will coordinate the results with the NC Historic Preservation Office and the NC Office of State Archaeology.	Final Design
5	Community Resources & Section 4(f)	Pages 77-80 & Appendix C	DSAs 1-7 and 13-17	NCDOT will coordinate with the Town of Holly Springs relative to a potential Section 4(f) de minimis use finding for the Middle Creek School Park.	Prior to the Final EIS
6	Community Resources & Section 4(f)	Pages 77-80 & Appendix C	DSAs 4, 11, and 16	NCDOT will coordinate with the NC Forest Service relative to a potential Section 4(f) de minimis use finding for the Watershed Loop Extension Trail in Clemmons Educational State Forest.	Prior to the Final EIS
7	Community Resources & Section 4(f)	Pages 77-80 & Appendix C	All DSAs	NCDOT will coordinate with the City of Raleigh relative to a potential Section 4(f) de minimis use finding for the Neuse River Trail.	Prior to the Final EIS
8	Noise	Pages 82-84	All DSAs	NCDOT will prepare a Design Noise Report for the final design of the Preferred Alternative, including further evaluation of potential noise mitigation techniques.	Final Design
9	Major Drainage Structures	Page 102	All DSAs	NCDOT will perform a more detailed hydrologic and hydraulic analysis for each major drainage crossing for the Preferred Alternative.	Final Design
10	Utilities	Page 103	All DSAs	NCDOT will coordinate with the appropriate utility owners during design of the Preferred Alternative for all utility conflicts, including means to avoid or minimize impacts.	Final Design
11	Indirect Effects & Cumulative Impacts	Pages 104-106	All DSAs	NCDOT will prepare a quantitative assessment for indirect and cumulative effects and impacts for the Preferred Alternative.	Prior to the Final EIS

SUMMARY INFORMATION

The North Carolina Department of Transportation (NCDOT) and Federal Highway Administration (FHWA) propose to build a new, limited-access highway from NC 55 in Apex, to US 64/US 264 Bypass (I-495) in Knightdale—a distance of approximately 27 miles. The proposed highway, known as Complete 540–Triangle Expressway Southeast Extension, is being proposed as a toll facility.

This proposed highway has been shown to be the most practical solution for meeting the purposes of the project, which are to improve mobility and reduce traffic congestion south and east of the Raleigh area during peak travel periods. A secondary purpose of the project is to improve system linkage in the regional roadway network by completing the 540 outer loop around the greater Raleigh area, which would benefit commuters living south and east of Raleigh as well as motorists making longer trips through the Triangle Region.

This Draft EIS includes all the topics specified by the Council on Environmental Quality in Title 40 of the Code of Federal Regulations (sections 1502.10 to 1502.18). The emphasis in this Draft EIS is on key findings of the study conducted for the proposed project, including purpose and need, alternatives, and characteristics of the affected environment and environmental consequences. While thorough in its description of these items, this Draft EIS is meant to be a summary of the work that has been done. More detailed technical reports are incorporated by reference throughout this document and are contained on a companion media disk enclosed on the back cover and online at www.ncdot.gov/projects/complete540. Those technical reports are considered to be part of this document and are the building blocks from which the Draft EIS was constructed. This Draft EIS also includes, in Appendix C, the proposed project's Draft Section 4(f) Evaluation. Printed copies of this Draft EIS are available for review at locations listed in Appendix A.

The following individuals may be contacted for additional information concerning this Draft EIS:

Mr. Edward T. Parker
Federal Highway Administration
310 New Bern Avenue, Suite 410
Raleigh, North Carolina 27601-1418

Mr. Eric Midkiff, P.E.
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina 27699-1548

Comments on the findings contained in this Draft EIS are due on Friday, January 8, 2016. Written comments should be sent to Mr. Eric Midkiff, P.E. at the above address or emailed to complete540@ncdot.gov. The public meetings and hearing dates will be announced to the public. Oral comments will be received at the public meetings and hearing.

Contents

Supporting Documents

The following technical reports form the basis for this Draft EIS. Each can be found on the disk attached to the back cover of printed copies of this document. They are also available online at www.ncdot.gov/projects/complete540.

- Purpose and Need Statement (May 2011)
- Alternatives Development and Analysis Report (May 2014)
- Community Characteristics Report (May 2011)
- Community Impact Assessment (June 2015)
- Indirect and Cumulative Effects Report (December 2014)
- Historic Architectural Resources Survey Report (November 2014)
- Air Quality Analysis Report (October 2015)
- Traffic Noise Analysis Report (May 2015)
- Natural Resources Technical Report (August 2014)
- Waters Report (September 2014)
- Freshwater Mussel Survey Report (February 2012)
- Dwarf Wedgemussel Viability Study: Phase I (March 2014)
- Preliminary Hydraulics Study (September 2014)
- Preliminary Hydraulics Study Addendum (February 2015)
- GeoEnvironmental Report for Planning (June 2014)
- Utility Impact Report (November 2014)
- Build Traffic Analysis Report (December 2009)
- No-Build Traffic Analysis Report (December 2009)
- Traffic Forecast Technical Memorandum (April 2014)
- Detailed Study Alternatives Traffic Analysis Technical Memorandum (February 2015)
- Right of Way and Relocation Report (March 2015)
- Stakeholder Involvement Report (March 2015)
- Northern Long-Eared Bat Section 7 Documentation (July 2015)

CHAPTER 1

Study Overview

Understanding the proposed project, why we need to study it, and how this kind of study is done.

This chapter is an introduction to the study being conducted for the proposed Complete 540 project. It describes the proposed project and explains the requirements that guide the environmental study being conducted for it.

THE PROPOSED PROJECT

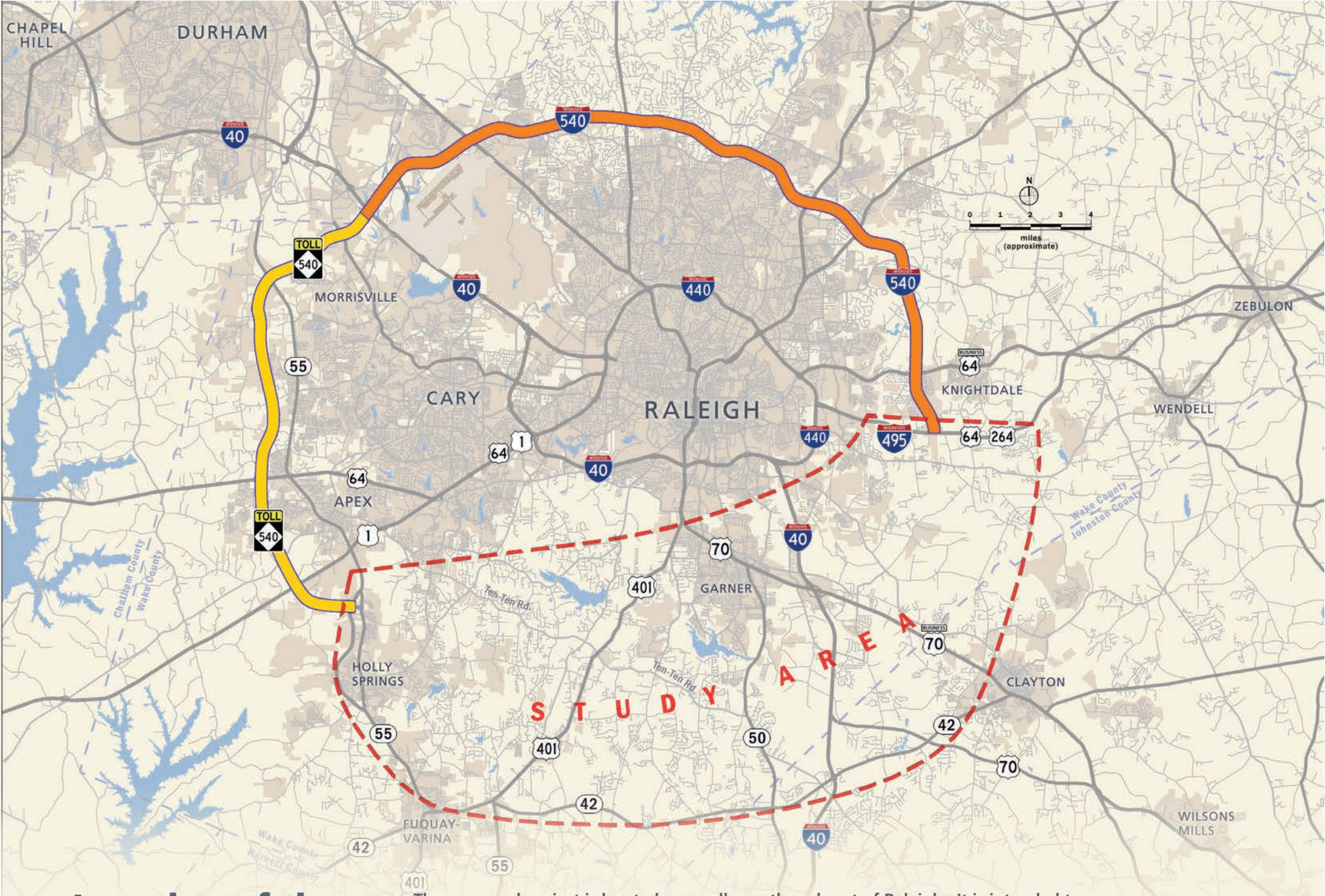
The subject of this document is the "Complete 540" project—the proposed completion of the 540 outer loop that today partially encircles greater Raleigh. As it exists today, the 540 outer loop extends around the north and west sides of Raleigh. From its eastern ending point, at US 64/US 264 Bypass (I-495) in Knightdale, to I-40 in Morrisville, it is called I-540. From I-40 southward to its western ending point, at NC 55 Bypass in Apex, it is called NC 540. The Complete 540 project would construct the remaining segment of the 540 outer loop, around the south and east sides of the Raleigh area.

This proposed project has been under consideration for many years. An "outer loop" around the northern half of Raleigh, beyond what is now the I-440 Beltline, was first included on long range plans in the mid-1970s. By the mid-1980s, the pace of development in the area led NCDOT to expand the northern outer loop idea to a full loop around all of Raleigh.

The first section of what is now I-540 connected I-40 and US 70/Glenwood Avenue. This segment opened to traffic in early 1997. It was then extended in stages, in a clockwise direction, to Leesville Road, in 1999; to Creedmoor Road, in 2000; to Falls of Neuse Road, in 2001; to Capital Boulevard, in 2002; and finally, to the US 64/US 264 Bypass, in 2007. Together, these segments form what is today Interstate 540.

The next extension of this outer loop came with the construction of Toll NC 540, which was originally planned as the Western Wake Freeway. This roughly thirteen-mile segment extended from I-540 at NC 54, southwest of I-40 and west of Raleigh, southward to NC 55 Bypass in Apex. With the completion of Toll NC 540, about 60 percent of the 540 outer loop around Raleigh is now built and open to traffic.

As these northern segments of the 540 outer loop were being built, route location planning was underway for the southern and eastern segments. By the mid-1990s, initial planning for this remaining segment of the 540 outer loop had been completed and a strip of land from NC 55 eastward to I-40, south and east of Raleigh, was identified as a possible route location for the project.



Location of the Proposed Project

The proposed project is located generally south and east of Raleigh. It is intended to complete an outer loop or beltway around the Raleigh area by completing the remaining link of NC 540, also known as the Triangle Expressway. The study area shows the specific area where the study efforts were focused.

A potential route location from I-40 east to US 64/US 264 Bypass (I-495) also began to be considered by transportation planners at about this time.

As with most large-scale highway projects, the funding for the northern and western portions of the 540 outer loop was identified well in advance – in the early and mid-1990s. Then, as now, the main source of this funding was the US Highway Trust Fund, which is supported by the federal and state taxes placed on gasoline and other motor fuels. Economic conditions have changed since that time, and the purchasing power of the federal tax on motor fuels, which has not been raised since 1993, has substantially declined as cars have become more fuel-efficient and the costs of steel, asphalt, and other road construction materials have increased.

These changing economic conditions, coupled with the rapid growth that was occurring in the area, meant that construction of the southern and eastern segments of the 540 outer loop project could not proceed as rapidly as had other segments. These conditions were also an important reason that the state's General Assembly formed the North Carolina Turnpike Authority, and why the western portion of the 540 outer loop was built as a toll road.[1]

The sustained pace of growth and development in the Triangle Region, and specifically in southern and eastern Wake County, is today intensifying the kinds of transportation needs that were first identified decades ago and which led to the planning and construction of the northern and western portions of the 540 outer loop. In conducting the current study, NCDOT reexamined those needs and concluded that completion of the 540 outer loop could help address them.[2] The next chapter of this document explains this in more detail and describes the main purpose of the proposed project and the specific transportation problems it could help solve.

FEDERAL, STATE, AND LOCAL COOPERATION

Construction of the existing 540 outer loop was possible only after extensive coordination and cooperation among local, state, and federal agencies. This cooperation had its beginnings in the early 1960s with the passage of the Federal-Aid Highway Act of 1962. Under this legislation, transportation planning is conducted for entire urban areas rather than just within city limits, and planning is a cooperative activity between states and local communities. This set the stage for a more "metropolitan" level of planning and resulted in the creation of a new kind of agency that would be capable of carrying out these planning functions. These agencies became known as "metropolitan planning organizations," or MPOs, and quickly became established in urban areas around the country in order to take advantage of federal matching funds.[3]

In the Raleigh area, the Capital Area Metropolitan Planning Organization, or CAMPO, was formed in response to the 1962 Federal-Aid Highway Act. CAMPO's formal governing body is comprised of elected officials from each of the cities and towns in the greater Raleigh area. CAMPO also has a staff of professional transportation planners who conduct the analyses needed for the organization to carry out its mission. CAMPO staff members and officials work closely with NCDOT staff in determining its priorities for the following 15 to 20 years for funding of needed transportation projects. These priorities are reflected in CAMPO's Transportation Improvement Program and related documents.

The subject of this Draft Environmental Impact Statement—the Complete 540 project—is included in CAMPO's currently adopted Long Range Transportation Plan.

LAWS AND REGULATIONS THAT GOVERN THIS STUDY

While the Federal-Aid Highway Act of 1962 was an important milestone in terms of transportation planning, there have been several other Federal-Aid highway bills before and after the 1962 law. One of the fundamental purposes of most of these laws has been to authorize federal funding for surface transportation projects. In addition, these bills and other related legislation:

- authorized construction of the interstate highway system (the Federal Aid Highway Act of 1956)
- created the US Department of Transportation (the US Department of Transportation Act of 1966)
- improved highway safety standards (the National Traffic and Motor Vehicle Safety Act of 1966)
- protected parks, historic sites, and wildlife areas (the US Department of Transportation Act of 1966)
- established public hearings on the effects of highway projects (the Federal Aid Highway Act of 1968) [4]

In addition to these statutes there have been several other federal laws and Executive Orders that have a direct bearing on how state highways are planned and constructed. Many of these will be discussed in more detail as they apply to later chapters in this document. One, the National Environmental Policy Act of 1969, governs the preparation of this DEIS and is described in the paragraphs that follow.

The National Environmental Policy Act

The National Environmental Policy Act, or "NEPA," serves as our nation's basic charter for protection of the environment.[5] Among other things, it has established the way in which federally funded highway projects are studied and how decisions are made about them.

As stated in the legislation itself, the purposes of NEPA are:

"To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare or man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality"[6]

In creating NEPA, Congress recognized "the profound impact" of human activity "on the interrelations of all components of the natural environment" and the "critical importance of restoring and maintaining environmental quality." Congress further recognized "that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment."[7]

NEPA requires that regulations be established to tell federal agencies what they must do to achieve the goals of the Act. These regulations were developed by the Council on Environmental Quality (CEQ), which was established in tandem with NEPA, and have the status of statutory. The President and federal agencies share responsibility for implementing these regulations so that NEPA achieves its policy objectives.[8]

NEPA states that before the environmental document is prepared, the federal agency proposing the project "shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved." NEPA also states that the views of the appropriate Federal, State, and local agencies be made available to the President, the Executive Office Council on Environmental Quality and the public, and that these views must accompany the proposal throughout review processes. (More information about the government agency coordination and public review requirement can be found in Chapter 6.)

The basic steps established by NEPA include the following:

1. Purpose and Need — This first step documents what the proposed project is intended to accomplish. In so doing, an area's transportation problems are identified, needs are established, and a formal project purpose is declared. These actions help focus the study on solutions that will help solve the specific transportation problem. This sets limits on the type and location of possible reasonable alternative solutions to address the identified transportation problem.

2. Affected Environment — The next step is to gain an understanding of the communities and natural features in the area that could be affected by the proposed project. This step is necessary before the various project alternatives can be compared in terms of their benefits and consequences.

3. Alternatives — Once an area's transportation problems have been identified, various ways of addressing those problems can be developed and examined to determine whether they would meet the established purpose of the project. These ways of addressing the problems are known as alternatives. Any alternatives that do not meet the project's purpose are dropped from further consideration—before any additional resources are spent on their development. Other alternatives may be eliminated if they don't rank well in terms of costs, benefits, or impacts.

4. Environmental Consequences — The alternatives that are found to meet the project's purpose are then analyzed to determine how they would affect the natural and human environment. These environmental consequences are generally referred to as the project's "impacts" or "effects."[9] Each alternative's impacts can also be compared against a measure of how well the alternative would meet the project's purpose, which can be thought of as the project's benefits. Measures are also identified that would mitigate unavoidable impacts.

By documenting the results of these four basic steps in a written statement, and by making that statement available for review and comment by governmental officials and the public, the NEPA process gives decision-makers the type and quality of information needed to make informed decisions about where and how to implement the project, or whether to proceed with it at all.

Each of these steps is explained in more detail in various chapters of this document.

COORDINATION BETWEEN GOVERNMENT AGENCIES

Coordination between federal agencies is an important part of the NEPA process. CEQ regulations require that the federal agency proposing the project must use "a systematic, interdisciplinary approach" and must "consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved."[9] Also, because NEPA applies to all federal agencies and because a significant project or action may require action by two or more agencies, each of these agencies must ensure their own compliance with NEPA for that project. To avoid duplication of effort, coordination between the two agencies is helpful, sometimes including designating "cooperating" agencies or joint agency decision making.

In the case of highway projects, the Federal Highway Administration (FHWA) and state Departments of Transportation routinely coordinate proposed projects with many other federal, state, and local agencies. These often include the US Army Corps of Engineers, the US Environmental Protection Agency, the US Department of the Interior (Fish and Wildlife Service), the US Coast Guard, and others. Likewise, there are various state agencies charged with enforcing certain federal and state laws that apply to major projects.

Each of the agencies with responsibility for a proposed project are contacted early in the NEPA process and are involved in the four main steps explained in the previous section. Working closely together helps these agencies ensure compliance with the laws established for the protection of the natural and

NEPA process gives decision-makers the type and quality of information needed to make informed decisions about where and how to implement the project, or whether to proceed with the project at all.

The National Environmental Policy Act of 1969

The National Environmental Policy Act of 1969 was the first national law to require an assessment of the environmental effects of proposals for major governmental actions. It was a groundbreaking piece of legislation for many reasons.

- **NEPA established a broad national policy of protecting the natural and human environment by avoiding impacts, mitigating unavoidable impacts, and considering reasonable alternatives to the proposed action.**
- **It requires the involvement of a wide variety of transportation planning and environmental and community professionals to allow a fuller understanding project effects.**
- **It seeks comments from affected jurisdictions, and requires that all information about project effects be available to the public.**

Although NEPA does not require a particular outcome or decision, the assessment process is intended to help agency decision-makers take a "hard look" at a policy or project before acting upon it.

Underlying NEPA is the belief that knowledge and rationality applied to public issues are more likely to yield results in the public interest.

NEPA also created the Council on Environmental Quality, which has primary responsibility for overseeing implementation of impact assessments. Although this was first done through guidelines, after 1978 those guidelines were elevated to the status of statutory law.

For more information, see:
Caldwell, Lynton K. "Implementing Policy Through Procedure: Impact Assessment and the National Environmental Policy Act (NEPA)" Environmental Methods Review, Porter and Fitipaldi, eds., International Association for Impact Assessment. Fargo, ND 1998.

human environment. In addition, as described earlier, other statutes and local regulations require that the proposing agency coordinate with state and local officials. For the Complete 540 project the FHWA and the NC Department of Transportation have conducted such coordination, along with the close cooperation of the Capital Area Metropolitan Planning Organization (CAMPO) (see Chapter 6 for more detail).

PUBLIC INVOLVEMENT GOALS AND OPPORTUNITIES

NEPA and other federal laws require that the agency proposing the project provide opportunities for meaningful public involvement. Members of the public or other stakeholders who might be affected by the project or have an interest in it are notified of the proposal and given the opportunity to comment on the findings contained in the Draft EIS. Over the years, public involvement opportunities have been expanded and now project agencies begin public involvement early in the NEPA process, long before the Draft EIS has been prepared. The ways in which agencies engage with the public has been expanded as well.

This expanded public involvement effort now meets several objectives. First, it informs the public that the project has been proposed and is being studied. It further explains the goals and objectives of the study itself. It also seeks information about the study area and how the project could affect those who actually live and work in the area. It also ensures that members of the public have the ability to review the findings of the study, to ask questions about the project, to understand the assumptions upon which the project's purpose and impact assessment are based, and to provide comments about the project.

All public comments made about the proposed project are considered, and, when warranted, the project proposal is modified in response to comments made. Regardless of whether public comments alter the project proposal, comments made or questions asked receive responses and are documented in the Final EIS for review by federal agencies. All substantive comments are addressed before the Final EIS is approved. Chapter 6 provides more detail about how the public has been involved in the proposed project so far.

CHAPTER 2

The Purpose of the Proposed Project

Understanding why the project has been proposed and the problems it would help solve.

This chapter describes the proposed project, why it is needed, and the problems it is intended to address. It also explains the project's primary purpose and how that information is used to develop alternative ways of meeting area transportation needs.

AN INTRODUCTION TO PURPOSE AND NEED

An important part of this EIS is the "purpose and need statement" about the project. Preparation of this statement is an early step in the environmental study process and is the foundation upon which additional development of the project is based. The purpose and need statement spells out why the proposed project—with its costs and environmental impacts—is being pursued. In other words, it establishes the rationale for the project and demonstrates the problems that would result without it.

There are many advantages in clearly stating the project's purpose and need. These include: stating a shared understanding of the area's transportation problems and possible solutions; guiding development and evaluation of reasonable alternatives to meet the project purpose; ensuring project decisions are legally defensible; and justifying project impacts and costs.

Need

In purpose and need analyses, "need" describes the transportation problems the proposed project is intended to address, which then forms the foundation for the purpose section of the statement. The need section establishes evidence of current or future transportation problems or deficiencies and justifies the commitment of resources and impacts to the environment.

Purpose

Based on these needs, the purpose section describes positive intended outcomes that will address the documented needs. The stated purpose of the project is required in order to develop and evaluate potential solutions to address the needs. It is important that the statement of project purpose be 1) comprehensive enough to allow for a range of reasonable alternatives and 2) specific enough to provide a reasonable limit to the range of all possible

alternatives. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense.[1]

Primary Purposes — In developing statements of purpose and need, two different kinds of purposes are possible. A primary purpose is the "driver" of the project and reflects the fundamental reason the project is being pursued. There can be one or more primary purposes. Any proposed transportation alternative that does not achieve the primary purpose would be deemed unreasonable and thus eliminated from further consideration.

Secondary Purposes — Secondary purposes (often referred to as "other desirable outcomes") are additional purposes that are desirable, but are not the core purpose of the project. They may not by themselves justify eliminating alternatives based on not meeting the purpose of the project but they could factor into eliminating alternatives based on other issues. Secondary purposes could also be considered in selecting a Preferred Alternative.

PURPOSE OF THE COMPLETE 540 PROJECT

Two primary purposes have been established for the Complete 540 project, based on general transportation problems in the Raleigh area and specific, more localized needs. The first purpose is to improve mobility within or through the study area during peak travel periods. The second purpose is to reduce forecast congestion on the existing roadway network within the project study area.

A secondary purpose of the project is to improve system linkage in the regional roadway network by completing the 540 outer loop around the greater Raleigh area—a goal that has been sought by area planners for more than 40 years. It is expected that construction of this remaining 540 link would benefit local commuters living south and east of Raleigh as well as motorists making longer trips through the Triangle Region to and from points south and east.

The transportation problems that form the basis for these project purposes, and the specific needs that stem from those problems, are summarized in the paragraphs that follow.

Transportation Problems in the Raleigh Area

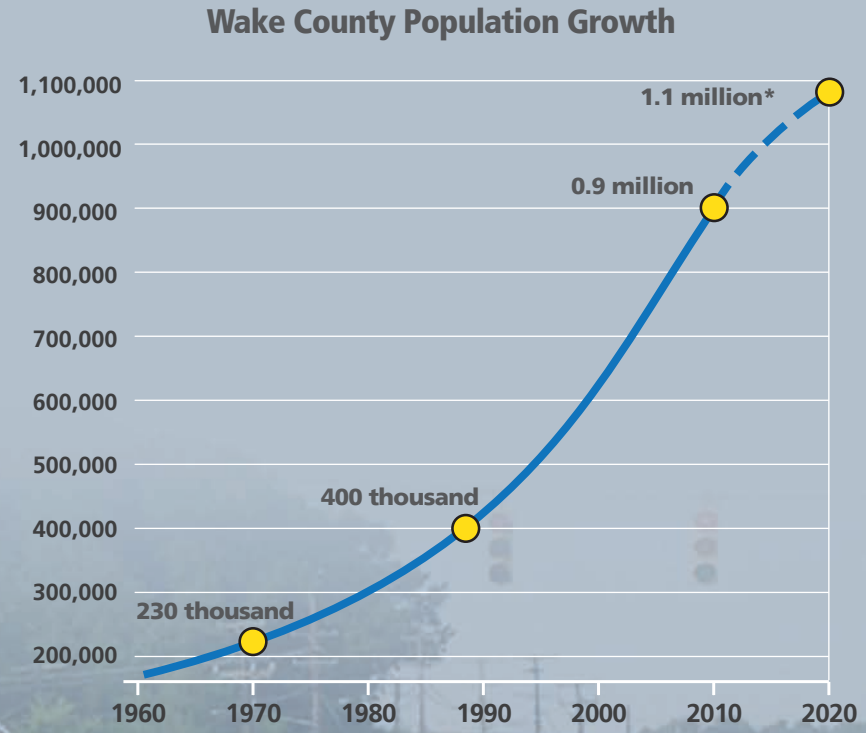
Compared to other metropolitan areas around the country, the Triangle Region of Raleigh, Durham, and Chapel Hill has been growing in population and associated land development at a rapid pace. The population of the Raleigh-Cary metropolitan area, composed of Wake, Johnston and Franklin counties, has grown by over 52 percent since 2000, making it the nation's second fastest-growing metro area.[2]

Within the Raleigh metropolitan area, much of this growth is taking place in southern and eastern Wake County and in western Johnston County. Communities such as Cary, Apex, Holly Springs, Fuquay-Varina, Garner, Clayton, and Knightdale have all seen exceptionally high growth rates since 2000, despite the significant downturn in economic activity in the wake of the 2008 recession. Population projections point to continued rapid population growth in the Raleigh area. The North Carolina Office of State Budget and Management anticipates that the Raleigh area's population will expand by another 50 percent over the next two decades.[3]

As land is developed to accommodate these kinds of population increases, public services, utilities and infrastructure must also be expanded. These include such things as police and fire stations, medical facilities, and schools, along with water lines, sewer lines, treatment plants, and electrical and communication utilities, and the transportation system.

A Rapidly Growing Region

Wake and Johnston counties have both experienced rapid population growth and associated land developmemt over the past few decades. State demographers and local land use planners are in agreement that this growth will continue into the next decade. Such growth brings a variety of changes, including economic development and job opportunities, as well as the need for expenditures on a wide range of services, utilities, and infractructure upgrades and expansion, including new and expanded roadways.



* North Carolina Office of State Budget and Management Population Projections

Specific Needs in the Study Area

As mentioned earlier, the first step in identifying a purpose statement for a transportation project is to explore in detail the transportation problems that are known to exist or are anticipated in the area. The next step is to use that information to state specific needs that are going unmet in the area. Once an area's needs are clearly identified, ways to address those needs can be developed and studied. The needs that have led to the development of the proposed Complete 540 project are described in the paragraphs that follow.

1. More Route Choices

Much of the growth that has occurred in the Triangle Region over the past few decades has been in developments that include mostly low-density, single-family residences. One outcome of this kind of land use is the heavy burden it places on local roads. These single-family developments often have few connection points to the area's larger roadway network, meaning that vehicles leaving the development are all funneled onto the same limited number of roads. The traffic congestion this creates becomes worse when there are long distances between residential areas and employment locations, with several of these developments all needing to access the same roadways.

As noted by the Capital Area Metropolitan Planning Organization (CAMPO), the Triangle Region "is one of the nation's most sprawling regions, and current forecasts project both continued outward growth and infill development in selected locations, most notably in the central parts of Raleigh, Durham and Chapel Hill. A key challenge for our transportation plans is to match our vision for how our communities should grow with the transportation investments to support this growth."[4]

Therefore, because of the growth that has occurred and is expected to occur in the future, one need in the area is to improve mobility by providing additional route choices for those who live or work in, or travel through, the study area.

The major job center in the Triangle Region is the Research Triangle Park (RTP), home to more than 170 companies and public institutions that employ over 50,000 workers. More than 25 percent of workers in the Raleigh area commute to jobs in RTP.[5] Other important employment and retail centers are scattered across the Triangle Region, including Raleigh-Durham International Airport and the nearby Brier Creek area, downtown Raleigh, the North Carolina State University Centennial Campus in west Raleigh, the Crabtree Valley area in north Raleigh, and the Crossroads area in southeast Cary.

Most travel in the Raleigh area is by private automobile. Nearly 90 percent of area residents' travel to work is by car, and in nearly 90 percent of those trips, travelers drive alone.[6] Most development in the Raleigh area has been and continues to be at low densities, leading to long distances between homes and jobs, retail destinations, and other activity centers. In addition, there are few transit options in the area, particularly in the rapidly growing areas south and east of Raleigh.

Residents of the rapidly growing communities in southern and eastern Wake County and western Johnston County are currently dependent on certain existing roadways to reach their destinations. Many of these trips are made on I-40 and I-440, routes that already serve high volumes of traffic. They are also the key routes used by commercial truck traffic carrying goods across the region and other long distance traffic across North Carolina and beyond. Congestion on these roadways leads to less efficient travel across the region for commercial and other long distance traffic.

Other routes connecting southern and eastern Wake County and western Johnston County to activity centers in the Triangle Region include east-west roads such as Ten Ten Road and NC 42 and north-south roads such as NC 55, US 401, NC 50, and US 70. Compared to high-speed facilities such as I-40, these routes have lower posted speed limits, traffic signals, and more stop-and-go

Land Use and Mobility

Single-family, detached houses in suburban style developments continue to be very desirable for large segements of the US population. Often, however, these developments are relatively isolated, with few connections to the existing roadway network. When a larger area or region is filled with this type of development, it can lead to increased levels of congestion on local roads.[7]

travel conditions. These factors lead to inefficient travel to key activity centers such as RTP, Brier Creek, and Raleigh-Durham International Airport.

2. Reducing Congestion on the Existing Roadway Network

Today, many of the roadways south and east of Raleigh are moderately to extremely congested during "rush hour" or, more specifically, the morning and evening peak travel times. This is especially true along roads near large activity centers such as RTP and Raleigh-Durham International Airport. These levels of congestion are expected to worsen over the next several years.

One of the most common ways planners measure different levels of traffic congestion is known as "level of service," or LOS. The method for determining these levels can be complicated, but the measuring system itself is fairly simple: roadway or intersection LOS can range from "A" through "F," with A being the best condition and F the worst condition. At level of service A, traffic is light; vehicles can move freely with no conflicts from other vehicles. At level of service F, traffic moves very slowly and is at or near the condition commonly known as "gridlock."

During the morning and evening peak travel times, many of the roadways south and east of Raleigh operate at poor levels of service. These include: segments of I-40 south of central Raleigh; much of NC 42 between NC 55 and I-40; portions of Ten Ten Road south of Apex; and, much of NC 50 south of Garner.

Estimates prepared by transportation planners at CAMPO show that by 2035, traffic volumes on area roads will be about double what they were in 2005. This increase in traffic, along with anticipated population growth and continuing land development, will mean that an increasing number of roadway segments and intersections will have unacceptably low levels of service. CAMPO's 2035 Long Range Transportation Plan, and its 2040 plan, both identify many future transportation projects that would help counter this increase in traffic congestion, including the Complete 540 project.

To understand the specific effect the proposed project would have on area roadways in the future, planners considered what is referred to as the "No-Build" roadway network, which is defined as all the major roadways in the greater study area that either currently exist or are included in adopted future plans, but not including the proposed project. This gives a picture of what traffic conditions would be like in the future without the project. Then, the same calculations are made, but with the proposed project included. This is referred to as the "Build" roadway network. By comparing the No-Build to the Build condition, the effect the proposed project would have on the major roadways can be more precisely determined.

After conducting this analysis and comparing the No-Build to the Build condition, the project team concluded that under the No-Build condition, levels of service will worsen to LOS E or F, which indicate poor conditions, on many

The Triangle is one of the nation's most sprawling regions ... A key challenge is to match our vision for how our communities should grow with the transportation investments to support this growth.

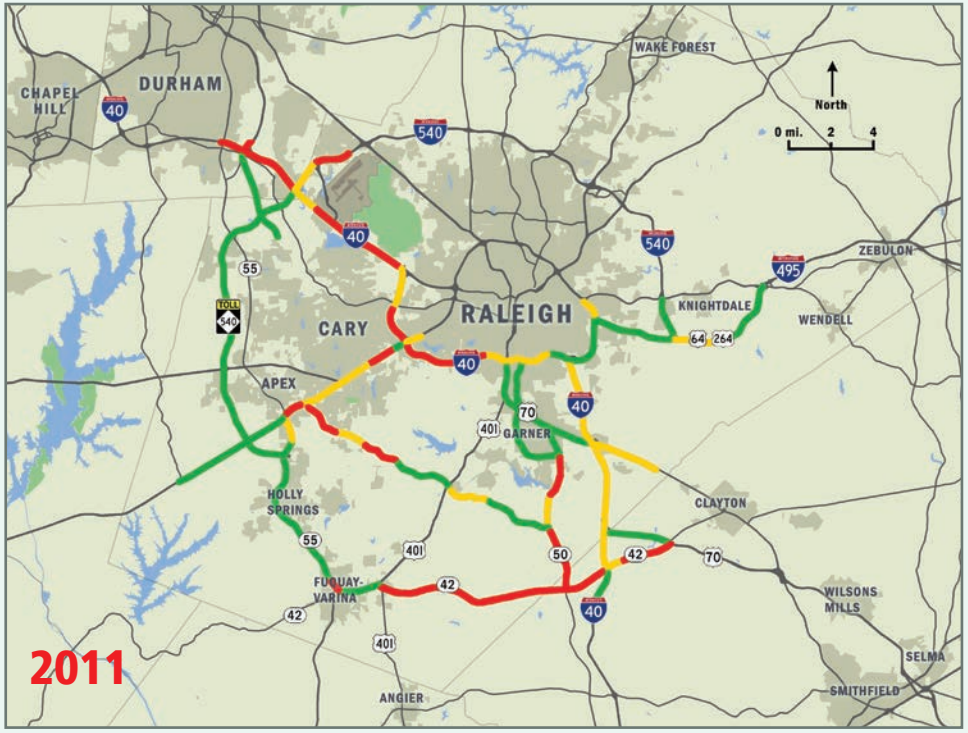
– Capital Area Metropolitan Planning Organization

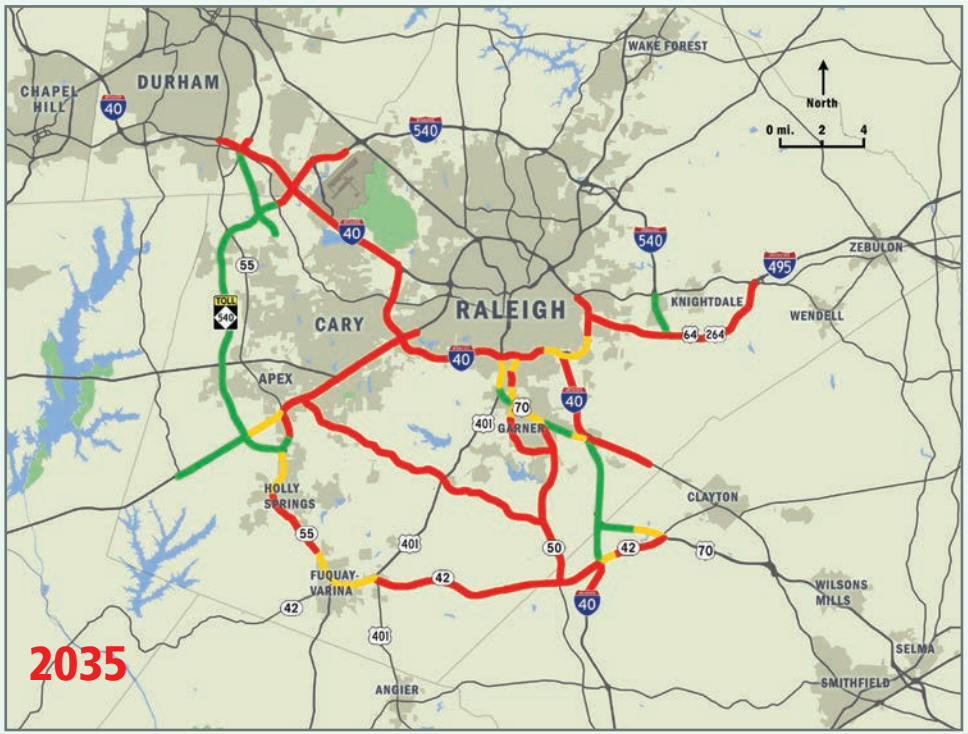
Traffic congestion

Current and future levels of service

Level of service (LOS) is a way of describing the amount of congestion on a roadway segment or intersection, using a grading system based on the letters A through F. Level of service "A" means that a relatively low number of cars use the road compared to its maximum capacity. Under this condition, traffic can move freely with no hindrance from other vehicles. As the LOS letters move down from A, each lower grade indicates a higher volume of traffic, with increasing levels of congestion, delays, and stop-and-go conditions. At level of service F, traffic volumes on the road have greatly exceeded the road's capacity with road conditions at or near what is commonly referred to as "gridlock."

These two maps show the levels of service at peak travel times on the main roads in and around the Complete 540 study area. The top map shows conditions in 2011 and the bottom map shows the projected conditions in 2035, both without the Complete 540 project in place. Conditions in 2035 reflect the congestion on the existing main roads resulting from the projected population and employment growth.* For these simplified maps, the six levels of service have been combined into three categories:





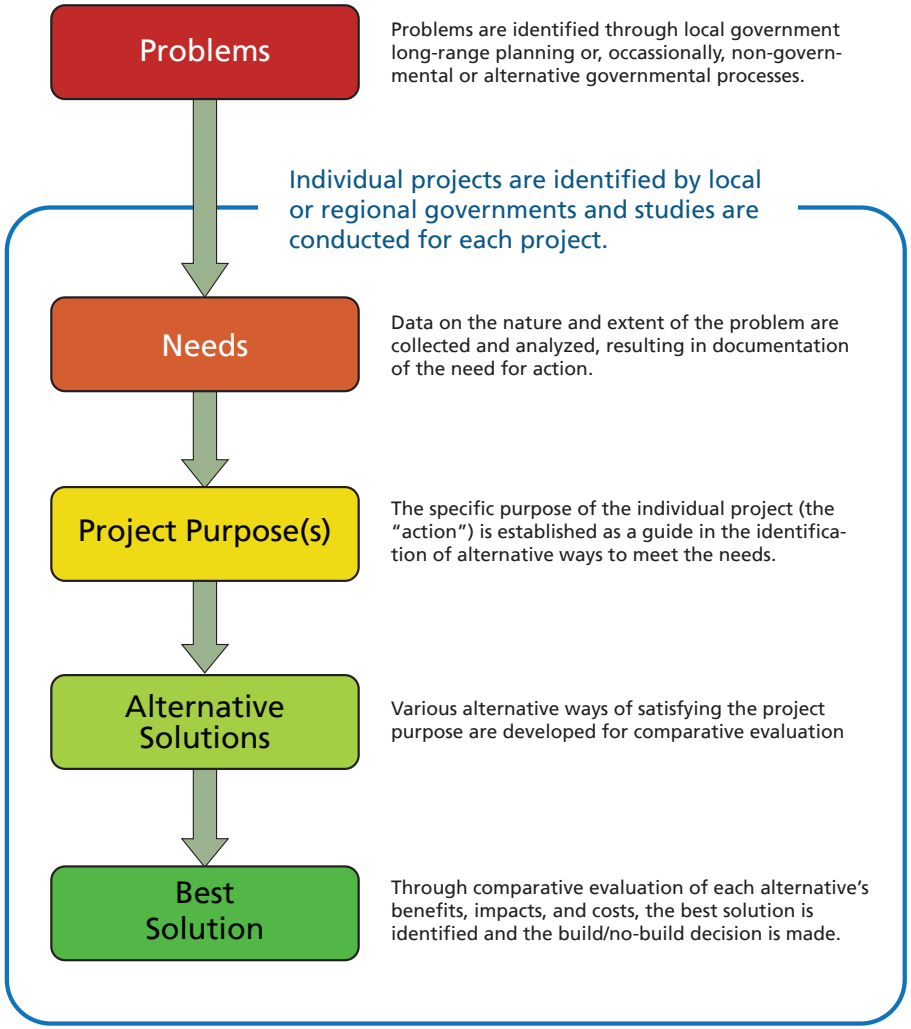
Levels of Service During Peak Travel Times

- A, B or C . . . . . Good to fair
- D . . . . . Poor
- E or F . . . . . At or near gridlock

*The 2035 condition does not reflect the reallocation of land use that would be expected from the project not being built. Once a Preferred Alternative is selected, a quantitative assessment of the indirect effects of the build and no-build scenarios on land use and associated traffic conditions will be evaluated. For additional information regarding growth and development assumptions for the project, please refer to the Indirect Effects and Cumulative Impacts discussion beginning on Page 104 of this Draft EIS as well as the Indirect and Cumulative Effects Report.

Source: Complete 540 Build and No-Build Traffic Analysis Reports (2009)

Finding solutions to transportation problems



of the area's roadways by 2035. These include almost all segments of I-40, US 1/US 64, Ten Ten Road, NC 42, and NC 50, and portions of NC 55. Poor levels of service mean conditions would be at or near gridlock during both the morning and evening peak travel times.

FOR MORE DETAILED INFORMATION

Several technical reports prepared for the Complete 540 study contain much greater detail on the information presented in this chapter, as noted below:

Purpose and Need Statement

Community Characteristics Report

Build Traffic Analysis Report

No-Build Traffic Analysis Report

Traffic Forecast Technical Memorandum

More information about these documents can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways those documents can be accessed, either in paper or electronic form.

CHAPTER 3

The Study Area and Its Features

Understanding the important characteristics of the area where the project would be built.

The purpose of this chapter is to describe natural, social, and physical conditions in the area of the proposed project. This is an important part of the NEPA process because it establishes a baseline or standard against which project impacts may be measured.

INTRODUCTION

Having established the purpose of the project, the next step is to begin exploring alternative ways of achieving that purpose. Before that can be done, however, it is important to understand the social characteristics, natural environmental features, and certain physical features that have been built in the study area that could be affected by the proposed project.

This chapter describes the information that was collected by the study team about the project area and explains the key factors that could be affected by the proposed project. It is not a comprehensive inventory of all the many natural and social factors that are present; instead, it focuses on factors that have a bearing on the type of project being proposed and on the factors that have an influence on the physical locations of the project alternatives. These include categories such as endangered species, relocations, sensitive water bodies, and others.

Often referred to as the "affected environment" chapter, this section of an EIS helps decision-makers focus on the project's key issues. It is important because it sets a baseline against which impacts may be measured.

This chapter begins with a description of the project's study area. It then presents information about the important community characteristics and features of the natural environment in this area, followed by information about the physical environment.

THE STUDY AREA

The general location of the proposed project is called the study area. The study area boundaries are expansive enough to allow a range of reasonable alternatives to be studied. As shown on the map on page 2 of this document, the Complete 540 study area extends between the project's western terminus at NC 55 Bypass in Apex and its eastern terminus at US 64/US 264 Bypass (I-495)

An Increasingly Developed Area

The Raleigh-Durham-Chapel Hill metropolitan area is one of the fastest growing regions in the country, with the area immediately south of Raleigh being one of the places much of this growth is occurring. Since the 1990s, older rural land uses have been steadily converting to the kinds of land uses typically associated with suburban development

Rapid Growth Rates

The population of the Raleigh-Cary metropolitan area has grown by over 52 percent since 2000, making it the nation's second fastest-growing metro area.

Single Family, Detached Homes

As in many parts of the US, the dominant type of residential growth has taken the form of single family, detached housing units, in suburban style developments.

Automobile Dominance

A common characteristic of this kind of growth is that the private auto is often the only transportation option available to access jobs, shopping, medical facilities and the like.

in Knightdale. To the north, the study area boundary corresponds with the southern outskirts of Raleigh and Cary; the southern boundary of the study area corresponds to NC 42. The study area includes much of southeastern Wake County and parts of northern Johnston County. It also includes parts of eight incorporated cities and towns—Apex, Holly Springs, Cary, Fuquay-Varina, Garner, Raleigh, Knightdale, and Clayton—along with many unincorporated communities.

LAND USE AND POPULATION CHARACTERISTICS

The way the landscape has been developed and is being used and the communities that are found in the study area may affect where a new highway such as the proposed 540 could be located. These elements of the human environment are summarized below.

Suburban Development

As recently as the early 1990s, much of the land in the study area was rural or undeveloped. The most common development in the study area was in the form of farms and other agricultural activities. Non-farm residences were widely scattered, often on large rural lots. Starting generally about 20 years ago, this pattern began to change, with suburban-style residential developments increasingly replacing agricultural or vacant land. Today, suburban development is the dominant land use throughout much of the study area.

Although there are variations to the pattern, a common set of characteristics defines this suburban development. These developments are dominated by single-family, detached homes, many of which are relatively large in size compared to the typical housing built in the area in previous decades. The residents of these homes have been highly dependent on the individual automobile. For example, nearly all the trips to work made in the study area (93 percent) between 2009 and 2013 were by car.[1] Another common characteristic is a system of local streets that are typically contained within each individual development, with few connections to larger, regional roads (commonly called "arterials").

Commercial and office land uses tend to either be spread out along the major arterials, with access provided to each individual parcel, or are clustered in

Businesses Along Major Roads

In older suburban areas, businesses tend to be spread out along major roadways. In newer areas, the tendency is for businesses to be clustered at major intersections.

Mixed Use Developments

The number of mixed-use projects being built in the area is increasing. They typically include residential units, retail space, office space, and other uses, including parking facilities.

Higher Density Clusters

Another trend is development of higher density residential projects that use less land and allow more walking and other non-motorized forms of transportation.

"plaza" style developments at the intersections of major roads. These plaza style developments tend to have large parking areas near the roadways, with the commercial structures placed along the rear of the parcels. Major commercial arterials in the study area include NC 55 Bypass, US 401, US 70 Business, and NC 42 near I-40. Major commercial intersections include Holly Springs Road at Sunset Lake Road, Ten Ten Road at Kildare Farm Road and Holly Springs Road, US 70 Business at White Oak Road, Timber Drive at NC 50, and Rock Quarry Road at Battle Bridge Road.

Although suburban residential, commercial, and office development predominate, there are small areas of light industrial land uses in the study area as well. These are located in an area near the I-40 interchange at US 70 Business, along US 401, and near the western project terminus area, at NC 55 Bypass.

These land uses are not spread evenly throughout the study area. Much of the suburban development has occurred west of US 401 in the vicinity of the existing communities of Holly Springs, Fuquay-Varina, Apex, and Cary. In the north-central portion of the study area, in and around the town of Garner, there are pockets of older, higher density development, generally north of Timber Drive. There are also pockets of farming and undeveloped tracts, generally located near NC 42 between US 401 and NC 50, and throughout the area east of I-40.

As described in the project's Indirect and Cumulative Effects Report and Community Impact Assessment, development continues to be planned and built in the study area at a relatively rapid rate, but the characteristics of these developments are changing. Many of the community leaders in the study area are now promoting developments that are not solely residential, with a trend towards mixed-use, higher density, clustered development at major intersections and interchanges.

Most of the existing higher density developments in the study area are located near NC 55, along US 401, along US 70 Business, and near the I-40 interchange at NC 42. These tend to be smaller apartment complexes and townhouse developments. In response to strong regional and national trends, local governments are planning for an increasing percentage of new residential construction to be of this multi-family, higher density variety.

In addition to shifting the type of land development to more mixed uses, most of the smaller communities that ring the study area are seeking to maintain or build upon the "small town" or traditional "main street" characteristics that have historically been present in their downtown core areas.

Parks and Recreation Facilities

Parks and recreation facilities are important components of the overall community fabric and, for purposes of highway planning, they are often designated as protected land uses. Section 4(f) of the US Department of Transportation Act of 1966, states that public parks and recreation facilities cannot, in most cases, be disrupted by highway projects unless it can be shown that there are no feasible and prudent alternatives to doing so. Given that it is hundreds of square miles in size, the Complete 540 study area contains many small parks and recreation facilities that are protected in this way.

There are several notable park facilities in the study area. A string of linked smaller parks in the community of Garner together comprise a large area of parkland. These smaller parks include: South Garner Park, Thompson Park, White Deer Park (which is planned for expansion), and Lake Benson Park. In addition, the planned Bryan Road Nature Park is intended to connect to Centennial Park by way of the Mahler's Creek Greenway. The Town of Cary's Middle Creek School Park, which connects to several existing and planned greenways, comprises another large area of parkland in the study vicinity. Another valuable public resource is Clemmons Educational State Forest, located on Old US 70 at the Wake-Johnston county border, northeast of Clayton. The Neuse River Trail is a 28-mile long greenway trail adjacent to the Neuse River, to the east of Raleigh. A notable planned facility is Southeast Regional Park, a county park that Wake County plans to construct near NC 42 and Barber Bridge Road, in the Willow Springs area. Another notable planned facility is Sunset Oaks Park, which the Town of Holly Springs plans to construct in the Sunset Oaks neighborhood. Each of these facilities are or have the potential to be protected by the Section 4(f) requirements.

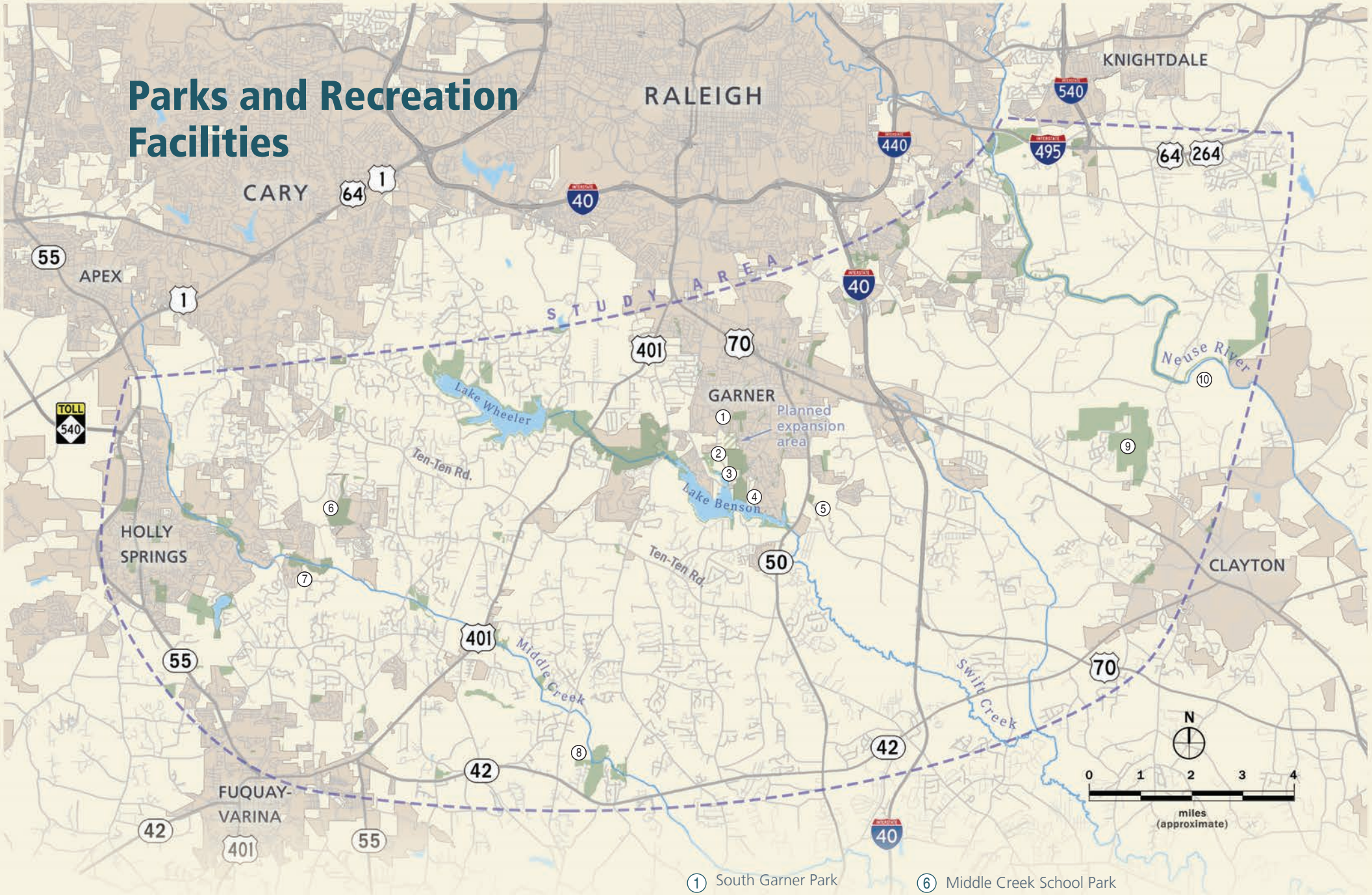
Bass Lake Park, in the community of Holly Springs, is just one of many public park and recreation facilities within the Complete 540 study area.

Historic Properties and Districts

Like recreation facilities, historic properties or districts may qualify for protection, under Section 4(f) of the US DOT Act or Section 106 of the National Historic Preservation Act of 1966, or both. In order to be protected by these statutes, properties or districts must be listed on the US Department of the Interior's *National Register of Historic Places* or be determined to be eligible for listing on the *National Register*. In some cases, local historic sites or districts may not be eligible for *National Register* listing but are still considered important enough to be considered in locating new highways.

Other than the downtown areas of Fuquay-Varina and Garner, there is only one large-sized historic district in the study area that is on the *National Reg-*

Parks and Recreation Facilities



With a large study area containing many residential developments, there is a large number of small, neighborhood-sized parks and recreation areas. There are also several larger, more regional-level facilities. The larger parks and recreation parcels are shown here.

1. South Garner Park
2. Thompson Park
3. White Deer Park
4. Lake Benson Park
5. Centennial Park
6. Middle Creek School Park
7. Planned Sunset Oaks Park
8. Planned Southeast Regional Park
9. Clemmons Educational State Forest
10. Neuse River Trail

ister—a 338-acre rural historic district located on both sides of Sunset Lake Road in Fuquay-Varina.

Several other, smaller properties are currently listed on the *National Register*, but they are scattered throughout the study area, with no concentrated locations. For the purposes of studies such as the one being conducted for the Complete 540 project, properties that are not listed on the *National Register* but have been found to be eligible for listing are treated as if they were listed. The listed and eligible properties found in the study area are discussed in more detail in Chapter 5 of this document.

The Jones-Johnson-Ballentine Historic District is a 338-acre agricultural complex that is listed on the National Register of Historic Places. It consists of two farms with numerous houses and outbuildings. It is located in the Complete 540 study area, on Sunset Lake Road in Fuquay-Varina.

Other Public or Semi-Public Land Uses

There are several other public or semi-public land uses and facilities that, while not protected by regulations, could influence the location of a new highway. These include hospitals and other medical facilities, emergency service locations (for example, police and fire stations), educational facilities, places of worship, military installations, prisons, or other large public holdings. Given the size of the Complete 540 study area and the large number of people that live within it, these types of public or semi-public land uses are numerous and scattered throughout the area. For example, there are dozens of public K-12 and private schools and numerous places of worship scattered throughout the study area.

Notable properties in these categories include:

- the main campus of Wake Technical Community College, which is located on US 401 in unincorporated Wake County, between the towns of Garner and Fuquay-Varina.
- Randleigh Farm—a large tract on Battle Bridge Road jointly owned by Wake County and the City of Raleigh intended for use as a planned development.
- NC State University/USDA property, a planned development located along US 70 Business, near Wake/Johnston county line (this property is currently the NC Central Crop Research Station).
- a large area owned by City of Raleigh east of Randleigh Farm, which includes a police training facility and the Neuse River Wastewater Treatment Plant.
- the Dempsey E. Benton Water Treatment Plant, on NC 50 in Garner.

ECONOMIC CHARACTERISTICS

As described in the project's Community Impact Assessment, the Raleigh area has a robust and diversified economy and includes many of the State's largest

employers. These include numerous universities, Research Triangle Park, and state government. Other important area components of the area's employment mix include biotechnology, information technology, higher education, and health care.

The North Carolina Department of Commerce-Division of Employment Security (DES) projects that the Capital Area Workforce Development Board (WDB) area, which includes Wake and Johnston counties, will gain 112,810 jobs between 2010 and 2020, an increase of 21.5 percent. As documented in the Indirect and Cumulative Effects Report, local planners also anticipate continued job growth in the project area and many jurisdictions anticipate that commercial land uses will make up a growing share of local land uses.

Income Levels

The median household income in the project study area is somewhat higher than median household incomes in Wake or Johnston County and is much higher than the state's median household income. A smaller percentage of study area residents have incomes below the federally defined poverty level.[2] Likewise, homes in the study area have a higher median value than in either county or the state as a whole. Incomes are generally higher along the study area's western side, in southern Cary, Apex, and Holly Springs. Some parts of the study area, however, are characterized by lower incomes, higher rates of poverty, less homeownership, and lower home values. These areas are generally concentrated along the north central and northeastern edges of the study area (in Garner, southeast Raleigh, and Knightdale) and in central Clayton.

Racial/Ethnic Percentages

The racial and ethnic makeup of the study area is similar to the overall makeup of Wake and Johnston Counties. About 33 percent of residents of the study area self-identify as members of minority racial or ethnic groups. Minority populations in the study area are more concentrated at its northern edge, in Garner, southeast Raleigh, and Knightdale. Hispanic residents are concentrated in Garner, Clayton, Knightdale, and near US 401. About five percent of study area residents are classified by the US Census Bureau as having limited English language proficiency—most of these individuals are Spanish-speakers.[3]

NATURAL ENVIRONMENT CHARACTERISTICS

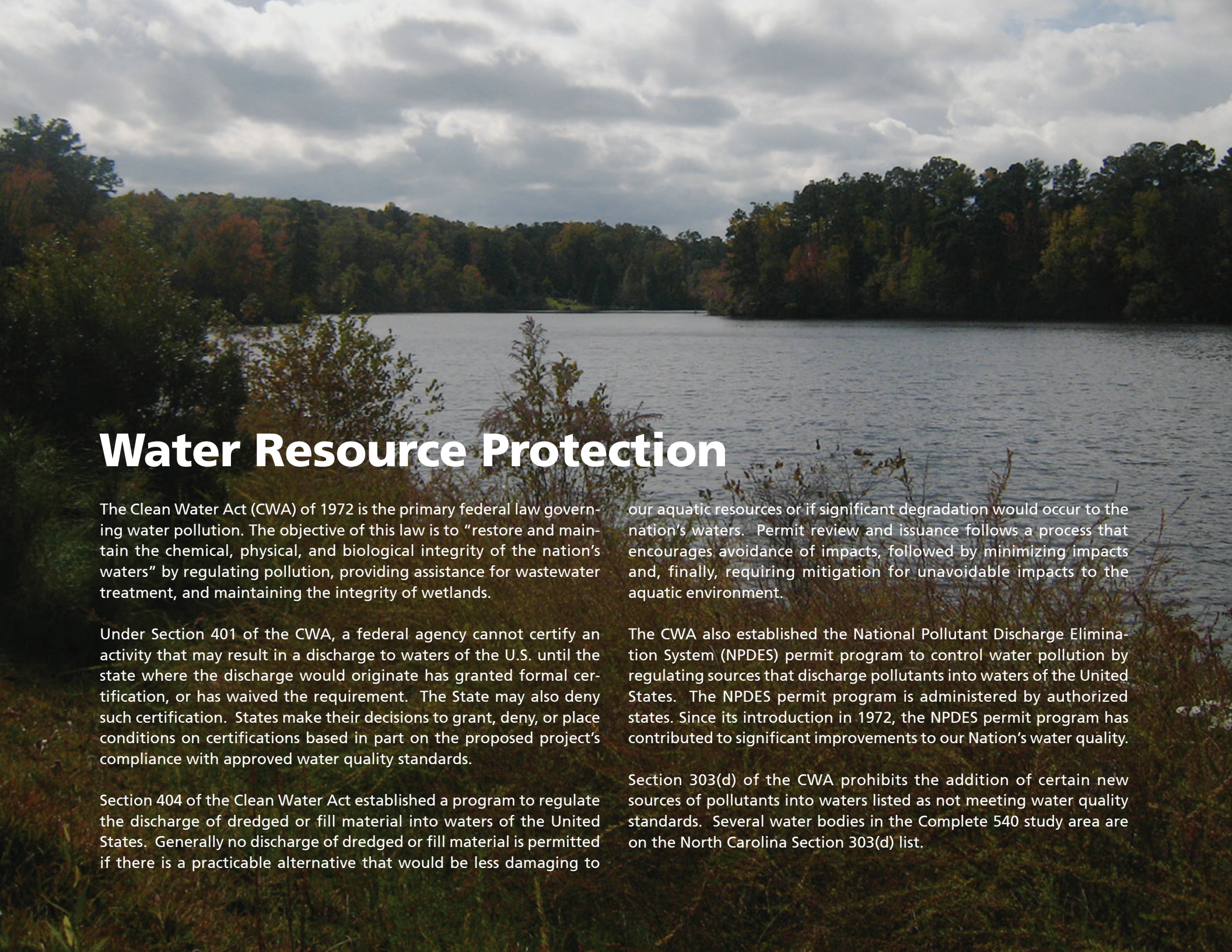
In addition to the study area's various land use characteristics, there are also natural environment elements that can affect where a new highway such as the proposed project could be located. These include rivers, streams and lakes; wetland areas; and areas with federally protected plant or animal species, and other protected areas. These elements of the natural environment are summarized below and are described in much greater detail in the study's Natural Resources Technical Report.

Physical Setting of the Study Area

The Complete 540 study area is located in North Carolina's piedmont region, which is described as the area of gently rolling hills separating the coastal plain from the Appalachian Mountains. Elevations in the study area range from 140 to 460 feet above sea level. The study area itself lies mainly within the Neuse River basin, with a small portion extending to the Cape Fear River basin at the far western edge of the study area.

Area Rivers, Streams, Lakes

There are no natural lakes in the region; all water bodies with substantial surface areas are "impounded," formed by dams on rivers and streams. The principal rivers and streams in the study area include the Neuse River, Swift Creek, Middle Creek, and Little Creek. These are shown on the "Water Resources" map on page 28. Large expanses of floodplain are not present in



Water Resource Protection

The Clean Water Act (CWA) of 1972 is the primary federal law governing water pollution. The objective of this law is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters" by regulating pollution, providing assistance for wastewater treatment, and maintaining the integrity of wetlands.

Under Section 401 of the CWA, a federal agency cannot certify an activity that may result in a discharge to waters of the U.S. until the state where the discharge would originate has granted formal certification, or has waived the requirement. The State may also deny such certification. States make their decisions to grant, deny, or place conditions on certifications based in part on the proposed project's compliance with approved water quality standards.

Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into waters of the United States. Generally no discharge of dredged or fill material is permitted if there is a practicable alternative that would be less damaging to our aquatic resources or if significant degradation would occur to the nation's waters. Permit review and issuance follows a process that encourages avoidance of impacts, followed by minimizing impacts and, finally, requiring mitigation for unavoidable impacts to the aquatic environment.

The CWA also established the National Pollutant Discharge Elimination System (NPDES) permit program to control water pollution by regulating sources that discharge pollutants into waters of the United States. The NPDES permit program is administered by authorized states. Since its introduction in 1972, the NPDES permit program has contributed to significant improvements to our Nation's water quality.

Section 303(d) of the CWA prohibits the addition of certain new sources of pollutants into waters listed as not meeting water quality standards. Several water bodies in the Complete 540 study area are on the North Carolina Section 303(d) list.

the study area; however, narrow bands of floodplain areas are found along stream edges.

Neuse River — The Neuse River is the largest river in the study area and is an important water resource. The reach of the Neuse River within the study area has been identified by the NC Department of Environment and Natural Resources (NCDENR) as an Anadromous Fish Spawning Area. An anadromous fish species is a species that is born in fresh water, spends most of its life in the sea, and then returns to fresh water to spawn. Anadromous Fish Spawning Areas are portions of rivers or streams designated by NCDENR as places where spawning of anadromous fish has been documented through direct observation of spawning, capture of running ripe females, or capture of eggs or early larvae. The Neuse River has also been designated as a Primary Nursery Area, which refers to an area important for post-larval development of commercially important fish and shellfish.

Although it supports these fish populations, the Neuse River in the study area also is listed on the North Carolina 2014 Final 303(d) list of impaired waters due to high copper levels.[4] (See "Water Resource Protection," on the facing page for additional information.) The portion of the Neuse River in the study area for this project is classified as Class C waters, which include secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture.

Development within the Neuse River basin is subject to the Neuse River Buffer Rules, administered by the NC Department of Environment and Natural Resources-Division of Water Resources (NCDENR-DWR). These rules require development within the Neuse River basin to maintain minimum 50-foot buffers along each side of streams.

Swift Creek (including Lake Benson and Lake Wheeler) — Swift Creek is an important water body in the study area and includes two impounded areas that form Lake Benson and Lake Wheeler.

As shown on the map on the following page, in the Complete 540 study area, Swift Creek has been classified as Water Supply III (WS-III), which is defined as waters used as sources of water supply for drinking, culinary, or food processing purposes. Like the Neuse River, these waters are also protected for Class C uses. A management plan is in place for Swift Creek and its impounded water bodies (Lake Wheeler and Lake Benson). This plan established the boundaries of the Swift Creek Watershed Critical Area. It also established strict limitations on development within the Watershed Critical Area.

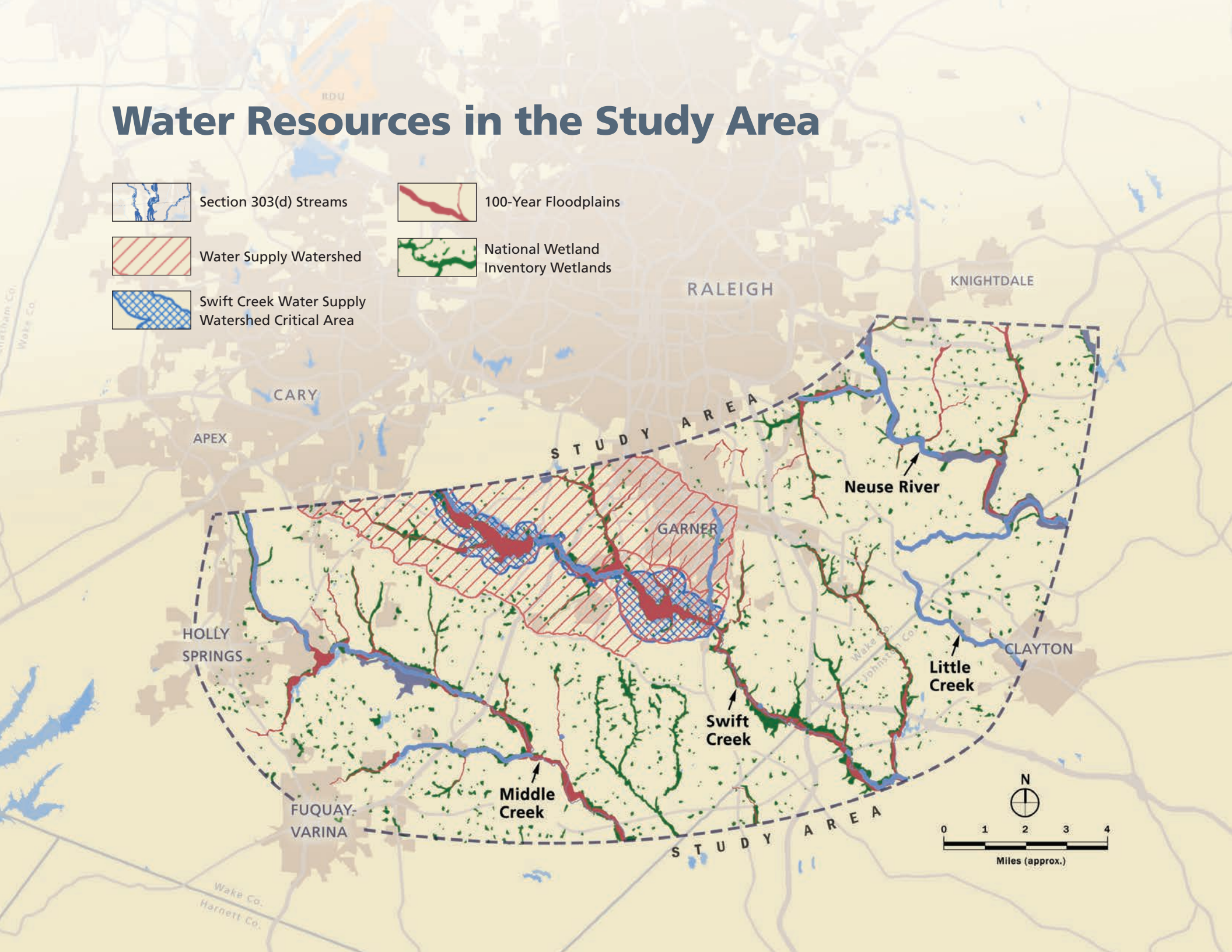
In addition to these water supply protections, portions of Swift Creek in the study area are on the North Carolina 2014 Final 303(d) list of impaired waters due to "impaired benthic integrity," which refers to the biological condition of a stream.

Portions of Swift Creek in the study area also support populations of the dwarf wedgemussel, a species of mussel listed by US Fish and Wildlife Service (USFWS) as endangered. (See page 30 for more detail.)

Development within Swift Creek WS-III watershed is limited by watershed protection policies, which limit development densities near Swift Creek, within Wake County's 1990 Swift Creek Land Management Plan area. This plan identifies a Watershed Critical Area immediately surrounding Lake Wheeler, Lake Benson, and Swift Creek between these two lakes. Development is limited to very low densities within the Critical Area.

Little Creek— Little Creek is located near Clayton, in northern Johnston County, where it flows into Swift Creek. It is on the North Carolina 2014 Final 303(d) list due to impaired benthic integrity and a poor fish community. Little Creek is classified as Class C waters.

Water Resources in the Study Area



Middle Creek and Terrible Creek— Middle Creek and Terrible Creek are two streams in the western part of the study area. Portions of both are on the North Carolina 2014 Final 303(d) list of impaired waters. Middle Creek is on the list due to impaired benthic integrity and a poor fish community. Terrible Creek, which flows into Middle Creek, is on the list due to impaired benthic integrity. Both Middle Creek and Terrible Creek are classified as Class C waters.

Beddingfield Creek — Beddingfield Creek is in the eastern part of the study area, where it flows into the Neuse River. It is on the North Carolina 2014 Final 303(d) list due to impaired benthic integrity. Beddingfield Creek is classified as Class C waters.

Wetlands

The Clean Water Act (CWA) defines wetlands as "areas that are inundated or saturated by surface or groundwater 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. Pockets of small wetlands are scattered throughout the area and are mainly associated with rivers and streams.

An initial analysis of wetland type, quality, and location was made for the entire study area by consulting the National Wetlands Inventory (NWI) database, which is maintained by the USFWS. More precise mapping of potentially impacted wetlands was done through on-the-ground field work, conducted by qualified biologists, to determine the precise location of CWA wetlands. These more detailed determinations are described in Chapter 5 of this document.

Upland Areas (Terrestrial Communities and Forests)

Aside from rivers, streams, floodplains, and wetland areas, most of the study area's "upland" areas consist of land that is classified as "maintained/disturbed" (such as lawns, roadway shoulders and ditches, etc.) or "agriculture/pasture" land (according to NC OneMap classifications). In addition, the study area also contains a large amount of forested land.

Other Notable Areas

Several sites are designated by the North Carolina Natural Heritage Program (NHP) as NHP Natural Areas. A NHP natural area is an area of land or water that is important for the conservation of the natural biodiversity of North Carolina. The Natural Heritage Program identifies these natural areas based on biological surveys. Identification of these natural areas is based on ecological and biological information, rather than property boundaries.[5]

Protected Species

An important consideration in the Complete 540 study is making sure that the requirements of the Endangered Species Act of 1973 are met. The purpose of this legislation is to protect and recover imperiled species and the ecosystems upon which they depend. The USFWS and the National Marine Fisheries Service have the responsibility of administering the Act. These agencies maintain a list of species that have been determined to be endangered with extinction or are threatened and may become endangered.

Several endangered plant and animal species are listed as known to or are believed to occur in either Wake or Johnston counties. These include:

Red-cockaded woodpecker (*Picoides borealis*) – This species typically occupies open, mature stands of southern pines, particularly longleaf pine. It excavates cavities for nesting and roosting in living pine trees, aged 60 years or older.

Tar River spinymussel (*Ellipto steinstansana*) – In North Carolina, this species is found in the rivers and streams of the Neuse River and Tar River basins.

Endangered Species

The Dwarf Wedgemussel

The dwarf wedgemussel (*Alasmidonta heterodon*) is a freshwater mussel classified by the US Fish and Wildlife Service (USFWS) as a federally endangered species. Under the Endangered Species Act of 1973, all federal agencies (including the US Department of Transportation) must ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

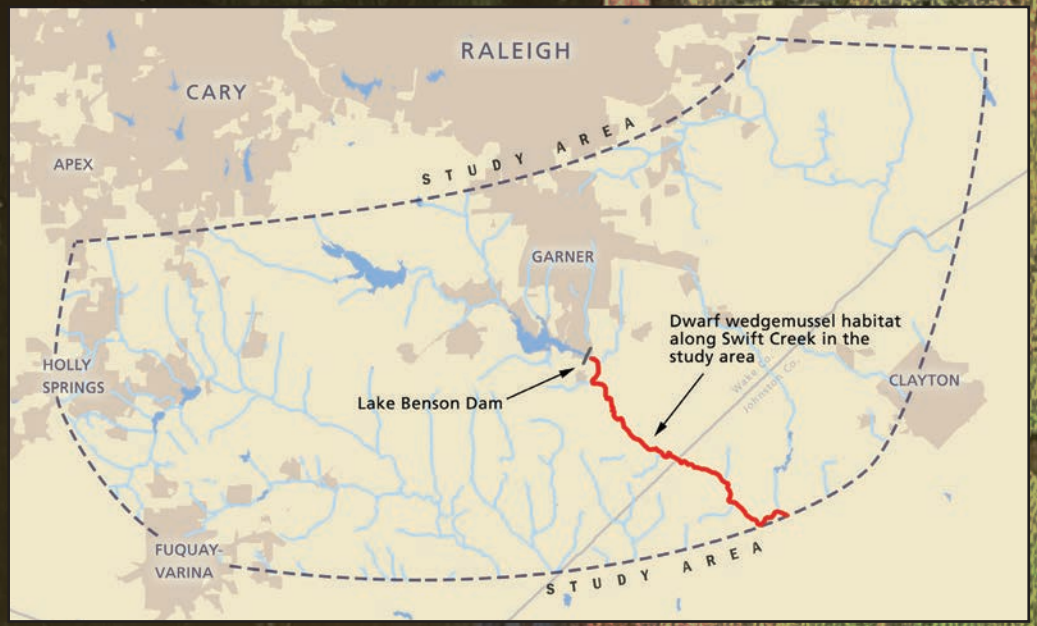
As part of its work to ensure the continued viability of the dwarf wedgemussel, the USFWS published a Recovery Plan for this species in 1993. In this plan, the habitat provided by Swift Creek is identified as essential for the recovery of the species in the Neuse River basin (USFWS, 1993).

Although suitable habitat is found along the entire length of Swift Creek, the dam on the southeast side of Lake Benson has the effect of dividing the creek into two separate sections. Because mussels cannot travel back and forth across the dam, any individuals that might occur upstream of the dam would be isolated from individuals found downstream.

Downstream from the Lake Benson dam, Swift Creek is part of a larger, contiguous area of mussel habitat — a location where actual specimens of the dwarf wedgemussel have been found. As a result, the length of Swift Creek downstream from Lake Benson is particularly important for the long-term survival of this species in the region.

Although the Dwarf Wedgemussel Recovery Plan has been in place for more than 20 years, the species continues to be in jeopardy. This is due, in part, to increased sedimentation levels in Swift Creek as a result of runoff from land development in the Swift Creek watershed. In keeping with federal regulations, the USFWS is working closely with NCDOT and the Federal Highway Administration to ensure the Complete 540 project would not further jeopardize the continued survival of this mussel population.

More information on this subject can be found in the following reports prepared for the Complete 540 study: Freshwater Mussel Survey Report (February 2012) and Dwarf Wedgemussel Viability Study: Phase I (March 2014).



Michaux's sumac (*Rhus michauxii*) – This plant is found in the inner Coastal Plain and Piedmont regions of North Carolina. It grows best in areas where disturbances have created open areas.

Northern long-eared bat (*Myots septentrionalis*) – This species was listed as a federally threatened species in April 2015. It is found primarily in western North Carolina, but is known to or is believed to occur in central and eastern North Carolina.

Of particular importance to the Complete 540 project is the dwarf wedgemussel (*Alasmidonta heterodon*) which is found in the rivers and streams of the Neuse River watershed and could be directly affected by the proposed project.

PHYSICAL CHARACTERISTICS

In addition to the study area's various land use characteristics and natural environment elements, there are also various physical structures that can affect where a new highway such as the proposed 540 could be located. These include such things as other highways, water and sewer plants, various power stations and power lines, fuel transmission pipelines, underground storage tanks, as well as areas that have been found to be contaminated with hazardous materials. These elements of the physical environment are summarized below and are described in much greater detail in the study's Community Impact Assessment, Utility Impact Report, and GeoEnvironmental Report for Planning (see list of reports at the end of this chapter for a full list of source materials.)

Highways

Because the proposed 540 project would be a limited-access highway, with access to and from it only allowed at interchange on and off ramps, the location of other major roads that would intersect with 540 is an important consideration. These include the following:

- NC 55 Bypass
- Bells Lake Road
- Old Stage Road
- I-40
- Old Baucom Road
- Auburn Knightdale Road
- US 64/US 264 Bypass (I-495)
- Holly Springs Road
- US 401
- NC 50
- White Oak Road
- US 70 Business
- Poole Road

These intersecting roads are important because constructing interchanges can result in various impacts, and because of potential changes in traffic patterns and land uses around them.

Drinking Water and Waste Water Treatment Facilities

Facilities that purify drinking water or treat wastewater are typically owned and operated by local or regional governments and require substantial public investment. Because they represent a type of land use that would be expensive and potentially disruptive to relocate, they are best avoided when seeking routes for new roads such as the proposed 540 project. The major wastewater treatment facilities in the study area include the following:

City of Raleigh Dempsey E. Benton Water Treatment Plant — This facility is located on NC 50 in Garner; it also has an associated bio-solids treatment facility on Wrenn Road near I-40.

City of Raleigh Neuse River Wastewater Treatment Plant — This facility is located on Battle Bridge Road, in the far eastern portion of the study area.

Western Wake Regional Water Reclamation Facility — This facility is located just west of study area and is jointly operated by Cary, Apex, Holly Springs, and Morrisville.

South Cary Water Reclamation Facility — This facility is located on West Lake Road, east of Holly Springs.

Town of Apex Water Reclamation Facility — This facility is located on Pristine Water Drive, near the extreme western edge of the project.

Town of Clayton Little Creek Water Reclamation Facility — This facility is located on Durham Street, in Clayton.

Electricity and Fuels Generation and Distribution

Although power plants, large power lines, and fuel pipelines are more often privately owned than are water facilities, they still represent large, expensive physical structures that would be costly and potentially disruptive to relocate. Therefore, as with water facilities, they are best avoided when developing new highways.

In the Complete 540 study area there are two electric power substations—one on Battle Bridge Road and another on Ten Ten Road near Sauls Road. There are also several large powerlines that traverse the study area. Underground, there are two natural gas pipelines that cross the study area.

The Complete 540 study area also includes a solar field managed by the City of Raleigh. This facility is the Neuse River Solar Farm, located on a 30-acre tract at the corner of Battle Bridge Road and Brownfield Road in the eastern part of the study area.

Communications Facilities and Distribution Lines

Another factor in locating new highways is the presence of communication towers. The Complete 540 study area contains several such towers in various locations. One particularly noteworthy installation is a group of three large towers located along US 70 Business, just north of Clayton. These towers are important because they include television, radio, emergency (911), federal/state police, and weather communications. Additionally, just north of US 70 Business, along Rock Quarry Road, there is a smaller tower that provides warning sirens for the Shearon Harris Nuclear Power Plant (west of Holly Springs), Federal Aviation Administration air traffic control communications equipment, and cell phone transmission facilities. Given these functions, relocation to accommodate a highway would be costly and potentially disruptive. As a result, their presence is a factor in developing various route location options.

Contamination Sites, Hazardous Materials, and Landfills

The built environment also includes sites that either store hazardous materials or have been designated as contaminated, as well as landfill sites. Facilities that store hazardous materials are located throughout the study area, mainly along major roads. These sites include gas stations, former gas stations, auto repair and salvage facilities, and dry cleaners. No large scale contamination sites are known to exist in the study area.

There are three landfills in the study area. The South Wake Landfill is located just south of the existing end of NC 540, at NC 55 Bypass in Apex. The Buffaloe Landfill is located on the west side of US 401, about a mile south of US 70 Business. There is also a construction and demolition debris landfill on Brownfield Road south of Battle Bridge Road.

MORE DETAILED INFORMATION

Several technical reports prepared for the Complete 540 study contain much greater detail on the information presented in this chapter, as noted below:

Community Features

- Community Characteristics Report
- Community Impact Assessment
- Historic Architectural Resources Survey Report

Natural Environment

- Natural Resources Technical Report
- Indirect and Cumulative Effects Report
- Freshwater Mussel Survey Report
- Dwarf Wedgemussel Viability Study: Phase I

Physical Features

- GeoEnvironmental Report for Planning
- Utility Impact Report
- Community Impact Assessment

More information about these documents can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways those documents can be accessed, either in paper or electronic form.

CHAPTER 4

Alternatives for Meeting the Project Purpose

Understanding the various options that were developed to meet the project purpose.

This chapter describes the various transportation options that were examined to meet the project purpose while keeping community and environmental effects to a minimum. This includes a description of the methods used to decide which alternatives should be carried forward for detailed analysis and which should be dismissed.

INTRODUCTION

As described in Chapter 2, area transportation needs were identified and two specific purposes for the proposed project were established: to improve mobility within or through the study area during peak travel periods and to reduce forecast congestion on the existing roadway network within the project study area. Chapter 3 described the next step in the study, which was to gather information about the social, natural, and physical environment in the study area. This chapter describes how these two sets of information were used in the process of deciding what type of transportation improvements would best achieve the project purpose and where they should be located. These different ways of meeting the project purpose are called "alternatives."

Identification of Alternatives

It is important to start with a wide range of alternatives, both in terms of the kind of transportation improvement that might be used and where they would be implemented. This wide range of alternatives avoids focusing on one type of assumed solution when there might be others that would better meet the project purpose. For this reason, non-highway options, or "concepts," may be considered as along with highway options. These may include approaches such as altering the demand for the use of existing roads, changing how the existing roadway system is managed, or introducing or enhancing mass transit.

The identification of alternative solutions is an important stage in the NEPA process. FHWA states that identifying and analyzing alternatives is the key to ensuring that project decisions are made in an informed, objective manner.

Screening of Alternatives

Once a wide range of alternatives has been identified, they each need to be analyzed. The ones that look most promising can then be studied more closely while those with less merit can be dropped from further consideration. Because there is always a very wide range of possible alternatives at the beginning, some can be dismissed early in the process, while others require more investigation before their benefits and impacts can be compared. Ultimately,

by eliminating some alternatives and combining others, a range of reasonable alternatives is established.

This process of analysis and comparison, followed by decisions on which alternatives to drop and which to keep, is called "screening." Typically, several rounds, or "iterations," of screening are conducted, depending on the number and type of alternatives developed for any given project. The reason for using an iterative screening process is to avoid the need to do extensive, detailed analysis of each alternative when some can be dismissed for fundamental reasons. For example, the first screening typically is concerned only with whether any of the alternatives initially identified would meet the purpose of the project. As described in Chapter 2 of this document, any alternative that would not meet the project's established purpose or purposes is dropped at this stage—there is no reason to continue studying an alternative if it would not achieve the primary purpose of the project.

The next screen typically consists of an initial review of the remaining alternatives, comparing how well, or to what degree, they would meet the project's purposes, and the extent to which they would negatively affect the area's social, natural, or physical features. In this second screen, these comparisons are based on relatively general information about each alternative's benefits and impacts. The least favorable alternatives are dismissed; those that remain are then studied in more detail, and another screen is conducted, based on that new benefit-impact information. Using this process, the most detailed level of analysis, which is the most costly and time consuming to conduct, is required for only a small number of reasonable alternatives that meet the project purpose. These are referred to as "detailed study alternatives," or DSAs.

The screening process includes reviews by federal, state, and local agencies and the public. During the first iteration, agency representatives provide comments about the ability of each alternative to meet the project's purposes. In subsequent rounds of screening, agency representatives provide comments on each alternative's potential impacts. The public is informed about the nature and location of the alternatives and provides comments about the alternatives. This information becomes part of the data used in screening alternatives.

The "No-Build" or "no project" alternative is always considered an option throughout the study. It cannot be ruled out until the "Build" alternative's effects have been thoroughly studied, and all comments from government agencies and the public have been fully considered and responded to.

The No-Build Alternative

The screening process is intended to find the optimal way of meeting the project purpose—in other words, an alternative that would maximize benefits while minimizing impacts. This is known as the "Build" alternative. Consideration of Build alternatives does not, however, mean that a Build alternative will be selected. First, it must be determined that the costs of the Build alternative in dollars and environmental impacts are an acceptable trade-off for the benefits it would bring. Because it is possible that those costs will be found unacceptable, the option of not implementing the project—known as the "no project" or "No-Build" alternative—is considered a viable alternative throughout this study. The No-Build alternative can be ruled out after the

Build alternative's effects are studied, presented to the public and governmental agencies, and comments from them are received and considered. In addition, the No-Build alternative provides a baseline against which the benefits, costs and impacts of Build alternatives can be compared.

THE COMPLETE 540 PROCESS

Although for some studies there are valid reasons to deviate from this process, this was not the case on the Complete 540 project, and alternatives development and screening took place as described above. This began with the exploration of alternative "concepts" or possible non-highway solutions for meeting the project's purposes, along with initial identification of possible highway alternatives. These were then subjected to a series of screenings. At the end of this screening process, the study's DSAs (detailed study alternatives) were agreed upon and further analysis was conducted for them.

The steps that resulted in the designation of the DSAs are described in the remaining sections of this chapter. The more detailed impact assessment conducted for the DSAs is the subject of the following chapter.

The Initial Set of Concepts

Three alternative concepts other than roadway construction were considered:

Transportation Demand Management (TDM) Concept —TDM includes strategies designed to reduce the need or "demand" that individuals have to use the roadway system itself. If people need to use their cars and trucks less often, mobility for those remaining on the roads will improve, and traffic congestion will diminish. Examples of TDM include techniques to increase ride-sharing, to achieve staggered work hours at larger employment centers, and to promote working at home (telecommuting).

Transportation System Management (TSM) Concept — TSM measures typically consist of low-cost, minor improvements to roadways to increase the capacity or efficiency of the overall roadway system. Examples of these kinds of improvements include coordinating traffic signals at intersections, installing turn lanes at intersections, and limiting the number of access points on various roadway segments.

Mass Transit/Multi-Modal Concept — The Mass Transit option would expand bus and rail passenger service in the project area, resulting in fewer cars and trucks needing to use the existing roadway system. The Multi-Modal option would combine expanded transit service with all of the roadway projects included in CAMPO's 2035 Long Range Transportation Plan, but excluding the Complete 540 project.

In addition to these non-roadway alternatives, several different roadway options were considered. These included:

Making upgrades and other improvements to existing roadways — This alternative differs from the TSM concept in that it would not be limited to smaller improvements but would involve major reconstruction of extensive portions of existing roads in the study area. Three combinations of existing roadways having the greatest potential to meet the project purposes were examined. Each of these combinations would require widening some of the larger roads in the study area (such as I-40 and the area's US Routes) to twelve lanes, and widening other area roads to six lanes, some of which would require frontage or service roads.

Combination, or "hybrid," options — This concept would combine upgrading certain existing roadways, as described above, with some completely new construction in other areas. Three options having the greatest possibility of meeting the project purposes were examined. One of these three would construct a new, limited-access facility in the western portion of the study area

Examples of Non-Highway Concepts

Transportation Demand Management is an approach to reducing traffic on existing roadways by attempting to change drivers' need to use roads. Staggered work hours at large employment centers is one technique that can make a difference.

Transportation Systems Management is an approach to making existing roadways operate more efficiently. Improving traffic signal operations, maintenance, timing, and location is one way of better managing the system.

Mass Transit / Multi-Modal relies on either expansion or implementation of bus and passenger rail service to reduce car and truck use on the existing roadway system; or, it combines expanded transit service with the roadway projects included in area long-range plans.

(west of I-40) and would improve existing roads in the eastern portion. The other two would reverse this pattern, upgrading existing roads west of I-40 and building a new facility east of I-40.

Construction of an entirely new highway — This option would construct a completely new, limited-access facility. It would be similar in design to the existing segments of 540, with access to and from the highway provided using on and off ramps at interchanges.

A "No-Build" alternative was also considered. This option is based on the assumption that the transportation network in the study area will continue to develop as called for in CAMPO's 2035 Long-Range Transportation Plan, but without the Complete 540 project included.

Screening of the Initial Concepts

As described earlier, the objective of the first screening is to identify concepts that meet the project's primary purposes. To do this, measures of effectiveness were established for each purpose. A very general summary of these measures is described here. A much more detailed description of the full analysis can be found in the Complete 540 study's Alternatives Development and Analysis Report.

Screening Measures

For the first primary purpose—improving mobility—two screening measures were used. These measures were:

- calculation of average speeds of vehicles on major roads in the study area--if a concept would substantially improve these average speeds on these roads, it would be judged as having improved mobility.
- a calculation of travel times for commuters between major origins and destinations in and around the study area--if a concept would result in a substantial reduction in commuting times, it was also defined as improving mobility.

For the second primary purpose—reducing traffic congestion on area roads—three screening measures were applied. These measures were:

- a calculation of the total number of "vehicle hours" of travel on the major roadways in and around the study area--a reduction in the total number of vehicle hours on this roadway network is an indication of reduced congestion.
- a calculation of the total number of "vehicle miles" traveled on roads that are carrying more traffic than they were designed for (or that is predicted to reach this condition by the year 2035)--reduction in the total number of miles vehicles are traveling on these roads is also an indication of reduced congestion.
- applying the "vehicle hours" of travel calculation to this same set of roads that are or will in the future be beyond their capacity--reduction in vehicle hours traveled on these roads is an indication of reduced congestion.

Public and Agency Review

As part of the screening process, the initial alternative concepts and their screening measures were presented to the public and to regulatory agencies for their review and comment. Public presentations were done at a series of informal public meetings conducted by the study team (NCDOT and FHWA) in September of 2010; the study team met with local, state, and federal agency representatives in the summer and fall of 2010.

Results of the Screening of Initial Alternative Concepts

A combination of qualitative and quantitative methods was used to assess the effectiveness of each alternative. A summary of the results for each is described below.

Transportation Demand Management — After applying the screening measures, the study team concluded that the TDM concept would not meet either of the project's primary purposes. In order to achieve increased mobility and reduced congestion, as many as 60 percent of commuters who currently drive their own vehicles to work would need to permanently switch to options such as carpooling, vanpooling, or telecommuting (working from home). Because there is no evidence to suggest this is attainable in the Triangle Region, TDM would not be able to reduce congestion or increase mobility.[1] It would therefore not meet the project purpose and was dropped from further consideration.

Transportation System Management — The TSM concept of making minor improvements on area roads to improve efficiency would not meet either of the project's primary purposes. While TSM improvement can increase speeds on freeways, expressways, and major arterial roads, these types of roadways account for only a small percentage of the total miles of congested roadways in the study area. Even if all TSM-eligible facilities in the study area were improved, these improvements would not result in comparatively large reductions in forecast traffic congestion. Because TSM improvements would not meet the project purpose, it was dropped from further consideration.

Mass Transit/Multi-Modal Improvements — The mass transit/multi-modal concept also would not meet the project's purposes. As explained in the Complete 540 study's Alternatives Development and Analysis Report, neither existing nor forecast ridership levels on the existing transit system are high enough to remove enough vehicles from the roadway network to meet the primary purposes of the project. It is also doubtful that expanding the existing system would be a viable option. Taking as a starting point the example of bus service, a study conducted for the Complete 540 project[2] revealed that the number of buses serving the study area on a daily basis would need to increase from the 50 or so that are currently in use to nearly 600, and each would need to consistently operate at nearly full capacity (about 50 passengers each), in order to remove enough vehicles to achieve a decrease in study area traffic congestion and an improvement in travel times sufficient to meet the proj-

ect's primary purposes. It is doubtful, however, that such expansion would be feasible. The cost associated with such a large expansion of bus service would be high and would include: employment of drivers and mechanics; staff for operations, administration, and other support functions; infrastructure improvements to accommodate bus operations on the roadway network; infrastructure improvements to accommodate bus maintenance, staging, and storage; and costs for acquisition, operation, and maintenance of the vehicles themselves. It is unlikely that these expansion and ongoing operation costs could be met by bus fares alone. In addition, there is no guarantee that ridership levels would be high enough to achieve the desired reduction in area traffic congestion. Other forms of mass transit include light or heavy rail but those options would require even greater expenditures than the expansion of bus service would require and would require additional expenditures for locating, designing, building, and maintaining new rail lines. It is for these reasons that NCDOT concluded the mass transit/multi-modal concept is not feasible and would not meet the purpose of the project.

Constructing upgrades and other improvements to existing roadways — When the screening measures were applied to the several combinations developed for this concept, the result was that while each would provide some improvement in mobility and some reduction in local roadway congestion, the level of benefit was minimal, and would not compare favorably with the remaining concepts. As a result, the study team determined it was prudent to dismiss this concept from further consideration.

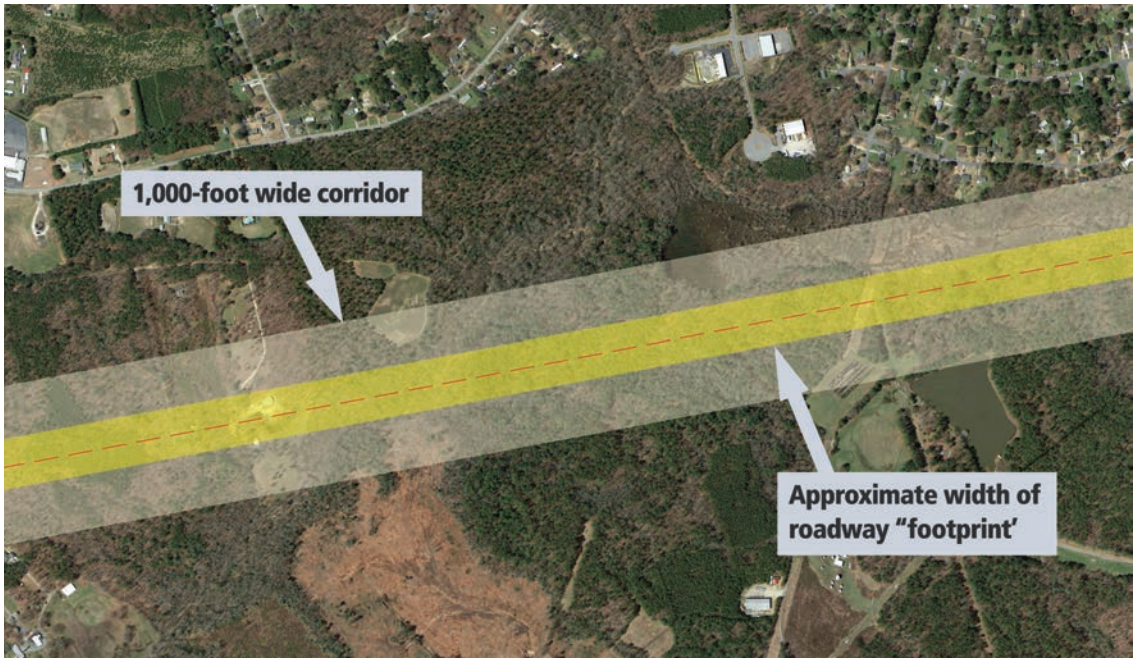
Combination or "hybrid" options — As mentioned above, three hybrid options having the greatest potential to meet the project purposes were examined. These options would combine new construction with the upgrading of some of the study area's existing roads. After applying the screening measures to each of these, the study team found that one would not achieve either of the project's primary purposes. Another would achieve the purpose of decreasing traffic congestion, but it would not improve mobility. As a result, each of these hybrid options was dismissed from further consideration. The third hybrid option was found to achieve both of the primary purposes and, as a result, it was retained for further development and evaluation. This option would upgrade two roads between NC 55 and I-40 to six lanes (Jessie Drive and Ten Ten Road) and would construct a new, limited-access facility from I-40 to I-495.

Construction of an entirely new highway — Applying the screening measures to the new highway concept, the study team found that it would achieve both of the project's primary purposes, improving mobility and reducing congestion. Compared with the other concepts, the new highway concept provided the largest decrease in average travel times and the largest reductions in congestion on the local roadway system. As a result, this option was retained for further development and evaluation.

The No-Build or no project concept was retained as a baseline for comparing to the Build concepts as they were developed in more detail.

Development of Preliminary Corridor Alternatives

With the first screening completed, the next step was to develop the new highway and hybrid concepts at a greater level of detail, laying out wide "corridors" within which the new and expanded roadways could be built. For this study, corridors were established at 1,000 feet in width. These corridors were then screened to see which should be developed at a greater level of detail and which should be dismissed. The actual roadway would typically require less than half the width of the 1,000-foot corridor, which allows room for shifts and adjustments later, once a smaller number of possible corridors had been selected.



For this study, broad "corridors" were drawn at a width of 1,000 feet. These allowed the study team to calculate impacts at a general level of detail. Narrower, 300-foot wide bands were drawn within the corridors to represent the basic "footprint" of the roadway itself, allowing impact calculations at a more detailed level.

Even though the corridors are much wider than the actual road would be, a certain amount of engineering precision is required when developing them. For example, they cannot be drawn with curves so sharp that a limited-access highway could not be built within them. Likewise, extra room is needed in the corridors, beyond the standard 1,000-foot width, to account for the land that would be needed to build the interchanges required at locations where the new road would cross major existing roadways.

To establish this level of precision, the basic features of the project's likely design were established. Although these features could change later in the study, for planning purposes it was assumed that the new highway segments would continue the design used in the existing segments of the Triangle Expressway, with six travel lanes, divided by a 70-foot wide median. For the areas where existing roads would be improved, it was assumed that various existing two and four lane roads (Jessie Drive and Ten Ten Road, for the most part) would be widened to six lanes and would have additional restrictions on access.

Independent Utility and Logical Termini

To ensure meaningful evaluation of alternatives, FHWA regulations require that:

1. projects have logical limits (known as "logical termini") and be long enough that the environmental analysis has a sufficiently broad scope,

2. projects are usable even if no additional transportation improvements in the area are made (known as "independent utility"), and

3. approval of a project would not restrict consideration of alternatives for other foreseeable transportation improvements.[3]

The western project terminus is at NC 55 in Apex, where the existing Western Wake Freeway (NC 540) ends. The eastern project terminus is at US 64/US 264 Bypass (I-495) in Knightdale, where the existing I-540 ends. These two end points are necessary for development of alternatives that would enhance the transportation connections between the rapidly growing communities south

Over the entire course of the study to date, dozens of combinations of corridor segments were examined, some of which were dismissed early in the study. This map shows each of those segments.

After much initial work, a initial set of "Build alternative" corridors was presented for public, government, and agency review in the fall of 2010. These corridors consisted of smaller, color-coded corridor segments.

and east of Raleigh to major employment and activity centers in the vicinity of the 540 outer loop. Providing enhanced transportation connections would improve system linkage in the regional roadway network, a secondary purpose of the project. This would provide continuity for the 540 outer loop system.

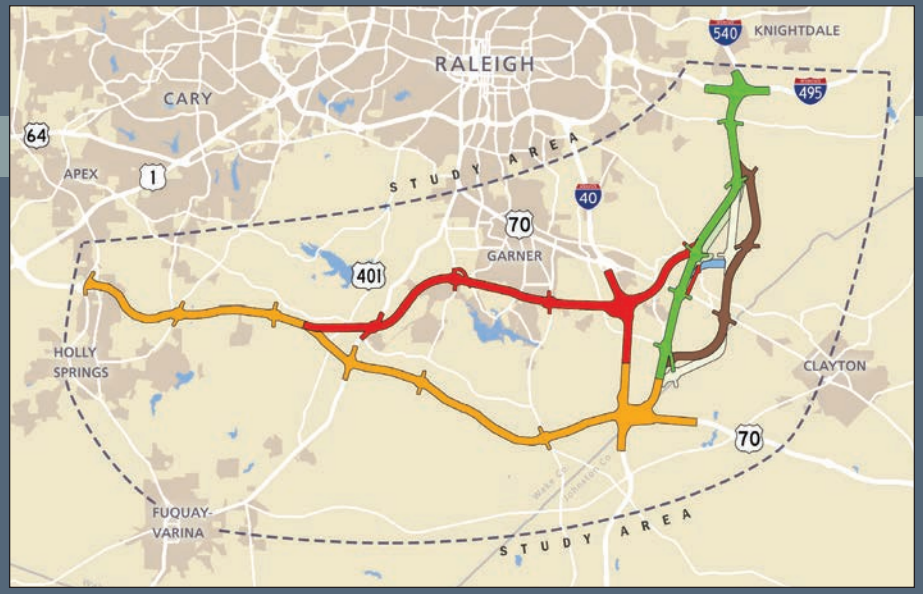
In addition to enhancing connections to locations along the existing segments of the 540 outer loop, the Complete 540 project would also have independent utility. The project as a whole would allow an option for travelers to bypass I-40/I-440 south of Raleigh, providing direct connections between I-40 in southwest Durham to I-40 near the Wake/Johnston County line and to US 64/US 264 Bypass east of Raleigh.

Approval of the Complete 540 project would not restrict consideration of alternatives for other reasonably foreseeable transportation improvements. The project has been developed in coordination with CAMPO and the local governments in the project area. Continuing coordination will help to avoid potential conflicts with foreseeable transportation improvements.

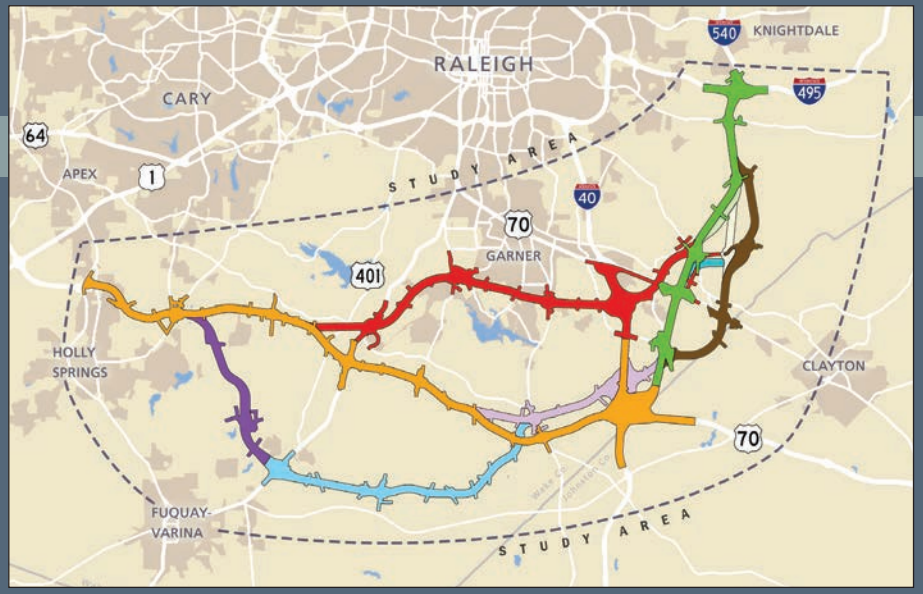
Initial Set of Corridor Locations

A large number of corridors were identified and studied. This began with development of numerous small segments spanning various parts of the study area, typically between two of the area's existing major roadways. The segments could be connected in a variety of ways to make what are known as "end-to-end" corridors—complete alternatives that span the beginning and end points of the project. Each of these corridors began at NC 55 Bypass in Apex, where the existing NC 540 ends, and each corridor ended at US 64/US 264 Bypass (I-495) in Knightdale, where the existing I-540 currently ends.

Numerous individual segments were developed by the study team. Their locations were based on a review of the community, environmental, and physical features in the study area (as described in the previous chapter of this document). The relatively large number of segments that were developed could be connected in many different ways, and resulted in hundreds of possible end-to-end corridor alternatives.



As a result of comments received in the fall of 2010, some of the corridor segments were dismissed and others were added in early 2011.



Much government and agency scrutiny of the 2011 corridors took place throughout 2011 and 2012, resulting in some new corridor segments being added, and some from earlier in the study revisited, in 2013.

The study team then compiled preliminary information about the potential effects of each alternative on the study area's social, environmental, and physical features. These features included wetlands, streams, floodplains, endangered species, and social features such as potential relocations of homes and businesses. At this stage in the process, these features were based on pre-existing information that was collected, reviewed, and placed on study mapping.

Using this information, the study team identified the segments that were very similar and determined which among them would have lower negative effects on the study area's social, environmental, and physical features. Unlike the first screening of the initial alternative concepts, which focused on whether the various broad concepts would meet the project purposes, this evaluation was intended to eliminate alternatives based on their potential effects on social, environmental, and physical features. When comparing two or more similar segments spanning the same part of the study area, the study team eliminated the segments with more potential to negatively affect these features. The segments that remained could be combined in various ways to form nine end-to-end corridor alternatives.

The study team then prepared more detailed information about the potential impacts of each of these nine corridor alternatives. To calculate these impacts, a general, or preliminary, roadway design was established in each corridor. These designs were based on a standardized width of 300 feet, which would be the approximate width of the actual roadway and its associated border areas (which include drainage ditches, side slopes, etc.). The designs also included the areas needed for interchanges, access roads, and other elements that go beyond the basic roadway width.

With these general roadway designs in each corridor, their effects, or "impacts," could be calculated and compared. The impact categories included overall roadway length, wetlands, streams, floodplains, endangered species, and social categories, such as potential relocations. At this stage in the process,

these categories were based on secondary or pre-existing information that was collected, reviewed, and placed on study mapping.

In the fall of 2010, the study team presented this information to regulatory agencies, local governments and to the public. At that time, the corridor information was displayed as color-coded corridor segments, as well as numbered, end-to-end corridors (those corridors are shown in the map above). In reviewing the various corridors and segments, the public, local governments, and agency representatives made several comments and suggestions. Some of these resulted in changes to the corridor alternatives, with various new segments being added to avoid or minimize impacts to resources, and some segments dropped from further consideration due to high potential impacts without offsetting benefits. Also dropped from further consideration was the hybrid concept -- a combination of new construction and the upgrading of certain existing roads—which would have required a very large number of residential relocations and resulted in substantial impacts to wetlands without offering an offsetting relative advantage over other options under consideration.

The new set of corridors that emerged was then subject to additional review and analysis. Based on the comments and suggestions made during additional agency, government, and public reviews, including a round of public information meetings in the fall of 2013, the corridors under consideration were further modified and the impact assessments were updated. Public, governmental and agency input helped to identify a set of alternatives to be studied in much greater detail. These studies would include more precise engineering of the preliminary designs and labor-intensive work in the study area to officially demarcate or otherwise identify the exact locations of social, environmental, and physical features. These alternatives are referred to as "detailed study alternatives," or DSAs.

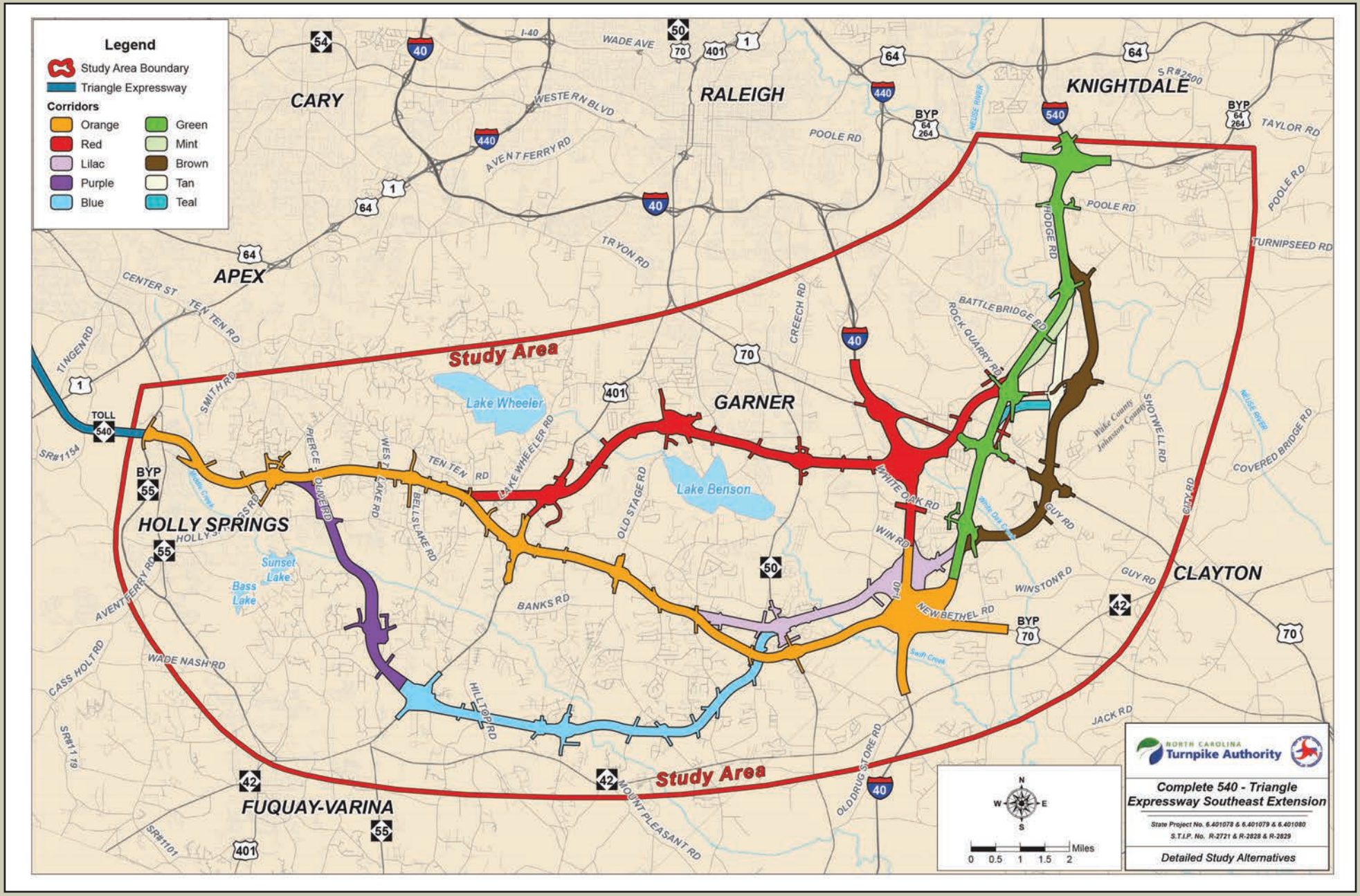
After this process was complete, ten corridor segments were selected for detailed study. The various combinations of these segments result in seventeen end-to-end DSAs. Each of the ten corridor segments has a mix of benefits and constraints, which are summarized below. They are described in greater detail in the next chapter of this document.

Corridor Segments West of I-40

Orange Corridor Segment — The main advantage of this segment is that it follows a corridor that was identified and set aside as a protected corridor by NCDOT for this project in the mid-1990s. As a result, development activity has been limited within the protected corridor for nearly two decades. Because of its long-term protected status, local governments and the public have expressed a great deal of support for this option, and many of the study area's communities have factored it into their adopted future land use plans.

A disadvantage is that this corridor would cross a portion of Swift Creek that may be important for the continued survival of the federally protected dwarf wedgemussel in this waterbody. In addition, there are more acres of wetlands within this corridor than some of the other options, based on preliminary information from the USFWS's National Wetlands Inventory (NWI) mapping.

Lilac Corridor Segment – This option diverges from the Orange Corridor segment near Sauls Road. It was developed to reduce potential effects on wetlands, based on data available from NWI mapping. As shown on the bar chart on page 90, it was later found that DSAs using the Lilac Corridor segment would have a somewhat smaller total impact on jurisdictional wetlands than those using the Orange Corridor segment. It would also offer the advantage of crossing a narrower section of Swift Creek than the Orange Corridor segment, reducing direct effects on Swift Creek and its associated wetlands. However, a notable disadvantage of the Lilac Corridor segment is that is crosses several established residential neighborhoods and would require a large number of relocations. Another disadvantage is that it would directly affect a biosolids



Detailed Study Alternatives

The alternatives pictured here are those selected for more detailed study. The following chapter describes the work conducted to achieve that greater level of detail, along with the results obtained.

sprayfield that treats water from the Dempsey Benton Water Treatment Plant. Like the Orange Corridor segment, the Lilac Corridor segment also has the disadvantage that it would cross the portion of Swift Creek important to the continued survival of the dwarf wedgemussel.

Purple and Blue Corridor Segments — Although these segments have been assigned two different colors (because various earlier combinations of segments were discarded), they function as one corridor segment. This corridor is farther south than the other options under consideration. For this reason, the Purple and Blue Corridor segments may better serve traffic in growing areas near Fuquay-Varina than the other corridors, which is a potential advantage of this corridor segment. Also, the route created by connecting the Purple and Blue Corridor segments to the Lilac Corridor segment would have fewer acres of NWI wetlands than a similar route using the Orange Corridor segment to connect to the Lilac Corridor segment, which is another advantage of this option.

Despite these benefits, the Purple and Blue Corridor segments have two notable disadvantages. First, they form a route that would cross heavily developed areas in eastern Holly Springs. Also, by bringing the project's route this far south in the study area, these corridors may create pressure to approve new development in rural southern Wake County and in Harnett County, some of which could be in conflict with local, approved land use plans. Officials from Wake County, Holly Springs, and Fuquay-Varina have each expressed their opposition to this route. They have also been strenuously opposed by many area homeowners associations and individual members of the public.

Red Corridor Segment — The Red Corridor segment forms a potential route that is the farthest north of all the corridor segments. There are two key reasons why this option is under consideration. The first is that it is the only segment that would cross Swift Creek upstream of the Lake Benson dam, meaning it would be upstream of the crucial habitat for the federally endangered dwarf wedgemussel. The second reason is that it crosses fewer acres of NWI-mapped wetlands than any of the other options. These are the key advantages of the Red Corridor segment.

The Red Corridor segment also has several key disadvantages. It crosses a heavily developed area in the town of Garner, including several established subdivisions. It also crosses several park and recreational resources in this area. It is the only corridor that would cross the Swift Creek Water Supply Watershed Critical Area. The Red Corridor segment is formally opposed by the Town of Garner and Wake County and has been strongly opposed by many area homeowners associations and individual members of the public.

Corridor Segments East of I-40

Green and Mint Green Corridor Segments — The key advantage of both of these segments is that they would avoid a substantial public land use: the Clemmons Educational State Forest. A key disadvantage is that they both will require relocation of a small communications tower and may require protections for one of a group of three large communications towers near US 70 Business. As noted in the previous chapter, these include warning sirens for the Harris nuclear power plant (west of Holly Springs), Federal Aviation Administration air traffic control communications equipment, cell phone transmission facilities, and various communication systems. Given these functions, relocation to accommodate a highway would be costly and potentially disruptive.

These two options differ in their potential effects on another public investment: the Randleigh Farm property, which is a development being pursued jointly by the City of Raleigh and Wake County. The Green Corridor segment bisects this property, while the Mint Green Corridor segment shifts these impacts to the east, closer to the edge of the property, which would likely be less disruptive.

Tan Corridor Segment — The Tan Corridor segment was developed in an attempt to avoid the disadvantages associated with the Green and Mint Green segments. It would shift the impacts to the Randleigh Farm property even farther to the east than the Mint Green Corridor segment, further reducing

Toll Financing Considerations

The CAMPO 2035 Long Range Transportation Plan indicates that the funding for the Complete 540 project would include tolling. Based on early, planning-level analyses of the amount of traffic that would use the facility, and the amount of money that traffic would generate, NCDOT determined that a financing option that includes tolling would be feasible for this project. Using tolls, NCDOT could provide a portion of the funding early in the process, which could be added to other funding sources and allow construction of the project many years earlier than would be possible with traditional funding sources alone.

This New Location Alternative Concept is an extension of the Triangle Expressway (NC 540), North Carolina's first modern toll road. This facility was constructed using a combination of funding sources, some of which are being repaid through toll collections. A similar approach is anticipated for the Complete 540 project.

It is assumed that toll collection for this project would be all-electronic using open road tolling technology. Open road tolling allows for tolls to be collected at highway speeds and eliminates the need for conventional toll plazas, with no need for motorists to stop or slow down in order to pay tolls.

disruption to existing development plans compared to the Mint Green Corridor segment. Another advantage of this segment is that it would avoid the communication towers near US 70 Business.

Because the Tan Corridor segment would cross various existing subdivisions, it has the potential to be disruptive to a larger number of property owners than other options under consideration in this area. It would also need to cross the northwest corner of Clemmons Educational State Forest.

Brown Corridor Segment — This segment would have the advantage of completely avoiding the Randleigh Farm property and avoiding the communication towers near US 70 Business. Another advantage is that it would allow the road to cross the Neuse River at a more favorable location than the other options, giving the Brown Corridor segment the potential to minimize effects to the river and associated natural features. Due to the angle at which it would cross Auburn-Knightdale Road, the Brown Corridor segment's interchange design in this location would require fewer acres of land than the other segments.

The key disadvantages of the Brown Corridor segment are that it would directly affect a biosolids sprayfield that is part of the Neuse River Wastewater Treatment Plant and would directly affect a City of Raleigh police training facility located on Battle Bridge Road. It would also need to cross the northwest corner of Clemmons Educational State Forest.

Teal Corridor Segment — This is a short segment that would connect the southern part of the Green Corridor segment to the northern part of the Brown Corridor segment. The resulting combination of segments would have several advantages: it would completely avoid the Randleigh Farm property, would also cross the Neuse River in a more favorable location, allowing a smaller interchange footprint at Auburn-Knightdale Road, and would avoid crossing the Clemmons Educational State Forest.

The key disadvantages of the route formed by the Teal Corridor segment are that it would likely disrupt the important communication towers near US 70 Business, and would affect the Neuse River Wastewater Treatment Plant bio-solids sprayfield and the City of Raleigh police training facility.

NEXT STEPS

With these ten corridor segments and seventeen end-to-end corridors established as DSAs, the next step was to refine them even further and then perform one last screening to determine the preferred route location for the proposed Complete 540 project. This would be known as the "Build" alternative and would be the route location and design that would be compared against the "No-Build" or no project option. The next chapter of this document, "Expected Benefits and Impacts of Each Alternative" describes the additional refinements made and the detailed fieldwork that was conducted to fully understand the impacts each would have on the social, natural, and physical environment.

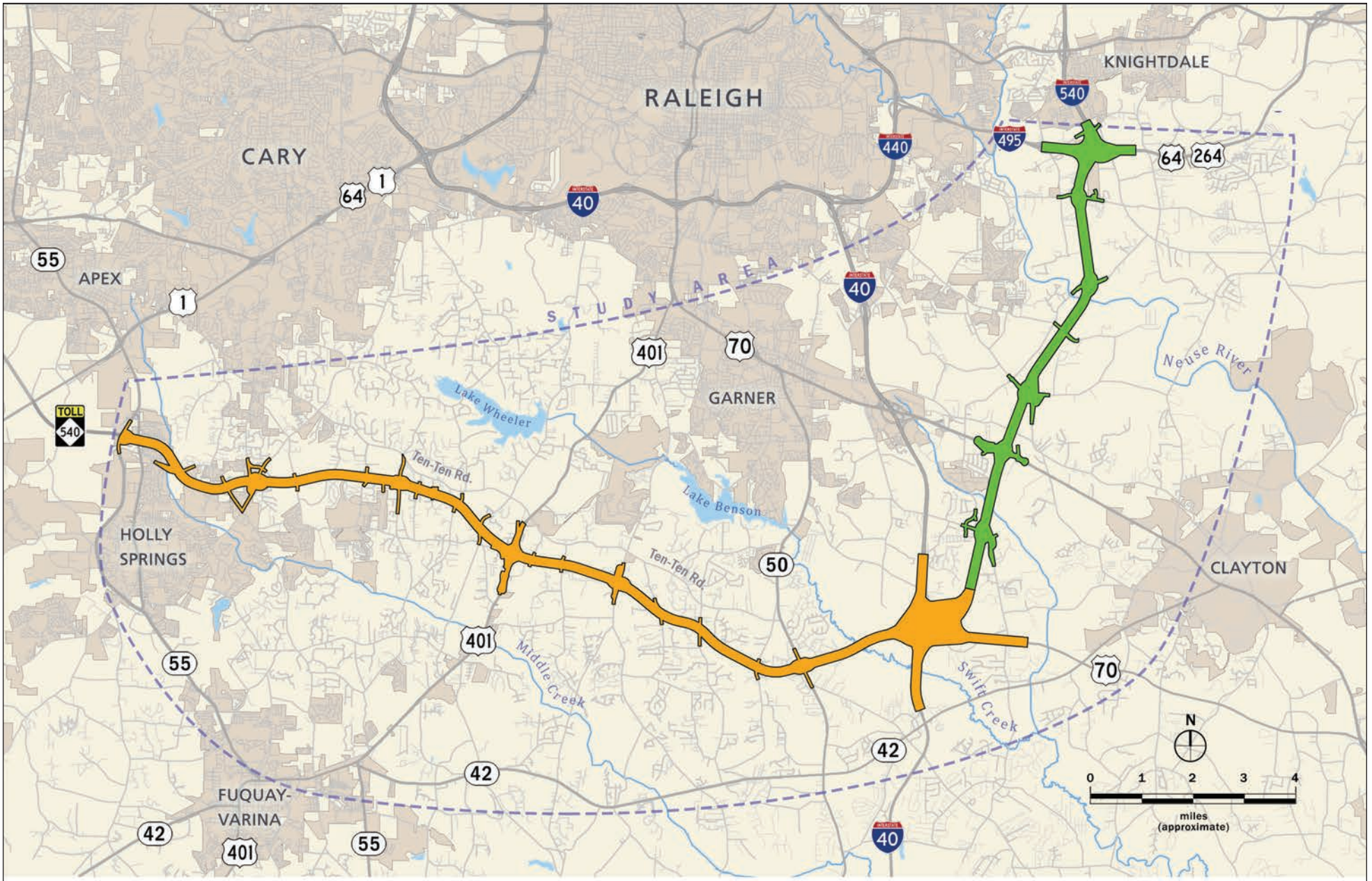
MORE DETAILED INFORMATION

More detailed information on the alternatives development and screening can be found in the Complete 540 project's Alternatives Development and Analysis Report.

More information about this document can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways this document can be accessed, either in paper or electronic form.

INDIVIDUAL DSA MAPS

The pages that follow contain maps showing each individual Detailed Study Alternative in isolation. On each map is a listing of the various color-coded corridor segments that form each alternative.

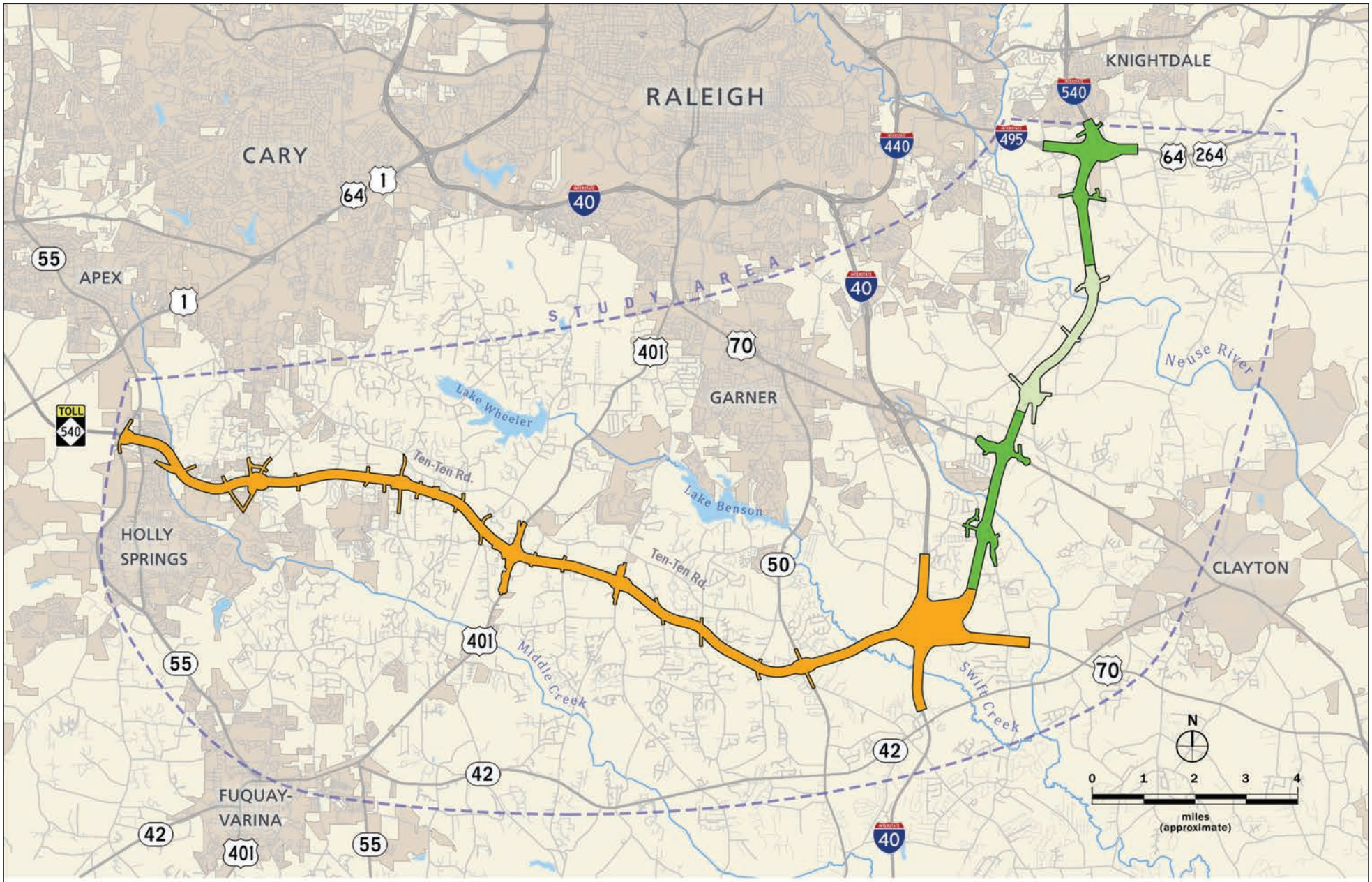


Detailed Study Alternative No. 1

This DSA uses these corridor segments:

Orange Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

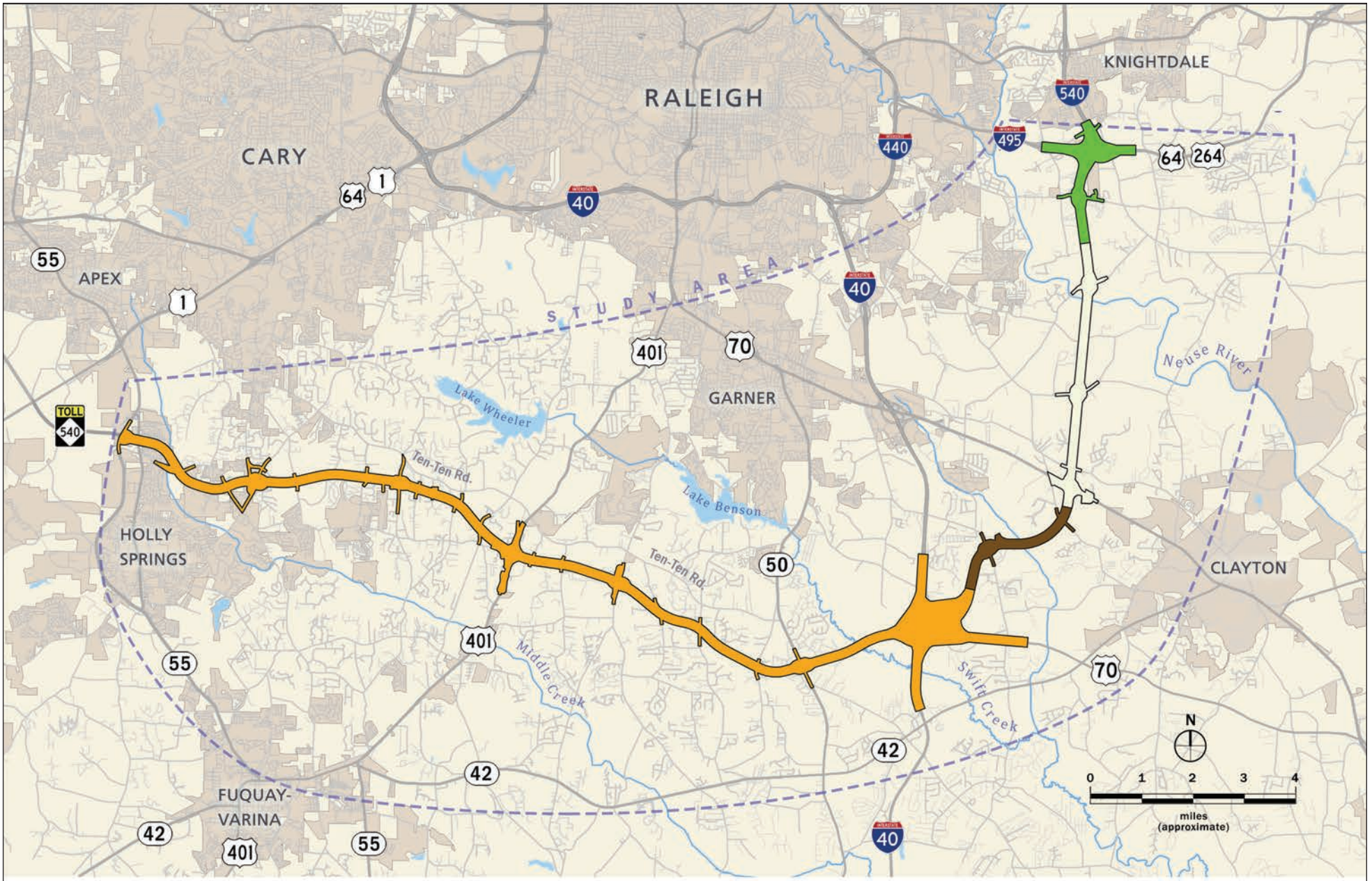


Detailed Study Alternative No. 2

This DSA uses these corridor segments:

Orange Green Mint

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

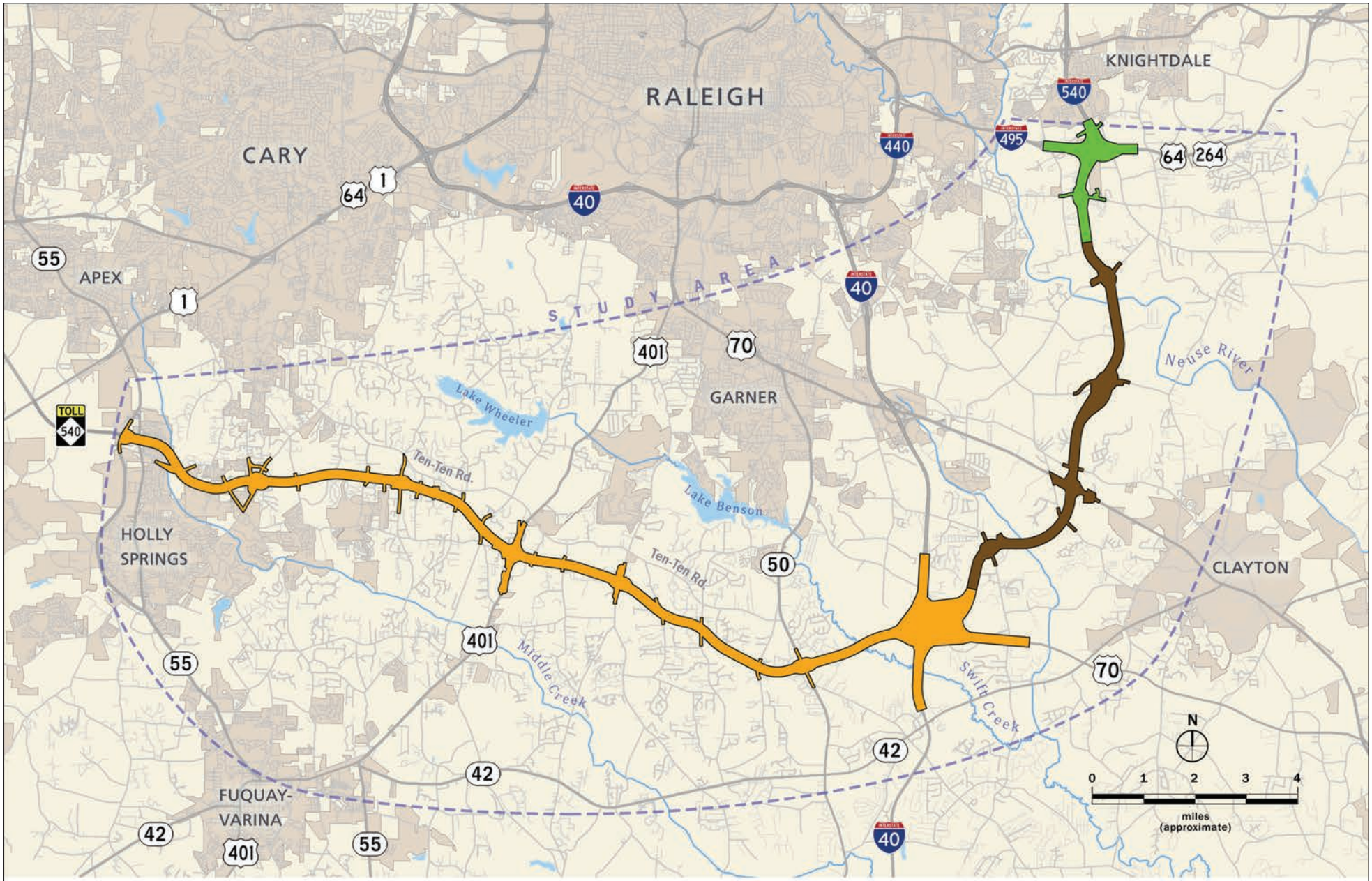


Detailed Study Alternative No. 3

This DSA uses these corridor segments:

Orange | Brown | Tan | Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

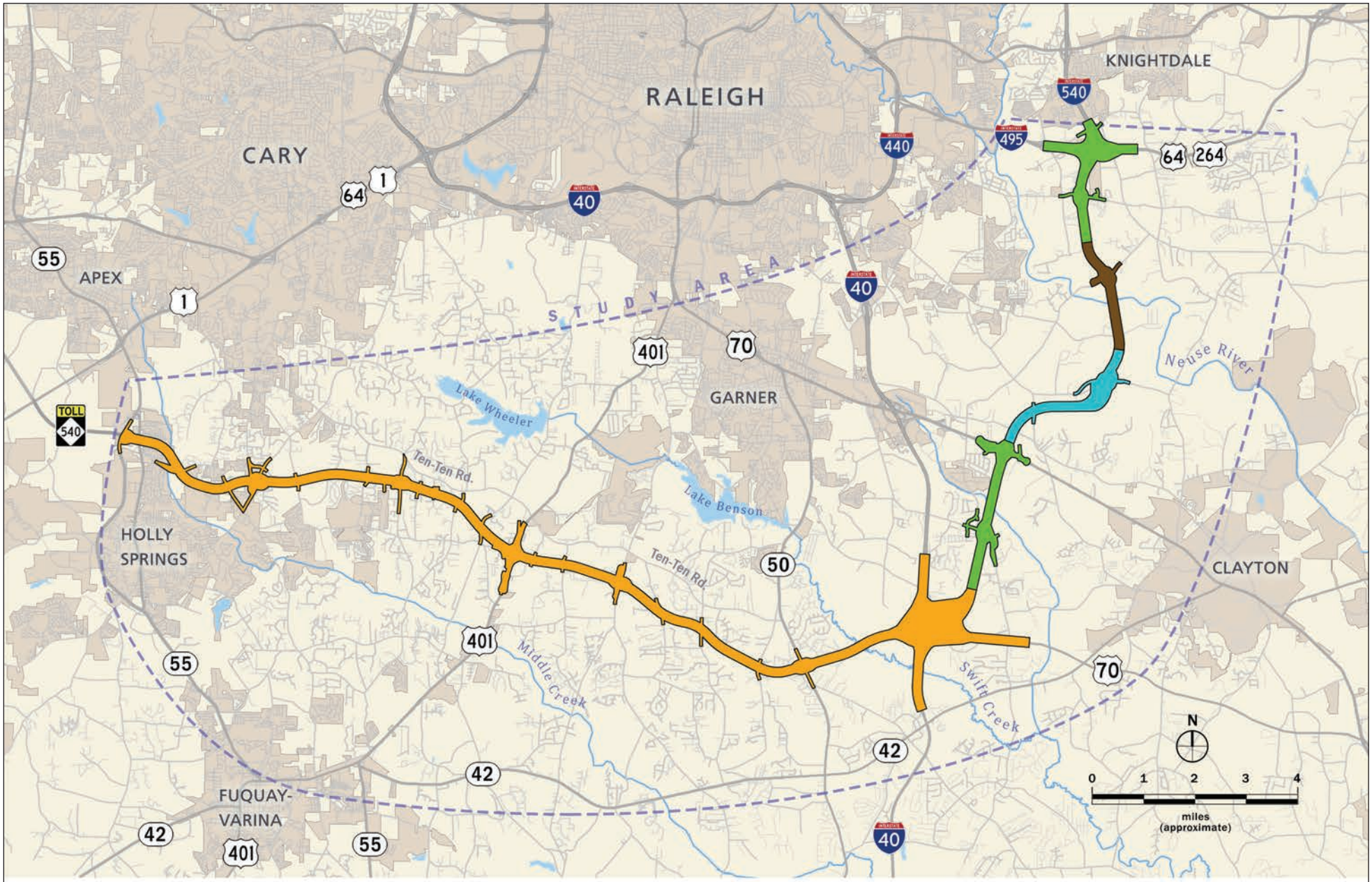


Detailed Study Alternative No. 4

This DSA uses these corridor segments:

Orange Brown Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

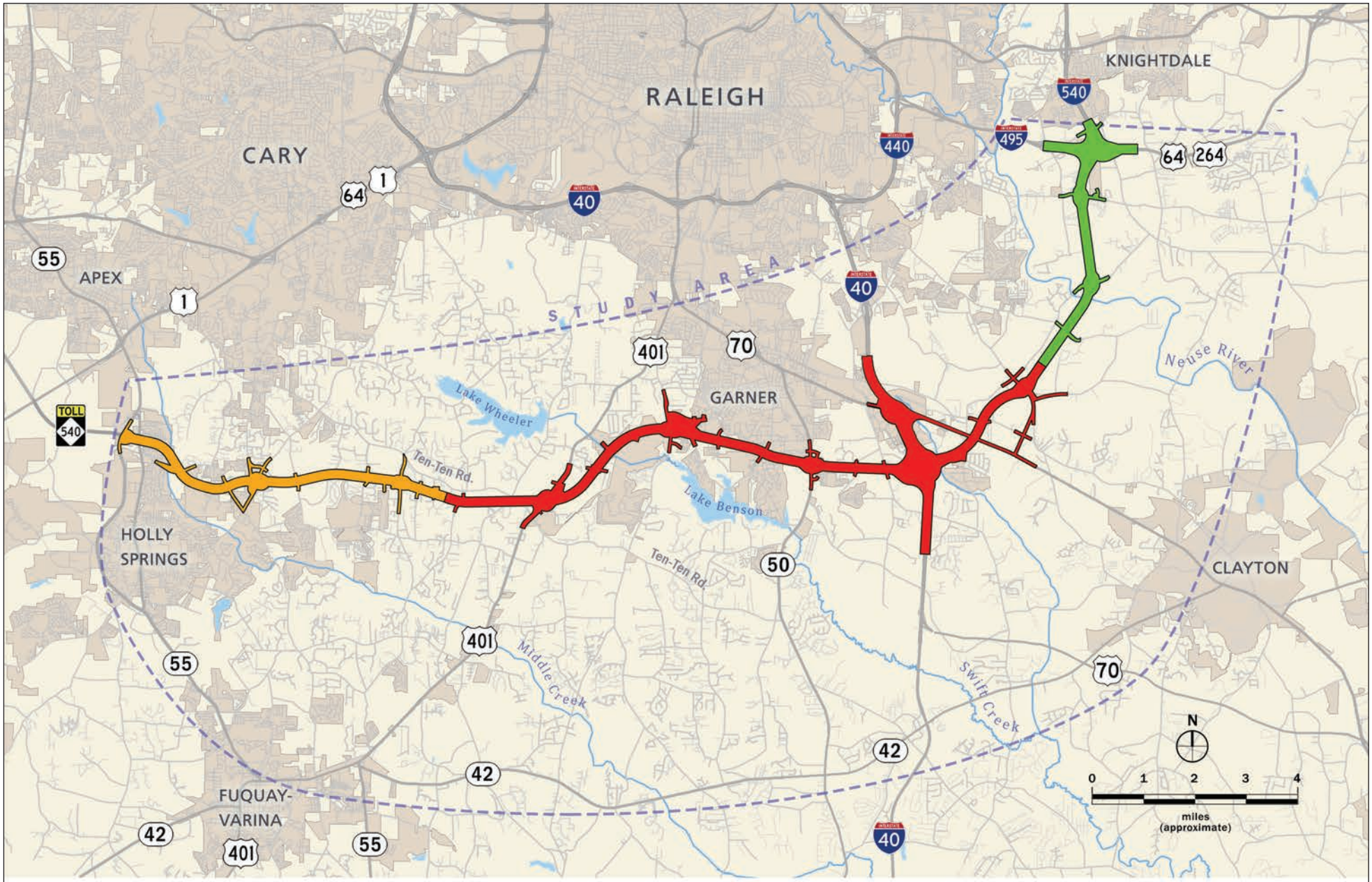


Detailed Study Alternative No. 5

This DSA uses these corridor segments:

Orange | Green | Teal | Brown

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

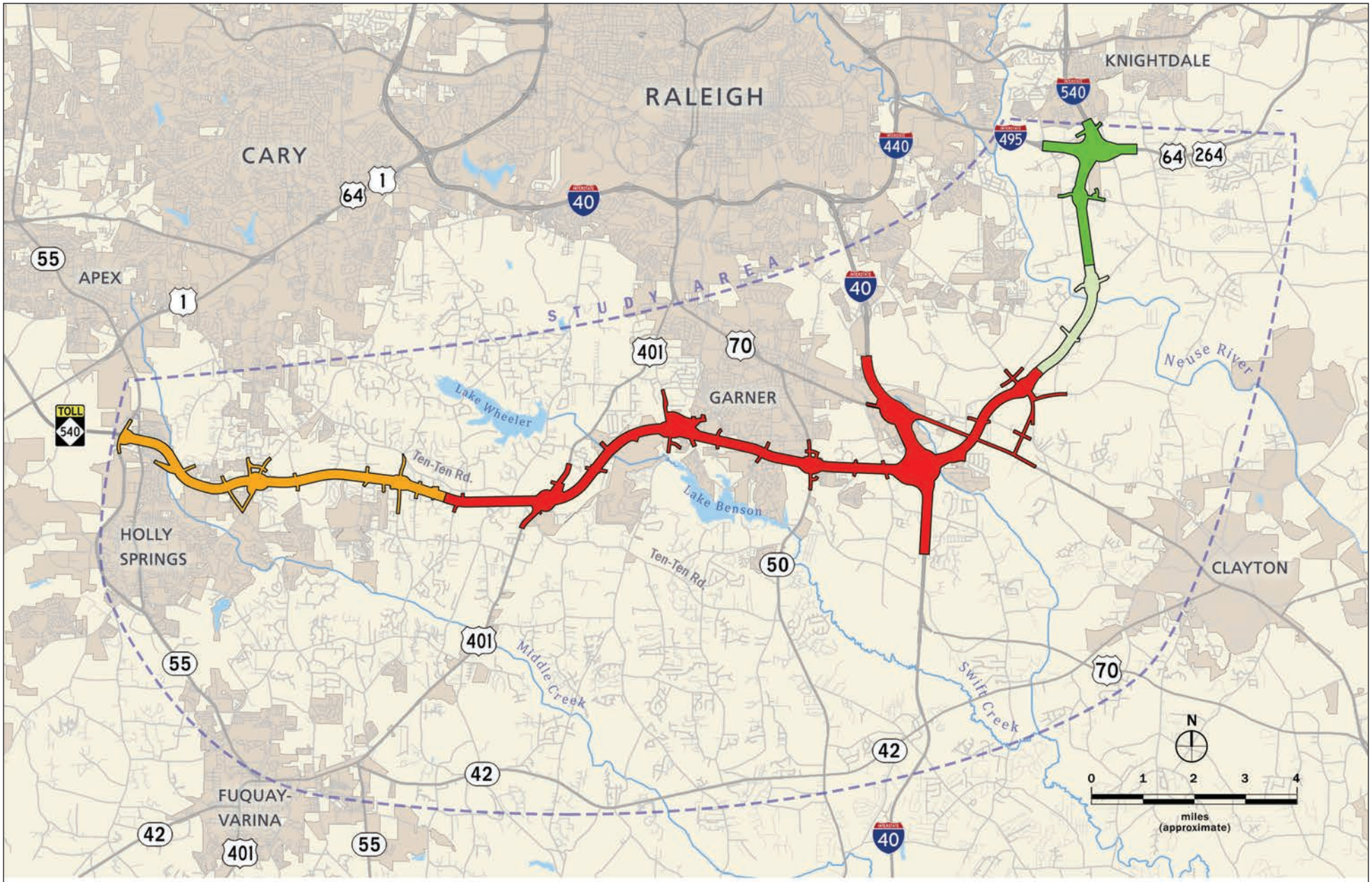


Detailed Study Alternative No. 6

This DSA uses these corridor segments:

Orange Red Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

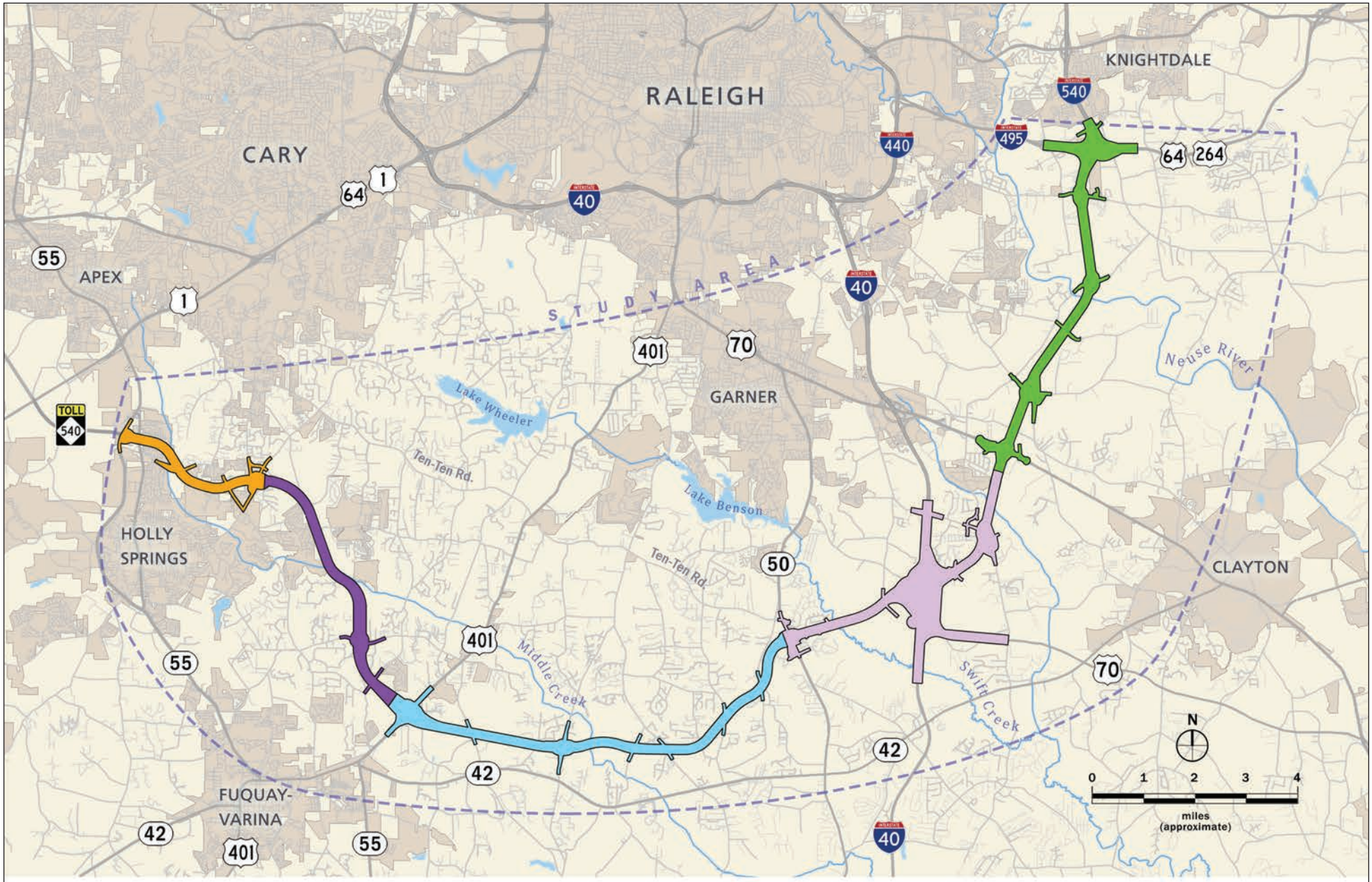


Detailed Study Alternative No. 7

This DSA uses these corridor segments:

Orange Red Mint Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

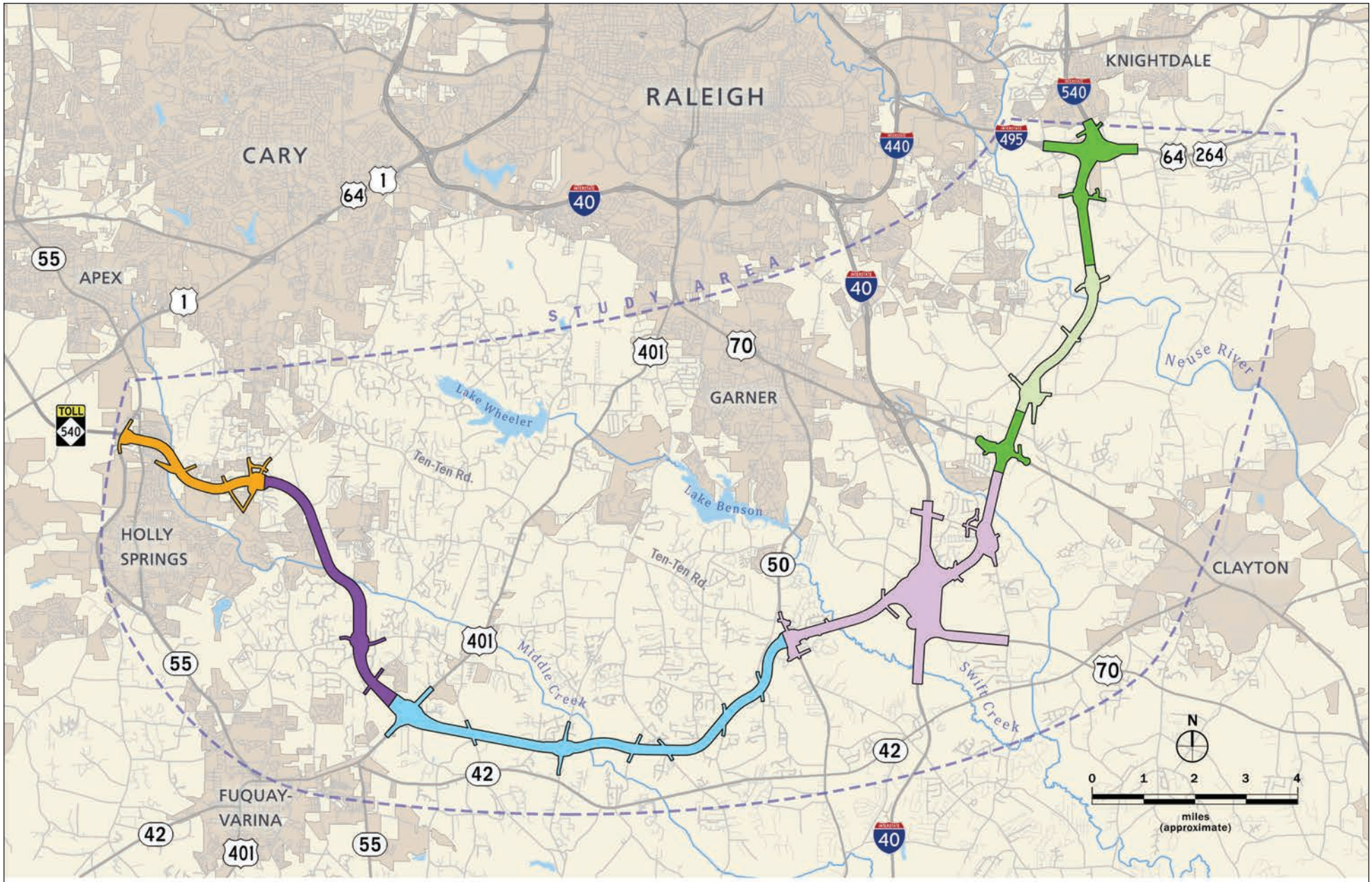


Detailed Study Alternative No. 8

This DSA uses these corridor segments:

Orange | Purple | Blue | Lilac | Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

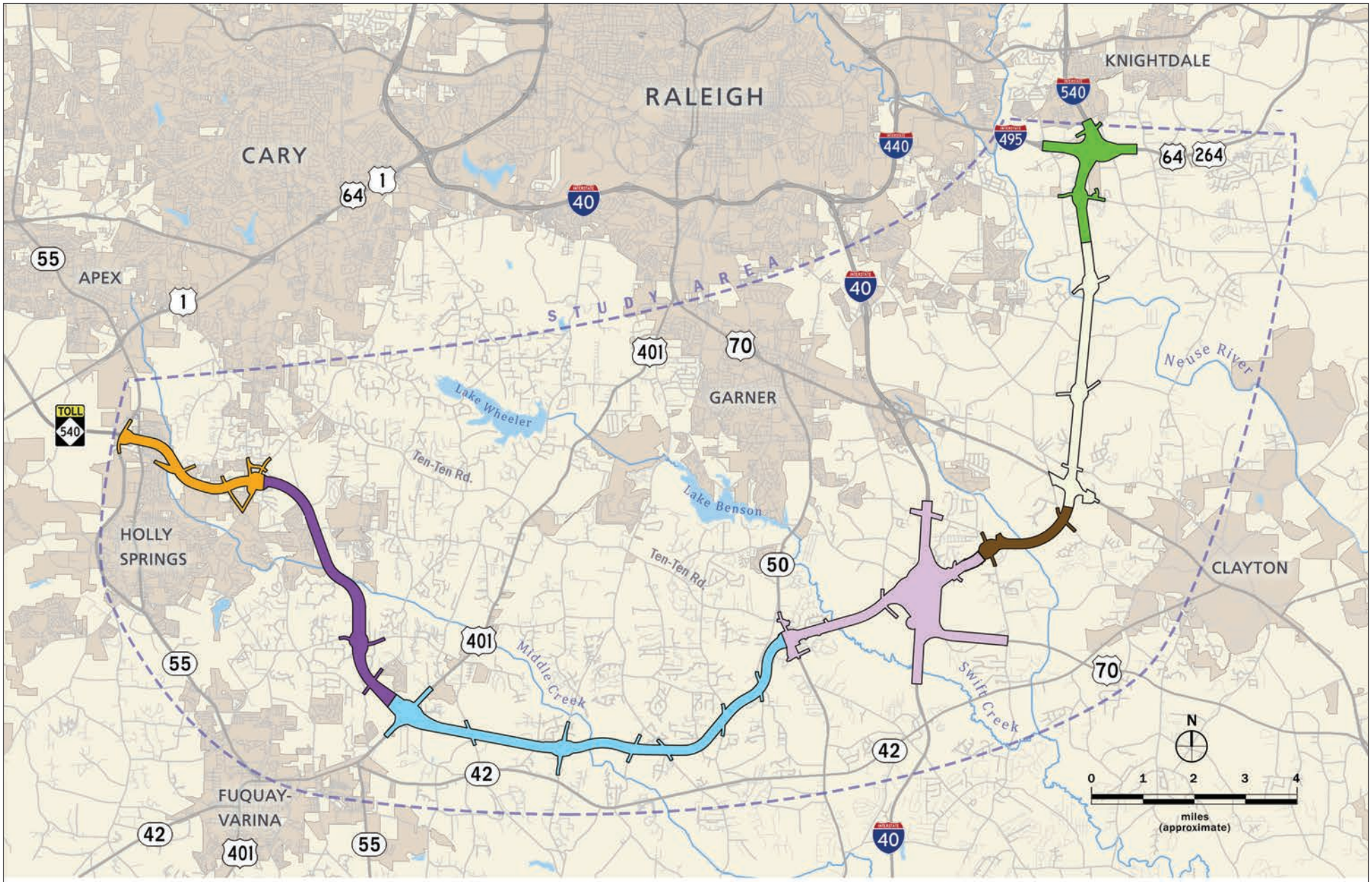


Detailed Study Alternative No. 9

This DSA uses these corridor segments:

Orange | Purple | Blue | Lilac | Green | Mint

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

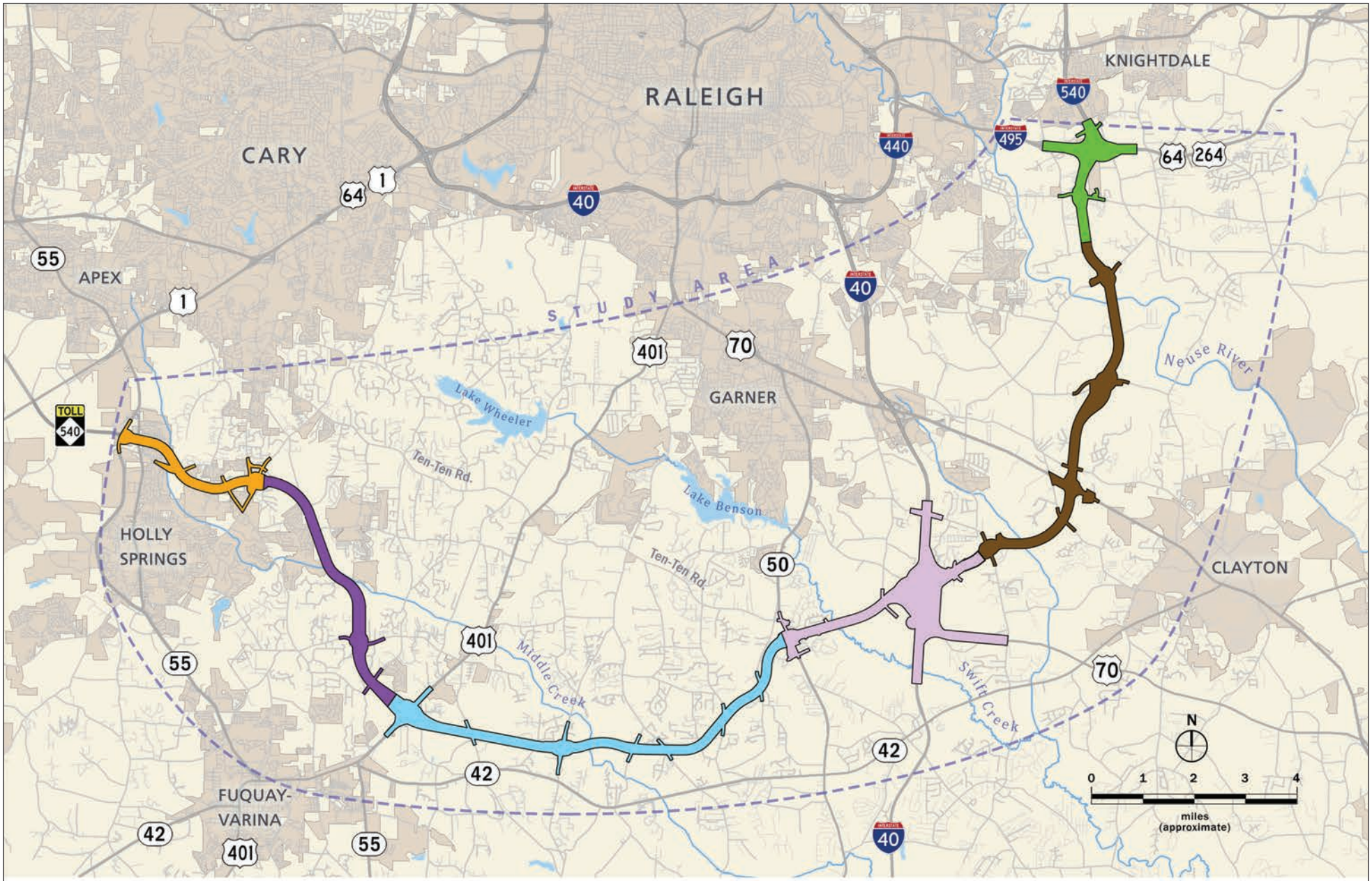


Detailed Study Alternative No. 10

This DSA uses these corridor segments:

Orange | Purple | Blue | Lilac | Brown | Tan | Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

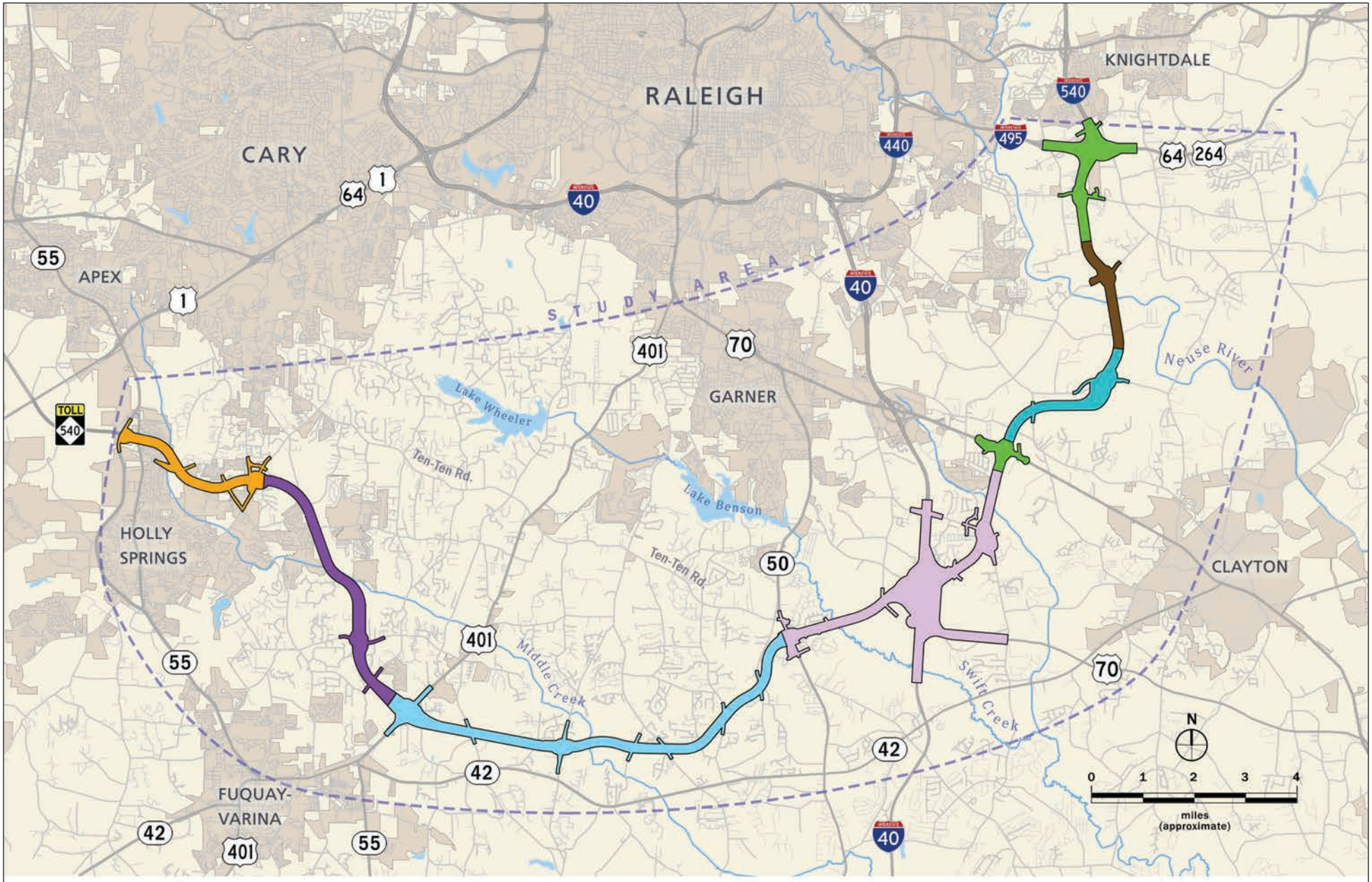


Detailed Study Alternative No. 11

This DSA uses these corridor segments:

Orange | Purple | Blue | Lilac | Brown | Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

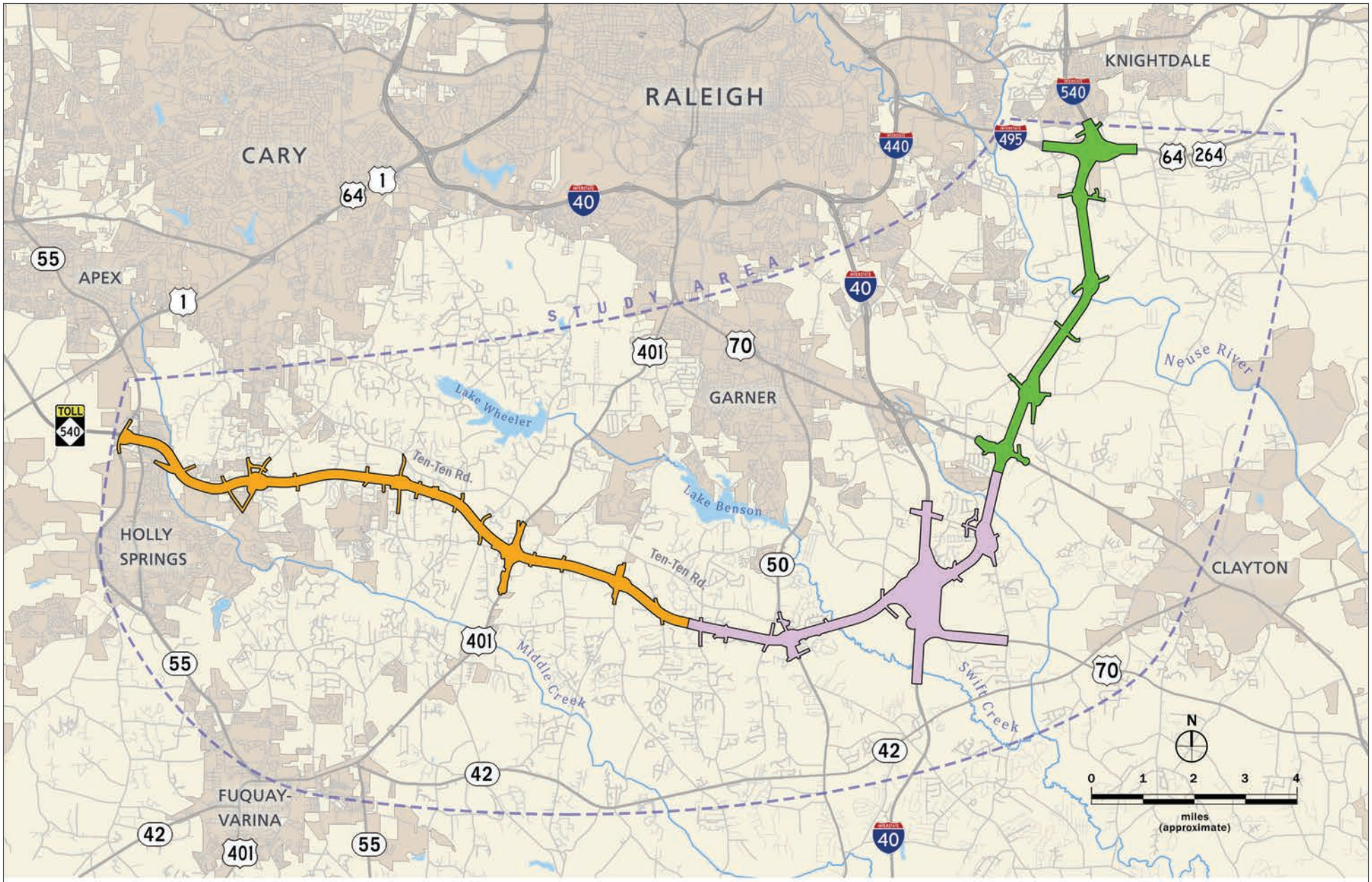


Detailed Study Alternative No. 12

This DSA uses these corridor segments:

Orange | Purple | Blue | Lilac | Green | Teal | Brown

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

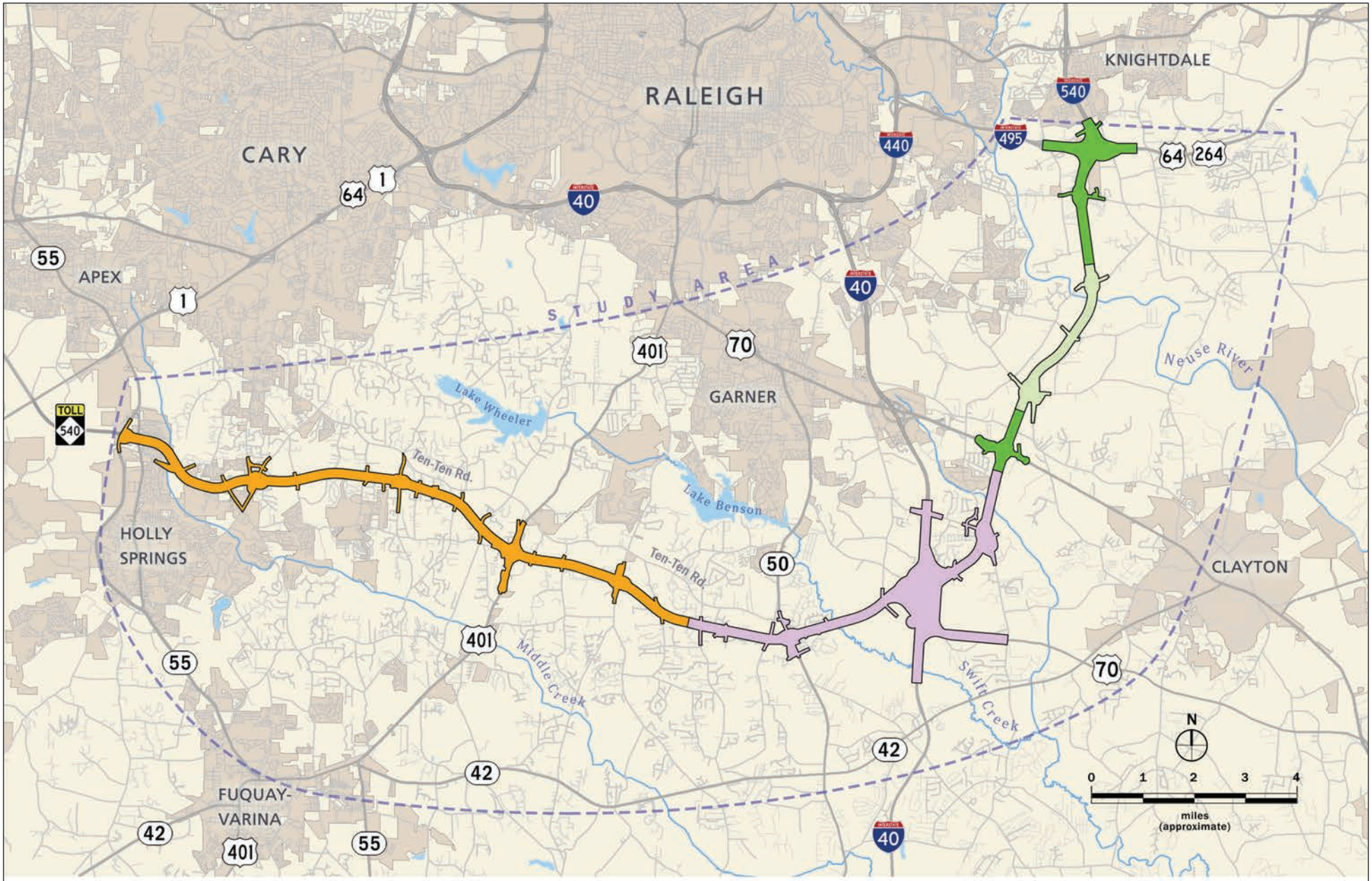


Detailed Study Alternative No. 13

This DSA uses these corridor segments:

Orange | Lilac | Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

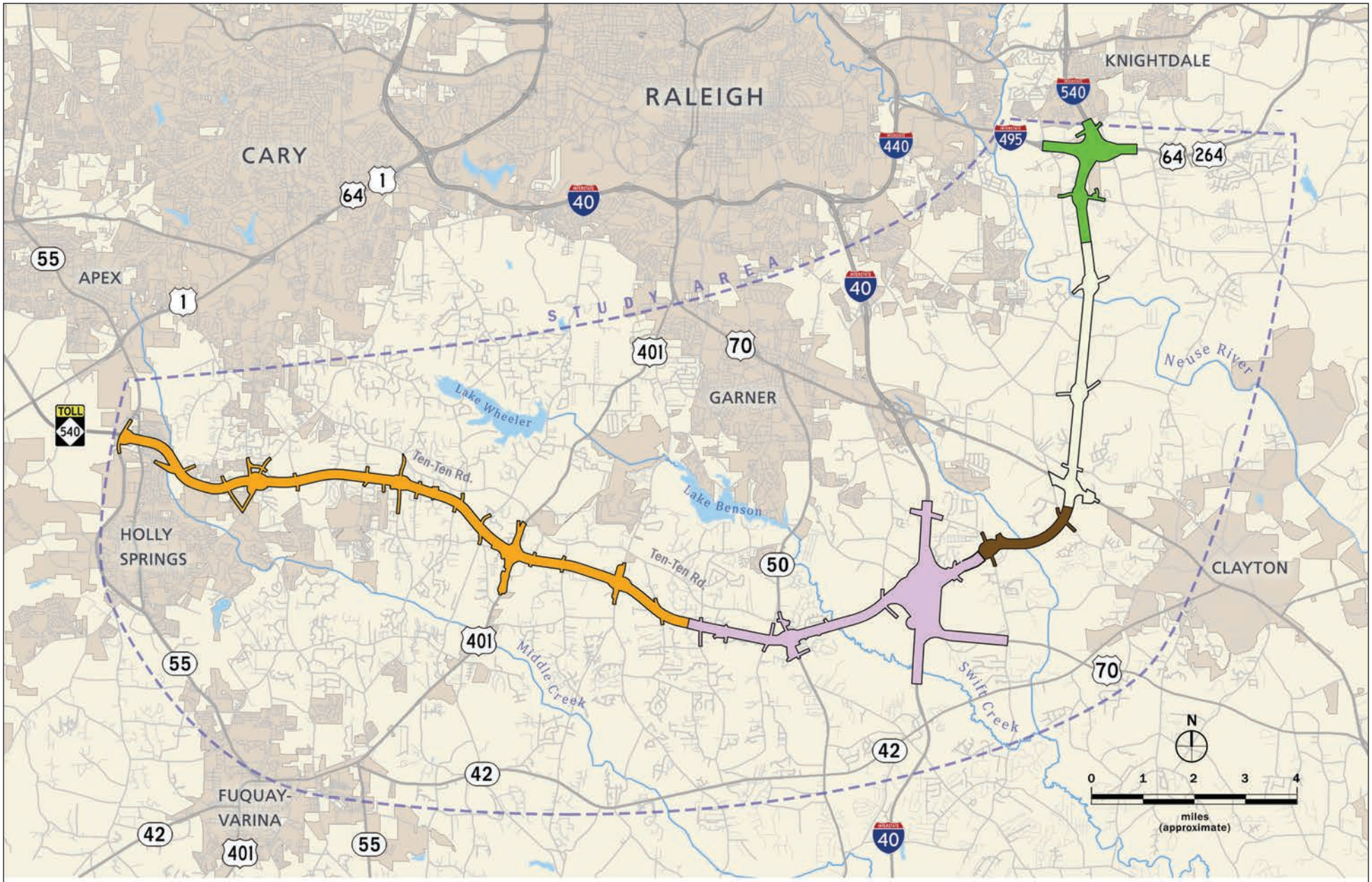


Detailed Study Alternative No. 14

This DSA uses these corridor segments:

Orange | Lilac | Green | Mint

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

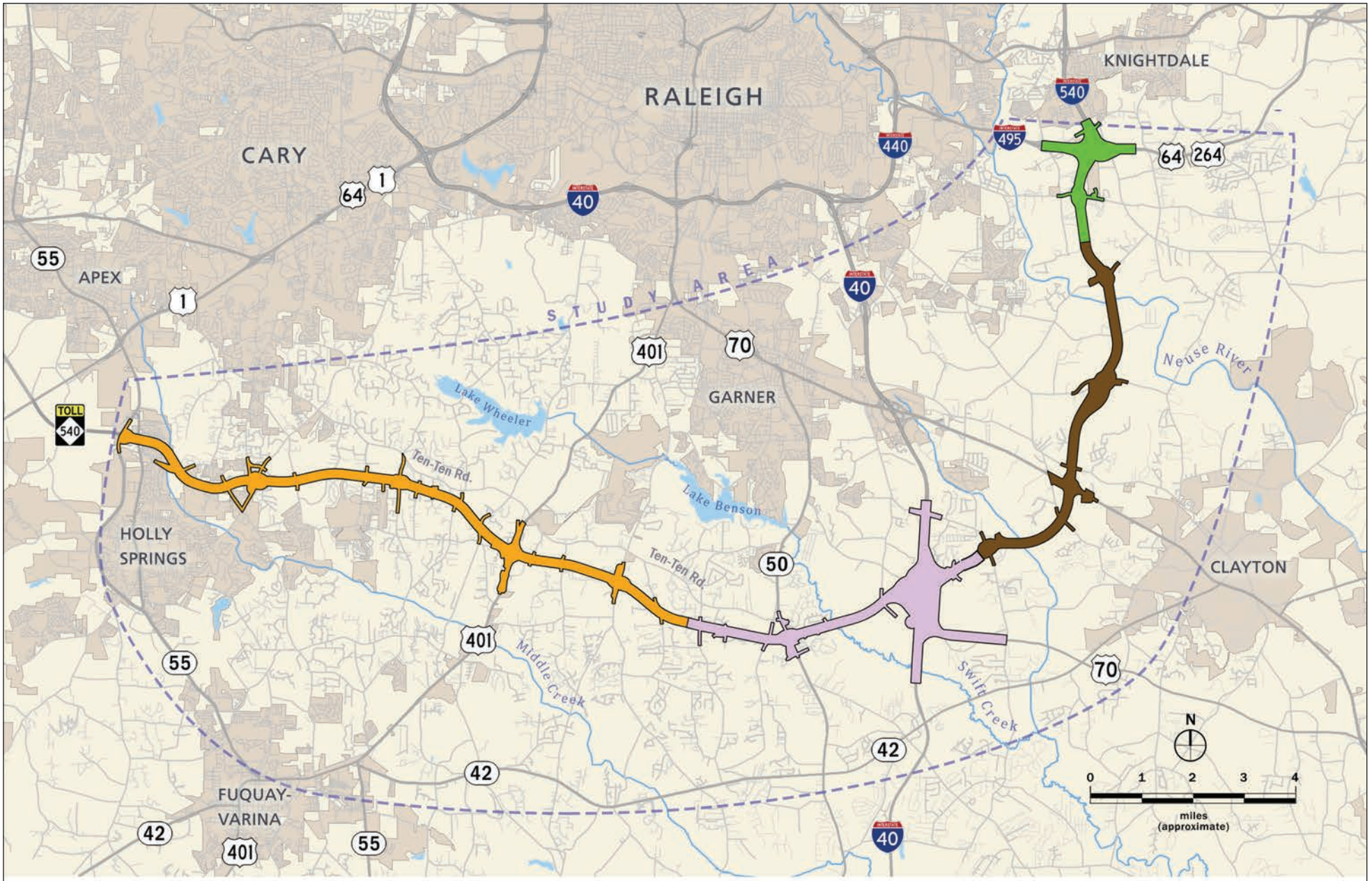


Detailed Study Alternative No. 15

This DSA uses these corridor segments:

Orange | Lilac | Brown | Tan | Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

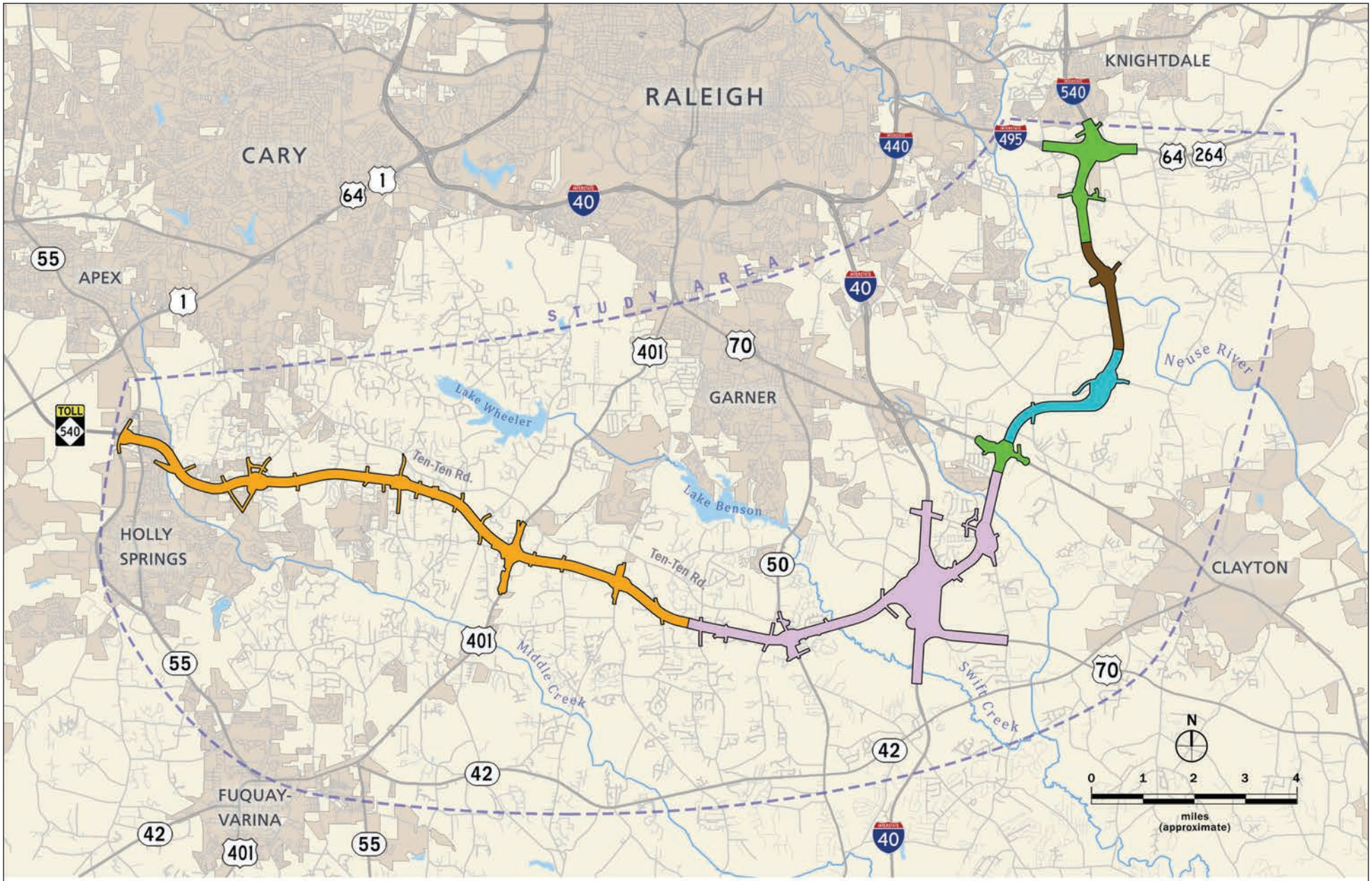


Detailed Study Alternative No. 16

This DSA uses these corridor segments:

Orange | Lilac | Brown | Green

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.



Detailed Study Alternative No. 17

This DSA uses these corridor segments:

Orange | Lilac | Green | Teal | Brown

For illustration purposes, the scale of the DSA shown here is approximate. The corridor segments are generally 1,000 feet in width, except at potential interchange locations where they are wider. The actual highway right-of-way width would likely be substantially less than the corridor width (approximately one-third of the corridor width). The small corridor stubs or spurs along the DSA indicates where cross street modifications may be required to have local roads cross either over or under the new highway, or at potential interchange locations.

CHAPTER 5

Expected Effects of Each Alternative

Understanding how the Detailed Study Alternatives would affect the study area.

This chapter describes the results of the more detailed analyses conducted for each of the Detailed Study Alternatives, along with a description of the methods used for each impact category.

INTRODUCTION

The preceding chapters of this document have explained the purposes of the project and identified the social, natural, and physical features of the study area. The previous chapter explained how that information was used to develop a wide range of initial alternatives for meeting the purpose and how some were later screened out, allowing a smaller set of alternatives to be designated as "Detailed Study Alternatives," or DSAs. As the term suggests, these alternatives need to be studied in greater detail before a Preferred Build Alternative can be selected.

This chapter describes the DSAs, the categories of effects that emerged as important in selecting a Preferred Alternative, and the effect that each alternative would have on the study area's features. This is done in five sections. The first presents information about effects on the community, or "human environment." The next covers effects on the natural environment, followed by effects on existing or planned physical features (the "physical environment") in the study area. The next section discusses the project's potential indirect and cumulative effects. The chapter concludes by presenting a comparison of the effects each of the DSAs would have on this comprehensive set of impact categories. This is done through the use of a comparative evaluation matrix. The matrix compares an array of effects for each of the DSAs. This matrix is included at the end of this chapter, along with a set of maps showing each DSA individually.

HUMAN ENVIRONMENT

The National Environmental Policy Act (NEPA) defines "environment" as having a human and natural component, and NEPA requires that a project's potential effects on both be studied. Human, or community, effects typically include such things as:

- relocations of homes, businesses, or community gathering places;
- community cohesion or "barrier" effects caused when a road cuts through an established community or - otherwise changes access to places in the community;
- changes in the ways people interact with their neighbors or with others in their neighborhood; or,
- various indirect effects, such as a road project influencing land use changes or development in ways not intended or planned for, or influencing secondary effects on the area's economic activities.

Each of these has been studied as part of the Complete 540 project and each is detailed in the paragraphs that follow.

Effects on Homes, Businesses, and Community Facilities

Because relocations of residences or businesses often involve altering relationships between people and their homes and neighbors, relocation impacts are among the most sensitive community-related effects associated with transportation improvements. The removal of families from neighborhoods, or businesses from their existing locations, affects not only those being relocated, but also those who remain in the affected neighborhood and those who live in the new areas that receive the relocated households or businesses.[1]

Types of Possible Residential Relocation Effects

Residential relocations can have physical, financial, and psychological effects including finding and moving into suitable replacement housing, associated costs not covered by the State, and the severing of community ties and other social relationships. The severity of these kinds of impacts varies greatly depending on the age, income, and other social characteristics of the people involved.

When a business is displaced, the impacts are generally financial, but in certain circumstances the effects may include difficulties in finding a suitable relocation site, loss of clientele, loss of employment base, and other similar effects.

Impacts related to the relocation of community facilities such as schools, community centers, churches, and recreational facilities are likely to be mostly psychological, although financial impacts associated with loss of client base or memberships may occur for facilities that collect dues or user fees to support their operations.[2]

Methods of Analysis

Several factors must be considered before a determination can be made about whether a home, business, or community facility will need to be relocated as part of a highway project's acquisition of land for right-of-way. The basic method used is outlined below.

The process began with right-of-way agents performing a field review of each parcel that could potentially require relocation. During this review, they identified and photographed potentially affected residences and businesses and reviewed current available aerial photography. Estimates of the general income levels of those who would potentially be displaced were made based on the housing costs. Once each potential relocation was identified, study team agents compiled a list for each DSA to categorize the potential displacements by type.

For properties that would otherwise not require relocation, the right-of-way agents checked to see whether the property's well or septic system would be affected by the DSAs. If no public water or sewer lines were planned for the area and the parcel was small, it was counted as a relocation if the well or septic system would be compromised. For larger tracts, if it appeared that sufficient areas adjacent to the structures would be available for replacement water and sewer systems, it was not counted as a relocation. In addition, if a

developed parcel would be affected so as to render it unusable, even though the building improvements were not directly affected, the parcel was listed as a relocation.

Potential Relocations on the Complete 540 Project

Although NCDOT places high priority on avoidance of neighborhoods and disruption of households in developing alternatives, each of the DSAs for the Complete 540 project would require some displacement of residences, businesses, and community facilities.

A large portion of what is now the Orange Corridor segment was established by NCDOT as a protected corridor for the project in the mid-1990s, protecting it from large-scale development. For this reason, the DSAs that include the full Orange Corridor segment (Alternatives 1 through 5) would require substantially fewer residential relocations than the other DSAs (those following the Red, Lilac, or Purple-Blue Corridor segments west of I-40). DSAs using the Red Corridor segment (Alternatives 6 and 7) would average 69 percent more total relocations; DSAs using the full Lilac Corridor segment (Alternatives 13 through 17) would average 76 percent more total relocations; and, DSAs using Purple-Blue Corridor segments (Alternatives 8 through 12) would average 108 percent more total relocations than those using the full Orange (Alternatives 1 through 5).

With respect to business relocations, while the actual numbers of relocations would be much lower than for residential ones, they tend to follow the same pattern: the DSAs that use the full Orange Corridor segment would have the fewest, and the DSAs that use the Purple-Blue segment would have the most.

With respect to non-profit and community facilities, the number of relocations is very low, with DSAs using the full Orange Corridor segment requiring three such relocations and the other DSAs requiring only one or two.

The chart on the following page shows the number of relocations that would occur for each of the 17 DSAs. The first column shows the abbreviations of each of the color-coded segments that connect to form the full, end-to-end alternative. It is important to note that in some alternatives only parts of each segment are used.

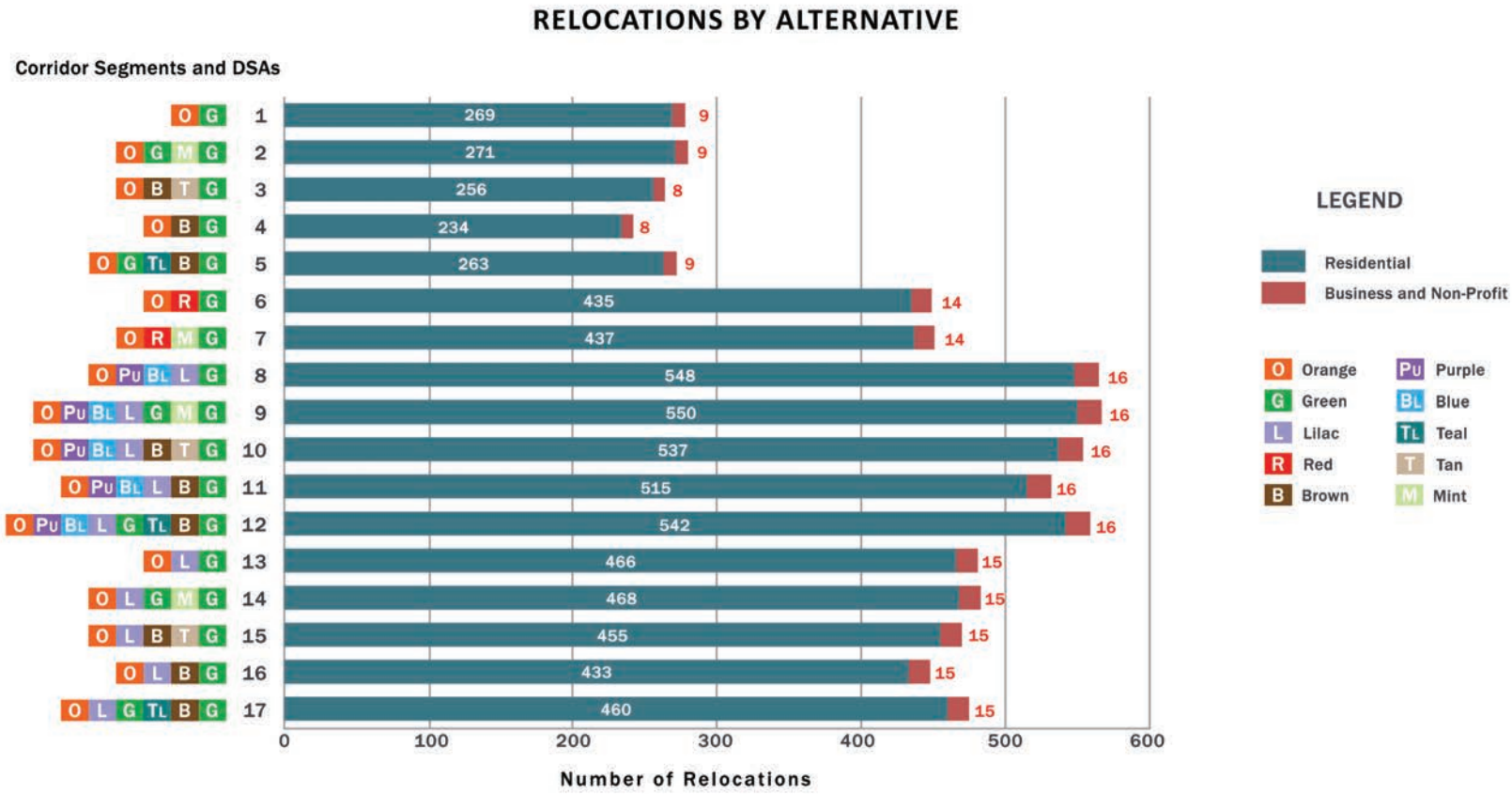
Community Facility Impacts

Although not actual relocations, some of the DSAs would have an effect on various educational, religious, and park and recreation facilities.

Several factors must be considered before a determination can be made about whether a home, business, or community facility will need to be relocated for a highway project.

Educational facilities—The campus of Wake Technical Community College is the only site that would be directly affected. The Orange Corridor segment (Alternatives 1 through 5 and 13 through 17) cross the northwest corner of the Wake Tech property, but would not affect any campus buildings. The only other effect on educational facilities would be alterations to existing school bus routes, some of which would be temporary, occurring only during construction of the project.

Places of Worship—Two places of worship would be affected. The first is The Word of Truth Church of God, located on Eddie Creek Drive, just off NC 55 near



the western edge of the study area. Each DSA would require the acquisition of approximately 1 acre from the church's 1.5 acre parcel, although the church building likely would be able to remain. The second is the Springfield Baptist Church, located on Auburn-Knightdale Road. DSAs 6 and 7 would affect this relatively large parcel. There would be no impact to the church building, and access would remain the same, but the DSAs would require the acquisition of property through the middle of this parcel, splitting it into a 20 acre piece to the north and a 19 acre piece to the south. In total, 11 acres would be required from the 50 acre parcel.

Middle Creek Park—The DSAs that include the Orange Corridor segment (Alternatives 1 through 7 and 13 through 17) would each need to acquire part of a small strip of land that is currently in public ownership and is associated with the Middle Creek Park complex. It is currently an undeveloped property along a residential neighborhood at the northern edge of the park.

Sunset Oaks Park (planned facility)—The DSAs that include the Purple Corridor segment (Alternatives 8 through 12) would cross this planned Holly Springs park, which is located in the Sunset Oaks neighborhood.

Southeast Regional Park (planned facility)—The DSAs that include the Blue Corridor segment (Alternatives 8 through 12) would directly affect privately-owned parcels that Wake County intends to purchase for development as part of this planned park. The County has purchased parcels at the southern end of the planned park area and plans to purchase the remaining parcels

(including those affected by Blue). If Wake County cannot develop the entire planned park, including these parcels, it would lose the North Carolina Clean Water Management Trust Fund grant it received to purchase parcels for the park.

White Deer Park planned expansion area—The DSAs that include the Red Corridor segment (Alternatives 6 and 7) would directly affect about nine acres of a parcel intended for the expansion of White Deer Park by the Town of Garner. When the Town purchased this expansion parcel in 2006, the deed transfer from Wake County included a condition that the parcel must be developed as a park and community center.

Bryan Road Nature Park (planned facility)—The same two DSAs that include the Red Corridor segment (Alternatives 6 and 7) would bisect the property to be used for the planned Bryan Road Nature Park. This severance would directly affect about four acres, making it difficult to achieve its intended uses. As with the White Deer Park noted above, when the Town of Garner purchased this parcel, the deed transfer from Wake County stipulated that the parcel be developed as a public nature park.

Clemmons Educational State Forest—The DSAs that include the Tan or the complete Brown Corridor segments (Alternatives 3, 4, 10, 11, 15 and 16) would each directly affect the northwest corner of the Clemmons Forest property. The Brown Corridor segment would directly affect about 18 acres of this 830-acre forest, while the Tan Corridor segment would directly affect about 7 acres.

Neuse River Trail—DSAs using the complete Green Corridor segment (Alternatives 1, 6, 8, and 13) would cross this trail facility on the same bridge that would cross the Neuse River. DSAs using the Mint Green Corridor segment (Alternatives 2, 7, 9 and 14) or Tan Corridor segment (Alternatives 3, 10, and 15) would accommodate a crossing of the trail with a box culvert underneath the road. The remaining DSAs, which all use the Brown Corridor segment in this area, would affect the trail in two places, where the trail parallels two existing roads. Under this scenario, the existing trail could be modified as part of the project design to maintain public use of the trail. All of these scenarios would allow continued use of the trail unhindered by the proposed road.

Police, Fire, and Emergency Services. Regardless of the DSA chosen, the proposed project would likely shorten response times for emergency vehicles in some study area locations by decreasing the number of indirect, circuitous routes, currently required on local roads. All larger, busier roadways crossed by the proposed project would receive either an underpass or an overpass, rather than being cut off. The only direct negative effects any of the DSAs would have on these services would be with DSAs using the Brown Corridor segment (Alternatives 4, 5, 11, 12, 16, and 17), which would cross a portion of a City of Raleigh police training facility located on Battle Bridge Road, affecting about nine acres of the site; however, the site could likely still function in its current use.

Barrier, Access, and Neighborhood Effects

Another category of sensitive, community-related effects associated with roadway projects principally affects those who are not relocated but who live or work near the project. These include disruption to what is known as "community cohesion," a condition known as "the barrier effect," and changes in access to the local roadway system and land uses along it.

Community cohesion refers to the quantity and quality of interactions among people in a community, as indicated by the degree residents know and care about their neighbors and participate in community activities. A community or neighborhood is said to be "cohesive" when its residents communicate and interact with each other in ways that lead to the neighborhood being seen as a singular unit.[3]

The barrier effect refers to a separation between people or places. Communities can become separated when a new facility, such as a highway, is built through them and local streets are closed. This effect can also be felt by individuals as a psychological impact, even when local street access is not substantially altered.[4] The barrier effect can also affect businesses, recreational facilities, and other public facilities and services because a new road can sometimes cut off enough clients or users to have a substantial negative effect on the continued operation of a business or facility.[5]

The term "access" refers to established paths or routes used by those living in, working in, or visiting the study area. New highway projects can cause changes in access by cutting off or rerouting local streets.

Potential Barrier, Access and Neighborhood Effects

NCDOT places a high priority on keeping disruption of neighborhoods to a minimum, but some disruption would result, regardless of the DSA selected. While some neighborhoods would be affected as a result of displacements of homes, businesses, and community services, others would be affected by changes in access to existing roads. With respect to community cohesion and the barrier effect, displacements through the central part of a neighborhood are generally more disruptive.

The neighborhoods that would experience the highest level of potential community cohesion or barrier effects are shown in the matrix on the following page. Aside from those shown on this table, there are numerous other developments that would be affected by displacements along their edges. The effects on community cohesion might be less in these cases, and there could be less of a barrier effect. DSAs that use the Purple-Blue Corridor segment would disrupt the most neighborhoods; alternatives using the complete Orange Corridor segment (in other words, those that don't connect to the Lilac Corridor segment) would disrupt the fewest.

In terms of effects on access, motorists in the study area will experience improved access to the region's higher speed, controlled access roadway network. This will improve access to major employment and activity centers (for example, Research Triangle Park and Raleigh-Durham International Airport) from locations within the study area.

Environmental Justice and Civil Rights

Under Executive Order 12898, issued in 1994 and titled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," the policies, programs, and plans of federal agencies may not place an unfair burden on groups of people in the US who have historically lacked political power because of socioeconomic, racial or ethnic discrimination. Because it is an Executive Order, EO 12898 applies only to federal agencies; nonetheless, it affects all federal, state, and local agencies that must comply with NEPA. With respect to the Federal Highway Administration, new policies and procedures were studied and established in the late 1990s to implement EO 12898.

As a recipient of federal funding, NCDOT must demonstrate compliance with Title VI of the Civil Rights Act of 1964 and other guidance designed to mitigate adverse impacts on low-income people, people of color, and transit-dependent individuals, among others. Title VI requires nondiscrimination on the basis of race, color, and national origin in programs that receive federal funds.

Potential Environmental Justice and Civil Rights Effects

As described in the project's Community Impact Assessment, the study team reviewed available data and conducted a field review to determine the potential for issues related to environmental justice in the study area. While Census data show that low-income, minority, and elderly individuals live in various locations across the study area, they do not appear to be concentrated in areas near any of the DSAs. This conclusion is based on interviews conducted

DEVELOPMENTS WITH A HIGH POTENTIAL FOR COHESION OR BARRIER EFFECTS
by Alternative and Color-Coded Corridor Segment

Residential Development:	DETAILED STUDY ALTERNATIVES																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Heather Ridge						R	R										
The Village at Aversboro						R	R										
Forest Landing						R	R										
Tiffany Woods						R	R										
Brookwood						R	R										
Talicud Trail								P	P	P	P	P					
High Grove								P	P	P	P	P					
Johnson Pointe								P	P	P	P	P					
Rowland Heights								B	B	B	B	B					
Littlejohn Acres								B	B	B	B	B					
Springhaven								B	B	B	B	B					
Blalock Forest								B	B	B	B	B					
Southern Meadows								B	B	B	B	B					
Britt Estates													L	L	L	L	L
Turner Farms								L	L	L	L	L	L	L	L	L	L
Hillington West								L	L	L	L	L	L	L	L	L	L
Barrington Hills								L	L	L	L	L	L	L	L	L	L
Blue Skies Mobile Home Park	O	O	O	O	O	O	O						O	O	O	O	O
Deerfield Park	O	O	O	O	O	O	O						O	O	O	O	O
Fairview Wooded Acres	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Key to Corridor Segments

- R = Red Segment
- P = Purple Segment
- B = Blue Segment
- L = Lilac Segment
- O = Orange Segment

NOTE: There are other developments in the study area that would also be directly affected, but those effects would be along the edges. The potential for cohesion or barrier effects is not as great as it would be for those shown here.

with urban planners from each locality in the study area, augmented by visual assessments of housing conditions, data on home values, and Census data.

The study of potential relocations for each DSA included an assessment of the likely household income level for residential relocations. The assessment concluded that a relatively small number of required displacements would affect low-income residents. The proportion of total residential relocations affecting low-income residents would be smaller than the proportion of study area residents with low incomes. This suggests that none of the DSAs would result in a disproportionate relocation effect on low-income individuals.

In terms of the possible Civil Rights implications of the project being constructed as a toll road, the study team has concluded that, while there will continue to be free alternative routes available, the imposition of tolls may unavoidably impose a burden on some motorists who would otherwise benefit from the project. However, the proposed project would likely reduce traffic congestion on the local roadway system. Those who cannot afford to use the toll facility would still benefit from it in this way.

Historic Architectural Resources

Historic properties or districts are typically protected under Section 4(f) of the US DOT Act and Section 106 of the National Historic Preservation Act (NHPA) of 1966. In order to be protected by these statutes, properties or districts must be listed on the US Department of the Interior's National Register of Historic Places (NRHP) or be determined to be eligible for listing on the NRHP.

The US Advisory Council on Historic Preservation has adopted a formal, four-step process for completing a review of a federal project's potential effects on historic resources under Section 106 of the National Historic Preservation Act (NHPA).

1. **Initiate the Section 106 review process, determining if it applies to the project.**

2. **Identify historic properties in the project area. An initial, general survey of the "Area of Potential Effects" (APE) around the DSAs is conducted to identify resources that may exist, based on the age of the area's buildings and other general characteristics. Project historians identify sites currently listed on the *National Register of Historic Places* (NRHP) and collect photographs and existing information about potential historic sites, working with the State Historic Preservation Office (HPO) to determine which potential historic sites warrant more detailed study. Project historians then conduct more thorough investigations of those sites, completing more detailed fieldwork, more extensive archival research, interviews, etc., as needed. With this information, HPO determines which sites are eligible for inclusion on the NRHP, based on criteria established in the NHPA.**

3. **Assess the effect of the project on identified historic properties. Once the NRHP listed and eligible properties are identified, the project historians and HPO continue their collaboration to determine the potential effect (No Effect, No Adverse Effect, or Adverse Effect) on each of the sites identified.**

4. **Resolve potential adverse effects by exploring options by avoiding, minimizing, or mitigating those effects. Project historians and HPO work together to find creative solutions for resolving potential adverse effects while also meeting the project's purpose.**

The Advisory Council on Historic Preservation, an independent federal agency that promotes the preservation of our nation's historic resources, has formally adopted criteria for designations describing the magnitude of a project's potential effects on historic resources.[6] These designations are:

No Effect – There would be no effect on the resource from the proposed project

No Adverse Effect – There would be an effect on the resource, but it is determined that the effect would not compromise the characteristics that qualify the property for listing on the *National Register*.

Adverse Effect – There would be effects that would diminish the intregrity of the property or alter the characteristics that qualify the property for the *National Register*.

Potential Effects on Historic Resources

For the Complete 540 project, 22 individual properties in the Area of Potential Effect (APE) for the project were determined to be either eligible for the NRHP or are already on the NRHP. In addition, one rural area was found to qualify for the NRHP as an historic agricultural district. There were also two properties identified in 2012 as eligible for the NRHP as part of the surveys done for a different NCDOT project (the Raleigh Station and Track Configurations Project). Potential effects to these two properties were also considered as part of this study.

As documented in a letter from the North Carolina State Historic Preservation Office (HPO) (dated December 10, 2014 – See Appendix B), most of the DSAs were determined to have No Effect on most of the listed or eligible resources. Impacts on the other properties were designated as either "Adverse Effect," or "No Adverse Effect with Environmental Commitments" (meaning the finding of No Adverse Effect is contingent on various commitments being made to reduce

or mitigate impacts to the property). Properties receiving these designations are shown in the table on page 78.

When the proposed project's effect on historic resources is organized in terms of DSAs, we see that:

- Alternatives 6 and 7 (Red Corridor segment) would have adverse effects on two eligible resources (Dr. L. J. Faulhaber Farm and Bryan Farms Historic District);
- Alternatives 3, 10 and 15 (Tan Corridor segment) would have adverse effects on one eligible resource (Baucom-Stallings House); and
- Several DSAs would require environmental commitments to reduce or mitigate impacts to the Panther Branch School, Britt's Store, and/or the Mount Auburn School.

Archaeological Resources

With respect to the Complete 540 project's effect on archaeological resources, an agreement was reached between HPO and NCDOT that detailed archaeological investigations will be conducted after a Preferred Alternative is selected; that is, after this Draft EIS is approved and a formal public hearing is held for the proposed project (see letter dated January 3, 2011, from the NCDOT Archaeology Group Leader to the HPO, and letter dated January 27, 2011, from the HPO to the NCDOT Archaeology Group Leader in Appendix B). The investigations will identify and evaluate archaeological sites for their eligibility for the NRHP and will be completed in further consultation with the HPO.

Section 4(f) Impacts

As described in Chapter 3, Section 4(f) of the US Department of Transportation Act of 1966 protects certain types of properties from disruption by federal projects unless it can be shown that there are no feasible and prudent alternatives to doing so. Properties that are protected by Section 4(f) include publicly owned parks and recreation areas, wildlife and waterfowl refuges, and historic sites. FHWA can only approve a project alternative that uses such a Section 4(f) property if there is no feasible and prudent alternative to using the property and development of the alternative has included all possible planning to minimize its potential harm to the property.[7] A detailed evaluation of the potential effects of the DSAs on Section 4(f) resources is in Appendix C. This information is summarized below.

Potential Impacts to Section 4(f) Resources

For historic sites, Section 4(f) is applicable to properties that are listed or eligible for listing on the National Register of Historic Places (NRHP). For the Complete 540 project, the direct effects of project DSAs on the following three NRHP-eligible sites would potentially constitute "use" under Section 4(f):

- Dr. L. J. Faulhaber Farm (Red Corridor segment; Alternatives 6 and 7)
- Bryan Farms Historic District (Red Corridor segment; Alternatives 6 and 7)
- Baucom-Stallings House (Tan Corridor segment; Alternatives 3, 10, and 15)

For parks, recreation areas, and refuges, Section 4(f) is applicable when an existing or planned resource meets the following criteria:

- It is publicly-owned
- It is (or is planned to be) open to the entire public during normal hours of operation
- The major purpose of the resource must be for park, recreation or refuge activities
- The resource must be "significant" to the agency with authority over it (this is determined through coordination with the agency).

Section 4(f) is potentially applicable to several of the existing and planned parks and recreation areas described earlier in this chapter. These resources

Historic Sites Affected and Summary of Effects or Commitments

Historic Site	National Register Status	Alternatives and Segments Causing the Effect	Effect Determination	Summary of Effects, or Commitments Required for No Adverse Effect
Panther Branch School	On NRHP	Alternatives 1 thru 5 (Orange segment)	No Adverse Effect, with Environmental Commitments	REASONS FOR NO ADVERSE EFFECT WITH ENVIRONMENTAL COMMITMENTS • Sauls Road is planned to be elevated over new facility just north of Panther Branch School site. • Impacts do not show substantial increase in noise levels. • Small (18-inch) retaining wall required to eliminate need for permanent easements at school and across street--decorative treatments may be required on the wall surface. Designs for the wall will be reviewed by HPO prior to finalization for construction.
Dr. L. J. Faulhaber Farm	Eligible for Listing on NRHP	Alternatives 6 and 7 (Red segment)	Adverse Effect	REASON FOR ADVERSE EFFECT DETERMINATION The 540 project would bisect farm and require demolition of contributing structures.
Bryan Farms Historic District	Eligible for Listing on NRHP	Alternatives 6 and 7 (Red segment)	Adverse Effect	REASON FOR ADVERSE EFFECT DETERMINATION The 540 main highway and its associated improvements on existing roads would require construction within historic boundary and require use of agricultural fields that are contributing resources to the historic district.
Britt's Store	Eligible for Listing on NRHP	Alternatives 8 thru 12 and 13 thru 17 Blue and Lilac segments	No Adverse Effect, with Environmental Commitments	REASONS FOR NO ADVERSE EFFECT WITH ENVIRONMENTAL COMMITMENTS • Adhere to design change made to spare demolition of contributing structures. • The modified design would include a curb along NC 50 and Ten Ten Road that may impact parking. • Additional parking may be needed and will be coordinated with HPO and property owner.
Mount Auburn School	Eligible for Listing on NRHP	Alternatives 6 and 7 (Red segment)	No Adverse Effect, with Environmental Commitments	REASONS FOR NO ADVERSE EFFECT WITH ENVIRONMENTAL COMMITMENTS • Coordination with property owner (Wake County) and HPO to agree on appropriate noise abatement measures. • No construction impacts or easements allowed within historic boundary.
Baucom-Stallings House	Eligible for Listing on NRHP	Alternatives 3, 10, and 15 (Tan segment)	Adverse Effect	REASON FOR ADVERSE EFFECT DETERMINATION The 540 project would bisect the house property and require demolition of contributing structures.

are listed below; each meets the above criteria and the direct effects of the noted DSAs would likely constitute "use" under Section 4(f).

Middle Creek School Park – The Orange Corridor segment (Alternatives 1 through 5 and 13 through 17) crosses a narrow strip along the northern edge of this park, directly affecting 1.6 acres of this 105-acre park. There are no active recreational uses in this area; all of the park's recreational facilities are well to the south of this area. The DSAs affecting this property are not anticipated to adversely affect its recreational activities, features, and attributes.

Planned Sunset Oaks Park – The Purple Corridor segment (Alternatives 8 through 12) would cross this planned 78-acre park, directly affecting about 10 acres. It would also split the parcel in two, leaving about 5 acres east of the road right-of-way and the remainder to the west.

Clemmons Educational State Forest – While there is an element of recreation associated with this property, its primary function is for forest resource management. According to FHWA policy, if recreation has not been established as the primary purpose of a resource, it does not qualify as a recreational resource under Section 4(f) (see Section 4(f) Policy Paper in Appendix C for more detail). Both the Tan (Alternatives 3, 10, and 15) and Brown (Alternatives 4, 11, and 16) Corridor segments would affect small areas of managed forest at the northwest corner of the property, but these effects would not be considered "use" under Section 4(f). However, an individual trail within Clemmons (the Watershed Extension Loop Trail) independently qualifies as a recreational resource under Section 4(f). The Brown Corridor segment directly affects about 500 feet of the three-mile long Watershed Extension Loop Trail, although the trail could likely be reconfigured to maintain its use. For this reason, the DSAs affecting this trail are not anticipated to adversely affect its recreational activities, features, or attributes. The Tan Corridor does not affect any trails in the State Forest.

Section 4(f) of the US DOT Act of 1966 protects parks and recreation areas, certain historic properties, and wildlife refuges from disruption by transportation projects unless it can be shown there is no "feasible and prudent" alternative to doing so.

White Deer Park planned expansion area – The Red Corridor segment (Alternatives 6 and 7) would directly affect about 9 acres of the 35-acre parcel that the Town of Garner plans to develop as an extension of the adjacent White Deer Park. This effect would also leave a 12 acre portion of the planned expansion parcel isolated north of the road right-of-way.

Planned Bryan Road Nature Park – The Red Corridor segment (Alternatives 6 and 7) would bisect this planned park, directly affecting about 6 acres and separating the remaining parcel into a 10 acre section north of the road right-of-way and a 4 acre section to the south.

Neuse River Trail – All of the DSAs would cross the Neuse River Trail. All except those using the Brown Corridor segment would accommodate the trail under the road by a bridge or a box culvert, depending on alignment. DSAs using the Brown Corridor segment in this area (Alternatives 4, 5, 11, 12, 16 and 17) would affect the trail in two locations, where the trail parallels Old Baucom Road and where it parallels Brownfield Road, but the trail could be modified as part of the project design to maintain public use of the trail. While all the

DSAs would affect this property, these effects are not anticipated to be adverse with respect to its recreational activities, features, or attributes.

If the "use" of a Section 4(f) property is very minor and would not adversely affect the activities, features, and attributes of the resource, it may be a "*de minimis*" impact. If the use is *de minimis*, there does not have to be proof that there is no feasible and prudent alternative to using the property. Of the affected resources listed above, the potential impacts to Middle Creek School Park, the Watershed Extension Loop Trail in the Clemmons Educational State Forest, and the Neuse River Trail have the potential to be considered *de minimis* by the FHWA. FHWA will coordinate with the agencies with jurisdiction over these resources to determine if they agree that the potential impacts to them would not adversely affect their activities, features and attributes. FHWA intends to use their agreement as the basis for a *de minimis* finding. Coordination with the HPO determined that there would be no *de minimis* impacts on any of the historic sites within the project's Area of Potential Effects (APE).

Section 4(f) has been determined not to be applicable to another of the park resources described earlier in this chapter. While some of the land intended for development of the Wake County Southeast Regional Park is in public ownership by Wake County, the Blue Corridor segment (Alternatives 8 through 12) would only impact land currently in private ownership. According to FHWA policy, Section 4(f) is not applicable to privately held properties planned for future park development.

Land Use Planning

A new highway through or near a residential area may influence development in that area, potentially changing its character. The local development affected by the highway may be unplanned and may run counter to area development plans.[8]

Potential Effects on Land Use Planning

As described in Chapter 4, most local governments in the study area have adopted land use plans that include completion of the 540 Outer Loop. Several plans include land use policies that explicitly support the project, and most base these policies on the assumption that the project will be located along the protected corridor (the Orange Corridor segment, Alternatives 1 through 5), between NC 55 Bypass and I-40. Representatives from six different local governments stated in interviews that construction of the project is required in order for their current planning objectives to be met and that the other Alternatives west of I-40 would be in conflict with their plans.

The Red Corridor segment (Alternatives 6 and 7) would have serious negative impacts on local land use planning objectives and desired development patterns. It would limit the Town of Garner's plans to promote orderly growth and, by directly affecting a portion of the Town's major commercial and industrial center (Greenfield South Business Park), would not support the Town's objectives of promoting the local tax base and expanding non-residential uses. Town officials have indicated that the effects of the Red Corridor segment would require a rewrite of Garner's Comprehensive Growth Plan.

The Purple-Blue Corridor segment (Alternatives 8 through 12) would also negatively impact local land use planning objectives; in particular, it would conflict with Town of Holly Springs and Wake County land use plans. The Town of Holly Springs' current comprehensive plan, Vision Holly Springs, establishes regional centers for mixed use development along major transportation routes through the town to ensure best possible access while minimizing negative effects on area residential development. Shifting the Complete 540 route from the protected corridor (Orange Corridor segment) to a different, alignment (the Purple-Blue Corridor segment) farther to the south would affect the Vision Holly Springs objectives by not providing transportation access in the locations identified in the plan as requiring this access. It would also

have negative effects on residential development that was built according to the Town's adopted land use plans. The Purple-Blue Corridor segment would similarly conflict with vehicular, bicycle, and pedestrian connectivity between neighborhoods and would not support development of denser, more intense activity centers in the locations envisioned in the Town's plans. Similarly, the Purple-Blue Corridor would conflict with planned locations of future activity centers in Wake County's land use plan, shifting needed transportation access away from these areas onto more residential areas.

In the portion of the study area east of I-40, most of the DSAs would offer at least partial support to local planning objectives. One exception is Green Corridor segment's impact on property known as Randleigh Farm (DSAs 1, 6, 8, and 13). This property is a 417-acre tract owned jointly by Wake County and the City of Raleigh and planned as a mixed-use community. The Green Corridor segment would conflict with those plans. The Mint Green and Tan Corridor segments would also affect this development, but would shift impacts closer to the eastern edge of the property boundaries. The Brown and Teal Corridor segments would avoid the Randleigh property but would have impacts to other City of Raleigh-owned properties in the area.

Economic Effects

Business relocations, addressed at the beginning of this chapter, are also a component in the project's overall economic effects. Specifically, the DSAs that use full Orange Corridor segment (Alternatives 1 through 5) would have the fewest business relocations (either 5 or 6 relocations, depending on DSA); DSAs using the Purple-Blue Corridor segment (Alternatives 8 through 12) would have the most (16 relocations).

In addition, the Red Corridor segment (Alternatives 6 and 7) would affect the Greenfield South Business Park, which is a 416-acre commercial and industrial complex located in the town of Garner, between I-40 and US 70 Business. This industrial park is the town's primary industrial recruitment area and, according to Garner officials, is the foundation of the town's local employment base. The Red Corridor segment would directly affect about 44 acres of land in this park. Garner officials estimate that the affected land has a total Wake County tax value of over $30 million and would therefore decrease its tax base by at least that amount.

Garner's current economic development policy, as outlined in town's 2006 Comprehensive Growth Plan, identifies the need to expand the town's tax base and to achieve a more balanced mix of non-residential and residential development by expanding non-residential uses. By eliminating a substantial amount of land targeted for commercial and industrial development, DSAs 6 and 7 would conflict with this goal.

Visual Character and Aesthetic Effects

A new highway can be visually dominant in an area, and, by the nature of its scale (relative to the rest of the area) and design, it may be considered a physical intrusion by residents living nearby. Additionally, a new highway may replace or block a pleasant view and as a result be considered a visual blight on the landscape.[9]

As described in Chapter 3, the land uses around much of the DSAs areas are low-density suburban and rural, with visually pleasing landscapes that include open agricultural fields, pastures, forest-lined streams, and woodland areas. Introduction of a large roadway facility like the Complete 540 project through the study are would likely alter local perceptions of the current visual environment, and all the DSAs have the potential to detract from existing views of rural and natural areas. Overall, visual changes experienced by those living (or in some cases working) along the DSAs would be intermittent, with some residents subjected to a view of the roadway and others shielded from the roadway by topography and vegetation. In addition, a large roadway facility like

CONTROL OF TRAFFIC NOISE

Highway traffic is one of the more dominant sources of noise in both urban and rural areas. In an effort to encourage the control of noise, Congress passed the Noise Control Act of 1972. Congress further directed the Federal Highway Administration (FHWA) to develop noise standards associated with roadway traffic. Effective control of traffic noise requires not only reasonable and feasible steps to block highway noise that affects properties located adjacent to highways, but also land use planning to control the types of uses permitted next to large, busy highways. And, while the control of land use is traditionally the responsibility of local government, the control of traffic noise associated with specific highway projects is the responsibility of the transportation agency that is planning, designing, and constructing the project.

Complete 540 could spur additional development that would change the surrounding visual environment from its current open and fairly rural state.

Along the Orange Corridor segment (Alternatives 1 through 5), a few existing neighborhoods were developed prior to corridor protection, but many others were developed with the assumption that the road would eventually be built along the protected path. For this reason, there are wooded buffers shielding many of these neighborhoods from the proposed right-of-way within this corridor segment.

Alternatives using the Purple-Blue Corridor segment (Alternatives 8 through 12) or the Lilac Corridor segment (Alternatives 8 through 17) would bisect existing residential neighborhoods and would cross open rural landscapes (more so than along the Orange Corridor segment), so these DSAs would likely have a greater visual impact than Alternatives 1 through 5.

Alternatives using the Red Corridor segment (Alternatives 6 and 7) would cross several existing neighborhoods and two areas with existing and planned nature-oriented parks. These options would likely also have a greater visual impact than Alternatives 1 through 5.

All the options east of I-40 would have about the same degree of visual impacts on the fairly rural landscape there.

Noise Effects

Highway traffic is one of the more dominant sources of noise in both urban and rural areas. Effective control of traffic noise depends not only on reasonable and feasible steps to block highway noise that affects properties located adjacent to highways, but also on land use planning to control the types of uses permitted next to large, busy highways. And, while the control of land use is traditionally the responsibility of local government, the control of traffic noise

associated with specific highway projects is the responsibility of the transportation agency that is planning, designing, and constructing the project.[10]

Because noise impacts may affect the quality of life for residents and may be disruptive at other community facilities (such as schools, for example), a detailed process is followed for calculating noise impacts from projects such as Complete 540. NCDOT's current Traffic Noise Abatement Policy and Traffic Noise Abatement Manual provided the methods followed for this study.

Methods of Analysis

The study team examined 1000-foot wide corridors for each of the seventeen DSAs. This included identifying all land uses within the corridors that might be sensitive to traffic noise, such as residences, schools and parks; these are called "receptors." Out of the approximately 4,200 receptors that were identified, 30 were determined to be representative of the broader area for study purposes. Field measurements were then taken at each of these 30 sites to determine existing noise levels. In addition to measuring traffic noise, other data were collected at each site, such as terrain, traffic volumes, traffic speeds, roadway factors, and similar conditions that could affect noise levels.

Once all the data were collected for each of the 30 sites, they were input into a standard computerized Traffic Noise Model (TNM). The model is used to predict the noise levels in the future, both with and without the proposed Complete 540 project in place—also known as the "build" and "no build" conditions. The increase in noise levels between the conditions today and future build conditions was used to identify all locations that would experience increases in noise levels above thresholds set by the NCDOT's Traffic Noise Abatement Policy.

As with all categories of impact under NEPA, impacts that cannot be avoided must be minimized to the greatest extent feasible, and those that remain must be compensated for or corrected, if at all possible. This compensation is

Noise readings were taken at many locations along the DSAs. Along with traffic count data, these readings were used to establish a database of existing noise levels.

An important part of the noise analysis conducted for projects such as Complete 540 is determining locations where noise walls would be warranted.

known as "mitigation." With respect to noise impacts, the most effective form of mitigation is often the construction of physical sound barriers or walls. It is not always feasible to build sound walls at every site that would receive a noise impact. To be considered feasible, there must be no obstacles to its construction and it must be shown to reduce noise levels by a certain established amount (5 decibels at one affected property). It must also be shown to benefit enough affected sites for its required length and height. In other words, it is not considered feasible to build long, high sound barriers if such a barrier would only benefit a small number of sites.

Results

In total, 4,189 residential receptors, six schools, two child care facilities, eight recreational facilities, one medical facility, sixteen churches, and ten commercial receptors were identified within the project limits. Noise impacts are predicted to occur at between 454 and 804 of the over 4,200 receptors across the 17 DSAs.

Measures for reducing or eliminating noise impacts were considered for all impacted receptors for each DSA. The primary noise abatement measure considered was noise barriers. Noise barriers to reduce sound levels were investigated at 91 locations. The number of noise barriers per DSA found to be both feasible and reasonable ranged from 16 to 24, depending on the DSA.

After a Preferred Alternative is selected, NCDOT will complete additional noise studies to make final decisions about where noise barriers would be constructed. Noise barriers found to be feasible and reasonable during the preliminary noise analysis may not be found to be feasible and reasonable during the final noise analysis due to possible changes in the proposed design. Conversely, noise barriers not considered feasible and reasonable during the preliminary noise analysis may be found to meet the established criteria during the final noise analysis and be recommended for construction.

Traffic Considerations

As part of the process for assessing the effect the Complete 540 project could have on the human environment, the ways in which the DSAs would alter traffic patterns or traffic congestion on other road segments and intersections in the study area were assessed.

Concepts Defined

Two important, and related, measures of traffic congestion and roadway function are traffic capacity and level of service. Capacity is a measure of the maximum hourly rate that vehicles can drive on a section of road or through an intersection without experiencing excessive delays. Level of service (which was described in Chapter 2) is a way of describing the amount of congestion on a roadway link or intersection, using a grading system based on the letters A through F (with A being the best and F the worst).

The Capital Area Metropolitan Planning Organization (CAMPO) is the agency responsible for developing the travel demand model for roadways in the Raleigh region. The travel demand model is a computer program that takes into account existing and future land uses and the amount of traffic those uses typically generate. The model can be used to give reasonable predictions of future traffic volumes on the area's roadways. Officials at CAMPO use this model to help determine where and when roadway improvements will be needed.

Each DSA was evaluated to determine how it would affect nearby roadway capacities and the levels of service they provide, based on data generated by CAMPO's official travel demand model.

Methods Summary

One of the first steps required in the analysis of future traffic conditions is to establish a base year, which is intended to reflect conditions at the time of the

study, and a future year, reflecting conditions several years after the project has been built. For the purposes of the Complete 540 study, the study team's traffic engineers established 2012 as the base year, and 2035 as the future "design year."

Next, the travel demand model was used to obtain traffic volume data for four different conditions. First, the base year volumes were calculated without the project included in the calculations. Next, the base year volumes were generated again, except this under different scenarios including the proposed project in various locations. This set of "existing" traffic volumes with and without the project was intended to simulate traffic conditions at the time the project would be built. Finally, the same process was used to generate traffic volumes with and without the project in the 2035 "design year," which gives an indication of the long-term effect the proposed project would have on area traffic conditions.

In general, LOS D (which can be thought of as "fair" or moderately congested traffic conditions) has been established by CAMPO as the minimum acceptable level of service for highway segments and intersections during peak, "rush hour" traffic conditions. This level of service was used as the minimum standard in gauging the effects of the DSAs on area traffic.

Potential Effects on Area Traffic Patterns

Growth and development under either the build (i.e., the 17 DSAs) or no-build scenarios will result in travel pattern changes on freeways, major and minor arterial roads, and will affect the associated traffic operations along each of these roads. These effects, which include traffic volume increases and decreases and changes in traffic patterns, could be somewhat different under a build scenario, due to the introduction of a new freeway and interchanges and associated redistribution of traffic that may not occur otherwise. These build effects could redistribute traffic to the new Complete 540 freeway and its 13 interchanges, away from existing major and minor roads near the freeway such as Ten Ten Road, NC 42, and US 70. The build scenario was developed in a manner that addresses the anticipated travel pattern changes and associated traffic operations by providing level of service D or better on Complete 540 and nearby intersections during peak travel hours. In the no-build scenario, the growth and development that is expected in the study area would result in an additional burden on the existing roads. The effects under the no-build scenario include increased pressure on existing capacity, degraded road and intersection levels of service, and reduced mobility in southern and eastern Wake County. A quantitative assessment of the indirect effects of the build and no-build scenarios on traffic operations will be evaluated once a Preferred Alternative has been selected.

Under base year conditions with the proposed project there are several transportation locations whose traffic volumes or patterns could be affected. These include:

Access-controlled freeways

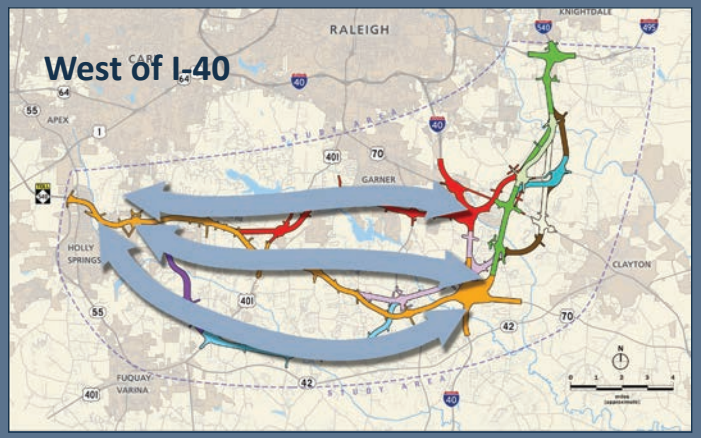
- I-40
- I-540
- NC 540
- US 64/US 264 (Knightdale Bypass) (I-495)
- US 70 (Clayton Bypass)

Existing and planned interchanges

- Toll NC 540 (Triangle Expressway) & NC 55 Bypass
- I-40 & US 70 Business
- I-40 & US 70 (Clayton Bypass)
- US 64 / US 264 (Knightdale Bypass) & Hodge Road
- I-540 & US 264 / US 64 (Knightdale Bypass)

BASIC TRAFFIC PATHWAYS

Strictly in terms of the effect they would have on area-wide traffic patterns, the DSAs west of I-40 can be grouped into three large pathways, each affecting area traffic in different ways. West of I-40, the DSAs essentially follow one of three distinct paths: Alternatives 1 through 5 and 13 through 17 use the Orange Corridor segment or a combination of the Orange and Lilac Corridor segments; Alternatives 6 and 7 use a combination of the Orange and Red Corridor segments; and Alternatives 8 through 12 use the Orange, Purple-Blue, Lilac Corridor segments. East of I-40, each of the DSAs essentially follows a similar path.



- US 64 / US 264 (Knightdale Bypass) & Smithfield Road
- US 64 Business & I-540
- Toll NC 540 at Old Holly Springs-Apex Road (planned)

Eighteen existing at-grade intersections

- NC 55 Bypass and NC 540 EB Ramps
- NC 55 Bypass and NC 540 WB Ramps
- Holly Springs Road (SR 1152) and Kildaire Farm Road (SR 1300)
- US 401 and Donny Brook Road (SR 1503) / Old McCullers Rd (SR 2779)
- US 401 and Wake Tech Drive
- US 401 and Ten Ten Road (SR 1010)
- US 401 and Dwight Rowland Road (SR 2753)
- US 401 and Meadow Drive (SR 2886)
- Old Stage Road (SR 1006) and Vandora Springs Road (SR 2711)
- Old Stage Road (SR 1006) and Norman Blalock Road (SR 2750)
- Vandora Springs Road (SR 2711) and Buffaloe Road (SR 2711)
- NC 50 and Cleveland Road (SR 1010) / Stevens Oaks Drive (SR 5324)
- NC 50 and Ten Ten Road (SR 1010)
- White Oak Road (SR 2700) and Raynor Road (SR 2555)
- Rock Quarry Rd (SR 2542) and Auburn-Knightdale Rd (SR 2555)
- Rock Quarry Road (SR 2542) and Old Baucom Road (SR 5204)
- Poole Road (SR 1007) and Hodge Road (SR 2516)
- Hilltop Needmore Road (SR 1393) and Old Mills Road (SR 1421)

Numerous major and minor arterial roads

- Kildaire Farm Road realigned (DSA 1-17)
- Doughtymews Lane extension (DSA 8-12)
- Donny Brook Road realigned (DSA 1-5, 13-17)

- Old McCullers Road severed from US 401 and realigned to Wake Tech internal circulation (DSA 1-5, 13-17)
- Dwight Rowland Rd severed and realigned via Meadow Dr (DSA 8-12)
- Vandora Springs Road and Buffaloe Road realigned (DSA 6-7)
- Norman Blalock Road realigned (DSA 8-12)
- Raynor Rd and Tiffany Creek Dr realigned (DSA 1-2,5,8-9,12,13-14,17)
- Old Baucom Road realigned (DSA 1-2, 6-9, 13-14)
- Red Brick Road Connector (DSA 8-17)

All 17 DSAs would provide nearly identical levels of service in the base year. The analysis conducted for these locations shows that each would provide at least a level of service of D or better. This can be interpreted as meaning that the project would not cause any unacceptable problems on the study area's roadway network and would result in improved conditions on the overall network in the base year.

Under future, "design year" conditions, the locations affected by the DSAs include approximately 19 existing or future interchanges and 36 existing or future at-grade intersections or entrance/exit ramp intersections.

As with the base year conclusions, the analysis conducted for the design year conditions shows that each of these locations would provide at least a level of service of D or better, again meaning that the project would provide acceptable levels of service on the study area's future roadway network during peak travel hours.

In summary, each of the DSAs is shown to meet the need for the project by improving mobility and providing better connections between other transportation routes in and near the project study area, compared with the No-Build Alternative. This means access to homes, businesses, public services, and other facilities in area would be improved over the No-Build Alternative. The No-Build Alternative would generally result in worse operations at existing intersections and along segments of existing highway in the design year.

More Information the Human Environment Effects

Several technical reports prepared for this study contain more detailed information on the human environment effects described above. These include:

- Community Impact Assessment
- Historic Architectural Resources Survey Report
- Traffic Noise Analysis Report
- Traffic Forecast Technical Memorandum
- Detailed Study Alternatives Traffic Analysis Technical Memorandum
- Right of Way and Relocation Report
- Stakeholder Involvement Report

More information about these documents can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways those documents can be accessed, either in paper or electronic form.

NATURAL ENVIRONMENT

As explained in Chapter 3, many elements of the natural environment can affect where a new highway such as Complete 540 is located. These include such things as rivers, streams and lakes; wetland areas; and areas with protected plant or animal species, and other protected areas. Similar to the features that comprise the human environment, NEPA analyses generally include an explanation of ways to mitigate environmental consequences including avoiding and minimizing effects on protected natural resources. The US Army Corps of Engineers (USACE) evaluation under Section 404 of the Clean Water Act calls for impacts to aquatic areas to be avoided, then minimized to the extent practicable. Any impacts to aquatic resources protected by federal or state regulations that remain after they have been minimized should be offset by compensatory mitigation to the extent feasible and reasonable.

Unlike most of the human environment categories, impacts to the natural environment are in many cases under the jurisdiction of state and federal agencies,

which must ensure that various regulations protecting the environment are met. The categories of natural environmental resources that are protected or that otherwise have the potential to be substantially affected by the Complete 540 project are described in the paragraphs that follow.

Water Resources and Aquatic Habitats

Waters of the United States are protected by many statutes and regulations, principal among these being the federal Clean Water Act. Water resources protected under the Clean Water Act include most surface waters (in other words, lakes, rivers, streams, and wetlands). Groundwater resources are protected by the Safe Drinking Water Act. These sources may be used for drinking water, industrial processes, agriculture, and irrigation. Water resources also provide opportunities for recreation, such as fishing, boating and swimming.

Protecting water bodies from pollutants that are carried from road surfaces by rain water is important when planning and constructing a highway. Stormwater runoff from highways carries silt, heavy metals, petroleum products, nitrogen, and phosphorus, each of which may contribute to the degradation of surface water and groundwater.

A new highway's effect on water quality often depends on the size of the waterways crossed, the number of crossings, and the time of year that construction takes place. Short-term impacts on water quality within a project area may be caused by soil erosion and sedimentation. Long-term impacts also occur, with particulates, heavy metals, organic matter, pesticides, herbicides, nutrients, and bacteria entering groundwater and surface water bodies from highway runoff.

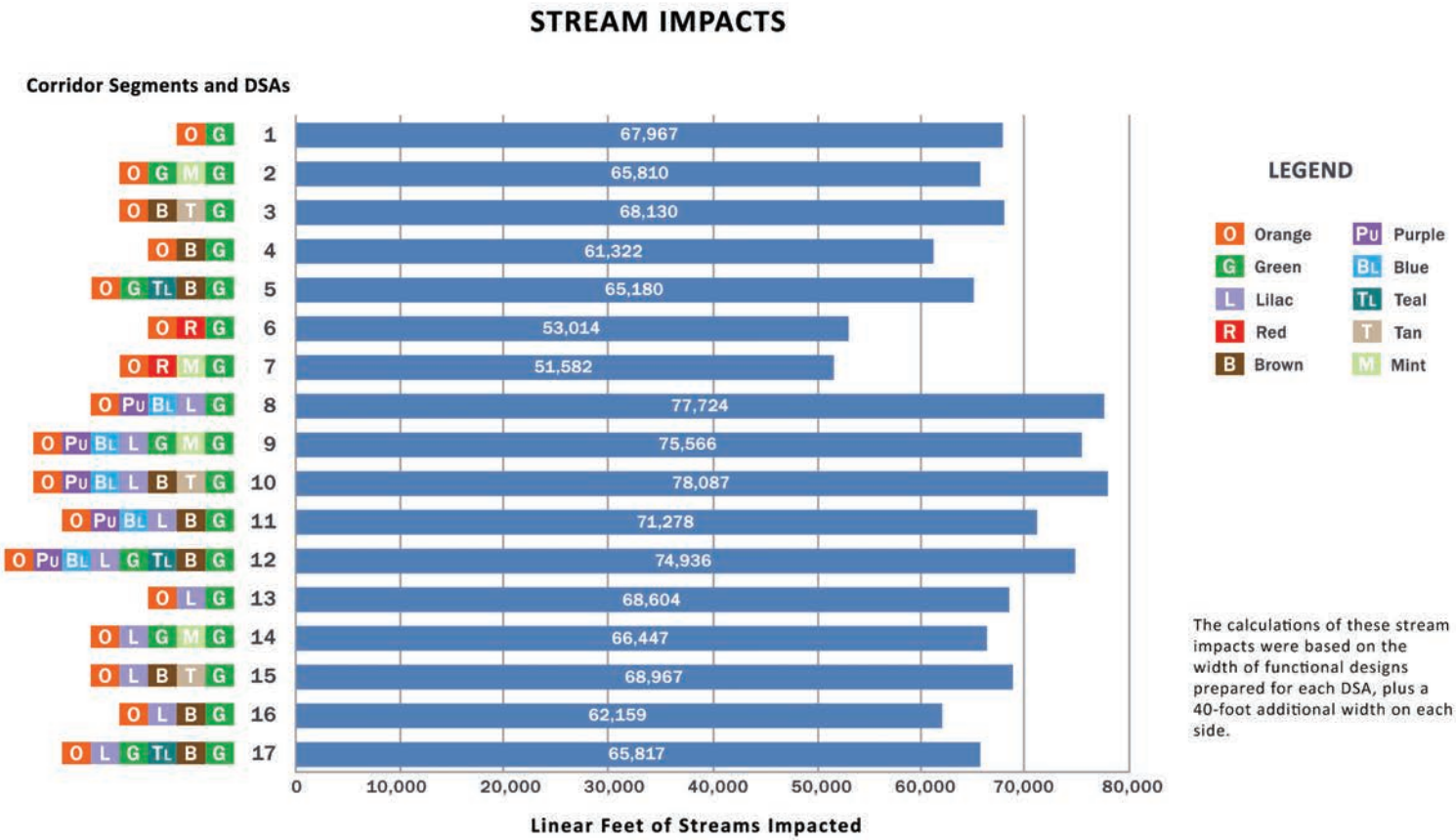
Aquatic habitats are the places in lakes and streams that support the life cycles of plants and animals—places that may be subjected to a variety of pollutants. A common way these habitats become polluted is by the introduction of small particles that become suspended in the water and scatter the sunlight that strikes the water's surface, causing the water to become cloudy. This cloudiness is called "turbidity." High levels of turbidity can affect a water body's biological productivity, recreational values, and habitat quality, and cause lakes to become increasingly shallow.

The materials that cause elevated levels of turbidity can enter lakes and streams as a result of road construction, which can cause an increase in the sediments entering the water body. These sediments can have direct negative effects on aquatic organisms by clogging or injuring gills and other respiratory surfaces, and can negatively affect aquatic habitat by altering water chemistry and reducing the concentration of dissolved oxygen.

Potential Effects on General Water Quality and Aquatic Habitat Conditions

The effects of highway construction on water resources would be similar for all of the DSAs. These include:

- Increased sediment loading and siltation due to watershed vegetation removal, erosion, and/or construction.
- Decreased light penetration and water clarity from increased turbidity.
- Reduced habitat suitability for dwarf wedgemussel and other aquatic animals due to increases in fine sediment.
- Impacts on feeding of all mussels and many other aquatic animals because of increased suspended sediment in the water.
- Changes in water temperature with vegetation removal.
- Increased concentration of pollutants from highway runoff, construction activities, and construction equipment.



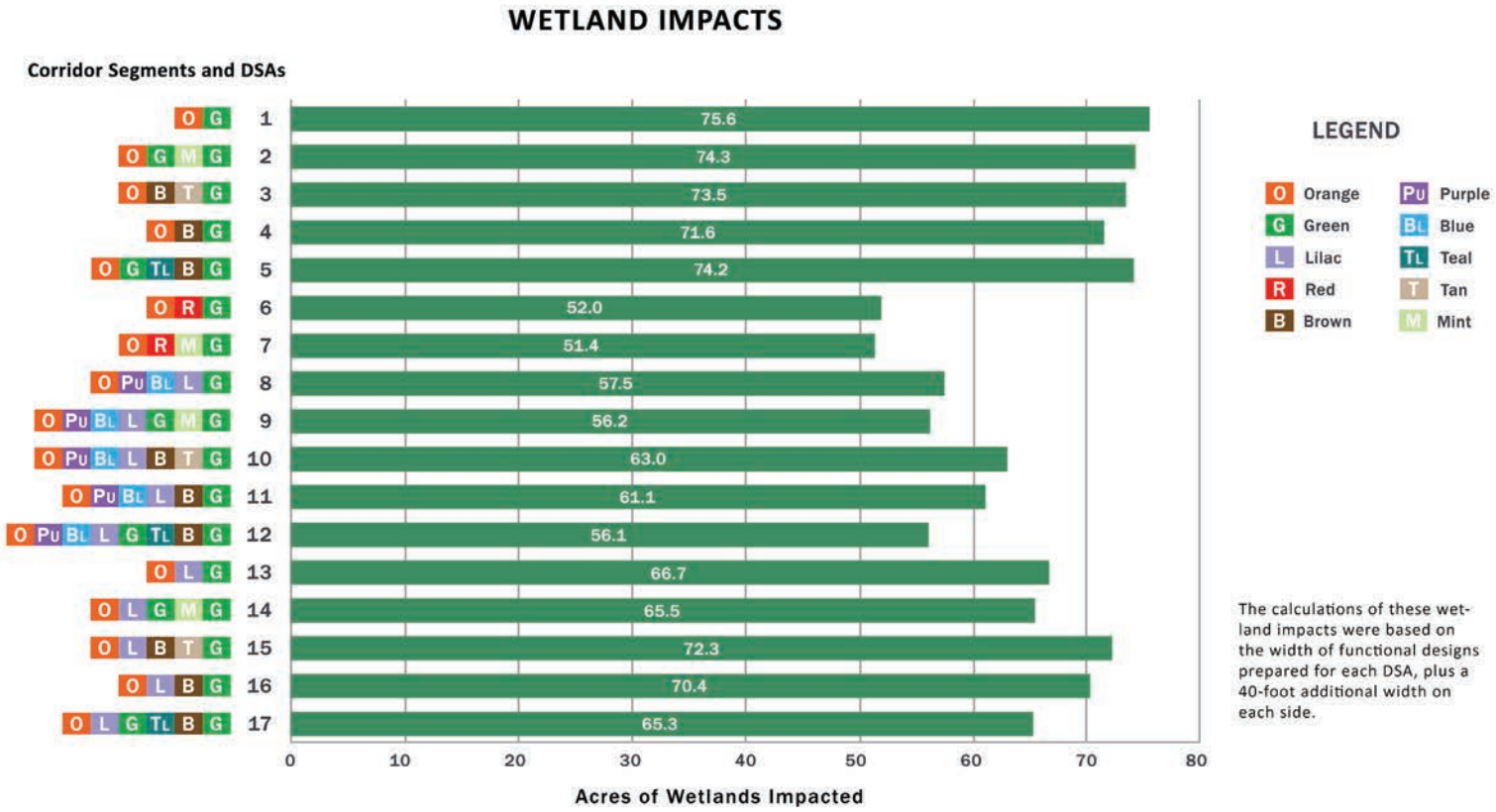
- Alteration of water levels and flows as a result of interruptions and/or additions to surface and groundwater flow from construction.

To keep these effects to a minimum, an erosion and sedimentation control plan would be developed and put in place before any construction occurs. This plan would be prepared in accordance with NCDENR and NCDOT guidance. Examples of Best Management Practices for erosion and sedimentation control that would be used during construction include: the use of dikes, berms, silt basins, and silt fencing; locating construction staging areas outside of floodplains and away from streams and tributaries; and rapid re-seeding of sites where vegetation is disturbed to help alleviate erosion and reduce sediment loading and runoff.

Potential Effects on Streams

The Complete 540 DSAs' potential for impacts to aquatic communities is directly related to the number of streams each DSA would cross, along with the total linear feet of streams affected.

As shown in the chart, DSAs using the Red Corridor segment (Alternatives 6 and 7) west of I-40 would have the lowest total linear feet of stream impacts. These DSAs would also have the fewest stream crossings (109 and 106, respec-



tively). DSAs using the Purple-Blue Corridor Segment (Alternatives 8-12) would have the highest total linear feet of stream impacts, averaging 44 percent greater linear feet of impacts than DSAs using the Red Corridor segment. The Purple-Blue DSAs cross Middle Creek twice, while the other options cross Middle Creek once. Within each group of DSAs using a particular alignment west of I-40, those using the full length of the Brown Corridor segment east of I-40 would have less stream impacts than those following the other options east of I-40. There is relatively little variation in stream impacts among the other alignments east of I-40 (Alternatives using the Green, Mint Green, or Tan Corridor segments).

Wetlands and Ponds

As described in Chapter 3, the Clean Water Act defines wetlands as "areas that are inundated or saturated by surface or groundwater 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.

Potential Effects on Wetlands

As a result of fieldwork conducted by the Complete 540 study team's biologists, 543 wetland sites that are under the jurisdiction of the US Army Corps of Engineers (USACE) were identified in or near the DSAs.

As shown in the chart, DSAs using the Red Corridor segment (Alternatives 6 and 7) would have the smallest total impact on jurisdictional wetlands, each affecting just under 52 acres. DSAs using the Purple-Blue Corridor segment (Alternatives 8 through 12) would have the next smallest total impact, averaging about 59 acres of wetlands—which is approximately 14 percent greater than the average impact of DSAs 6 and 7 (Red Corridor segment). DSAs using

the Lilac Corridor segment (Alternatives 13 through 17) would affect slightly more acres of wetlands, averaging about 68 acres of impacts. DSAs using the Orange Corridor segment (Alternatives 1 through 5) would affect the greatest amount of wetlands, averaging about 74 acres of impacts—which is approximately 43 percent greater than the average impact of DSAs 6 and 7 (Red Corridor segment). The portions of the DSAs located east of I-40 have very little difference in wetland impact among them. The majority of the variation in wetland impacts occurs in DSA segments west of I-40.

Potential Effects on Ponds

There are 105 ponds within or near DSAs that fall under the jurisdiction of the USACE. The DSAs' total impacts range from about 18 acres, for Alternative 7 (using the Red and Mint Green Corridor segments) to about 28 acres for alternatives using the portion of the Orange Corridor segment west of I-40, and Teal to Brown east of I-40.

Potential Strategies to Avoid, Minimize, and Mitigate Jurisdictional Resources

Through development of the preliminary functional designs within the DSAs, NCDOT has attempted to avoid impacts to streams and wetlands to the greatest practicable extent. This included developing alignments and interchange configurations for the DSAs that avoided these resources as much as possible, while also minimizing impacts to other resources. NCDOT has also tried to minimize the total impacts to these resources by considering bridges instead of culverts over some of the larger streams and bridges over some of the larger and high quality wetlands. NCDOT will continue to seek ways to avoid and minimize impacts in further design efforts for the Preferred Alternative.

Mitigation policy for jurisdictional Waters of the US has been established by USEPA and USACE regulations in 33 CFR Part 332 and 40 CFR Part 230, Subpart J. Under these regulations project sponsors first strive to avoid effects to wetlands to the greatest extent practicable. Those effects that cannot be avoided are then be minimized to the greatest practicable extent. For any remaining unavoidable impacts to Waters of the US, compensatory mitigation of impacts to achieve an outcome of "no net loss" of aquatic function is required. The purpose of this policy is to restore and maintain the chemical, biological, and physical integrity of Waters of the US.

Unavoidable impacts of the Preferred Alternative to Waters of the US will be offset by compensatory mitigation. Potential on-site stream and wetland mitigation opportunities will be investigated after a Preferred Alternative is selected. If on-site mitigation is not feasible, mitigation will be provided through the NCDENR Division of Mitigation Services. Additional information on this program can be found at: http://portal.ncdenr.org/web/eep.

The Swift Creek Watershed Critical Area

In the Complete 540 study area, Swift Creek (above the Lake Benson Dam) has been classified as a Water Supply III Watershed, which designates waters used as sources of water supply for drinking, culinary, or food processing purposes. These waters are also protected for Class C uses, which include secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. A management plan is in place for Swift Creek and its impounded water bodies (Lake Wheeler and Lake Benson). This plan established the boundaries of the Swift Creek Watershed Critical Area. It also established limitations on development within the Watershed Critical Area to protect water quality.

DSAs that use the Red Corridor segment (Alternatives 6 and 7) are the only DSAs that cross the Swift Creek Watershed Critical Area. For this reason, NCDENR-DWR and USEPA have expressed concern about these DSAs, as documented in the Complete 540 study's Alternatives Development and Analysis Report. Construction of the project along either of these DSAs would require extensive coordination with these officials to reach an agreement about the best ways to protect this water resource.

Jurisdictional Waters

Determining when a lake, pond, stream, or wetland is considered a "Water of the United States"

The Clean Water Act of 1972 is intended to help protect the quality of our nation's water-bodies by regulating the kinds of materials that can be discharged into them. Lakes, ponds, streams, and wetlands that meet conditions established in the Act are designated as "waters of the United States" and fall under the jurisdiction of the US Army Corps of Engineers (USACE).

Section 404 of the Act requires that any public or private entity conducting activities that require dredging, filling, or otherwise discharging material into US waters must first receive a permit from the USACE. Under Section 401 of the Act, the permit applicant must first obtain certification from their State's regulatory agency indicating that the project complies with State water quality standards. In North Carolina, that agency is the Department of Environment and Natural Resources (NCDENR).

Any roadway project undertaken by the NCDOT that would affect waters of the United States must be issued a "Section 404 permit" before construction can proceed. Before that can happen, however, NCDOT must determine, or "delineate," which lakes, ponds, streams, or wetlands that would be affected by the project are classified as US waters. For the Complete 540 study, the delineation/jurisdictional determination process was done as follows:

Biologists surveyed an area 1000 feet wide for each DSA for streams, ponds, and wetlands. At each location, the boundaries or edges of these water-bodies were flagged, with the location of each flag recorded using global position satellite (GPS) technology. They also documented in writing each site's specific biological characteristics.

Once all the potential waters of the US are flagged, staff members from the USACE and NCDENR review the documentation for each site and conduct their own field reviews to verify the assessments.

The study team's biologists then incorporate any changes required by these agencies and document them in a field assessment report which is called the Waters Report, for this project. At this point, the identification of waters of the US is considered "field verified," and their boundaries are considered official and can be used to make detailed assessments of the potential effect the DSAs would have on them.

The Neuse River Buffer Zone

As described in Chapter 3, the Neuse River is the largest river in the study area. It has been designated by the North Carolina Department of Environment and Natural Resources (NCDENR) as an Anadromous Fish Spawning Area and an inland Primary Nursery Area. Anadromous Fish Spawning Areas are portions of rivers or streams designated by NCDENR as places where spawning of anadromous fish (fish that live in salt water for part of their life cycle) has been documented. Primary Nursery Areas are portions of water bodies that provide ideal habitat for young fish and shellfish. Although it supports these fish populations, portions of the Neuse River in the study area also have impaired water quality and are listed on the North Carolina 303(d) list of impaired waters due to high copper levels.[11]

To protect water quality in the Neuse River, streamside "riparian zones" have been established along the river, portions of which are in the Complete 540 study area. These areas are subject to the Neuse River Buffer Rules administered by NCDENR-DWR. DSAs using the Red Corridor segment (Alternatives 6 and 7) would have a smaller total impact on protected buffer zones than the other DSAs.

Floodplains

The term "floodplain" refers to the total area that is inundated with water during heavy, prolonged rain events or other conditions that result in high water flows. For regulatory purposes, the floodplain is defined by the area inundated during the one percent probability flood event, more commonly referred to as the 100-year flood zone. Floodplains are not the same as a floodway. The term "floodway" refers to the channel of a river or stream and the parts of the floodplain adjacent to the channel that must be kept free of encroachment so that the one percent annual chance flood can be carried without substantial increases in flood heights (typically no greater than one foot).

Floodplains are protected because of their many beneficial attributes. Specifically, floodplains:

- provide for the natural moderation of floods, the maintenance of water quality, and the recharge of groundwater
- support large and diverse populations of plants and animals
- often contain wetlands areas, which are biologically very productive and provide vital breeding grounds for fish and wildlife
- may contain cultural resources including archeological and historical sites, unique habitats for ecological study, open space, and recreation opportunities

The 100-year floodplain is defined as the total area covered by water during the one percent probability flood event—an event whose severity has a one percent chance of happening in any given year,

- generally provide excellent resources for agricultural, aquacultural, and forestry production
- have aesthetic and other intangible attributes that have important social and economic value[12]

Method of Analysis

The evaluation of floodplain impacts is based on official Federal Emergency Management Agency (FEMA) flood insurance studies and FEMA Flood Insurance Rate Maps (FIRM) for Wake and Johnson Counties (Wake County: 2005; Johnston County: 2005). These studies and maps provide a standardized way

of assessing the extent to which any of the DSAs would encroach upon any 100-year floodplain areas.

Potential Effects on Floodplains

The study team's analysis revealed that DSAs 8, 9, and 10 would have the highest floodplain impact, ranging from 102 to 103 acres. This magnitude of impact is because these DSAs, which all follow the Purple and Blue Corridor segments, each cross and follow alongside Middle Creek in the Holly Springs/Fuquay-Varina area. Additional floodplain impacts also occur for these DSAs because they would cross the Neuse River at a less perpendicular angle than DSAs using the Brown or Teal/Brown Corridor segments, east of I-40.

DSAs using either the Orange Corridor segment or the Orange/Lilac segment west of I-40 and then the Brown or Teal/Brown segments east of I-40 (Alternatives 4, 5, 16 and 17) would have the lowest floodplain impact, ranging from 49 to 65 acres. This impact is lower because these alternatives cross a narrower section of the floodplain along the Neuse River than other options east of I-40.

Terrestrial Habitat

An important consideration with respect to the Complete 540 DSAs is minimizing fragmentation of terrestrial habitat, which refers to habitat on land. Fragmentation occurs when one large tract of land that is suitable for supporting one or more species is divided into two or more smaller pieces that are physically separated. This can happen when large developments are built or when linear facilities like utilities or, in particular, new roads are built through undeveloped or lightly developed tracts. When highways "fragment" landscapes, they divide wildlife populations into smaller, more isolated units, making the populations less stable over time. They may also be more susceptible to inbreeding and to genetic defects. Habitat fragmentation threatens all wildlife species that have to cross roads to meet their biological needs.[13]

Due to the suburban nature of much of the land development that has occurred in the study area, there is already a substantial amount of habitat fragmentation, with few large forested areas remaining. This increases the importance and value of wooded areas that are often found along streams and tributaries because they provide long, unbroken stretches of habitat and serve as travel corridors for wildlife. In addition, forested uplands are often important habitat for migratory birds. This project will comply with requirements set forth in the Migratory Bird Treaty Act of 1918.

Potential Effects on Terrestrial Habitat

Each of the DSAs would contribute to habitat fragmentation to some extent. In general, existing fragmentation is more severe in the northern and western portions of the study area, where development is more highly concentrated. Farther south and east, it is still possible to find larger tracts of relatively undisturbed land. As a result, the farther south or east a DSA is located, the more likely it is to fragment habitat. In particular, the DSAs that use the Purple/Blue Corridor segment (Alternatives 8-12) are both farthest to the south and also cross Middle Creek twice—two factors that would cause greater fragmentation.

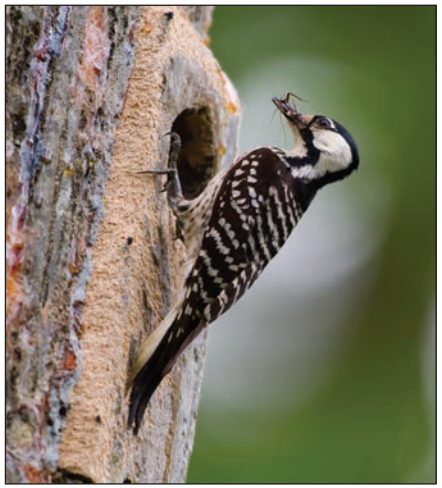
Best Management Practices used during construction can greatly minimize erosion and sedimentation at stream crossings, which can help minimize negative effects. For large tracts of land that would be divided, wildlife crossings can be considered in locations where crossings would lessen fragmentation. At the request of the resources agencies, NCDOT has incorporated a bridge into the preliminary design for the Blue Corridor segment in one location in order to provide a crossing for wildlife—this was the only location where the agencies requested a bridge for this purpose.

Protected Species

As discussed in Chapter 3, endangered plant and animal species and their habitats are an important consideration in the Complete 540 study.

The following endangered species are listed as occurring in either Wake or Johnston counties. As part of the detailed analysis conducted for the DSAs, biologists and other qualified natural resource specialists conducted field surveys to determine if such species occur in the vicinity of the DSAs, if suitable habitat for those species is in the vicinity of the DSAs, and whether the project has the potential to affect these species. Project staff then develop a Biological Conclusion for each species, indicating whether the project will affect the species and, if so, whether it is likely to adversely affect the species. These activities were/are being conducted for the Complete 540 project and the results are summarized in the paragraphs that follow.

Red-cockaded woodpecker — The habitat for this federally-endangered species of woodpecker is very specific: it excavates cavities for nesting and roosting only in living pine trees, particularly longleaf pine, that are at least 60 years old and that are located contiguous to pine stands that are at least 30 years of age, providing foraging habitat. This species foraging range is generally no more than a one-half mile radius from its nest site.



As part of the field surveys, study team biologists searched for suitable red-cockaded woodpecker habitat in the study corridors for each DSA's route. Although suitable foraging habitat was found, subsequent surveys within a half mile of the DSAs did not reveal any pine trees with cavities, which would provide nesting habitat for the species. North Carolina's Natural Heritage Program records indicate that there have been no recorded occurrences of this species within one mile of any of the DSA study corridors. As a result, the Biological Conclusion for this species is "No Effect" for all the DSAs.

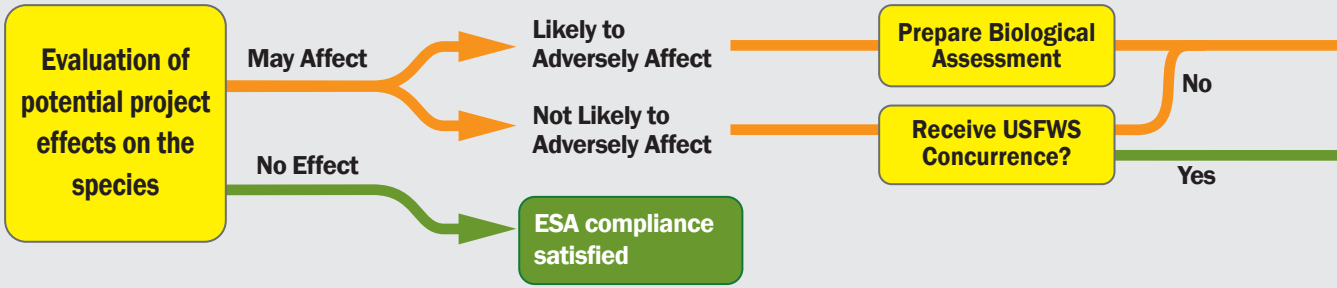
Dwarf wedgemussel — As described in Chapter 3 of this Draft EIS, the length of Swift Creek downstream from Lake Benson is important habitat for the long-term survival of the dwarf wedgemussel. Study team biologists surveyed Swift Creek, along with other streams in the study area, for evidence of this species and did locate dwarf wedgemussel individuals in Swift Creek, below the Lake Benson dam. More information about these surveys is in the project's Freshwater Mussel Survey Report.

At the request of USFWS, the study team is currently conducting a detailed habitat viability study for the dwarf wedgemussel in Swift Creek. The first phase of this study is complete and is documented in the report titled Dwarf Wedgemussel Viability Study: Phase I. This phase of the study showed that while population numbers are in decline for most mussel species in Swift Creek, there is evidence that the dwarf wedgemussel is persisting and reproducing. This work also concluded that while continued dwarf wedgemussel viability in Swift Creek will be a challenge, targeted efforts to propagate the species and increase its numbers in Swift Creek could improve the chances of maintaining its viability in Swift Creek.

The Biological Conclusion for this species is currently unresolved. All DSAs except those using the Red Corridor segment (Alternatives 6 and 7) cross Swift Creek below Lake Benson and therefore have the potential to affect the dwarf wedgemussel. NCDOT is working with USFWS to develop feasible strategies to

Section 7 Consultation

The Endangered Species Act (ESA) of 1973 was enacted to protect and recover imperiled species and the ecosystems upon which they depend. Section 7 of this law may require federal project sponsors to engage in consultation with the US Fish and Wildlife Service (USFWS) to ensure proposed projects do not jeopardize the continued existence of any federally endangered or threatened species.

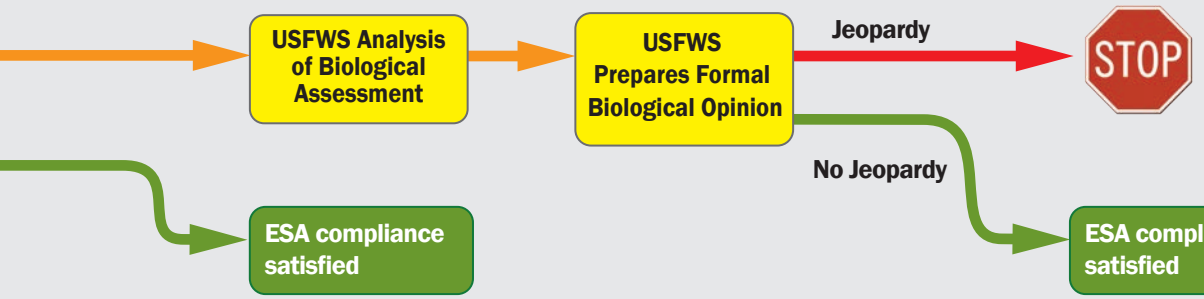


offset the project's effects on the species and will complete the Section 7 consultation process (see graphic above) following the selection of the Preferred Alternative. The outcome of the consultation process will be documented in the Final EIS and/or Record of Decision (ROD).

Tar River spinymussel — The Tar River spinymussel lives in relatively silt-free gravel or coarse sand along the bottom of fast-flowing, well-oxygenated streams. While suitable habitat exists for the Tar River spinymussel in the project area, the only documented occurrence of this species in the Neuse River was in the Little River, a tributary of the Neuse River in Johnston County, according to Natural Heritage Program records. Study team biologists surveyed streams in the study area for evidence of the Tar River spinymussel, but did not find any individuals of this species. While that there is suitable habitat for the species but no evidence of any individuals in the project area, project consultation for mussel species is not yet complete. For this reason, the Biological Conclusion is currently unresolved for the Tar River spinymussel.

Michaux's sumac — This federally endangered plant species grows in sandy or rocky, open, upland woods in acidic or neutral pH, well-drained sands or sandy loam soils. It does not tolerate shade and grows best where disturbances maintain open habitat. It is often found along maintained railroad, roadside, power line, and utility rights-of-way. As with the red-cockaded woodpecker surveys, field surveys for Michaux's sumac were conducted within the study corridors along each DSA, focusing on areas with suitable habitat. These surveys were conducted during the optimal time of year (from May to October). Although suitable habitat was found, the biologists failed to locate any actual specimens of this plant. In addi-

For more information, see: http://www2.epa.gov/laws-regulations/summary-endangered-species-act



A Jeopardy finding means the project cannot proceed unless a different alternative can be found that avoids the conditions that led to the jeopardy finding.

A No Jeopardy finding can allow the project to proceed with the original alternative, but certain conditions, including issuance of an "incidental take" permit, may be required.

tion, North Carolina's Natural Heritage Program records indicate no recorded occurrences of this species within one mile of any of the DSAs. As a result, the Biological Conclusion is "No Effect" for all of the DSAs.

Northern Long-Eared Bat — This species was added to the federal list of threatened species in Wake County in April 2015. Its range includes most of the eastern United States. In North Carolina, it occurs in the mountains, hibernating in caves and mines; there are only scattered occurrence records in the rest of the state. Since this species is not known to be a long-distance migrant, and caves and mines are rare in eastern North Carolina, it is uncertain where the species hibernates in eastern North Carolina. The bat forages on forested hillsides and ridges, and occasionally over forest clearings, over water, and along tree-lined corridors. Mature forests may be an important habitat type for foraging.

On May 4, 2015, USFWS adopted a programmatic Biological Opinion for this species in eastern North Carolina (including the Complete 540 study area), and the Biological Conclusion for this species for the NCDOT program is "May Affect, Likely to Adversely Affect." The Biological Opinion provides an incidental take statement for all NCDOT projects in eastern North Carolina (including Complete 540) for the next five years. An incidental take is when a non-federal activity will result in the loss, or "take" of a threatened or endangered animal. As a condition of the incidental take statement, NDOT has agreed to conservation measures designed to minimize adverse effects, and benefit or promote the recovery of the species. More information about the status of the northern long-eared bat can be found in the technical report entitled: Northern Long-Eared Bat Section 7 Documentation.

Bald eagle — Although once an endangered species, bald eagle populations have recovered to the extent that the species is no longer listed as endangered under the Endangered Species Act. This species is still protected, however, by the Bald Eagle and Golden Eagle Protection Act of 1962.

Bald eagle habitat is found throughout North Carolina and generally consists of mature forest that is close to relatively large bodies of open water, which is used for foraging. This species uses large dominant trees for nesting, typically within one mile of open water. As part of the biological surveys conducted

for the Complete 540 project, study team biologists reviewed available aerial photography of the areas surrounding the DSAs. As part of their analyses, the study team determined that the Neuse River and Lake Benson are the only water bodies large enough or sufficiently open to be considered a potential feeding source for the species. During field surveys, no nests were discovered within the required survey area. North Carolina's Natural Heritage Program records show that there is one known occurrence of this species within one mile of the DSAs.

Because suitable bald eagle habitat is scarce in the study area, no bald eagle nests were found within the required survey areas, and because there are no documented occurrences of this species nearby, the study team's biologists have determined that the Complete 540 project will have no effect on the bald eagle.

Protected Species Summary

Although habitat exists, or could exist, for several species listed as endangered or otherwise protected, the biological field surveys concluded that the three species with the potential to be adversely affected by the Complete 540 project are the northern long-eared bat, the Tar River spinymussel, and the dwarf wedgemussel. Consultation for the bat is complete, but consultation with USFWS is ongoing for the Tar River spinymussel and the dwarf wedgemussel and will be documented in the Final EIS and/or ROD.

More Information on the Natural Environment Effects

Several technical reports prepared for this study contain more detailed information on the natural environment effects described above. These include:

- Natural Resources Technical Report
- Waters Report
- Freshwater Mussel Survey Report
- Dwarf Wedgemussel Viability Study: Phase I
- Indirect and Cumulative Effects Report
- Northern Long-Eared Bat Section 7 Documentation

More information about these documents can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways those documents can be accessed, either in paper or electronic form.

PHYSICAL ENVIRONMENT

The physical environment comprises features in the landscape that do not logically fall under either the human or the natural environment. In some cases these are structures, facilities, or other land uses that provide a valuable function to society that could be affected by the proposed project. In other cases they are elements of the landscape that could affect the project itself, such as areas that have been contaminated with hazardous materials. The important physical environment features in the Complete 540 study area and their relationship to the project's DSAs are presented in the paragraphs that follow.

Farmlands

In accordance with the requirements of the Farmland Protection Policy Act (FPPA) and State Executive Order Number 96, the study team conducted an assessment of potential effects of land acquisition and construction activities on prime, unique, and local or statewide important farmland soils.

The first steps included documenting where any of these soils are located in the study area and calculating the acreages of these soils that would be required by each of the DSAs. Next, these acreage totals were applied to various impact rating scales established by the Natural Resources Conservation Service (NRCS). The result is a Farmland Conversion Impact Rating (FCIR)

The Farmland Protection Policy Act

In the early 1980s, a nationwide study of US agricultural resources found that millions of acres of farmland were being converted across the nation each year. The 1981 Congressional report, "Compact Cities: Energy-Saving Strategies for the Eighties," identified the need for Congress to implement programs and policies to protect farmland and combat urban sprawl and the waste of energy and resources that accompanies sprawling development. The result was passage of legislation that included the Farmland Protection Policy Act (FPPA), in 1981. Although this legislation did not authorize the federal government to regulate the use of private or non-federal land or otherwise affect the rights of property owners, the FPPA law was enacted to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses.[14]

Despite 30 years of farmland preservation policy, farmland conversion to non-farming uses continues to be an important issue, both in the US and in North Carolina. According to the US Department of Agriculture's National Resources Conservation Service (NRCS), more than 23 million acres of farmland was converted to other used in the US during the 25-year period between 1982 and 2007, and North Carolina has been in the top tier of states in this category.[15]

score. For "corridor type" projects such as the proposed Complete 540, the possible maximum total score is 260 points. DSAs with a total score of 160 or more are given additional consideration for protection from impacts.

Potential Effects on Farmlands

The soils analysis showed that none of the DSAs have total scores above the 160 threshold (the scores ranged from 101 for Alternative 6 to 136 for Alternatives 10 and 11). Thus, mitigation for farmland loss would not be required.

Although the scores did not exceed the threshold for required mitigation, the rating process did reveal that a substantial portion of each DSA's total acreage consists of soil types classified as prime, unique, or local or statewide important farmland soils. While the overall percentages of acres in these categories his high, there is little difference between in the total acreage in each DSA.

Potential Effects on Voluntary Agricultural Districts

In North Carolina, the Voluntary Agricultural District (VAD) program allows farmers to establish areas where agriculture is encourage and protected. The VAD program is implemented at county level. Farm landowners who join the program receive benefits in exchange for restricting development on their land for specific time period.

There are three VAD farms that would be directly affected by the DSAs:

A farm just north of Clayton Bypass along the Wake-Johnston county line. This farm would be affected by the Orange Corridor segment and the Lilac Corridor segment east of its connection to the Purple/Blue Corridor segment. All Alternatives except 6 and 7 (Red Corridor segment) would cross the property.

A farm on US 70 in Johnston County just south of the Wake-Johnston county line – this farm would be affected by the Brown Corridor segment. Alternatives 3, 4, 10, 11, 15, and 16 would cross its western edge.

A farm on Old Stage Road near NC 42. This farm would be affected by the Blue Corridor segment. Alternatives 8 through 12 would impact this property.

Air Quality

Because air quality, or air pollution, is typically a region-wide condition, it is considered part of the physical environment for the purposes of this study.

Concepts Defined

The Clean Air Act is the comprehensive federal law that regulates air emissions. Among other things, this law authorizes USEPA to establish national standards for air quality and to regulate emissions of hazardous air pollutants. These standards are known as the National Ambient Air Quality Standards, or NAAQS.

USEPA is responsible for implementing the national air quality standards. USEPA has targeted six pollutants for reduction as part achieving the standards: carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead. When a region's concentrations of any of these pollutants are above the established standards, the region is designated as a "non-attainment" area for that pollutant. Once the concentrations of specific pollutants are reduced enough to be within the standards, the area is designated as a "maintenance area."

Method of Analysis

In conducting the air quality impacts analysis, the Complete 540 study team consulted with the USEPA to determine the attainment status of the project

area. The USEPA has verified that both Wake County and Johnston County are in attainment with the USEPA's National Ambient Air Quality Standards (NAAQS). At the time the air quality analysis was initiated for this project, however, Wake County was not in attainment for carbon monoxide (CO) and was listed as a maintenance area for this pollutant. As a result, a CO "hot spot" analysis that was completed for the portion of the Complete 540 project located in Wake County. Although the USEPA has verified that Wake County has now achieved attainment status, the results of the hot spot analysis have been retained in the project's Air Quality Analysis Report.

A computer model called "CAL3QHC" was used to calculate the concentration of the emissions from vehicles at various locations. CAL3QHC was used to model the three intersections in the study area predicted to have the highest traffic volumes and to be the most heavily congested. The results of the MOVES model were input into CAL3QHC along with vehicle volumes, speeds and the configuration of the roadways to predict carbon monoxide concentrations.

Potential Effects on Air Quality

The results of the computer modeling for the proposed project indicated that the project is not expected to create carbon monoxide concentrations of that would be above the national air quality standards. As a result, the project is not expected to create a local air quality impact.

Under USEPA regulations, this project does not require a detailed study for particulate matter nor a detailed analysis of "Mobile Source Air Toxics" (MSATs), per FHWA's MSATs Guidance. For possible air quality concerns during construction, no substantial effect would occur if currently adopted rules for open burning and dust control are followed. As a result, the project is not expected to cause or contribute to any violation of USEPA's National Ambient Air Quality Standards.

IMPROVING AIR QUALITY

The need to protect the air from pollutants was made explicit with the passage of the Clean Air Act, in 1970. This act is the comprehensive federal law that regulates air emissions. Among other things, this law authorizes USEPA to establish national standards for air quality to protect public health and public welfare and to regulate emissions of hazardous air pollutants. These standards are known as the National Ambient Air Quality Standards, or NAAQS.

USEPA is responsible for the ensuring compliance with the national air quality standards. USEPA has targeted six pollutants for reduction as part achieving the standards: carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead.

A geographic area that meets or does better than the National Ambient Air Quality Standard is called an attainment area; an area that doesn't meet this standard is called a non-attainment area. In non-attainment areas, once the concentrations of specific pollutants are reduced enough to be within the standards, the area is designated as a maintenance area.

Major Drainage Structures

Drainage structures include bridges, box culverts, and pipe culverts. In the course of developing and studying the DSAs, waterbodies the DSAs would cross were analyzed and to determine the preliminary sizes and locations of the major drainage structures that would be needed for each DSA. This determination is important because properly designed drainage structures help minimize impacts to wetlands, streams, and floodplains. Drainage structures are also a key factor in the cost estimates of each alternative.

The analysis revealed that there are 81 sites along DSAs where a major drainage structure (defined as a structure with conveyance greater than a single 72-inch diameter pipe) would be needed. This analysis initially showed that 17 of these sites would require bridges. The study team then worked with various regulatory agencies to determine where additional bridges or longer bridges should be incorporated to better minimize direct impacts to streams and wetlands. As a result of this coordination, it was agreed that a total of 27 sites would be crossed with bridges. Once a Preferred Alternative is selected, a more detailed hydrologic and hydraulic analysis will be performed for each crossing location to determine the exact size and configuration of each structure.

Hazardous Materials and Contaminations Sites

During the NEPA phase of highway planning, the location of both permitted and nonregulated hazardous waste sites are identified. For the Complete 540 study, the NCDOT Geotechnical Engineering Unit staff consulted Environmental Protection Agency and NCDENR databases and conducted fieldwork to identify these locations within the study corridors. More specifically, the purpose of the surveys was to identify areas that could be contaminated with hazardous materials (e.g., active and abandoned underground storage tank sites, hazardous waste sites, landfills, and other similar sources of contamination).[15]

The data review effort resulted in 26 underground storage tank sites being located, five automotive repair sites, and one automotive salvage yard. No hazardous waste sites or landfills were found to be located in the project study area. The sites found are not expected to have a substantial effect on anticipated project costs or schedules.

The two DSAs using the Red Corridor segment (Alternatives 6 and 7) would each be affected by twelve of these sites, while DSAs using the entire Orange Corridor segment (Alternatives 1 through 5) would each be affected by between three and five sites.

Sprayfields

Spray irrigation is a method for disposing of secondary treated municipal wastewater by spraying it on the land surface. The sprayed wastewater either evaporates into the air, soaks into the soil, or percolates through the soil and recharges the ground water. Sprayfields are an important part of our water treatment infrastructure. Once in place they are difficult to relocate because of the specific kind of site that is needed to accommodate them. Two such sprayfields would be affected by the DSAs.

The first is associated with the Dempsey E. Benton Water Treatment Plant. The Lilac Corridor segment (Alternatives 8 through 17) would cross sprayfields that treat water piped from the City of Raleigh to the Benson treatment plant and would also affect one of the two 25-acre holding ponds on the property, requiring acquisition of about 89 acres of the 600 acre site. The Orange Corridor segment (Alternatives 1 through 5) would also affect about 11 acres of this site.

The second affected sprayfield is associated with the Neuse River Wastewater Treatment Plant. The Brown Corridor segment (Alternatives 4, 5, 11, 12, 16, and 17) would cross a portion of a sprayfield area that is part of this facility, affecting either 87 or 81 acres of the site, depending on whether the alignment

uses the full length of the Brown Corridor segment or instead follows the Teal Corridor segment to the Brown segment.

The City of Raleigh has indicated that all available sprayfields that are currently in operation are needed to accommodate the demand for waste water treatment.

Major Utility Installations

Utility lines and structures such as electrical lines, communication lines and towers, and fuel pipelines are present throughout the study area. Larger utility installations can have an influence on the location of new highways because they can be costly and disruptive to relocate. With respect to the locations of the DSAs, three utility installations are notable.

Pipelines

Several petroleum and natural gas transmission pipelines are located along the Orange and Lilac Corridor segments (Alternatives 1-5 and 13-17). Shifting the alignment of the Orange or Lilac Corridor segments to reduce potential conflicts with these pipelines was considered; however, impacts to neighborhoods and environmental resources would increase. Because the alignments could not be shifted, the DSAs using the Orange and Lilac Corridor segments would incur the additional cost involved with relocating these pipelines. This expense would be lower for the DSAs that connect to the Red or Purple/Blue segments because much of the pipeline crossing is located east of where these other DSAs connect to the Orange segment or west of where the Purple/Blue segments connect to the Lilac segment.

Transmission Towers

A group of three transmission towers is located along US 70 Business, just north of Clayton. These towers are important because they include television communications, radio communications, emergency (911) communications, federal/state police communications, and weather data collection. Of the three towers, the WRAL TV tower is the one closest to the Green Corridor segment (DSAs 1, 5, 8, 12, 13, and 17).

The Green Corridor segment near the tower is located along a stream and wetland area. Two of the western anchors for the TV tower are in the Green Corridor. Impacting one of the TV tower anchors would require relocation of the tower. Given the cost and possible disruption that relocation of this tower would require, study team engineers examined the potential highway location within the Green Corridor segment. In so doing, they shifted this segment to the west just enough to avoid the cable's anchor point. Concerns remain, however, about the proximity of some of the DSAs to the cable's anchor point (DSAs 1, 5, 8, 12, 13, and 17). Should one of these DSAs be chosen as the Preferred Alternative, additional detailed design analyses would be conducted to determine the roadway's final location that minimizes wetland and stream impacts while also providing for highway operations without impacting the TV tower anchor system.

More Information on the Physical Environment Effects

Several technical reports prepared for this study contain more detailed information on the physical environment effects described above. These include:

- Air Quality Analysis Report
- Preliminary Hydraulics Study
- GeoEnvironmental Report for Planning
- Utility Impact Report

More information about these documents can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways those documents can be accessed, either in paper or electronic form.

INDIRECT EFFECTS AND CUMULATIVE IMPACTS

For the Complete 540 study, the study team evaluated not only direct effects, such as those described in the previous sections of this chapter, but also indirect and cumulative effects. This section describes the analysis undertaken by the study team to determine these effects and the conclusions reached about them.

Concepts Defined

There are several important terms that must first be defined before the analysis of these kinds of effects can be presented. The Federal Highway Administration has defined these terms as presented below.[16]

- Direct effects are caused by the action and occur at the same time and place.
- Indirect effects are 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.
- Cumulative impact is the impact on the environment, which 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.

Method of Analysis for the Complete 540 Study

The NCDOT has developed extensive guidance and procedures for assessing indirect and cumulative impacts of transportation project. For the Complete 540 project, those methods were supplemented with techniques described in "A Practitioner's Handbook for Assessing Indirect Effects and Cumulative Impacts Under NEPA"[17] and the Council on Environmental Quality's 1997 guidance documents.[18]

Because both indirect effects and cumulative impacts occur beyond the immediate footprint of the project, the study team examined an area larger than the project study area that was established for locating project alternatives. For indirect effects on land use patterns the study team evaluated demographic and economic data and trends, and information about local land use plans. Interviews of planning officials from the many governmental jurisdictions in the project vicinity were also conducted by study team members.

At the current stage of the NEPA process for the Complete 540 study, indirect effects and cumulative impacts were assessed at a qualitative, or general, level. This qualitative assessment concluded that each DSA would result in indirect or cumulative effects of similar magnitudes, although the specific locations of these effects would vary according to DSA. For this reason, these impacts would not be a major factor in selecting the preferred DSA. Once a Preferred Alternative is selected, more detailed, quantitative analyses will be conducted for comparison with the "no build" alternative.

Potential Indirect Effects and Cumulative Impacts

As described previously, the Raleigh area has a rapidly growing population and a strong job market, and these two characteristics are expected to continue into the reasonably foreseeable future. As a result, there is high demand for new and higher-intensity development in the project area. As a major new transportation facility, the proposed project would alter the existing road network by creating new and more direct connections within the project area and between locations in the project area and major employment and commercial centers outside the area. It is expected the project could reduce travel times to the area's major employment and commercial centers by as much as ten minutes or more. (The study's Alternatives Development and Analysis Report explains these findings in more detail.)

The project would include interchanges with several major roads along the length of the project. Experience with new facilities of this kind in North Carolina and across the nation has shown that land near these interchanges typically becomes more attractive for new or higher density development, such as retail and other commercial uses. Land use and transportation planners in jurisdictions throughout the study area all anticipate that the project would substantially influence the land uses and intensities at these interchanges as well as other nearby locations throughout the project area. As a result, most of the area's local governments have based their plans for future growth on the assumption that the project will eventually be constructed and that the road's alignment will follow the existing protected path (the current Orange Corridor segment), between NC 55 Bypass and I-40.

The jurisdictions in the project area are generally subject to fairly stringent comprehensive growth management and development regulations, and most of the current elected officials in these jurisdictions have expressed support for these regulations. These policies could help guide any induced development the Complete 540 project might trigger. The locations of existing and planned public water and sewer infrastructure would also help guide those patterns.

Potential Indirect Effects

Planners interviewed for this analysis almost universally indicated they anticipate a continued strong market for development, regardless of whether the Complete 540 project is built. In other words, the area is expected to experience growth and land use change under either the build or no-build scenarios. Compared to the no-build scenario, however, the build scenarios could lead to more rapid growth and more intense development in some areas near proposed interchanges. In this way, each of the DSAs would likely lead induced land development and higher concentrations of high-density and more intense land uses in the vicinity of the DSA, especially near interchange areas. Some of the differences among the effects of the DSAs would include the following:

West of I-40, DSAs using the Orange Corridor segment (Alternatives 1 through 5) have a greater potential to support growth and development in accordance with local plans, in part because large portions of the Orange segment include the protected corridor. DSAs using the Orange and Lilac Corridor segments (Alternatives 13 through 17) also have a greater potential to support growth and development in accordance with local plans because the Lilac segment is located near the protected corridor.

DSAs using Red (Alternatives 6 and 7) would influence development farther to the north than under the other scenarios, in a pattern different from those envisioned in local plans. Local plans envision mixed-use activity centers developing in southern Wake County (generally south of Lake Benson), but these DSAs would be less likely to support that vision.

DSAs using Purple/Blue (Alternative 8 through 12) would shift development slightly farther to the south, into areas that are more rural, possibly increasing the overall potential for the project to induce land development, which would lead to development patterns diverging from those envisioned in local plans. The Purple/Blue segment would shift several interchange areas well to the south of the corresponding interchanges under other build scenarios, into areas without underlying plans in place to support the mixed use activity centers envisioned in local plans. These interchange areas could instead develop with more conventional strip commercial development in less concentrated, more scattered pattern—a type of land use that is discouraged by local planners.

East of I-40 there is relatively little variation in the various corridors' effect on local land use planning goals.

Growth and development under either the build or no-build scenarios would result in indirect effects on Swift Creek and its surrounding Watershed Critical Area, Middle Creek, and the associated natural features along each of these

streams. These effects could be somewhat greater under a build scenario, due to induced growth that may not occur otherwise. A quantitative assessment of the indirect effects of the build and no-build scenarios on water quality will be done once a Preferred Alternative has been selected.

Potential Cumulative Effects

Several past infrastructure projects have influenced development in portions of the project area, including road projects such as NC 55 Bypass and the Clayton Bypass, and water treatment facilities including the Dempsey E. Benton Water Treatment Plant, the Neuse River Wastewater Treatment Plant, and the South Cary Water Reclamation Facility.

Several planned development and infrastructure projects are also expected to influence growth in portions of the project area. These include the Veridea mixed-use development in Apex, the new Western Wake Regional Wastewater Treatment Plant, and major retail development near US 70 and White Oak Road in Garner.

Anticipated growth and development in various areas within the project area will continue to affect water quality and aquatic habitat. These effects are likely under either the build or no-build scenario. Construction of any of the DSAs would have the potential to affect water quality and to contribute to aquatic habitat degradation.

Continued development in the lower Swift Creek watershed, below the Lake Benson dam, may pose challenges for the long-term viability of dwarf wedgemussel habitat in this area. These challenges will exist in either the build or no-build scenario. The addition of the Complete 540 project to this area has the potential to add to the cumulative effects of other past and planned future projects on the long-term viability of the species in the lower Swift Creek watershed.

Continued growth under either the build or no-build scenarios will have the potential to contribute to forest fragmentation and wildlife habitat disturbance. Combined with the effects of past and planned future projects, the Complete 540 project could shift these effects farther to the south and east.

More Information on Indirect Effects and Cumulative Impacts

The technical report prepared for this study with detailed information on indirect effects and cumulative impacts is the Indirect and Cumulative Effects Report.

More information about this document can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways this document can be accessed, either in paper or electronic form.

COMPARATIVE EVALUATION MATRIX

The pages that follow contain the study's comparative evaluation matrix. The columns across the top contain many different categories of human, natural, and physical resources, as well as data pertaining to the estimated costs of the various project components. Listed down the side are the seventeen Detailed Study Alternatives. The cells formed by these rows and columns contain the impact data, correlating each DSA with each impact category.

It should be noted that some of the cells in this matrix do not contain any data. These are categories for which data will be analyzed in the next stage of this study process. Explanations about the categories and the data that appears in the matrix is contained throughout the many technical reports prepared as part of this study. Following the comparative evaluation matrix is a series of maps showing each individual Detailed Study Alternative in isolation. On each map is a listing of the various color-coded corridor segments that form each alternative.

COMPARATIVE EVALUATION MATRIX

DSAs and Key Impact Categories (page 1 of 3)

Corridor Segments and DSAs		LENGTH	ESTIMATED PROJECT COSTS					LAND ACQUISTION ITEMS					RELOCATIONS				
		TOTAL	TOTAL	Construction	Right-of-Way Acquisition and Relocation	Utility Relocation	Environmental Mitigation	TOTAL	TOTAL	Commercial	Residental	Vacant	Total	Residental	Business	Farm	Non-Profit Organizations
		miles	$ million					acres	number of parcels				number of relocations				
O G	1	28.3	2,195	1,757	296	66	75	1,830	741	38	510	193	278	269	6	0	3
O G M G	2	28.4	2,178	1,744	295	66	73	1,823	744	38	511	195	281	271	6	1	3
O B T G	3	29.1	2,188	1,765	282	66	75	1,802	754	44	509	201	265	256	5	1	3
O B G	4	29.4	2,189	1,776	262	83	68	1,818	719	44	484	191	243	234	5	1	3
O G TL B G	5	29.3	2,191	1,746	291	82	72	1,843	737	40	506	191	272	263	6	0	3
O R G	6	25.2	2,317	1,798	439	24	57	1,753	993	63	673	257	449	435	12	0	2
O R M G	7	25.3	2,315	1,786	442	31	56	1,752	995	63	673	259	451	437	12	0	2
O PU BL L G	8	30.9	2,566	1,902	541	41	81	2,135	1,213	57	861	295	566	548	15	2	1
O PU BL L G M G	9	31.0	2,547	1,887	541	41	79	2,128	1,216	57	862	297	569	550	15	3	1
O PU BL L B T G	10	31.6	2,550	1,897	530	41	83	2,092	1,230	63	862	305	556	537	15	3	1
O PU BL L B G	11	32.0	2,549	1,907	510	57	75	2,108	1,195	63	837	295	534	515	15	3	1
O PU BL L G TL B G	12	31.9	2,559	1,890	538	57	75	2,148	1,209	59	857	293	560	542	15	2	1
O L G	13	27.6	2,362	1,784	407	96	74	1,960	984	45	765	174	481	466	14	0	1
O L G M G	14	27.7	2,344	1,769	406	96	72	1,953	987	45	766	176	484	468	14	1	1
O L B T G	15	28.3	2,346	1,779	395	96	76	1,917	1,001	51	766	184	471	455	14	1	1
O L B G	16	28.7	2,346	1,789	375	113	68	1,933	966	51	741	174	449	433	14	1	1
O L G TL B G	17	28.6	2,356	1,772	403	112	68	1,973	980	47	761	172	475	460	14	0	1

Corridor Segment Key

O	Orange	PU	Purple	L	Lilac	TL	Teal	B	Brown
G	Green	BL	Blue	R	Red	T	Tan	M	Mint

Note: Preliminary cost estimates are in anticipated year-of-expenditure dollars.

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COMPARATIVE EVALUATION MATRIX

DSAs and Key Impact Categories (page 2 of 3)

CONTINUED FROM PREVIOUS PAGE

Corridor Segments and DSAs		STREAMS					WETLANDS		HYDRAULIC				CULTURAL RESOURCES			
		Crossings of Stream Segments	Stream Impacts	Section 303(d) Impaired Stream	Zone 1 Riparian Buffers	Zone 2 Riparian Buffers	Wetlands	Wetlands Impacts	Ponds		100 Year Floodplain	Swift Creek Critical Watershed	NRHP Listed and Eligible Sites with Adverse Effects		Existing and Planned Public Parks and Recreational Facilities	
		num.	linear feet		acres		num.	acres	num.	acres	acres		num.	acres	num.	acres
O G	1	142	67,967	525	97.9	63.9	153	75.6	41	24.9	85.4	0	0	0	1	1.6
O G M G	2	139	65,810	525	95.2	62.3	149	74.3	38	23.2	87.1	0	0	0	1	1.6
O B T G	3	140	68,130	1,154	99.9	65.3	139	73.5	40	23.9	85.7	0	1	5.9	2	8.6
O B G	4	132	61,322	1,231	89.1	58.3	135	71.6	38	26.1	58.8	0	0	0	2	19.2
O G TL B G	5	142	65,180	525	94.9	62.4	149	74.2	44	27.6	64.9	0	0	0	1	1.6
O R G	6	109	53,014	875	34.4	22.9	113	52.0	28	20.0	84.9	6.7	2	32.7	3	16.7
O R M G	7	106	51,582	875	37.1	24.7	111	51.4	25	17.7	86.6	6.7	2	32.7	3	16.7
O PU BL L G	8	139	77,724	106	114.3	75.5	161	57.5	37	19.7	101.7	0	0	0	1	9.6
O PU BL L G M G	9	136	75,566	106	111.5	73.8	157	56.2	34	18.0	103.4	0	0	0	1	9.6
O PU BL L B T G	10	137	78,087	735	115.9	76.8	146	63.0	35	18.0	102.0	0	1	5.9	2	16.6
O PU BL L B G	11	129	71,278	812	105.0	69.8	142	61.1	33	20.2	75.1	0	0	0	2	27.2
O PU BL L G TL B G	12	139	74,936	106	111.3	73.9	157	56.1	40	22.4	81.2	0	0	0	1	9.6
O L G	13	133	68,604	525	101.2	67.1	154	66.7	36	22.8	75.7	0	0	0	1	1.6
O L G M G	14	130	66,447	525	98.4	65.5	150	65.5	33	21.2	77.4	0	0	0	1	1.6
O L B T G	15	131	68,967	1,154	102.8	68.4	139	72.3	34	21.2	76.0	0	1	5.9	2	8.6
O L B G	16	123	62,159	1,231	91.9	61.4	135	70.4	32	23.4	49.0	0	0	0	2	19.2
O L G TL B G	17	133	65,817	525	98.2	65.6	150	65.3	39	25.6	55.1	0	0	0	1	1.6

Corridor Segment Key

O	Orange	PU	Purple	L	Lilac	TL	Teal	B	Brown
G	Green	BL	Blue	R	Red	T	Tan	M	Mint

Note: For categories where the unit of measure is either acres or linear feet, the impact calculations were based on the width of functional designs prepared for each DSA, plus a 40-foot additional width on each side.

NRHP = National Register of HIstoric Places

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COMPARATIVE EVALUATION MATRIX

DSAs and Key Impact Categories (page 3 of 3)

CONTINUED FROM PREVIOUS PAGE

Corridor Segments and DSAs		NOISE		PRIME FARMLAND SOIL				OTHER						
		Receptors Impacted	Likely Noise Barriers	TOTAL	Wake County	Johnston County	F.C.I.R. Total Points	Interchanges	Railroad Crossings	Dempsey Benton WTP Sprayfields	Neuse River WWTP Sprayfields	Randleigh Farm	City of Raleigh Law Enforcement Training Center	Potential Hazardous Materials Sites
		number		acres			points	number		acres				num.
O G	1	540	22	2,051	1,954	97	116	13	2	10.8	0	62.1	0	4
O G M G	2	539	22	2,040	1,943	97	117	13	2	10.8	0	29.5	0	4
O B T G	3	565	24	2,035	1,862	173	128	13	2	10.8	0	29.7	0	5
O B G	4	551	24	2,049	1,876	173	128	13	2	10.8	87.2	0	9.1	3
O G TL B G	5	541	22	2,056	1,959	97	118	13	2	10.8	81.5	0	9.1	4
O R G	6	804	20	1,972	1,972	0	101	13	4	0	0	62.1	0	12
O R M G	7	804	20	1,949	1,949	0	103	13	4	0	0	29.5	0	12
O PU BL L G	8	454	16	2,328	2,288	40	129	13	1	88.7	0	62.1	0	8
O PU BL L G M G	9	454	16	2,310	2,270	40	128	13	1	88.7	0	29.5	0	8
O PU BL L B T G	10	480	18	2,286	2,170	116	136	13	1	88.7	0	29.7	0	11
O PU BL L B G	11	510	18	2,300	2,184	116	136	13	1	88.7	87.2	0	9.1	9
O PU BL L G TL B G	12	456	16	2,332	2,292	40	128	13	1	88.7	81.5	0	9.1	8
O L G	13	598	23	2,175	2,135	40	121	13	2	88.7	0	62.1	0	8
O L G M G	14	597	23	2,165	2,125	40	121	13	2	88.7	0	29.5	0	8
O L B T G	15	624	25	2,122	2,006	116	128	13	2	88.7	0	29.7	0	11
O L B G	16	610	25	2,146	2,030	116	128	13	2	88.7	87.2	0	9.1	9
O L G TL B G	17	600	23	2,164	2,124	40	120	13	2	88.7	81.5	0	9.1	8

Corridor Segment Key

O Orange · PU Purple · L Lilac · TL Teal · B Brown
G Green · BL Blue · R Red · T Tan · M Mint

Abbreviations:
F.C.I.R. = Farmland Conversion Impact Rating
WWTP = Wastewater Treatment Plant
WTP = Water Treatment Plant

CHAPTER 6

Government, Agency, and Public Involvement

IDENTIFYING THE STUDY'S MAIN STAKEHOLDER GROUPS AND HOW THEY HAVE CONTRIBUTED TO THE STUDY'S OUTCOMES.

This chapter describes the Complete 540 study in terms of the people involved in its decision-making process. It describes the study's key stakeholder groups and explains how each has been involved in the study over time.

INTRODUCTION

This chapter describes the many ways that local governments, state and federal regulatory agencies, and members of the public have been involved in the development of the Complete 540 study. There are three main groups of project stakeholders, with each having a unique, if sometimes overlapping, interest in the outcome of the study. It also describes some of the reasons that government, agency and public involvement is so important.

Federal and State Policies Regarding Stakeholder Involvement

Under Federal Highway Administration policy, public involvement and a systematic approach, including a wide range of scientific expertise, are essential parts of the development process for proposed actions. Effective communication is critical to successful implementation of this policy.[1]

More specifically, it is FHWA policy to:

- Pursue communication and collaboration with federal, state, and local partners in the transportation and environmental communities, including other modal administrations within the U.S. DOT.
- Seek new partnerships with governments, businesses, transportation and environmental interest groups, resource and regulatory agencies, affected neighborhoods, and the public.
- Ensure that those persons historically underserved by the transportation system, including minority and low-income populations, are included in outreach.
- Actively involve partners and all affected parties in an open, cooperative, and collaborative process, beginning at the earliest planning stages and continuing through project development, construction, and operations.
- Ensure the development of comprehensive and cooperative public involvement programs during statewide and metropolitan planning and project development activities.[2]

With respect to coordination with other government agencies, FHWA states that effective interagency coordination is the key to achieving environmentally responsible transportation decisions.

FHWA also stresses that "public involvement is more than simply following legislation and regulations. In a democratic society, people have opportunities to debate issues, frame alternative solutions, and affect final decisions. Knowledge is the basis of such participation. The public needs to know details about a plan or action in order to evaluate importance or anticipated costs and benefits."[3]

REGULATORY AGENCY INVOLVEMENT

The involvement of various state and federal agencies is an essential part of projects such as the proposed Complete 540. As described in earlier chapters, there are several federal and state regulations that must be addressed over the course of a project's development. If the project is approved for implementation, various federal and state agencies have the responsibility for ensuring that compliance is achieved.

Because there are several agencies that need to be involved, the decision-making process can become time-consuming. In an effort to reduce these sometimes lengthy processes, Congress included various requirements for streamlining them in the 2005 highway funding legislation. Under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, or simply SAFETEA-LU, all reviews needed under other laws take place concurrently with the reviews required by NEPA. In addition, the sponsor of the project (in this case FHWA and NCDOT) creates a plan that ensures the completion of the environmental review process in a "timely, coordinated, and environmentally responsible manner." To comply with this requirement, the study team prepared a detailed, written plan to guide the required coordination with the agencies that have jurisdiction over some aspect of this project.

The plan identifies the FHWA as the Complete 540 project's "lead agency," and the US Army Corps of Engineers (USACE) as a formal "cooperating" agency. Cooperating agencies have the authority to adopt a study's EIS as their own, avoiding the lengthy preparation and review times required for the cooperating agency to prepare its own impact statement. This is particularly beneficial to USACE, which has the responsibility for issuing a permit for the project under the provisions of the Clean Water Act.

Other agencies with important roles in the project, identified as "participating agencies," include:

- the US Environmental Protection Agency (USEPA)
- the US Fish and Wildlife Service (USFWS)
- the NC Division of Cultural Resources (NCDCR)
- the NC Department of Environment and Natural Resources (NCDENR)
- the North Carolina Wildlife Resources Commission (NCWRC)
- the Capital Area Metropolitan Planning Organization (CAMPO)

For all agencies, the plan identifies roles and responsibilities at key steps in the NEPA process and spells out procedures for agencies to raise "issues of concern" and for resolving those issues. (An issue of concern is defined as an issue that in the agency's judgment could result in denial of a permit or substantial delay in issuing a permit.)

Formal "Scoping" Process

One of the first steps in the NEPA study process is "scoping," the process of narrowing the range of possible topics to be studied. The goal of scoping is to

identify those resources in the study area that could be substantially affected by the proposed project and those which are not likely to be of notable concern, allowing the study team to concentrate on what matters most instead of studying the entire "universe" of possible effects. Although scoping is a process that can occur throughout the study, a formal scoping meeting with local, state, and federal agencies is held early in the study.

The study team sent formal letters of invitation to resource and regulatory agencies in January 2010 and to local agencies and local government officials in February 2010. The scoping meeting itself took place on February 16, 2010.

The key issues raised as a result of the meeting were:

- Potential impacts to the dwarf wedgemussel population in Swift Creek
- Potential impacts to water quality, particularly in Swift Creek
- Potential impacts to jurisdictional wetlands and streams

Although these topics surfaced as particularly important, the scoping meeting results were not intended to dismiss from the study many of the other community and environmental resources in the study area.

Interagency Meetings

The main method for all the various government representatives and agencies to stay informed about the study's progress and to provide comments and responses to the study team is through interagency meetings. These face-to-face meetings are scheduled at key points in the study, when agency coordination is needed.

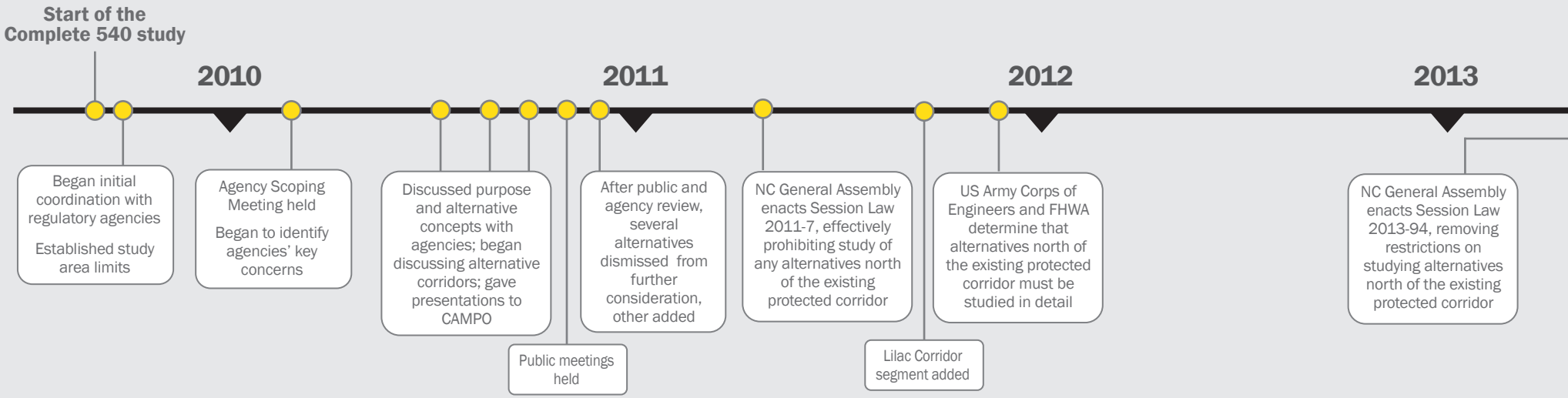
As of summer 2015, twelve such meetings have been held. During those meetings, FHWA and NCDOT received comments, suggestions, and formal requests on topics such as the project's statement of purpose, the development and analysis of alternative corridors, and decisions about the elimination or addition of various alternatives. Over the course of the study, to date, no agency has filed an official "issue of concern" about the study process or its technical documentation.

One issue, however, was raised that expanded the project's identification and analysis of alternative corridors. Early in the study, the agencies requested a northward expansion of the project's study area to allow early consideration of shorter project alternatives, closer to more heavily developed areas, and farther from less developed areas at the southern edge of the study area. This would also allow the study team to evaluate more potential locations for the project to cross Swift Creek, including a location outside the habitat area for the dwarf wedgemussel in Swift Creek south of the Lake Benson dam. This request resulted in the project's study area being expanded to the north (north of Lake Wheeler and Lake Benson), and the development of what became the Red Corridor segment, which traverses this area.

PUBLIC INVOLVEMENT

The Complete 540 study includes many different opportunities for the public to become engaged with the study. This engagement can include: receiving information from the study team about the project and its process; providing information to the team about the study area and its valued resources; asking questions and taking part in a dialogue with the study team (either in person, over the telephone, or in writing); and by providing comments regarding the study's details, process and decisions. The various public outreach and involvement techniques used so far have included: public meetings, the distribution of project newsletters, maintenance of a project website and telephone hotline, and meetings with small groups such as homeowner associations.

Timeline of Key Public, Agency, and Government Activities



Listed below is a summary of the main public involvement events that have been held to date and the public outreach elements that are ongoing for the study.

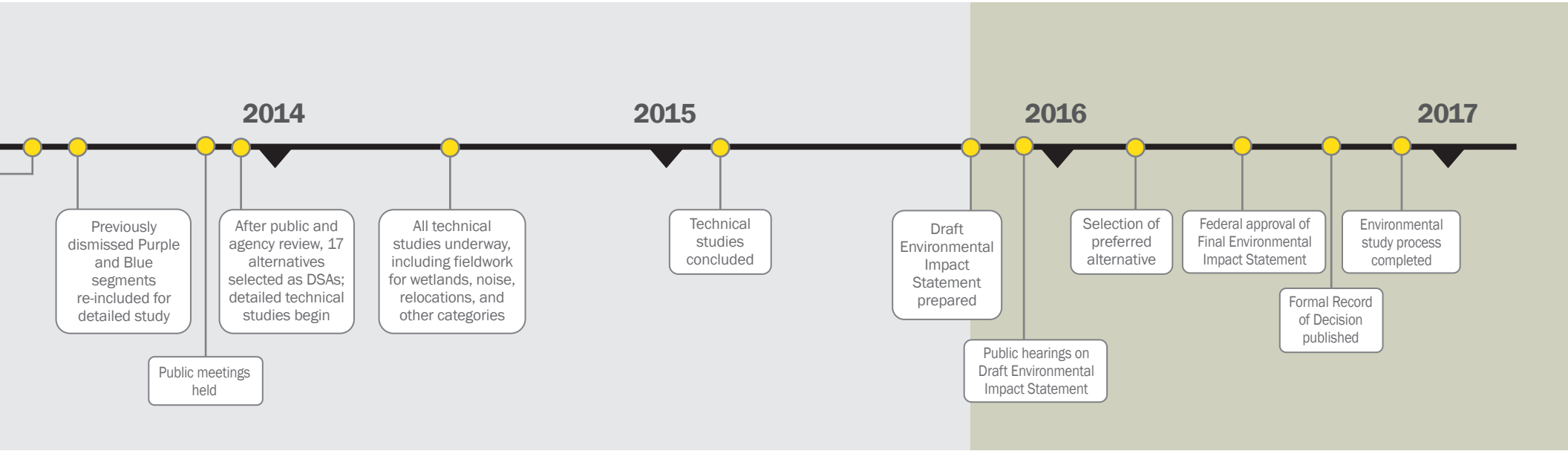
Public meetings

An initial series of public meetings took place in September 2010. Three meetings were held on consecutive afternoons and evenings at three different locations in the study area, with the same information presented at each one. The purpose of these meetings was for the study team to present the status of the Complete 540 study to the public and to give members of the public an opportunity to ask questions, discuss the study, and to provide comments to the study team regarding the project's purposes and the preliminary corridor alternatives that had been developed at that time. A Spanish translator was present at one of these meetings to accommodate the needs of the local Spanish-speaking population.

Some 1,200 individuals attended these meetings, in total, and approximately 2,100 public comments were submitted during or following these meetings. The most common subjects of these comments were:

- Overwhelming continued support for the Orange Corridor segment (the protected corridor) between NC 55 and I-40.
- Opposition to some of the other alternatives--in particular, Blue, Purple, and Red Corridor segments.
- Concern about the perceived inequity of placing tolls on the southern and eastern portion of 540 (the Complete 540 project segment) when existing segments of I-540 in the north are not tolled.

In response to local government and public comments about some of the possible impacts associated with corridor segments in the eastern portion of the study area, the study team developed the Tan Corridor Segment. This segment and the alternatives formed when it is used were included in the study in late 2010. A public meeting to present this to the public and receive comments on it was held in December 2010. About 250 comments were received during



or after this meeting. Many expressed opposition to potential neighborhood impacts associated with the Tan Corridor Segment.

A second series of public meetings was held in October 2013 to present the corridors selected as Detailed Study Alternatives and to provide an opportunity for members of the public to ask questions and provide comments. As with the 2010 meetings, three events were held on consecutive afternoons and evenings at three different study area locations, with the same information presented at each of these. A Spanish translator was again present to accommodate the needs of the local Spanish-speaking population.

Approximately 1,700 individuals attended these meetings, in total, and some 1,000 comments were received during or following these meetings. The main subjects of these comments were:

- Continued strong opposition to Purple, Blue and Lilac Corridor Segments
- Continued strong opposition to Red Corridor Segment
- Continued support for Orange Corridor Segment

More detailed descriptions of all the comments received from both the 2010 and 2013 meetings can be found in the study's Stakeholder Involvement Report.

Newsletters

Newsletters are another tool for sharing information about the study's findings, to announce public meetings, and to explain how the public can become more involved. The study team has published four editions of the newsletter to date. The first served as an introduction to the study; the second presented the preliminary alternatives and announced the 2010 public meetings; the third presented the recommended DSAs and announced the 2013 public meetings; and the fourth was a follow-up to the 2013 meetings, announcing the final DSAs. The newsletters were sent to all addresses in the study area, and to others who have requested to be on the mailing list, totaling more than 56,000 addresses. Newsletters were also prepared in Spanish and distributed at Hispanic-oriented businesses and churches in the project area. Both the English and Spanish versions are available for downloading on the study's website.

Project website

The study team created a project website early in the study to provide information about the study, to provide a place for the public to access various project maps, reports and other documents, and to provide a way for members of the public to submit comments and questions to the study team using an online submittal form. The website also includes a specific email address members of the public can use to get in touch with the study team. To date, more than 4,000 email messages have been processed by the study team.

Website: http://www.ncdot.gov/projects/complete540/
Email: complete540@ncdot.gov

Telephone hotline (800-554-7849)

Another way the public can receive project information, ask questions, and provide comments is by speaking with a study area representative on the project's telephone hotline. To date, the study team has received and responded to more than 1,000 calls on the hotline.

Small group meetings

In addition to the large, scheduled meetings that are part of the basic study process, the study team has made itself available to meet with small groups, such as homeowners associations and civic groups, whenever requested. These smaller gatherings allow the study team to explain specific aspects of the project at a level of detail not always possible at larger meeting or through written material. These gatherings also provide a forum for extended informal discussions that are not always possible otherwise. To date, the study team members have participated in 22 such meetings.

LOCAL GOVERNMENT OUTREACH

There are several local governments and non-governmental organizations in or near the study area whose involvement is an important part of the study. These include all the incorporated cities and towns, as well as the Capital Area Metropolitan Planning Organization (CAMPO), and the area's Regional Transportation Alliance.

CAMPO

The study team has provided project updates at many of CAMPO's Executive Board and Technical Coordinating Committee meetings. In addition, in 2014 CAMPO established the "540 Working Group," which comprises individuals from many of the jurisdictions noted above. Four meetings of the 540 Working Group have been held to date, with the project study team presenting updates on the Complete 540 study at each meeting.

Small group meetings with local governments and agencies

In addition to holding small group meetings with public groups, the study team has also met several times with local government staff and elected officials to provide more detailed information about the study and to answer questions and receive comments. To date, 26 such meetings have been held.

OTHER NOTABLE PUBLIC AND GOVERNMENT INVOLVEMENT

While most of the public outreach activities that have taken place over the course of the study have been initiated by the study team, some activities have been the result of community or local government actions.

Citizen Petitions

Several petitions have been organized by local citizen groups. The petition statements have generally concerned opposition to or support of a particular corridor segment. Eighteen such petitions have been received to date from various neighborhood groups and other local organizations.

Local Government Resolutions and Staff Comments

Over the course of the study so far, the study team has received a large number of local government resolutions and written comments from local government staff members. The content of the majority of these documents has been to formally support selection of alternatives that use the Orange Corridor segment as the preferred route, or to oppose one or more of the other corridors that do not use the Orange Corridor segment.

FOR MORE DETAILED INFORMATION

Documentation of all of the public, agency, and government outreach activities and also the documentation of all comments, petitions, and resolutions that have been submitted are on file at the offices of the NCDOT.

The technical report prepared for the Complete 540 study contains much greater detail on the information presented in this chapter is the Stakeholder Involvement Report.

More information about this document can be found in Chapter 7—Summary of Technical Reports. Chapter 7 also provides information about the ways this document can be accessed, either in paper or electronic form.

CHAPTER 7

Summary of Technical Reports

Understanding the purpose and content of the reports referenced throughout this document.

This chapter presents more detail about the documents that have been referenced throughout this Draft EIS. It also provides information about the ways those documents can be accessed. either in paper or electronic form.

TEXT INCORPORATED INTO THIS DOCUMENT

The primary purpose of this DEIS is to explain how decisions about the project were made and the information that was used to make those decisions. While thorough in its description of these items, this document is meant to be a summary of the work that has been done. More detailed technical reports are incorporated by reference throughout this document and are contained on a companion media disk enclosed on the back cover and online at www.ncdot.gov/projects/complete540. These technical reports have been reviewed and approved by the North Carolina Department of Transportatin and the Federal Highway Administration. Those technical reports are considered to be part of this document and are the building blocks from which the Draft EIS was constructed. As provided in the Council on Environmental Quality guidance on incorporation by reference, the following list of referenced documents identifies the referenced materials and indicates the entity that prepared the documents.

REFERENCED DOCUMENTS

Purpose and Need Statement
Completed by Lochner in May 2011

This report describes the proposed project and presents information about why the project is needed, explaining the existing transportation problems in the study area and the needs that the project will address.

Alternatives Development and Analysis Report
Completed by Lochner in May 2014

This report summarizes the process the study team used to develop and evaluate potential solutions to the needs identified in the Purpose and Need Statement. These potential solutions are called alternatives. This report also describes the identification of the set of alternatives selected for detailed

study in the project's Draft Environmental Impact Statement (EIS), or "Detailed Study Alternatives" (DSAs).

Community Characteristics Report
Completed by Lochner in May 2011

This report summarizes baseline conditions and trends in the communities within the project study area. This information provides the foundation for the project's community impact assessment.

Community Impact Assessment
Completed by Lochner in June 2015

This report evaluates the potential effects of the project and each of the DSAs on the surrounding communities and on quality of life in those communities. More specifically, this assess and documents the potential direct effects of the project on several aspects of the human environment, including social, physical and visual characteristics; land use patterns and economic trends; mobility and access patterns; and area neighborhoods. This report also includes recommendations for avoiding, minimizing, and mitigating these potential effects. This report includes information about the preliminary determination of Section 4(f) applicability to historic resources, parks and recreation areas in the study area.

Indirect and Cumulative Effects Report
Completed by Lochner in December 2014

This report assessment qualitatively evaluates the project's potential to cause environmental effects as a result of induced growth, as well as the potential incremental impacts of the project when added to other past, present, or reasonably foreseeable public and private projects.

Historic Architectural Resources Survey Report
Completed by Mattson, Alexander and Associates in November 2014

This report documents the surveys completed for all the properties within the Area of Potential Effects (APE) for the project that were identified as either already listed on the National Register of Historic Places (NRHP) or as potentially eligible for listing. NCDOT and the NC State Historic Preservation Office (HPO) used this information to identify the properties meeting eligibility criteria for the NRHP and to determine the potential effects of each of the project's DSAs on the listed and eligible historic properties.

Air Quality Analysis Report
Completed by Lochner in October 2015

This report documents the analysis of the potential air quality effects of the traffic anticipated for the project's DSAs. This analysis was completed in compliance with the federal Clean Air Act, in accordance with federal regulations and guidelines. The two primary components of the analysis were a quantitative "hot spot" analysis for carbon monoxide under each of the DSAs and a qualitative analysis of the project's potential effects on Mobile Source Air Toxics.

Traffic Noise Analysis Report
Completed by Lochner in May 2015

This report documents the analysis of the potential effects the traffic anticipated for the project will have on noise conditions along each of the DSAs. This analysis included a preliminary assessment of noise abatement along the DSAs.

Natural Resources Technical Report
Completed by Mulkey in August 2014

The purpose of this report is to inventory, catalog, and describe the various natural resources likely to be impacted by each of the DSAs under consideration. The report documents the results of various field surveys completed to gather necessary information on natural resources in the vicinity of the DSAs.

Natural resources addressed in the report include water resources, terrestrial habitat, and protected species.

Waters Report
Completed by Mulkey in September 2014

This report documents the field delineation of jurisdictional resources in the vicinity of the DSAs. These resources include wetlands, streams, and ponds.

Freshwater Mussel Survey Report
Completed by The Catena Group in February 2012

This report documents the field surveys completed for the dwarf wedgemussel and other rare freshwater mussel species in the streams in the project study area. It also documents habitat evaluations completed during these field surveys.

Dwarf Wedgemussel Viability Study: Phase I
Completed by The Catena Group in March 2014

This report documents the first phase of a study being conducted to assess the long-term viability of the dwarf wedgemussel in Swift Creek. This work included three main elements: 1) describing existing conditions in Swift Creek, 2) summarizing existing conservation measures for the dwarf wedgemussel in Swift Creek, and 3) assessing historic trends and future viability of the dwarf wedgemussel.

Preliminary Hydraulics Study and Addendum
Study completed by Mulkey in September 2014
Addendum completed by Mulkey in February 2015

These reports document the findings of the preliminary hydraulic study completed for the project DSAs. This included identification of all locations along the DSAs that would require hydraulic structures 72 inches in diameter or greater, based on hydrologic conditions and requirements. The reports indicate the size and type of hydraulic structure needed at each site to convey water across the DSAs.

GeoEnvironmental Report for Planning
Completed by NCDOT in June 2014

This report documents the results of a hazardous material evaluation conducted along the project's DSAs. The main purpose of this investigation was to identify properties along the DSAs that are or may be contaminated by hazardous materials. Hazardous material impacts include, but are not limited to, active and abandoned underground storage tank (UST) sites, hazardous waste sites, regulated landfills and unregulated dumpsites.

Utility Impact Report
Completed by Hinde Engineering in November 2014

This report summarizes the general location, dimension and characteristics of major utilities found within the vicinity of the project DSAs. The report documents individual utility and some non-utility conflicts where the potential relocation cost was anticipated to exceed $250,000.

Build Traffic Analysis Report
Completed by HNTB in December 2009

This report documents the planning-level traffic capacity analysis completed to predict conditions on the area roadway network under the Build scenario for this project. The report identifies existing and projected roadway facility operations and deficiencies for the major roadways surrounding the Complete 540 project under existing and future (2035) Build conditions. This analysis used a representative alignment for the Complete 540 project.

No-Build Traffic Analysis Report
Completed by HNTB in December 2009

This report documents the planning-level traffic capacity analysis completed to predict conditions on the area roadway network under the No-Build scenario. The report identifies existing and projected roadway facility operations and deficiencies for the major roadways surrounding the Complete 540 project under existing and future (2035) No-Build conditions.

Traffic Forecast Technical Memorandum
Completed by HNTB in April 2014

This report documents traffic forecasts completed for the 17 DSAs under existing and future (2035) conditions. The purpose of this report was to provide forecast traffic volumes and other traffic characteristics under each of the DSA scenarios.

Detailed Study Alternatives Traffic Analysis Technical Memorandum
Completed by HNTB in February 2015

This report documents the traffic capacity analysis completed for the 17 DSAs under existing and future (2035) conditions. The purpose of this analysis was to identify projected operations and potential deficiencies for the major roadways surrounding and intersecting each of the DSAs.

Right of Way and Relocation Report
Prepared by HDR and Lochner in March 2015

This reports summarizes the findings of the right-of-way and relocation study completed for the project DSAs. This technical study identified the number and type of parcels that will be involved in the right-of-way acquisition process for each DSA, based on preliminary functional designs, the number and type of relocations, and an estimate of the right-of-way and relocation costs.

Stakeholder Involvement Report
Prepared by Lochner in March 2015

The purpose of this report was to document coordination with the public, local governments, and the resource and regulatory agencies during the course of the project. The report summarizes public involvement techniques used during the study and input received from the public and local governments, and also documents interagency coordination and agency input.

Northern Long-Eared Bat Section 7 Documentation
Prepared by US Fish and Wildlife Service, US Army Corps of Engineers, Federal Highway Administration, and NC Department of Transportation in July 2015

This document is a compliation of materials related to coordination efforts concerning the recently protected (April 2015) northern long-eared bat. These materials include a Programmatic Biological Opinion for this bat species in eastern North Carolina (NCDOT Divisions 1 - 8).

CHAPTER 8

List of Preparers and Draft EIS Mailing List

Recognizing the individuals who contributed to this document and the agencies who have received a copy of it.

The purpose of this chapter is to recognize the study team members, their qualifications, and their roles on the Complete 540 study. This chapter also documents the jurisdictional agencies that have received a copy of this Draft EIS for review and comment.

LIST OF PREPARERS

This document was prepared by the FHWA and NCDOT, with assistance from a team of consulting engineers, scientists, and planners led by H.W. Lochner, Inc. (HWL) and HNTB, Inc. This team includes the individuals listed in the table below.

Name	Study Team Title	Education and Experience	Role in Draft EIS Preparation
Federal Highway Administration			
George Hoops, P.E.	Major Projects Engineer	M.S. Transportation Engineering; B.S. Civil Engineering 23 years experience	Project management; document review
Donnie Brew	Environmental Coordinator	M.S. Environmental Engineering; B.S. Civil Engineering 14 years experience	Project management; document review

Name	Study Team Title	Education and Experience	Role in Draft EIS Preparation
North Carolina Department of Transportation			
Eric Midkiff, P.E.	Project Development Section Head, Western Region	B.S. Civil Engineering 25 years experience	Project management; document review
HNTB, Inc.			
Kiersten Bass	Planning Services Manager	B.A., Planning and Environmental Studies 22 years experience	Project management; document review
Jennifer Harris, P.E., CPM	Senior Project Manager	B.S. Civil Engineering B.S. Environmental Engineering 17 years experience	Project management; document review
Bradley Reynolds, P.E., PTOE	Transportation Project Engineer	M.B.A., Business Administration BS, Civil Engineering 13 years experience	Traffic analysis
Donna Keener, P.E.	Senior Transportation Engineer	B.S. Civil Engineering 27 years experience	Project cost estimating
Tracy Roberts, AICP	Senior Project Manager	MPA, Public Administration 21 years experience	Air quality and traffic noise analysis document review
H.W. Lochner, Inc.			
Roy Bruce, P.E.	Senior Project Manager	M.S. Civil Engineering B.S. Civil Engineering 38 years experience	Project management; document preparation; impact analysis
Kristin Maseman, AICP, CEP	Project Manager	M.R.P. Urban Planning M.S. Biology; B.A Biology 16 years experience	Project management; document preparation; impact analysis
Jeffrey Schlotter, AICP	Senior Project Manager	M.A. Cultural Anthropology B.S. Urban Planning 30 years experience	Lead document writer; NEPA analysis
Brian Eason, P.E.	Senior Project Manager	B.S. Civil Engineering 24 years experience	Roadway design; impact analysis
Douglas Wheatley, P.E.	Transportation Engineer	B.S. Civil Engineering 10 years experience	Roadway design; impact analysis
David Shannon, P.E.	Senior Engineer	B.S. Civil Engineering 20 years experience	Noise and air quality impact analysis
Erica Salutz, P.E.	Engineer	B.S. Civil Engineering 10 years experience	Noise and air quality impact analysis

Name	Study Team Title	Education and Experience	Role in Draft EIS Preparation
Mulkey Engineers and Consultants, Inc.			
Wendee Smith, PWS*	Senior Project Manger	B.S. Natural Resources 16 years experience	Natural resources surveys and analysis; document preparation
Mark Mickley	Biologist	B.S. Biology 13 years experience	Natural resources surveys and analysis; document preparation
Brian Dustin	Biologist	B.S. Forestry 11 years experience	Natural resources surveys and analysis; document preparation
Jonathan Scarce, P.E.*	Senior Project Manager	B.S. Civil Engineering 24 years experience	Hydraulic surveys and analysis; document preparation
Mattson, Alexander and Associates			
Richard Mattson	Architectural Historian	Ph.D. Geography, M.A. Geography B.A. History	Historic architectural surveys and analysis; document preparation
Frances Alexander	Architectural Historian	M.A. American Civilization-Architectural History B.A. History	Historic architectural surveys and analysis; document preparation
HDR, Inc.			
Jane Nelson*	Right-of-Way Program Manager	B.A. Business Administration 31 years experience	Right-of-way and relocation surveys and analysis; document preparation
HInde Engineering			
Kevin Hinde, P.E.	Project Engineer	B.S. Civil Engineering 16 years experience	Utility relocation analysis; document preparation
Mike Davis	Senior Utility Coordinator	A.A.S. Civil Eng. Technology 39 years experience	Utility relocation analysis; document preparation
Dawson and Associates			
Fred Skaer	Senior Advisor	Sc.B. Civil Engineering Masters in Public Administration 41 years experience	NEPA advisor
John Studt	Senior Advisor	B.S. Biology M.S. Marine Ecology 32 years experience	NEPA advisor

* These individuals are no longer with the firm where the work was performed.

ORGANIZATIONS RECEIVING COPIES OF THIS DRAFT EIS

Federal Agencies

- US Army Corps of Engineers
- US Environmental Protection Agency
- US Department of Transportation
- US Department of the Interior – US Fish and Wildlife Service
- US Department of Commerce – National Marine Fisheries Service
- US Department of Agriculture
- US Department of Energy
- Federal Railroad Administration
- Federal Emergency Management Agency
- Office of Management and Budget

State Agencies

- NC Department of Commerce
- NC Department of Cultural Resources
- NC Department of Economic and Community Development
- NC Department of Environment and Natural Resources
- NC Department of Public Instruction
- NC Wildlife Resources Commission
- NC Attorney General
- NC State Clearinghouse

Local Governments and Agencies

- Capital Area Metropolitan Planning Organization
- City of Raleigh
- Greater Raleigh Chamber of Commerce
- Harnett County Board of Commissioners
- Johnston County Board of Commissioners
- Johnston County Schools
- Regional Transportation Alliance
- Town of Angier
- Town of Apex
- Town of Cary
- Town of Clayton
- Town of Fuquay-Varina
- Town of Garner
- Town of Knightdale
- Town of Holly Springs
- Town of Wendell
- Triangle J Council of Governments
- Wake County Board of Commissioners
- Wake County Public School System

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[5] NCDENR
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Index

Appendix A

DRAFT EIS REVIEW COPY LOCATIONS

DRAFT EIS REVIEW COPY LOCATIONS

Printed copies of the Draft EIS are available for public review at the locations listed below. Electronic copies are available on the project website at www.ncdot.gov/projects/complete540/.

NCDOT District Office – Wake County
4009 District Drive
Raleigh, NC 27607
919-733-3213

Capital Area Metropolitan Planning Organization
421 Fayetteville Street, Suite 203
Raleigh, NC 27601
919-996-4400

Holly Springs Department of Planning and Zoning
128 South Main Street
Holly Springs, NC 27540
919-557-3908

Fuquay-Varina Planning Department
401 Old Honeycutt Road
Fuquay-Varina, NC 27526
919-552-1429

Garner Planning Department
900 Seventh Avenue
Garner, NC 27529
919-773-4449

Clayton Planning Department
111 East Second Street
Clayton, NC 27520
919-553-5002

Knightdale Development Services
950 Steeple Square Court
Knightdale, NC 27545
919-217-2241

Holly Springs Community Library
300 W. Ballentine Street
Holly Springs, NC 27540
919-577-1660

Fuquay-Varina Community Library
133 S. Fuquay Avenue
Fuquay-Varina, NC 27526
919-557-2788

Hocutt-Ellington Memorial Library
100 S. Church Street
Clayton, NC 27520
919-553-5542

East Regional Library
946 Steeple Square Court
Knightdale, NC 27545
919-217-5300

Detailed Study Alternatives, Study Area, and Draft EIS Review Locations

Draft EIS Review Location

Appendix B

CULTURAL RESOURCES COORDINATION

Federal Aid #: **STP-0540(19)**
STP-0540(20)
STP-0540(21)

TIP#: **R-2721**
R-2828
R-2829

***Counties*: Wake and Johnston**

CONCURRENCE FORM FOR ASSESSMENT OF EFFECTS

Project Description: Complete 540, Triangle Expressway Southeast Extension

On ***December 2, 2014***, representatives of the

- ☒ North Carolina Department of Transportation (NCDOT)
- ☒ Federal Highway Administration (FHWA)
- ☒ North Carolina State Historic Preservation Office (HPO)
- ☐ Other

Reviewed the subject project and agreed on the effects findings listed within the table on the reverse of this signature page.

Signed:

Mary Pope Furr — 12/10/2014
Representative, NCDOT — Date

[signature] — 12-10-14
FHWA, for the Division Administrator, or other Federal Agency — Date

Renee Gledhill-Earley — 12-10-14
Representative, HPO — Date

Federal Aid #: **STP-0540(19)** *TIP#:* **R-2721** *Counties*: **Wake and Johnston**
STP-0540(20) **R-2828**
STP-0540(21) **R-2829**

Property and Status	Alternative	Effect Finding	Reasons
John Strain House (WA 1236) DE Criterion C	Orange	No adverse effect	New facility will be elevated above Lake Wheeler Road. Noise impacts do not show substantial increase in decibel levels at house. No construction impacts or easements within or adjacent to historic boundary.
	Red	No effect	New facility will be at grade and behind dwelling. No construction impacts or easements within or adjacent to historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Panther Branch School (WA 1202) NR Criterion A	Orange	No adverse effect with environmental commitments	Sauls Road will be elevated above new facility. Noise impacts do not show substantial increase in decibel levels at former school (now used as meeting hall for the Juniper Level Baptist Church). Small (18-inch) retaining wall required to eliminate the need for permanent easements at school and across street but decorative treatments may be used on the wall surface, and designs for the wall will be reviewed by the HPO prior to finalization
	Lilac	No effect	Sauls Road will be elevated above new facility. Noise impacts do not show substantial increase in decibel levels at former school (now used as meeting hall for the Juniper Level Baptist Church). No construction impacts or easements within or adjacent to historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Dr. L.J. Faulhaber Farm (WA 4811) DE Criterion A	Red	Adverse effects	New facility bisects farm and requires demolition of contributing structures.
	All other alternatives	No effect	Property is not within the remaining study corridors
William & Lillie Willis House & Store (WA 4808) DE Criteria A&C	Red	No adverse effect	Construction along existing US 401 terminates at edge of historic boundary. No change in access for house and store. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Bryan Farms Historic District (WA 0335-0338) DE Criterion A	Red	Adverse effect	New facility and y-line improvements require construction within historic boundary and require use of agricultural fields which are contributing resources to the historic district.
	All other alternatives	No effect	Property is not within the remaining study corridors
Meadowbrook Country Club (WA 5104) NR Criterion A	Red	No effect	Improvements along existing I-40 will not result in construction impacts or easements within historic boundary.
	Lilac	No effect	Improvements along existing I-40 will not result in construction impacts or easements within historic boundary.
	Orange	No effect	Improvements along existing I-40 will not result in construction impacts or easements within historic boundary.

	All other alternatives	No effect	Property is not within the remaining study corridors
Yeargan House (WA 0328) DE Criterion C	Red	No effect	Improvements along y-line will not result in construction impacts or easements adjacent to or within historic boundary.
	Lilac	No effect	Improvements along y-line will not result in construction impacts or easements adjacent to or within historic boundary.
	Orange	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Utley-Council House (WA 0599) NR Criterion C	Purple	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Thomas Store (WA 0594) DE Criteria A&C	Purple	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Jones-Johnson Farm (WA 0570) DE Criteria A&C	Purple/Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
J. Beale Johnson House (WA 0566) NR Criterion C, Local Landmark	Purple/Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Grady Rowland House (WA 1126) DE Criterion C	Blue	No adverse effect	House will be 10 feet above and approximately 400 feet from new facility thereby decreasing visual and auditory impacts. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Jones-Ellington House (WA 1176) DE Criterion C	Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Joseph M. Blalock Farm (WA 1174) DE Criterion A	Blue	No adverse effect	Noise impacts do not show substantial increase in decibel levels at farm. No construction impacts or easements within or adjacent to historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Dr. Nathan Blalock House (WA 1172) NR Criterion C, Local Landmark	Blue	No adverse effect	New facility will be in a 25 foot cut section therefore there will be no substantial increase in decibel levels at the house. Improvements along y-line will not result in construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Weathers Store (WA 1184) DE Criteria A&C	Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Britt's Store (WA 0341) DE Criteria A&C	Blue	Adverse effect	Y-line improvements require demolition of contributing structures.
	Lilac	Adverse effect	Y-line improvements require demolition of contributing structures.
	Modified Blue and Lilac	No adverse effect with environmental commitments	Y-line improvements follow existing radius of curve and will not impact structures. However, the addition of a curb along Benson and Ten Ten roads will hamper parking for business. Additional parking may need to be provided so need to coordinate with the property owner and HPO to discuss parking plan.

	All other alternatives	No effect	Property is not within the remaining study corridors
Wayland Poole House (WA 0315) NR Criterion C	Red	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Mount Auburn School (WA 0302) DE Criteria A&C	Red	No adverse effect with environmental commitments	Noise impacts show substantial increase in decibel levels at former school because new facility 30 feet above historic property. Will need to coordinate with property owner and HPO to investigate noise reduction/soundproofing measures. Y-line improvements include resurfacing and improving access in front of former school. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Penny House (WA 0289) DE Criterion C	Green	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Teal	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Red	No adverse effect	Realignment of Rock Quarry Road will move roadway away from historic property and leave house at end of a long driveway. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

W.A. Gowers Farm (WA 0290) DE Criteria A&C	Brown	No adverse effect	Y-line improvements include ditch and shoulder work in front of farm. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Gower-Johnson House (JY 0281) DE Criterion C	Brown	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Baucom-Stallings House (WA 0287) DE Criterion C	Brown	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Teal	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Tan	Adverse effect	New facility bisects house tract and requires demolition of contributing structures.
	All other alternatives	No effect	Property is not within the remaining study corridors

George Williams Farm (WA 4163) DE Criterion A	Orange	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Gerald Cochran House (WA 7107) DE Criterion C	Orange	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Initialed: NCDOT MPA FHWA DB HPO Rye

FHWA Intends to use the HPO's concurrence as a basis for a "de minimis" finding for the following properties, pursuant to Section 4(f):

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

January 3, 2011

Mr. Peter B. Sandbeck
Deputy State Historic Preservation Officer
North Carolina Department of Cultural Resources
4617 Mail Service Center
Raleigh, North Carolina 27699-4617

Dear Mr. Sandbeck:

RE: Triangle Expressway Southeast Extension, State Project Nos. 6.401078, 6.401079, 6.401080, TIPs R-2721, R-2828, R-2829 Division 5, Wake and Johnston Counties.

Attached please find mapping for the Triangle Expressway's Southeast Extension corridors currently under consideration per our December 2010 discussion with Office of State Archaeology staff. Thank you for providing information regarding the Branches Mill archaeological site (31WA663**) which may be eligible for inclusion on the National Register of Historic Places (NRHP). Purported Civil War skirmishes and an alleged unmarked Confederate Cemetery near Battles Bridge were also reviewed during the December meeting. Based upon those discussions it appears remote that such a cemetery is present within the project area. While the Unions 17th Corps crossed the Neuse River at this location, all know Confederate forces had already moved west of Raleigh two days beforehand making any engagement between Union and Confederate forces here unlikely. We will use this information to assist us in further consultation with your office on the development of an appropriate survey and NRHP site evaluation methodology for the project. The comprehensive survey and site evaluations will be initiated once a preferred alternative has been selected. The above referenced project is subject to compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implemented by the Advisory Council on Historic Preservation. Should you have any questions or comments regarding these reports please feel free to contact me at 919 431-1609 or mtwilkerson@ncdot.gov.

Sincerely,

Matthew T. Wilkerson
Archaeology Group Leader
Human Environment Unit

cc File

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
HUMAN ENVIRONMENT UNIT
1598 MAIL SERVICE CENTER
RALEIGH NC, 27699-1598

TELEPHONE: 919-431-2000
FAX: 919-431-2001

WEBSITE: WWW.NCDOT.ORG

LOCATION:
PROJECT DEVELOPMENT &
ENVIRONMENTAL ANALYSIS BRANCH -
ENVIRONMENTAL RESOURCE CENTER
4701-116 ATLANTIC AVENUE
RALEIGH NC, 27604

North Carolina Department of Cultural Resources
State Historic Preservation Office
Peter B. Sandbeck, Administrator

Beverly Eaves Perdue, Governor
Linda A. Carlisle, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

January 27, 2011

MEMORANDUM

TO: Matt Wilkerson
Office of Human Environment
NCDOT Division of Highways

FROM: Claudia Brown PW for Claudia Brown

SUBJECT: Triangle Expressway Southeast Extension, Division 5, R-2721, R-2828, R-2829, Wake and Johnston Counties, CH 98-0457

Thank you for your letter of January 3, 2011, transmitting the mapping for the preliminary alternatives for the above cited project.

The alternative maps will prove quite useful as the project moves forward and consultation continues regarding cultural resource concerns and investigations relative to this project. We look forward to working with you and your staff in determining the appropriate level of survey and methodology for site evaluation at the appropriate time.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address**: 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax**: (919) 807-6570/807-6599

Appendix C

DRAFT SECTION 4(f) EVALUATION

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INTRODUCTION

Section 4(f) of the Department of Transportation Act of 1966, as amended (49 USC 303), states that the US Department of Transportation may not approve the use of land from a significant publicly owned park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that:

- There is no feasible and prudent alternative to the use of land from the property; and
- The action includes all possible planning to minimize harm to the property resulting from such use.

Under Section 4(f), "use" falls into one of three categories:

- Permanent Incorporation – This refers to direct right of way acquisition or acquisition of a permanent easement as part of a transportation project.
- Temporary Occupancy – This results when Section 4(f) property is required for project construction-related activities, but is not permanently incorporated into the transportation facility.
- Constructive Use – This involves no actual physical use of the Section 4(f) property. It occurs when the proximity of the transportation project to the Section 4(f) property results in effects that would substantially impair the activities, features, and attributes of the property.

When the use of a Section 4(f) property is generally minor in nature, the use can sometimes be classified as a *de minimis* impact. A *de minimis* impact is one that, after taking into account avoidance, minimization, mitigation and enhancement measures, results in no adverse effect to the activities, features, or attributes qualifying a park, recreation area, or refuge for protection under Section 4(f).

In addition, Section 106 of the National Historic Preservation Act of 1966 protects those properties that are included in or eligible for inclusion in the National Register of Historic Places (NRHP). Chapter 5 of this Draft Environmental Impact Statement (EIS) identifies and describes the historic architectural resources and public parks that would be affected by Detailed Study Alternatives (DSAs) under consideration for the Complete 540 project.

Through consultation with the North Carolina State Historic Preservation Office (HPO), it was determined that there are 25 historic sites included in or eligible for inclusion in the NRHP in the vicinity of the DSAs that are subject to Section 4(f) requirements. Of these 25 sites, six have the potential to be affected by Complete 540 DSAs; this is documented in Attachment 1. Through this consultation, it was determined that three of these sites have the potential to be adversely affected and have potential Section 4(f) use by DSAs: the Dr. L. J. Faulhaber Farm, the Bryan Farms Historic District, and the Baucom-Stallings House. None of these sites are currently listed in the NRHP, but all have been determined to be eligible for listing. A fourth site, Britt's Store, was initially determined to have the potential to be adversely affected by DSAs; however, subsequent modifications were incorporated into the preliminary functional designs for these DSAs to eliminate this potential adverse effect and to avoid the Section 4(f) use, as documented in Attachment 1.

There are six existing and planned public parks and recreational sites that have the potential to be subject to Section 4(f): Middle Creek School Park, the planned Sunset Oaks Park, the planned expansion area for White Deer Park, the planned Bryan Road Nature Park, the Watershed Extension Loop trail in the Clemmons Educational State Forest, and the Neuse River Trail. The locations of all of these are shown in Figure 1. This appendix documents the location and characteristics of each of these historic sites and public parks, describes the potential impacts of the DSAs to each of them, and discusses avoidance and measures taken to minimize harm to each. There are no wildlife and waterfowl refuges affected by the DSAs. Each of the historic sites and the parks and recreational sites are discussed in this evaluation and are shown in figures at the end of the appendix.

Background information about the Complete 540 project study area is in Chapter 3 of this Draft EIS. Additional detail about the DSAs is in Chapter 4.

1. DESCRIPTION OF SECTION 4(F) PROPERTIES

1.1 Dr. L. J. Faulhaber Farm

The Dr. L. J. Faulhaber Farm is a 40-acre agricultural tract on the east side of US 401 in the Garner area. The Colonial Revival farmhouse was built in the 1930s, and the site includes several outbuildings. All of the buildings on the site appear to date from the time the farmhouse was constructed. The site is eligible for the NRHP under Criterion A for agriculture. The house and outbuildings remain on their original locations, and the setting, association, and rural feeling of this farm complex and the surrounding pastureland and woodland is unchanged. It is a well-preserved example of a Wake

County dairy farm from the 1930s, when the growing devastation of the cotton boll weevil spurred many local farms to diversify into dairy farming.

As shown in Figure 2, the NRHP boundary encompasses the entire 40-acre tract. The tract includes the house, an array of farm outbuildings, and the pasture and woodland, all of which are contributing resources. The landscape around this site is fairly rural, although US 401 in front of the property is a four-lane divided roadway, and there is substantial commercial and industrial development along US 401 beginning about ½ mile south of the site. No other sites in the vicinity of the Dr. L. J. Faulhaber Farm were found to be eligible for the NRHP.

1.2 Bryan Farms Historic District

The Bryan Farms Historic District encompasses portions of two farms in ownership by the Bryan family since the early 1900s. The farms are located on Bryan Road in Garner, west of White Oak Road. This district is eligible for the NRHP under Criterion A for agriculture. In the case of Bryan Farms, the landscape and buildings in this district are an increasingly rare example of the agricultural landscape in Wake County in the early-to-mid twentieth century. Its ownership pattern is also an example of the traditional subdivision of rural farmland among family members in Wake County.

As shown in Figure 3, the NRHP boundary encompasses a 129-acre area that contains a collection of farmhouses, farm and domestic outbuildings, surrounding fields, pastures, and woodland, all historically associated with the Bryan family in this area. Figure 4 shows the locations of the various structures in the district. All of the houses, outbuildings, fields, pastures, and woodland are contributing resources. This includes four farmhouses: the George and Julia Bryan House, the C. P. Bryan House, the Rand Bryan House, and the George Bryan House. As Bryan Road is unchanged since at least the 1930s, the segment of the road in this district is also a contributing resource. While the Bryan Road Historic District retains its rural character, there is widespread and expanding suburban residential and commercial development surrounding the area. No other sites in the vicinity of the Bryan Farms Historic District were found to be eligible for the NRHP.

1.3 Baucom-Stallings House

The Baucom-Stallings House is situated on a 31-acre tract on the north side of Old Baucom Road, southeast of Raleigh and east of Garner. The late-Greek Revival style house on the property was constructed in 1850, with additions and modifications through the early 1900s. The house is eligible for the NRHP under Criterion C for architecture. It displays significant historic elements of design, materials, and workmanship with few alterations. The house remains an intact example of the simple Greek Revival farmhouses erected in the second half of the nineteenth century in Wake County—these structures are increasingly rare.

As shown in Figure 5, the NRHP boundary encompasses the house, two outbuildings (a kitchen and a smokehouse), and fields and pastures north of the house. The landscape around this site is rural, consisting of farms and large-lot residential development. No other sites in the vicinity of the Baucom-Stallings House were found to be eligible for the NRHP.

1.4 Middle Creek School Park

The 105-acre Middle Creek School Park is in public ownership by the Town of Cary. It is located on the north side of Optimist Farm Road, adjacent to Middle Creek High School, in southern Cary; it is shown in Figure 6. The park opened in 2001 and includes a wide range of public recreational facilities, including:

- An athletic complex with four lighted baseball/softball fields with restrooms
- Two lighted multi-purpose fields with restrooms
- An 18-hole disc golf course
- Two basketball courts
- Eight lighted tennis courts with restrooms
- Picnic shelters
- A play area with an adjacent open lawn area
- Approximately one mile of paved trails

The park also includes undeveloped open space, including a 200-foot wide strip of open space through the center of the Jamison Park neighborhood, along the Camp Branch stream, and a narrow strip of open space along the north side of the neighborhood.

The park includes several public parking areas, which can be accessed via Middle Creek Park Avenue on the north and Optimist Farm Road on the south. The park is open from sunrise to sunset; in lighted areas where visitors are participating in an approved extended use activity, hours are extended until 30 minutes after the completion of the approved activity.

Middle Creek School Park is included in the Town of Cary's 2012 Parks, Recreational and Cultural Resources Master Plan, indicating its significance as a recreational resource to the Town of Cary. The plan identifies proposed greenway trails to be developed within Middle Creek School Park that would connect the park to Cary's regional multiuse trail system.

1.5 Planned Sunset Oaks Park

The Town of Holly Springs owns a 78-acre parcel at the southern end of the Sunset Oaks neighborhood, along Middle Creek; it is shown in Figure 7. The Town plans to develop the parcel as a public park called Sunset Oaks Park. The planned park is described in Beyond the Green, the parks and recreation master plan for Holly Springs, published in 2007. The plan designates the park parcel's current classification as a "Passive Regional Park," meaning that the parcel is currently open to passive recreational uses such as hiking, but that it does not yet include any organized recreational facilities. Inclusion of this planned park in the plan, indicates its significance as a recreational resource to the Town of Holly Springs.

Beyond the Green states that the Town intends to develop the Sunset Oaks Park as a town-wide entertainment park, which is defined as a large-scale facility, "the primary function of which is to provide active recreation opportunities and facilities [and] to allow for programmed, organized events and activities." This indicates that the Town has identified this future park as a significant recreational resource. The plan indicates that Sunset Oaks Park will initially include a minimum of two soccer fields and will likely eventually include more soccer fields to meet the Town's future needs. The plan also notes that environmentally sensitive areas should be preserved and protected and tree removal should be minimized and indicates that an educational program to better the public's awareness of their local natural environment could be integrated into the park. It also notes that as part of developing the park, a trail system to connect the park to Sunset Lake and Bass Lake could also be developed.

While the Town has acquired the park parcel, it has not yet begun to develop the park. Funding has not yet been programmed for development of the park. Plans for the park are not yet detailed to determine exactly where different recreational facilities will be located.

1.6 White Deer Park – Planned Expansion Area

White Deer Park, located on Aversboro Road in Garner, opened to the public in November 2009. The Town of Garner owns and manages this 96-acre park for public use, developing it as a nature park and environmental education center. The park features five picnic shelters, two playgrounds, two miles of paved trails and a 2,500 square foot nature center; it is the largest municipal park in Garner. The park is accessed via Aversboro Road and includes two parking areas.

White Deer Park is included in the Town of Garner Comprehensive Parks and Recreation, Open Space and Greenways Master Plan, adopted on June 4, 2007. The plan indicates that Garner plans to expand White Deer Park into an adjacent 35-acre parcel, shown in Figure 8—inclusion of this in the plan indicates its significance to Garner as a planned recreational resource. The Town of Garner owns the 35-acre parcel, although no development has taken place. When the town purchased this adjacent parcel in 2006, the Wake County deed transfer included a stipulation that the parcel must be developed for use as a park and community center—this is described and documented in Attachment 2. This information also underscores the significance of this resource to Garner's Master Plan for recreation.

The plan recommends development of the expansion parcel, in conjunction with the existing 96-acre White Deer Park parcel, with amenities such as signage, nature trails, visual accesses and overlooks, wildlife viewing stations and birding trails, picnic shelters, a new fishing pier, and boat access to water bodies. The plan also discusses the possibility of shifting a planned community arts center from the 96-acre White Deer Park parcel to the expansion parcel.

In addition to its relationship to the existing White Deer Park, the expansion parcel also directly abuts another Garner park, the Thompson Road Park, which is directly to the southwest. The expansion parcel will also help provide access between the existing White Deer Park and South Garner Park to the north, via a planned greenway. The existing White Deer Park also connects to Lake Benson to the south via the South Garner Greenway. Together, these parks and greenways form a linear chain of recreational resources in south Garner. The Master Plan suggests the value placed on maintaining connections between these resources by encouraging the development of trails and paths between them.

1.7 Planned Bryan Road Nature Park

The Town of Garner owns a 20-acre parcel off of Bryan Road, near Timber Drive, where it plans to develop an environmental education center; this site is shown in Figure 9. The town has owned this site since 1989. When the town purchased this parcel, the Wake County deed transfer included a stipulation that the parcel must be developed as a public nature park—this is described and documented in Attachment 2. This information also underscores the significance of this resource to Garner's Master Plan for recreation. The town has also proposed the Mahler's Creek Greenway to run north to south through this site. No specific location has been identified for this trail.

The Town of Garner Comprehensive Parks and Recreation, Open Space and Greenways Master Plan identifies the need to develop this planned park and states that the town should evaluate opportunities to develop the site with scenic passive recreation opportunities, in conjunction with development of Mahler's Creek Greenway. This

greenway would connect the planned Bryan Road Nature Park to the existing Centennial Park to the south. Inclusion of this planned park indicates its significance to Garner as a planned recreational resource.

1.8 Clemmons Educational State Forest/Watershed Extension Loop Trail

The Clemmons Educational State Forest is an 830-acre site in public ownership by the State of North Carolina, and managed by the North Carolina Forest Service. It is located on the north side of Old US 70 near Clayton, as shown in Figure 10. The forest is accessed from Old US 70 and includes a parking area.

The forest features self-guided nature trails with audio exhibit stations and an environmental education center with interactive exhibits. There are four main trails in the forest. Two of them are short trails (less than one mile long) that feature audio recordings about the history of the forest, information about the trees, and information about area geology. There are picnic sites as well as a large covered picnic shelter available for public use near these two trails. The other two trails are the two-mile long Demonstration Trail and the three-mile long Watershed Extension Loop.

North Carolina's Forest Resources Assessment, adopted in 2010, is the North Carolina Forest Service action plan. It establishes a vision for protecting North Carolina forest values and benefits and establishes a strategic plan for implementing that vision. The primary goal of the plan is forest resource management. Another of the elements of the vision established by the plan is enhancing the benefits of North Carolina's forests, and one component of this addresses recreation resources of the State's forests. This component describes the importance of the recreational resources of the State's forests in encouraging protection and sound management of the State's forests. According to the policy established in FHWA's *2012 Section 4(f) Policy Paper*[1], if recreation has not been established as the primary purpose of a resource, it does not qualify as a recreational resource under Section 4(f). However, the Watershed Extension Loop trail within Clemmons independently qualifies as a recreational resource under Section 4(f), as the Forest Service has indicated that it is a significant recreational resource.

Copies of correspondence from the Forest Service documenting the uses of the Clemmons Educational State Forest, and the significance of the Watershed Extension Loop trail as a recreational resource are in Attachment 3.

[1] Federal Highway Administration Office of Planning, Environment and Realty, Section 4(f) Policy Paper, 2012, http://www.environment.fhwa.dot.gov/4f/4fpolicy.asp.

1.9 Neuse River Trail

This 28-mile long greenway trail is a pedestrian and bicycle trail adjacent to the Neuse River through eastern Wake County. It is part of the City of Raleigh's Capital Area Greenway System. The trail traverses land owned by the City of Raleigh for various public services (e.g., wastewater treatment, solar energy production, and police training) and also crosses privately-owned land on City of Raleigh public easements. In the vicinity of the Complete 540 project DSAs, the trail is entirely on land owned by the City of Raleigh. Within the Complete 540 study area, the trail turns southward away from the Neuse River just east of Auburn-Knightdale Road, extending southeastward across Raleigh-owned land toward Brownfield Road, crossing Battle Bridge Road. The trail then extends along the east side of Brownfield Road, turning eastward to extend along the north side of Old Baucom Road, and then turns northeastward to continue to follow the Neuse River. The location of the trail is shown in Figure 11. Within the Complete 540 study area, there are two parking areas available to trail users. One is at Auburn-Knightdale Road and the other is at Mial Plantation Road.

The section of the Neuse River Trail in the Complete 540 study area opened to the public in 2013. The trail is included in the City of Raleigh's 2014 Parks, Recreation and Cultural Resources System Plan, underscoring its status as a significant recreational resource for the City of Raleigh.

2. IMPACTS ON SECTION 4(f) PROPERTIES – (4[f] USE)

As documented in this Draft EIS, there are ten color-coded alternative corridor segments, which combine to form seventeen different end-to-end DSAs under consideration for the Complete 540 project. Figure 1 shows the location of the 10 color-coded segments and Figure 12 is a graphic that indicates the combination of color-coded corridor segments and DSAs on each of these resources. The information below explains the potential effects of the color-coded corridor segments and DSAs on each of these resources.

2.1 Dr. L. J. Faulhaber Farm

The Red Corridor segment is the only corridor segment that would affect this site. This corridor segment is part of Alternatives 6 and 7, which would have identical impacts on the Dr. L. J. Faulhaber Farm. The Red Corridor segment would cross the property diagonally, beginning at the sites southwest corner, and extending to the northeast, as shown in Figure 13. There would also be an interchange on US 401 immediately southwest of this site. The Red Corridor segment would directly affect about 17 acres of this 40-acre site, requiring removal of all of the structures on the

site; for this reason, Alternatives 6 and 7 would each result in the complete loss of this eligible historic site. On December 10, 2014, through consultation with the North Carolina State Historic Preservation Office (HPO), it was found that the Red Corridor segment would have an Adverse Effect on the Dr. L. J. Faulhaber Farm—this is documented in Attachment 1.

None of the other DSAs under consideration (Alternatives 1-5 and 8-17) would have any effects on this site. To cross US 401, the other DSAs would use either the Orange Corridor segment or the Blue Corridor segment. Right of way improvements with the Orange Corridor segment would begin about ¾ mile south of the Dr. L. J. Faulhaber Farm, and improvements with the Blue Corridor segment would begin more than three miles south of the site. Through consultation with the HPO, it was determined that all of the other corridor segments besides the Red Corridor segment would have No Effect on the Dr. L. J. Faulhaber Farm.

2.2 Bryan Farms Historic District

The Red Corridor segment is the only corridor segment that would affect this site. This corridor segment is part of Alternatives 6 and 7, which would have identical impacts on the Bryan Farms Historic District. The Red Corridor segment would cross the southern edge of the property, as shown in Figure 14. The Red Corridor segment would directly affect about 15 acres of this 129-acre district. The right of way in the Red Corridor segment would require removal of one of the structures in the district, the George and Julia Bryan House at its southwestern corner, but would not require removal of any of the other structures in the district. However, the agricultural fields in this district, which would be directly affected by the Red Corridor segment, are also a contributing feature to its historic eligibility.

Both Bryan Road at the southwest corner of the site, and White Oak Road just to the southeast of the site, would be elevated over the new roadway, creating a notable visual change in the vicinity of the historic district. The roadway itself would also create a visual change along the southern edge of the remaining portion of the historic district, affecting the rural character of the district's landscape. Through consultation with the HPO, it was determined that the Red Corridor segment would have an Adverse Effect on the Bryan Farms Historic District—this is documented in Attachment 1.

As documented in the project's Traffic Noise Analysis Report, the peak hour noise level in this location under the build scenario for Alternatives 6 and 7 was determined to be 60 dB, compared to an existing level of 52 dB, which does not meet the criteria for a substantial noise level increase and does not approach or exceed federal noise abatement criteria standards. This district may be subject to temporary site impacts and visual and noise impacts during construction if either Alternative 6 or 7 were selected for the project.

None of the other DSAs under consideration (Alternatives 1-5 and 8-17) would have any effects on this eligible historic district. In this vicinity, between NC 50 and I-40, the other DSAs would use either the Orange Corridor segment or the Lilac Corridor segment. Right of way improvements with either of these other scenarios would begin more than two miles south of the Bryan Farms Historic District. Through consultation with the HPO, it was determined that all of the other corridor segments besides the Red Corridor segment would have No Effect on the Bryan Farms Historic District.

2.3 Baucom-Stallings House

Three of the corridor segments are in the vicinity of the Baucom-Stallings House—the Tan, Teal, and Brown Corridor segments. Only the Tan Corridor segment (Alternatives 3, 10, and 15) would directly affect the site. As shown in Figure 15, the Tan Corridor segment would require acquisition of the entire six acres within the NRHP-eligible boundary, and would require removal of the house and all other structures on the site. Through consultation with the HPO, it was determined that the Tan Corridor segment would have an Adverse Effect on the Baucom-Stallings House—this is documented in Attachment 1.

The Teal Corridor segment (Alternatives 5, 12, and 17) runs east to west about 1,000 feet south of the Baucom-Stallings House property, as shown in Figure 16. The new roadway would be at-grade, and the ground elevation slopes downward slightly from the Baucom-Stallings House to the path of the Teal Corridor segment to the south. There is also a fair amount of tree cover between the Baucom-Stallings House and the path of the Teal Corridor segment to the south. For these reasons, the visual impacts of the new road on the historic site may be fairly minimal. The Teal Corridor segment would also cross Old Baucom Road about ½ mile east of the Baucom-Stallings House property, as shown in Figure 16. Old Baucom Road would be elevated over the new roadway but, due to the distance between that location and the Baucom-Stallings House and due to the presence of wooded areas between these two sites, the overpass is not likely to be visible from the historic site. Improvements to Old Baucom Road to accommodate the overpass would begin about 1,000 feet east of the Baucom-Stallings House property. As documented in the Traffic Noise Analysis Report, the peak hour noise level in this location under the build scenario for the Teal Corridor segment was determined to be 55 dB, compared to an existing level of 51 dB, which does not meet the criteria for a substantial noise level increase and does not approach or exceed federal noise abatement criteria standards. Through consultation with the HPO, it was determined that the Teal Corridor segment would have No Effect on the Baucom-Stallings House.

The Brown Corridor segment (Alternatives 4, 11, and 16) would cross Old Baucom Road in the same location as the Teal Corridor segment. Its mainline alignment would follow a different path south of the Baucom-Stallings House, somewhat farther away—at its closest, it would be about ¼ mile away from the Baucom-Stallings House property. For these reasons, the Brown Corridor segment is unlikely to have notable effects, including noise, on the Baucom-Stallings House. Through consultation with the HPO, it was determined that the Brown Corridor segment would have No Effect on the Baucom-Stallings House.

None of the other DSAs under consideration (Alternatives 1, 2, 6-9, 13, and 14) would have any effects on this eligible historic site. In this vicinity, east of Auburn-Knightdale road, the other DSAs cross Rock Quarry Road using either the Green Corridor segment, Mint Green Corridor segment, or the Red Corridor segment. Right of way improvements with any of these other scenarios would begin about one mile west of the Baucom-Stallings House. Through consultation with the HPO, it was determined that these corridor segments would have No Effect on the Baucom-Stallings House.

2.4 Middle Creek School Park

The Orange Corridor segment (Alternatives 1-7 and 13-17) would directly affect a narrow strip of land at the extreme northern edge of Middle Creek School Park, as shown in Figure 17. The total affected area within this strip of land would total about 1.6 acres. The affected area is wooded open space along the northern edge of the Jamison Park neighborhood. This area connects to the main part of the Middle Creek School Park via a 200-foot wide strip of wooded open space extending about 2,400 feet along the center of the Jamison Park neighborhood, along the Camp Branch stream. There are no existing designated trails through either the strip along the north side of the neighborhood or through the strip through the center of the neighborhood. The Town of Cary's 2012 Parks, Recreational and Cultural Resources Master Plan does show a proposed greenway extending north from the main part of the park into the strip through the center of Jamison Park, but the plan map shows this proposed trail ending at Jamison Park Drive, about 1,700 feet south of the strip along the north side of the neighborhood.

There are no designated trails or other active recreational uses within the strip of land that would be affected by the Orange Corridor segment. In addition, the area that would need to be acquired for project right-of-way is nearly ½ mile away from the park's existing recreational facilities and over ¼ mile away from the northern limit of a planned greenway trail, which is the closest planned recreational feature in the park. The alternatives using the Orange Corridor segment are unlikely to directly affect existing or planned recreational uses in Middle Creek School Park. The shape of the northern strip of Middle Creek School Park and distance away from the park's existing and planned recreational features makes it unlikely that new recreational uses would be planned for this northern strip.

The northern strip's distance away from the existing and planned recreational uses also suggests that the visual and noise effects would be minimal. The northern strip can likely only be accessed from the strip through the center of Jamison Park, to the south, or from the backyards of the residential properties immediately to the south of the strip, so the Orange Corridor segment is unlikely to affect access to this area. The remainder of the park is accessed far to the south—the Orange Corridor segment would not affect this. Temporary construction impacts will affect the northern strip, but for the same reasons described above, these are not likely to directly affect the recreational uses in Middle Creek School Park. The Orange Corridor segment's effects on Middle Creek School Park may constitute a *de minimis* use under Section 4(f).

The remaining DSAs, which all use the Purple Corridor segment in this area (Alternatives 8-12), would completely avoid the Middle Creek School Park. These alternatives would follow an alignment about a mile away from the park.

2.5 Planned Sunset Oaks Park

As shown in Figure 18, the Purple Corridor segment (Alternatives 8-12) would cross the eastern section of this 78-acre planned park, directly affecting about 9.6 acres. It would also separate a remaining 4.5 acre section east of the new roadway from the remaining portion of the park west of the roadway. About 64 acres of the parcel would remain intact on the west side of the roadway. The Town of Holly Springs documented its concerns about the potential effects of the Purple Corridor segment on this planned park in an October 21, 2010, letter; a copy of this letter is in Attachment 4.

As this park has not yet been developed, the Purple Corridor segment would not impact any designated recreational uses. However, the Town of Holly Springs intends to develop the park with numerous recreational resources, including soccer fields and trails. The Town could likely still develop the park with these uses, but the space available for this would be reduced by about 18 percent. The park will likely be accessed via the Sunset Oaks neighborhood, directly north of the western side of the park parcel. For this reason, the Purple Corridor segment is unlikely to affect access to the park. There would be visual and noise effects on this parcel associated with the Purple Corridor segment, particularly immediately adjacent to the highway. However, because the primary plans for the park are for soccer fields, which are associated with crowd noise and ample lighting, these are not likely to have a notable negative effect on this recreational use. Temporary construction impacts will affect the eastern

portion of the park parcel, but the park may not be developed before the Complete 540 project is constructed.

The remaining DSAs, which all use the Orange Corridor segment in this area (Alternatives 1-7 and 13-17), would completely avoid the planned Sunset Oaks Park. These alternatives would follow an alignment about 1.5 miles away from the parcel.

2.6 White Deer Park – Planned Expansion Area

As shown in Figure 19, the Red Corridor segment (Alternatives 6 and 7) would cross the White Deer Park expansion parcel from west to east, directly affecting 9.4 acres of the parcel and leaving an isolated 12.2 acre section north of the new roadway. About 13.4 acres of the parcel would remain intact on the south side of the new roadway, where its connections to the existing White Deer Park and the Thompson Road Park would remain. The remaining 13.4 acres on the south side of the new roadway would continue to be able to be accessed via the existing White Deer Park to the south, but the 12.2 acres isolated on the north side could no longer be directly accessed via the existing park.

This parcel has not yet been developed, so the Red Corridor segment would not impact any designated recreational uses. However, the Town of Garner intends to develop the park with numerous nature-oriented recreational uses. Less than 40 percent of the original parcel would remain intact and directly accessible via the existing White Deer Park. While the parcel would still be developed with recreational uses, this direct effect on the parcel would notably limit the Town's ability to develop these uses at their intended scale.

The Red Corridor segment would also create a notable visual intrusion into this landscape that would negatively affect the nature-oriented quality of the planned recreational uses. The noise effects of the Red Corridor segment would also negatively affect this quality. Temporary construction impacts would also affect the parcel.

The remaining DSAs (Alternatives 1-5 and 8-17, which follow alignments south of Lake Benson, would completely avoid the White Deer Park expansion parcel. These alternatives would follow alignments more than three miles away from the parcel.

2.7 Planned Bryan Road Nature Park

As shown in Figure 20, the Red Corridor segment (Alternatives 6 and 7) would cross the planned Bryan Road Nature Park from west to east, directly affecting 5.7 acres and leaving 10.2 acres isolated on the north side of the new roadway and 4.2 acres isolated on the south side. The remaining 4.2 acres on the south side would retain direct access to Centennial Park to the south via the planned Mahler's Creek Greenway. It is likely that the planned park would be accessed via the Forest Landing neighborhood directly west of the park parcel. The Red Corridor segment would also directly affect much of this neighborhood, requiring 73 residential relocations. The Red Corridor segment would also negatively affect the ability to access the park parcel.

This parcel has not yet been developed, so the Red Corridor segment would not impact any designated recreational uses. However, the Town of Garner intends to develop the park with nature-oriented recreational uses, and the Wake County deed transfer to the Town for this parcel included a stipulation that the parcel must be developed as a nature park. Because the Red Corridor segment would leave two small, separated parcels, the Town is unlikely to be able to develop either of the remaining parcels with their intended uses.

The Red Corridor segment would also create a notable visual intrusion into this landscape that would negatively affect the nature-oriented quality of the planned recreational uses. The noise effects of the Red Corridor segment would also negatively affect this quality. Temporary construction impacts would also affect the parcel.

The remaining DSAs (Alternatives 1-5 and 8-17), which follow alignments south of Lake Benson, would completely avoid the planned Bryan Road Nature Park parcel. These alternatives would follow alignments more than three miles away from the parcel.

2.8 Clemmons Educational State Forest/Watershed Extension Loop Trail

Both the Brown Corridor segment (Alternatives 4, 11, and 16) and the Tan Corridor segment (Alternatives 3, 10, and 15) would directly affect small areas at the northwest corner of the Clemmons Educational State Forest. However, as described in Section 1.8 of this appendix, Section 4(f) would only apply to the Watershed Extension Loop trail, and not the Clemmons Educational State Forest property overall. As shown in Figure 21, the Brown Corridor segment (Alternatives 4, 11, and 16) would directly affect about 500 feet of the 3-mile long Watershed Extension Loop trail at its westernmost reach, but it would not affect any of the other trails within the forest or access to any trails. None of the other corridor segments would affect any of the forest trails. All of the corridors for Complete 540 are over a mile away from the main educational and other facilities in Clemmons, which are all located on the east side of the forest.

The correspondence from the Forest Service included in Attachment 3 indicates the importance of the Watershed Extension Loop trail to Clemmons and expresses concern about the potential effects of the Complete 540 project on the Clemmons trail. While the Brown Corridor segment would affect the Watershed Extension Loop trail, its impacts would be limited to a relatively small section at the far northwest

corner of the trail. There would also likely be opportunities to modify and/or reconstruct the trail so that visitors could continue to use the full length of the trail.

The Tan Corridor segment (Alternatives 5, 12, and 17) avoids all of the trails in the forest and is about 1,200 feet away from the northwestern corner of the Watershed Extension Loop trail. Given the wooded nature of this area, the new roadway likely would not be visible from the trail under this scenario, but this scenario would likely increase noise in the northwest corner of the trail. However, there are other roadways nearby (Old Baucom Road and Rock Quarry Road) that may currently create traffic noise in this area.

The remaining DSAs would follow either the Teal, Green, Mint Green or Red Corridor segments in this area. None of these corridor segments would directly affect the Clemmons Educational State Forest or any of its trails. The Teal Corridor segment (Alternatives 5, 12, and 17) would cross an area about 800 feet away from the northwestern corner of the Watershed Extension Loop trail. Like the Tan Corridor, given the wooded nature of this area, the new roadway likely would not be visible from the trail under this scenario, but this scenario would likely increase noise in the northwest corner of the trail. However, there are other roadways nearby (Old Baucom Road and Rock Quarry Road) that may currently create traffic noise in this area. DSAs following the Green, Mint Green, or Red Corridor segments (Alternatives 1, 2, 6-9, 13, and 14) would be over a mile away from the northwestern corner of the Watershed Extension Loop trail and over two miles away from any of the other trails in the Clemmons Educational State Forest.

2.9 Neuse River Trail

The Neuse River Trail completely crosses the Complete 540 study area. For this reason, all of the DSAs cross the trail, each crossing on either the Green, Mint Green, Tan, or Brown Corridor segment. DSAs using the Green Corridor segment in the vicinity of the Neuse River (Alternatives 1, 6, 8, and 13) would cross the trail on the same bridge that would cross the Neuse River, as shown in Figure 22. As shown in Figures 23 and 24, for DSAs using the Mint Green Corridor segment (Alternatives 2, 7, 9, and 14) or Tan Corridor segment (Alternatives 3, 10, and 15) in this area, the trail would be accommodated under the new road with an appropriately-sized box culvert to accommodate the trail.

DSAs using the Brown Corridor segment in this area, including DSAs that connect to Brown via the Teal Corridor segment (Alternatives 4, 5, 11, 12, 16, and 17), would affect the trail in two places, as shown in Figure 25. These options would cross the existing trail where it parallels Old Baucom Road and would also affect the existing trail where it parallels Brownfield Road. However, the existing trail could be modified as part of the project design to maintain public use of the trail, avoiding any permanent changes to trail use. The trail could be reconfigured to cross under the new roadway in a culvert or could follow Brownfield Road northward to Battle Bridge Road, which it could then follow to cross under 540 in conjunction with the bridges at this location. In either of these options the trail would be located east of 540 with a connection back to the current trail alignment along Old Baucom Road east of the 540 interchange.

There would be temporary construction impacts on the trail under any of these scenarios, but after construction, the trail will continue to function exactly as it currently functions and would follow the same alignment. None of these options would permanently affect any access point to the trail. Any of these options would generate traffic noise and would be visible from the trail; however, there are existing portions of the trail that are adjacent to existing roadways, cross existing roadway, or extend through areas with unsightly features such as wastewater treatment facilities, so these effects would not create unusual conditions along the Neuse River Trail. The effects of any of the DSAs may constitute a *de minimis* use under Section 4(f).

2.10 Summary

Table 1 (on the following page) summarizes the potential effects of the Complete 540 DSAs on the Section 4(f) resources in the vicinity of the DSAs. Alternatives 6 and 7, which use the Red Corridor segment, would each directly affect four of these resources: the Dr. L. J. Faulhaber Farm, the Bryan Farms Historic District, and White Deer Park Expansion Area, and the planned Bryan Road Nature Park. All of the DSAs using the Purple Corridor segment (Alternatives 8-12) would directly affect the planned Sunset Oaks Park. All of the DSAs using the Tan Corridor segment (Alternatives 3, 10, and 15) would directly affect the Baucom-Stallings House. All of the DSAs using the complete Brown Corridor segment (Alternatives 4, 11, and 16) would directly affect the Watershed Extension Loop trail in the Clemmons Educational State Forest. All of the DSAs except those using the Purple Corridor segment (Alternatives 1-7 and 13-17) would have a small effect on the Middle Creek School Park, but this may constitute a *de minimis* use.

3. AVOIDANCE AND MEASURES TO MINIMIZE HARM

3.1 Dr. L. J. Faulhaber Farm

The Red Corridor segment is under consideration at the direction of the Federal Highway Administration (FHWA) and the US Army Corps of Engineers (USACE) because, based on preliminary information available in the early stages of the Com-

Table 1. Potential Effects on Section 4(f) Resources by Detailed Study Alternative

Detailed Study Alternative	Section 4(f) Resource								
	Dr. L. J. Faulhaber Farm	Bryan Farms Historic District	Baucom-Stallings House	Middle Creek School Park	Planned Sunset Oaks Park	White Deer Park Expansion Area	Planned Bryan Road Nature Park	Watershed Extension Loop Trail (Clemmons)	Neuse River Trail
1				DM?					DM?
2				DM?					DM?
3			X	DM?					DM?
4				DM?				DM?	DM?
5				DM?					DM?
6	X	X		DM?		X	X		DM?
7	X	X		DM?		X	X		DM?
8					X				DM?
9					X				DM?
10			X		X				DM?
11					X			DM?	DM?
12					X				DM?
13				DM?					DM?
14				DM?					DM?
15			X	DM?					DM?
16				DM?				DM?	DM?
17				DM?					DM?

NOTES: X = Likely Section 4(f) use; DM? = Possible *de minimis* use.

plete 540 study, this option appeared to affect a smaller total amount of wetlands than other options under consideration. In addition, DSAs using this corridor segment are the only DSAs under consideration that avoid habitat important for survival of the federally endangered dwarf wedgemussel.

The sheer number of Section 4(f) sites along the Red Corridor segment (Alternatives 6 and 7) presented a major challenge in trying to modify this alignment so that it would both avoid all of these sites but still retain the potential to minimize wetland impacts and to avoid important dwarf wedgemussel habitat. Early in the study, a modified version of the Red Corridor segment, known as the Red Modified Corridor segment, was developed to avoid the two Section 4(f) park sites in this area (White Deer Park expansion parcel and planned Bryan Road Nature Park). It was subsequently found that the Red Modified Corridor segment had such numerous design constraints that it was not a feasible alternative. At the time the Red Modified Corridor segment was developed, the HPO had not yet determined the NRHP eligibility of the two historic sites in this area (Dr. L. J. Faulhaber Farm and Bryan Farms Historic District), but further modifications to the Red Modified Corridor segment to avoid these sites as well as the two park sites would have been even less feasible. A detailed explanation of the development and evaluation of the Red Modified Corridor segment is in the project's Alternatives Development and Analysis Report. Shifting the Red Corridor segment to avoid the Faulhaber Farm would also create impacts for other historic resources that are currently not impacted by the project.

All of the other DSAs under consideration (Alternatives 1-5 and 8-17) would completely avoid affecting the Dr. L. J. Faulhaber Farm, representing avoidance alternatives for this resource.

3.2 Bryan Farms Historic District

For the same reasons described for the Dr. L. J. Faulhaber Farm, it would not be feasible for an alignment in this part of the study area to avoid the Bryan Farms Historic District, while also avoiding the three other Section 4(f) resources in this area. While alignment modifications at Bryan Farms are possible to either avoid or minimize impacts to this resource, shifting the alignment shift to avoid this site would increase residential impacts and relocations. All of the other DSAs under consideration (Alternatives 1-5 and 8-17) would completely avoid affecting the Bryan Farms Historic District, representing avoidance alternatives for this resource.

3.3 Baucom-Stallings House

There are numerous corridor segments under consideration in this immediate area. While the Tan Corridor segment (Alternatives 3, 10, and 15) would affect this site, DSAs using any of the other corridor segments in this area would completely avoid affecting the Baucom-Stallings House, representing avoidance alternatives for this resource. Shifts in the alignment of the Tan Corridor segment to avoid the site to the east would not be feasible because these would further encroach into the Clemmons Educational State Forest, would require a skewed interchange, and potentially could require impacts to a landfill. Shifting far enough to the east to avoid the landfill is the Brown Corridor segment. Alignment shifts to the west could be accommodated to avoid this site but impacts to existing residential areas would be increased.

3.4 Middle Creek School Park

All of the DSAs except those using the Purple Corridor segment (Alternatives 8-12), which are avoidance alternatives for this resource, would affect the small strip of land at the far northern edge of the park. In the affected area, there is extensive residential development both north and south of the preliminary right-of-way within the Orange Corridor segment. Shifting the alignment in this area would result in additional residential relocations. As documented in the project's Alternatives Development and Analysis Report, a very large number of potential alignments were considered during the early stages of the study. This included other alignments farther west than the Purple Corridor segment, but none of these alignments was found to be reasonable or feasible.

If one of the DSAs affecting this area is selected as the Preferred Alternative, efforts could be taken during final design to minimize the impact to the park property to the greatest extent possible. As described in Section 2.4, any Section 4(f) use of this resource will likely be found to be *de minimis*.

3.5 Planned Sunset Oaks Park

There is extensive residential development surrounding the planned Sunset Oaks Park area, and this area also includes extensive streams and wetlands in and around Middle Creek. It would not be feasible to shift the alignment of the Purple Corridor segment (Alternatives 8-12) in this area to completely avoid the park parcel and avoid major design constraints without requiring notably more residential relocations and increasing effects on streams and wetlands.

All of the other DSAs under consideration (Alternatives 1-7 and 13-17) would completely avoid affecting the Planned Sunset Oaks Park, representing avoidance alternatives for this resource. If one of the DSAs affecting this area is selected as the Preferred Alternative, efforts could be taken during final design to minimize the impact to the park property to the greatest extent possible.

3.6 White Deer Park – Planned Expansion Area

As described above, the Red Corridor segment is under consideration because, based on preliminary information available in the early stages of the Complete 540 study, this option appeared to affect a smaller total amount of wetlands than other options under consideration. In addition, DSAs using this corridor segment are the only DSAs under consideration that avoid habitat important for survival of the federally endangered dwarf wedgemussel.

As described in the project's Alternatives Development and Analysis Report, a modified version of the Red Corridor segment, known as the Red Modified Corridor segment, was developed to avoid the White Deer Park expansion parcel and planned Bryan Road Nature Park, while also avoiding the numerous other parks and community facilities in the area. It was subsequently found that the Red Modified Corridor segment had such numerous design constraints that it was not a feasible alternative. Further modifications to the Red Modified Corridor segment to avoid the two NRHP-eligible sites in this area as well as the two park sites would have been even less feasible.

All of the other DSAs under consideration (Alternatives 1-5 and 8-17) would completely avoid affecting the White Deer Park expansion parcel, representing avoidance alternatives for this resource.

3.7 Planned Bryan Road Nature Park

For the same reasons described for the White Deer park expansion parcel, it would not be feasible for an alignment in this part of the study area to avoid the planned Bryan Road Nature Park, while also avoiding the three other Section 4(f) resources in this area. All of the other DSAs under consideration (Alternatives 1-5 and 8-17) would completely avoid affecting the planned Bryan Road Nature Park, representing avoidance alternatives for this resource.

3.8 Clemmons Educational State Forest – Watershed Extension Loop Trail

There are numerous corridor segments under consideration in this immediate area around the forest. The Brown Corridor segment (Alternatives 4, 11, and 16) is the only option that would directly affect the Watershed Extension Loop trail in the Clemmons Educational State Forest. DSAs using any of the other corridor segments in this area (Alternatives 1-3, 5-10, 12-15, and 17) would completely avoid direct effects on the trail, representing avoidance alternatives for this resource.

A westward shift in the alignment of the Brown Corridor segments to avoid the Watershed Extension Loop trail would result in increased stream impacts. Reconfiguring the trail would help to mitigate the effects of the Brown Corridor segment. If one of the DSAs following the Brown Corridor segment is selected as the Preferred Alternative, efforts could be taken during final design to minimize the impact to the Clemmons trail to the greatest extent possible. NCDOT and FHWA will continue to coordinate with the North Carolina Forest Service in an effort to minimize/mitigate potential impacts to the Watershed Extension Loop trail so that the effects of DSAs 4, 11, and 16 may constitute a *de minimis* impact.

3.9 Neuse River Trail

Due to the location of the Complete 540 project and its eastern terminus at US 64/ US 264 Bypass (I-495) and the fact that the Neuse River Trail follows the Neuse River for almost 30 miles in eastern Wake County, it is not possible for this project to completely avoid the trail. However, under any of the DSAs, the trail would be modified or reconfigured to allow continued recreational use of the trail—there would not be any permanent negative effect on continued recreational use of the trail. While the visual effects of the new roadway on the trail could be mitigated during final design and construction, it is important to note that there are existing portions of the trail that are adjacent to existing roadways, cross other roadways, or extend through areas with unsightly features such as wastewater treatment facilities. For this reason, the presence of 540 in this area would not create unusual conditions along the Neuse River Trail.

3.10 Summary

As explained previously, Section 4(f) states that the US Department of Transportation may not approve the use of land from a significant publicly owned park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless at determination is made that:

- There is no feasible and prudent alternative to the use of land from the property; and
- The action includes all possible planning to minimize harm to the property resulting from such use.

None of the DSAs under consideration for the Complete 540 project completely avoid use of all of the resources in the study area subject to Section 4(f). However, as shown in Table 1, there are potentially multiple DSAs that may result only in Section 4(f) uses that do not exceed *de minimis* impacts and, therefore, do not require the development and evaluation of a total avoidance alternative or a least overall harm analysis.

4. COORDINATION

A complete discussion of coordination with agency stakeholders, local governments, and the public to date over the course of the Complete 540 project is in the project's Stakeholder Involvement Report. This information is summarized in Chapter 6 of this Draft EIS. Details about the coordination with the HPO with regard to historic properties are in the project's Historic Architectural Resources Survey Report.

Due to the large size of the project study area and the number of DSAs under consideration, several meetings were held over the course of the project with the HPO to identify sites in the project area eligible for the NRHP. A subsequent meeting was then held with the HPO on December 2, 2014 to determine the potential effects of the DSAs on the listed and eligible historic sites. The conclusion of this process was the Concurrence Form for Assessment of Effects completed by NCDOT, FHWA, and the HPO on December 10, 2014; a copy of the form is in Attachment 1.

Coordination with the local governments that manage Middle Creek School Park (Town of Cary), the planned Sunset Oaks Park (Town of Holly Springs), the Neuse

River Trail (City of Raleigh) and White Deer Park and the planned Bryan Road Nature Park (Town of Garner) has been through the project's formal scoping process, public meetings, Interagency Meetings, meetings of the Complete 540 Working Group, and informal small group meetings. The Town of Holly Springs documented its concerns about the potential effects of the Purple Corridor segment on this planned park in the October 21, 2010, letter in Attachment 4. The Town of Garner document its concerns about the potential effects of the Red Corridor segment on the White Deer Park expansion parcel and the planned Bryan Road Nature Park in the January 9, 2012, letter in Attachment 2.

To date, coordination with the North Carolina Forest Service on the Clemmons Educational State Forest has been via telephone conversations and informal correspondence. The Forest Service documented its concerns about the potential effects of Complete 540 project alternatives on the forest in the May 2015 letters in Attachment 3.

5. NEXT STEPS

Additional steps will be taken to determine whether the potential effects on Middle Creek School Park and the Neuse River Trail by various DSAs constitute *de minimis* use. For these recreational resources, a determination of *de minimis* may be made when all three of the following criteria are satisfied:

1. FHWA must determine that the transportation use of the Section 4(f) resource, together with any impact avoidance, minimization, and mitigation or enhancement measures incorporated into the project, does not adversely affect the activities, features, and attributes that qualify the resource for protection under Section 4(f);

2. The public has been afforded an opportunity to review and comment on the effects of the project on the protected activities, features, and attributes of the Section 4(f) resource; and

3. The official(s) with jurisdiction over the property are informed of FHWA's intent to make the *de minimis* impact determination based on their written concurrence that the project will not adversely affect the activities, features, and attributes that qualify the property for protection under Section 4(f).

The public will have the opportunity to review and comment on the potential effects of the DSAs on these resources following publication of the Draft EIS, by reviewing the document, and at public hearings to be held after publication of the document. NCDOT and FHWA will then complete coordination with the officials with jurisdiction over these properties to make the *de minimis* impact determination. These steps will be documented in the project's Final EIS.

The results of this Section 4(f) evaluation and the subsequent *de minimis* impact determination will play a role in the selection of the Preferred Alternative for the Complete 540 project. Selection of the Preferred Alternative will also be documented in the Final EIS.

FIGURES

Figure 1
Potential Section 4(f) Properties

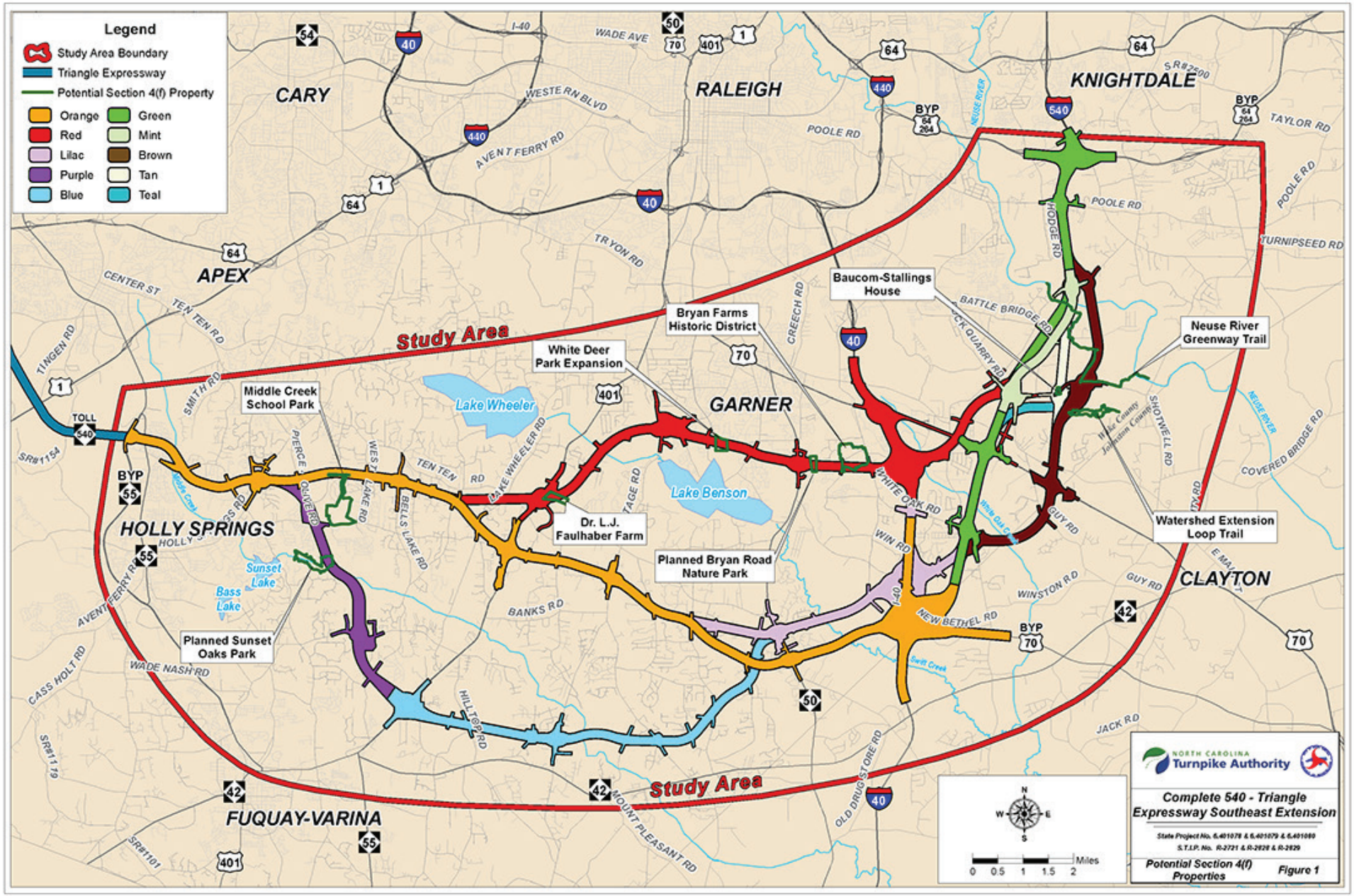
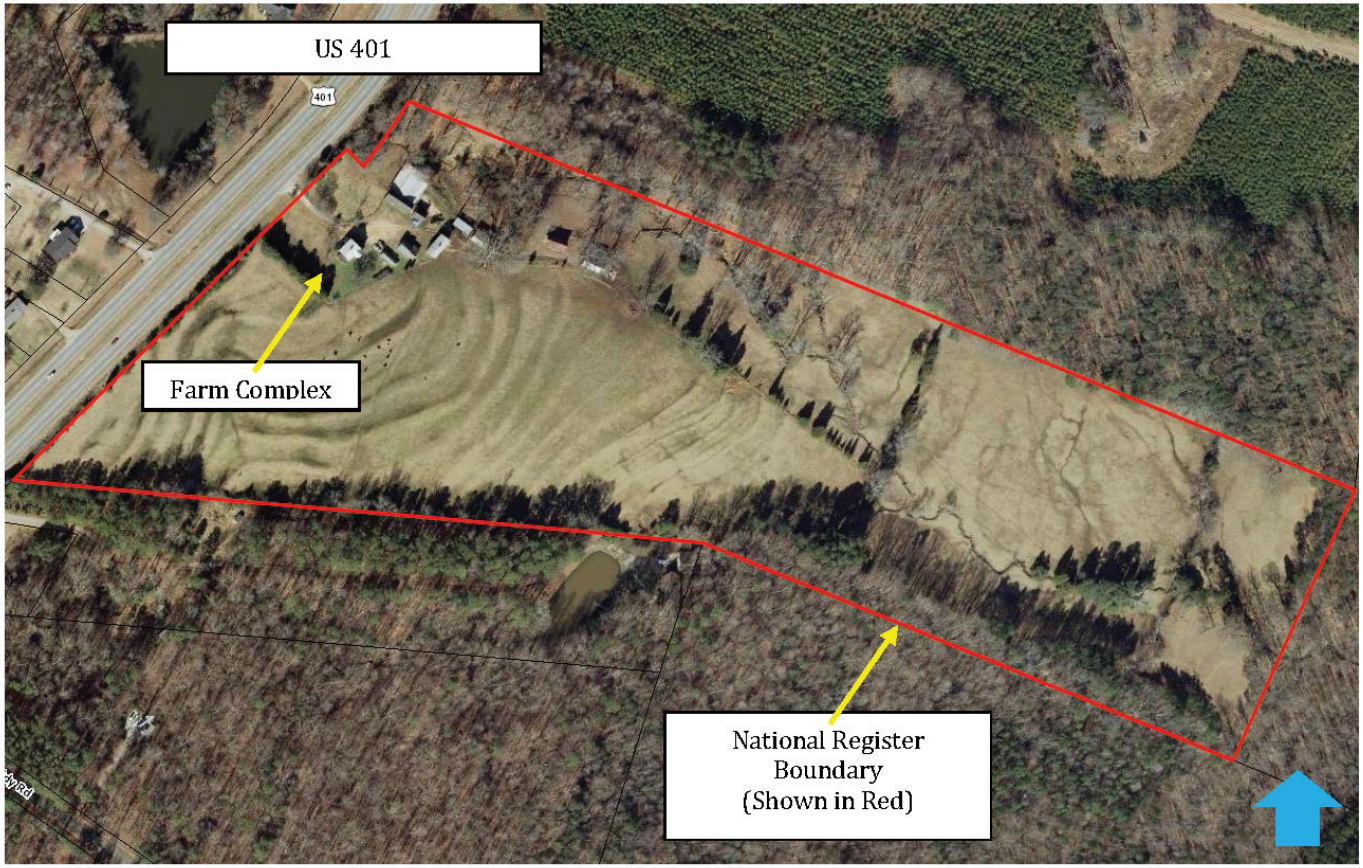


Figure 2

Dr. L. J. Faulhaber Farm
National Register Boundary



Source: Wake County Tax Map

Scale: 1" = 400'

Figure 3

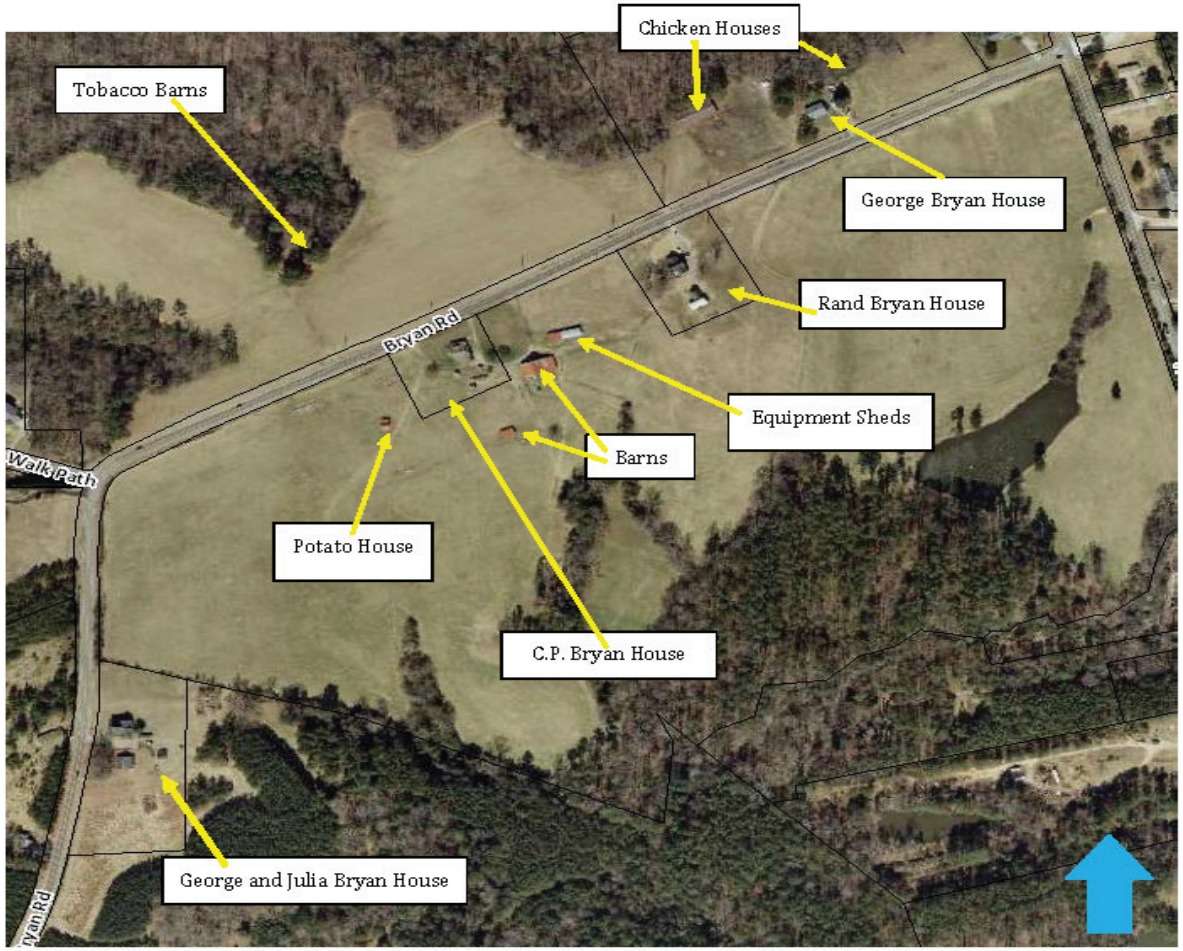
Bryan Farms Historic District
National Register Boundary

Source: Wake County Tax Map

Scale: 1" = 1,000'

Figure 4

Bryan Farms Historic District
Site Plan



Source: Wake County Tax Map

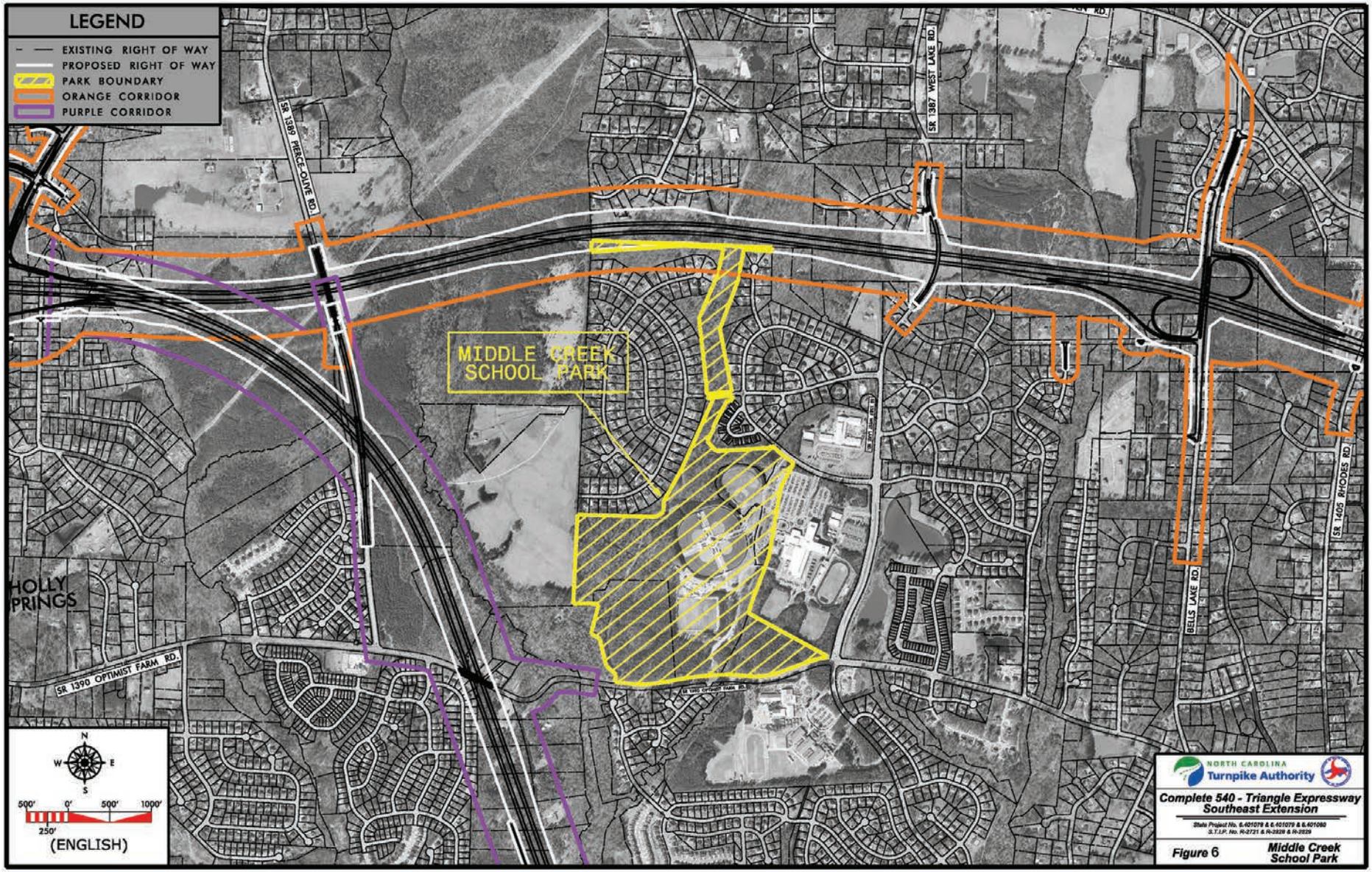
Scale: 1" = 500'

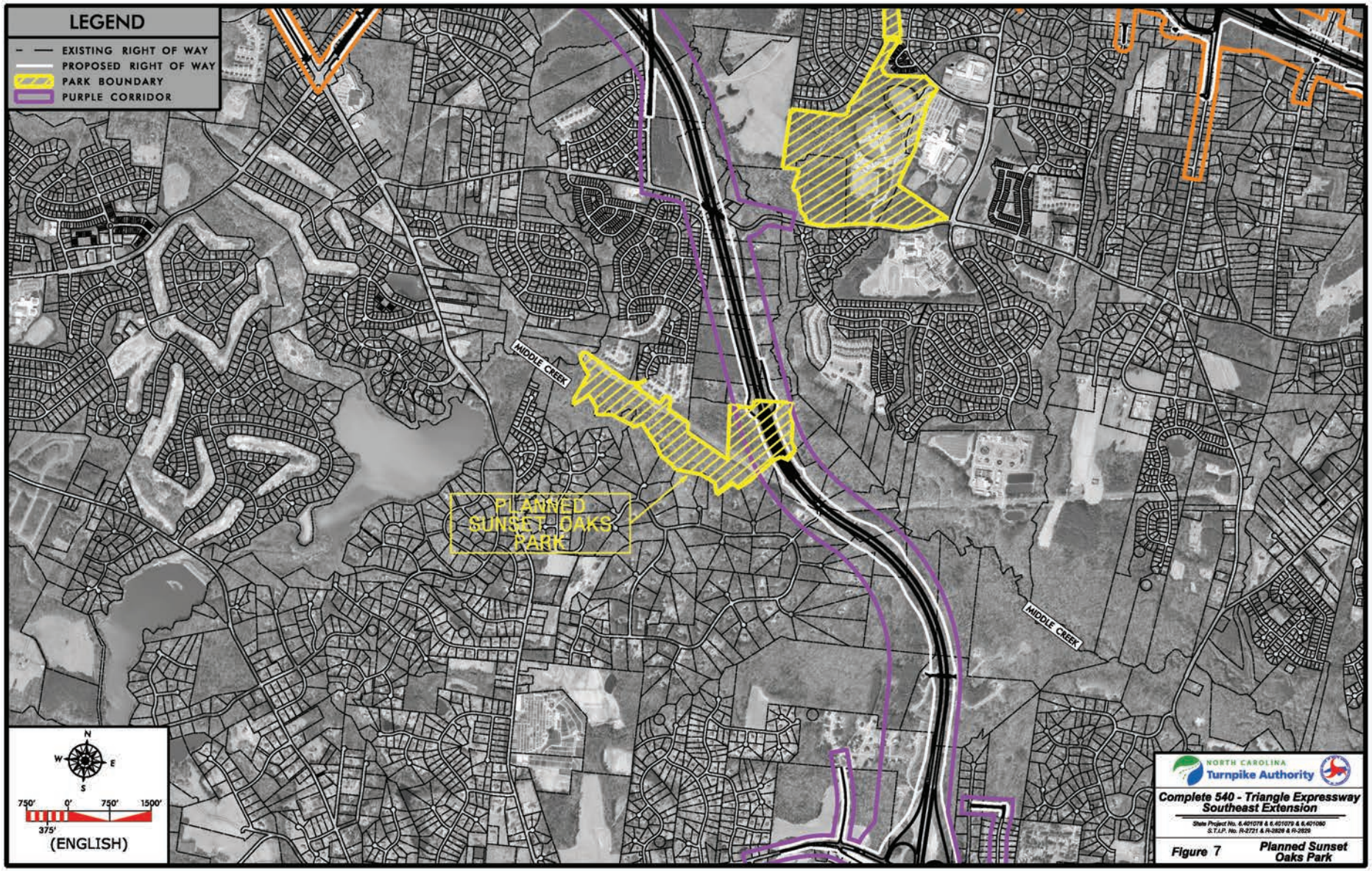
Figure 5

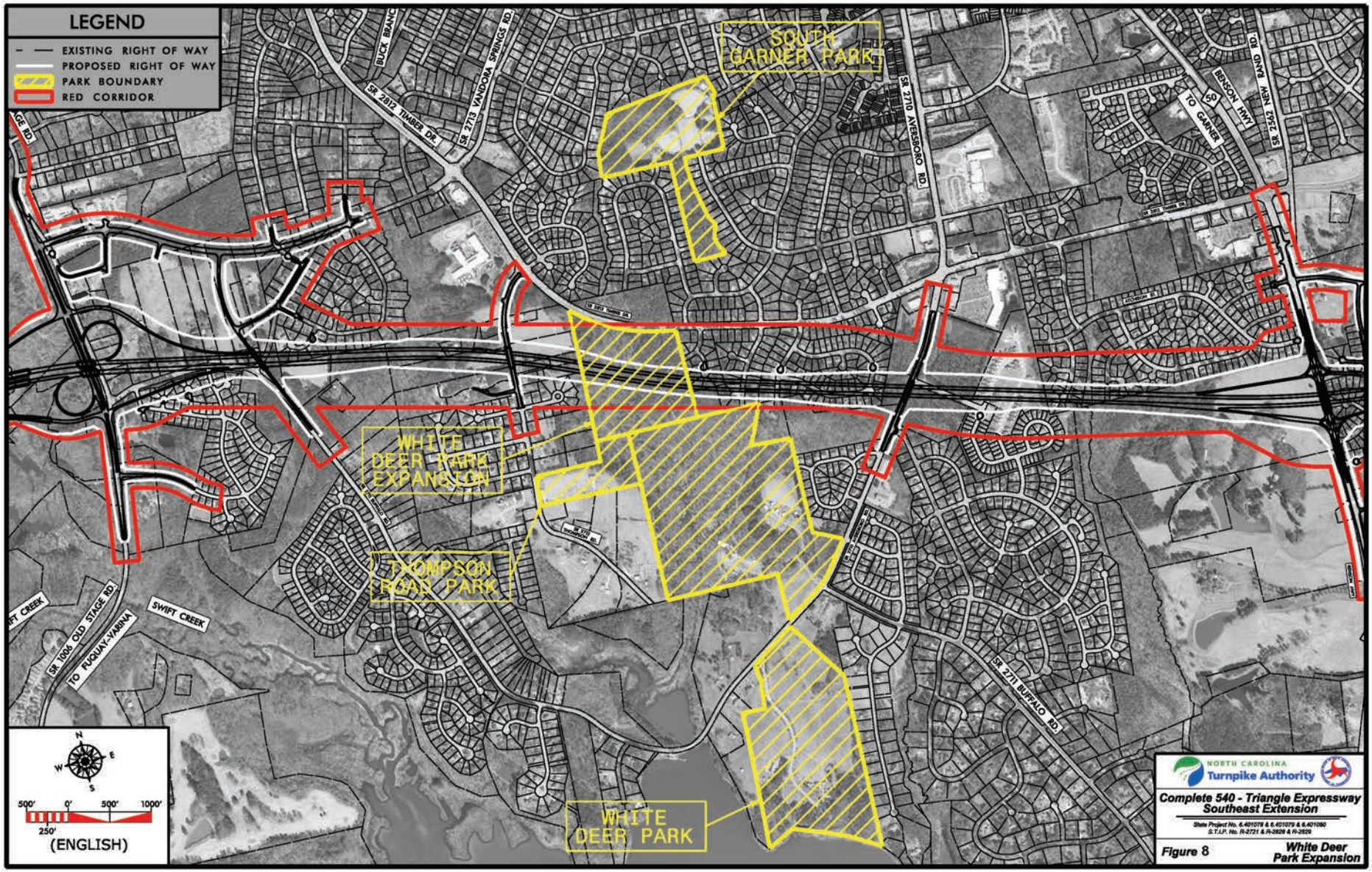
Baucom-Stallings House
National Register Boundary

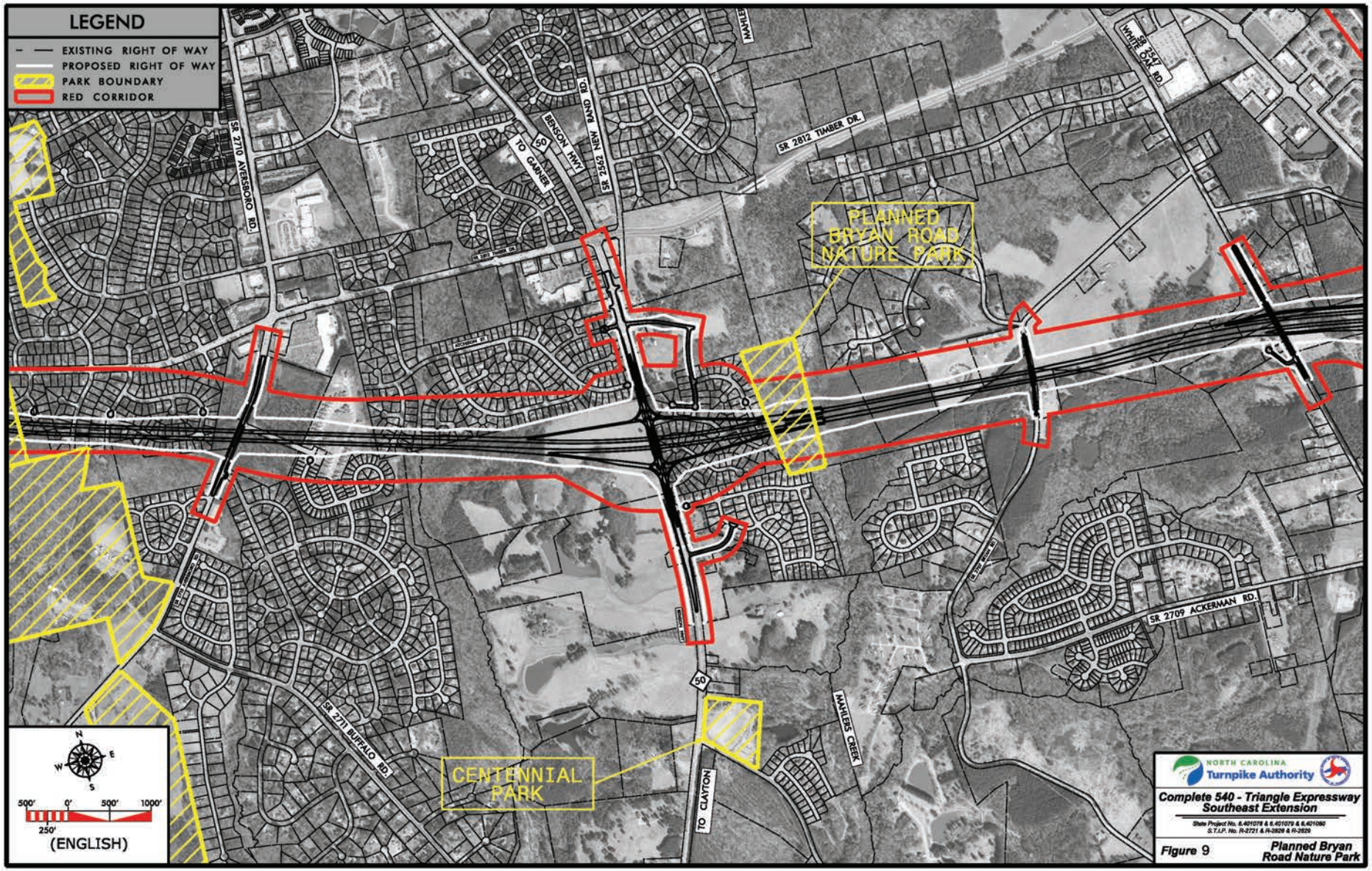
Source: Wake County Tax Map

Scale: 1" = 300'


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
ORANGE CORRIDOR
PURPLE CORRIDOR
MIDDLE CREEK SCHOOL PARK
SR 1389 PIERCE OLIVE RD.
SR 1387 WEST LAKE RD.
SR 1405 RHODES RD.
BELLS LAKE RD.
SR 1390 OPTIMIST FARM RD.
HOLLY SPRINGS
N
W
E
S
500' 0' 500' 1000'
250'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 6
Middle Creek School Park


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
PURPLE CORRIDOR
MIDDLE CREEK
PLANNED SUNSET OAKS PARK
MIDDLE CREEK
N
W
E
S
750' 0' 750' 1500'
375'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
State Project No. 6.401078 & 6.401079 & 6.401080
S.T.I.P. No. R-2721 & R-2828 & R-2829
Figure 7
Planned Sunset Oaks Park


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
RED CORRIDOR
SOUTH GARNER PARK
WHITE DEER PARK EXPANSION
THOMPSON ROAD PARK
WHITE DEER PARK
BUCK BRANCH
SR 2812 TIMBER DR.
SR 2713 VANDORA SPRINGS RD.
SR 2710 AVERSBORO RD.
BENSON HWY
TO GARNER
SR 2542 NEW BANG RD.
SR 1008 OLD STAGE RD.
TO FUQUAY-VARINA
SWIFT CREEK
SR 2711 BUFFALO RD.
500' 0' 500' 1000'
250'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 8
White Deer Park Expansion


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
RED CORRIDOR
PLANNED BRYAN ROAD NATURE PARK
CENTENNIAL PARK
SR 2710 AVERSBORO RD.
BENSON HWY
TO GARNER
SR 2542 NEW RAND RD.
SR 2812 TIMBER DR.
SR 2547 WHITE OAK RD.
SR 2709 ACKERMAN RD.
SR 2711 BUFFALO RD.
MAHLERS CREEK
TO CLAYTON
50
N
E
S
W
500' 0' 500' 1000'
250'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 9
Planned Bryan Road Nature Park

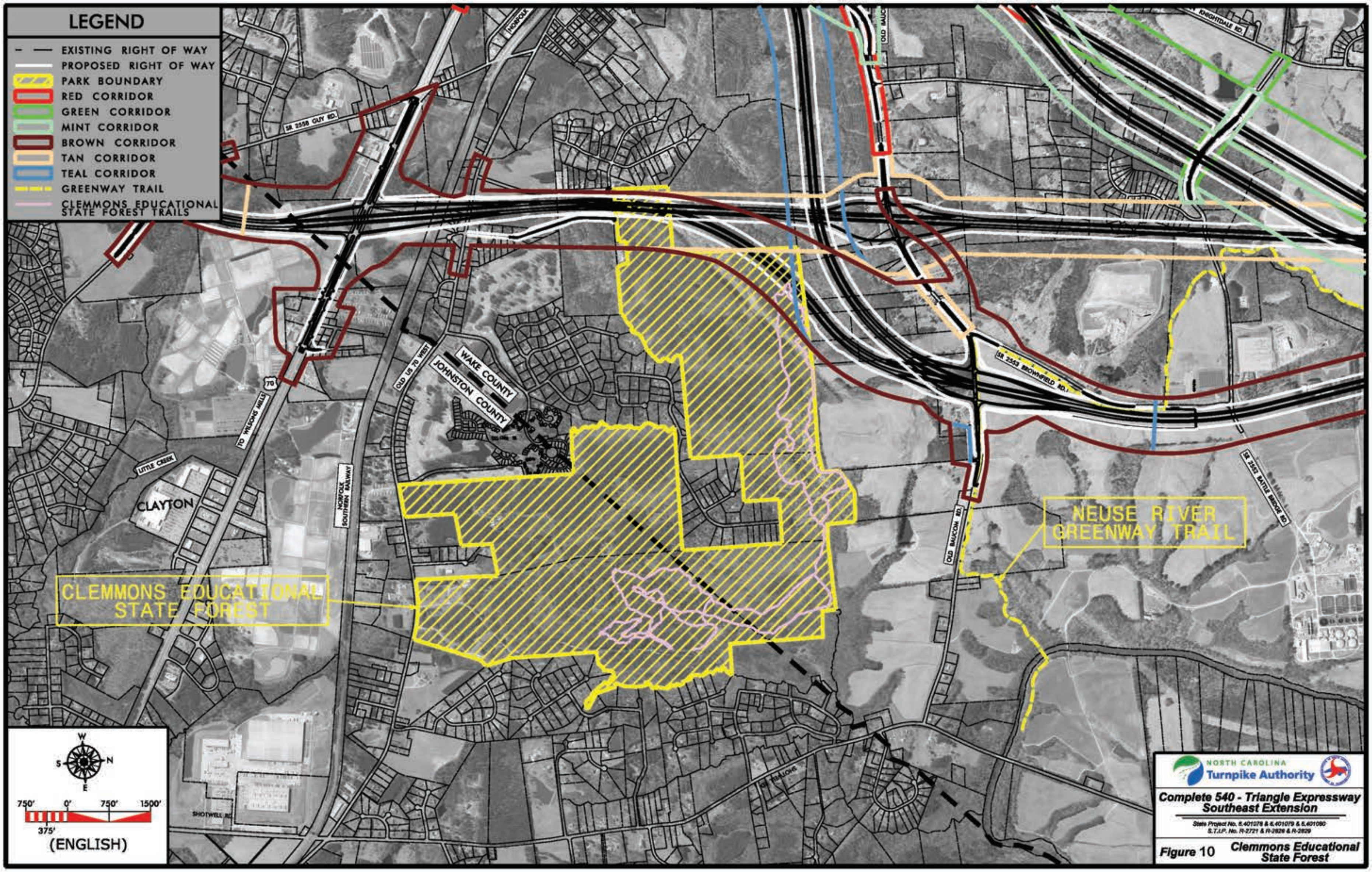
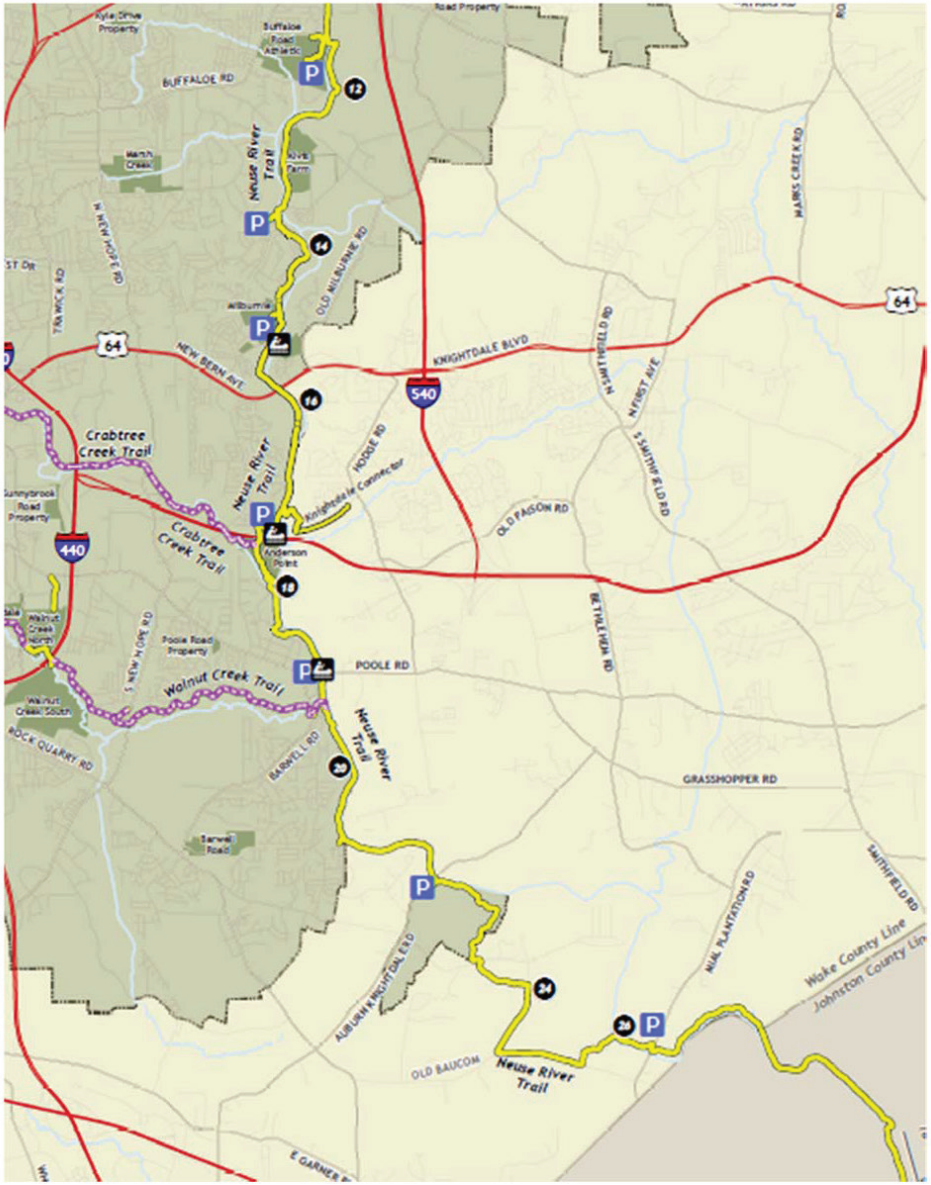

LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
RED CORRIDOR
GREEN CORRIDOR
MINT CORRIDOR
BROWN CORRIDOR
TAN CORRIDOR
TEAL CORRIDOR
GREENWAY TRAIL
CLEMMONS EDUCATIONAL STATE FOREST TRAILS
CLEMMONS EDUCATIONAL STATE FOREST
NEUSE RIVER GREENWAY TRAIL
WAKE COUNTY
JOHNSTON COUNTY
CLAYTON
OLD US 70 WEST
NORFOLK SOUTHERN RAILWAY
OLD BAUCOM RD.
SR 2553 BROWNFIELD RD.
SR 2558 GUY RD.
750' 0' 750' 1500'
375'
(ENGLISH)
NORTH CAROLINA
Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 10
Clemmons Educational State Forest

Figure 11

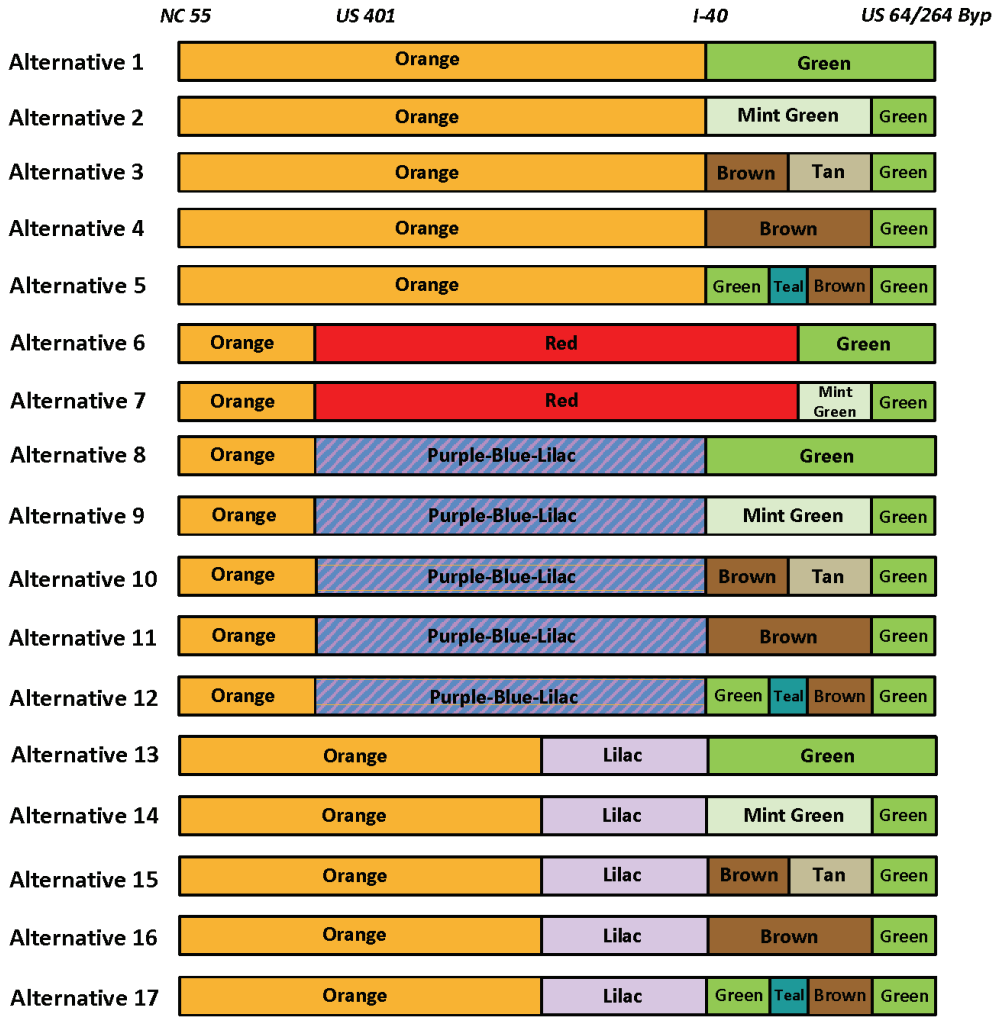
Neuse River Trail

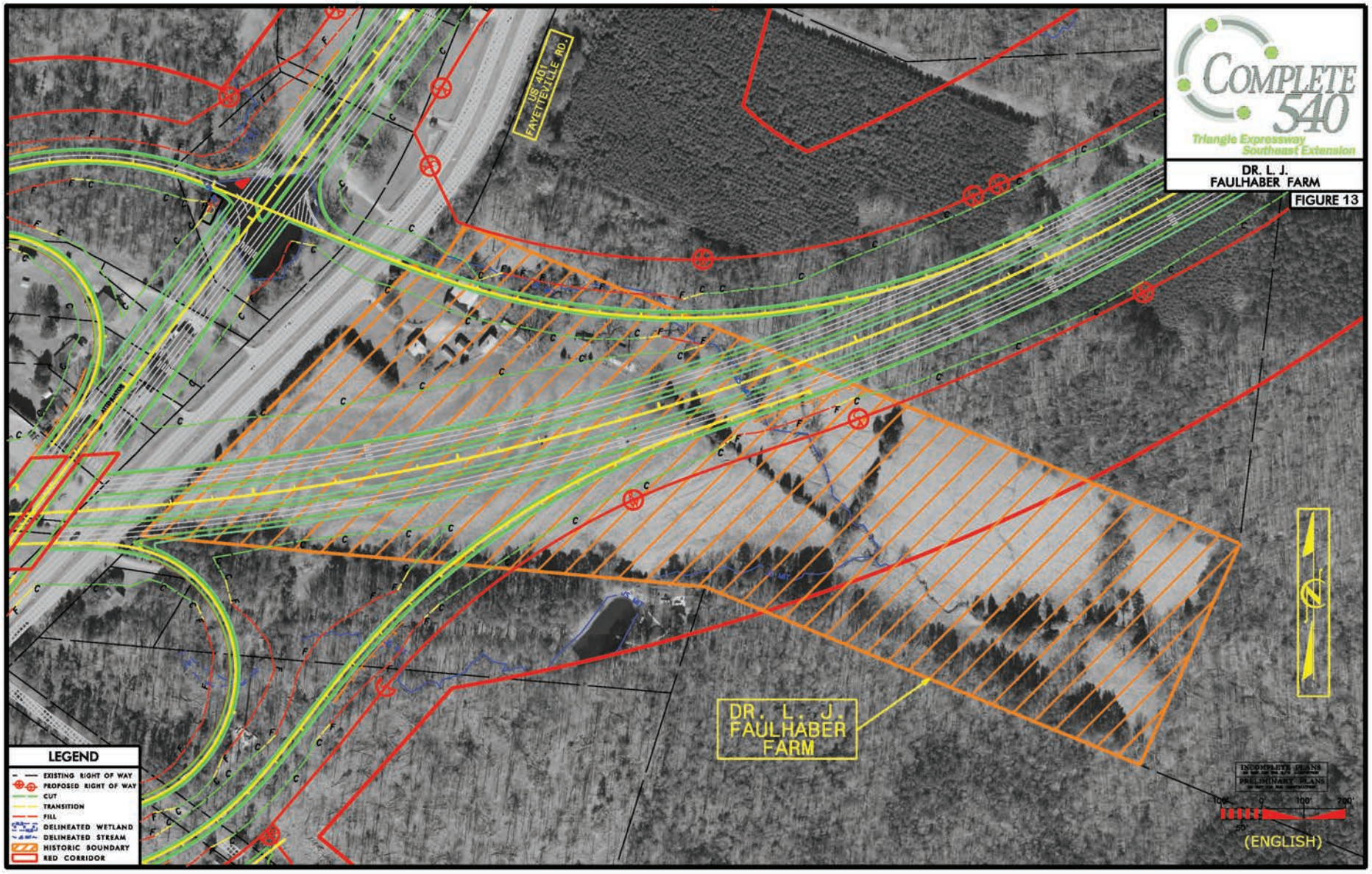


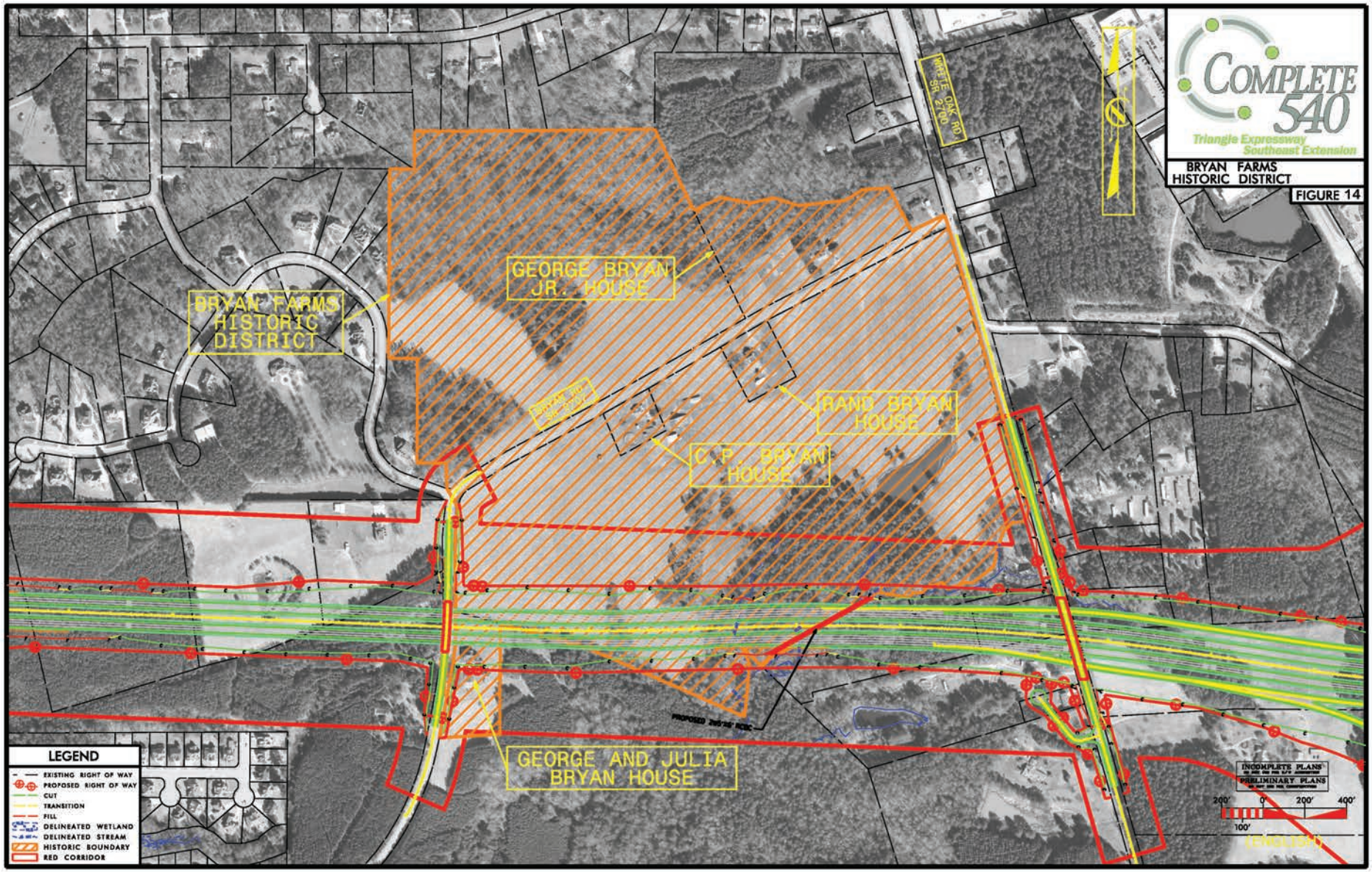
Source: City of Raleigh

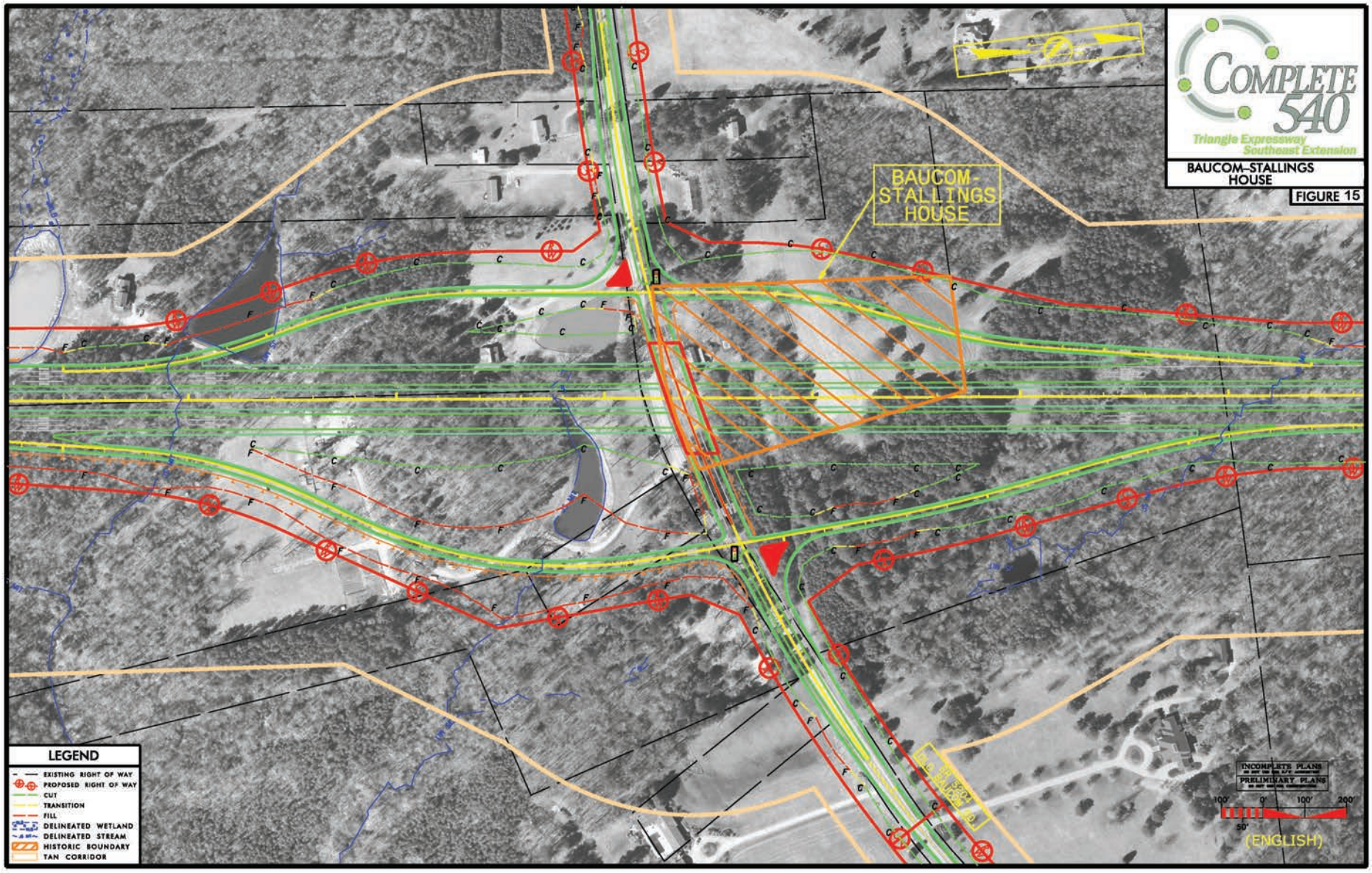
Figure 12
Guide to Detailed Study Alternatives

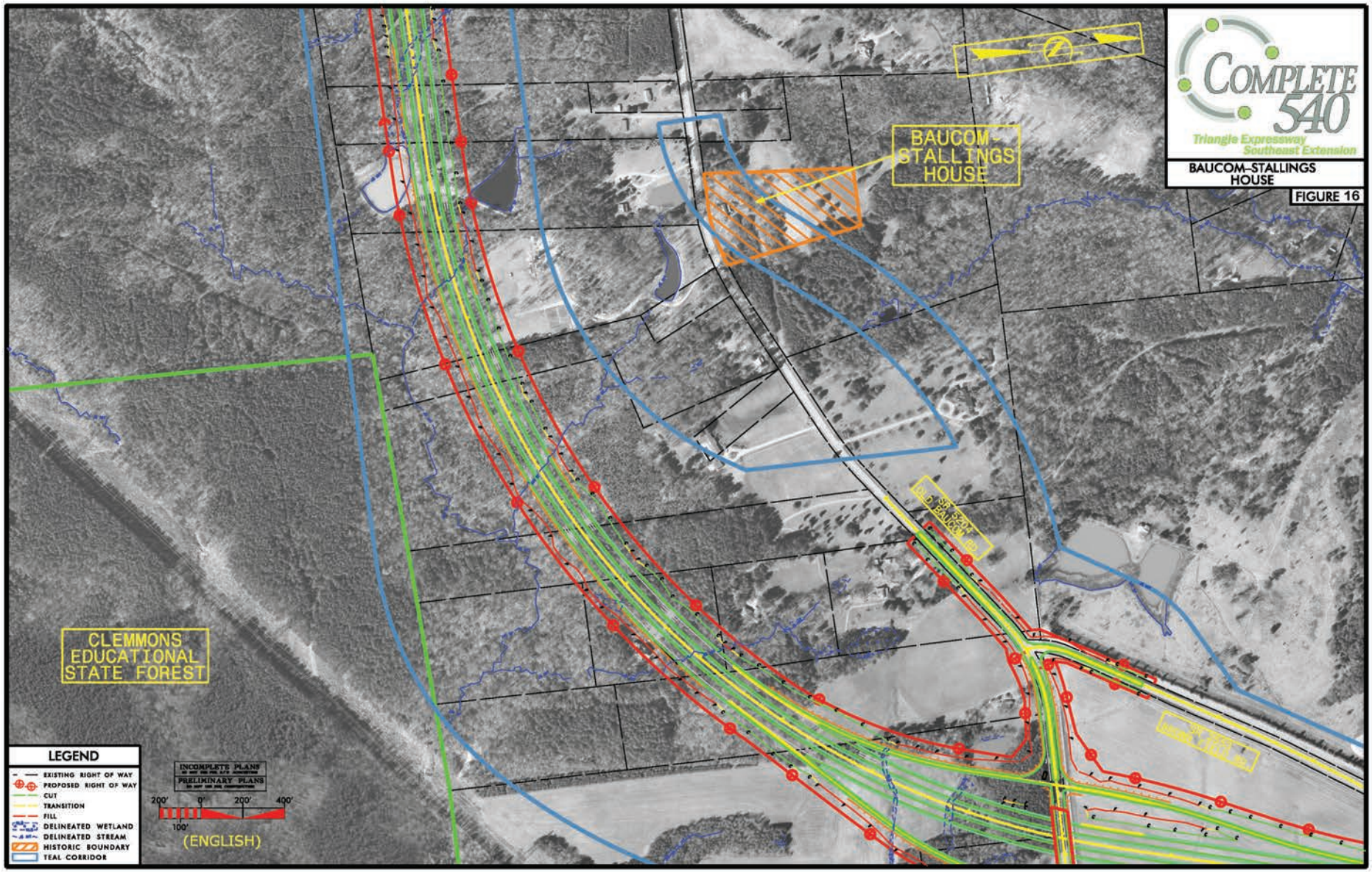
The color-coded alternative corridor segments under detailed study can be combined in various ways to form complete alternative routes connecting the two ends of the project – NC 55 in Apex and the US 64/US 264 Bypass in Knightdale. These combinations create seventeen possible alternative routes for a new location roadway for the Complete 540 project. The guide below illustrates these combinations:

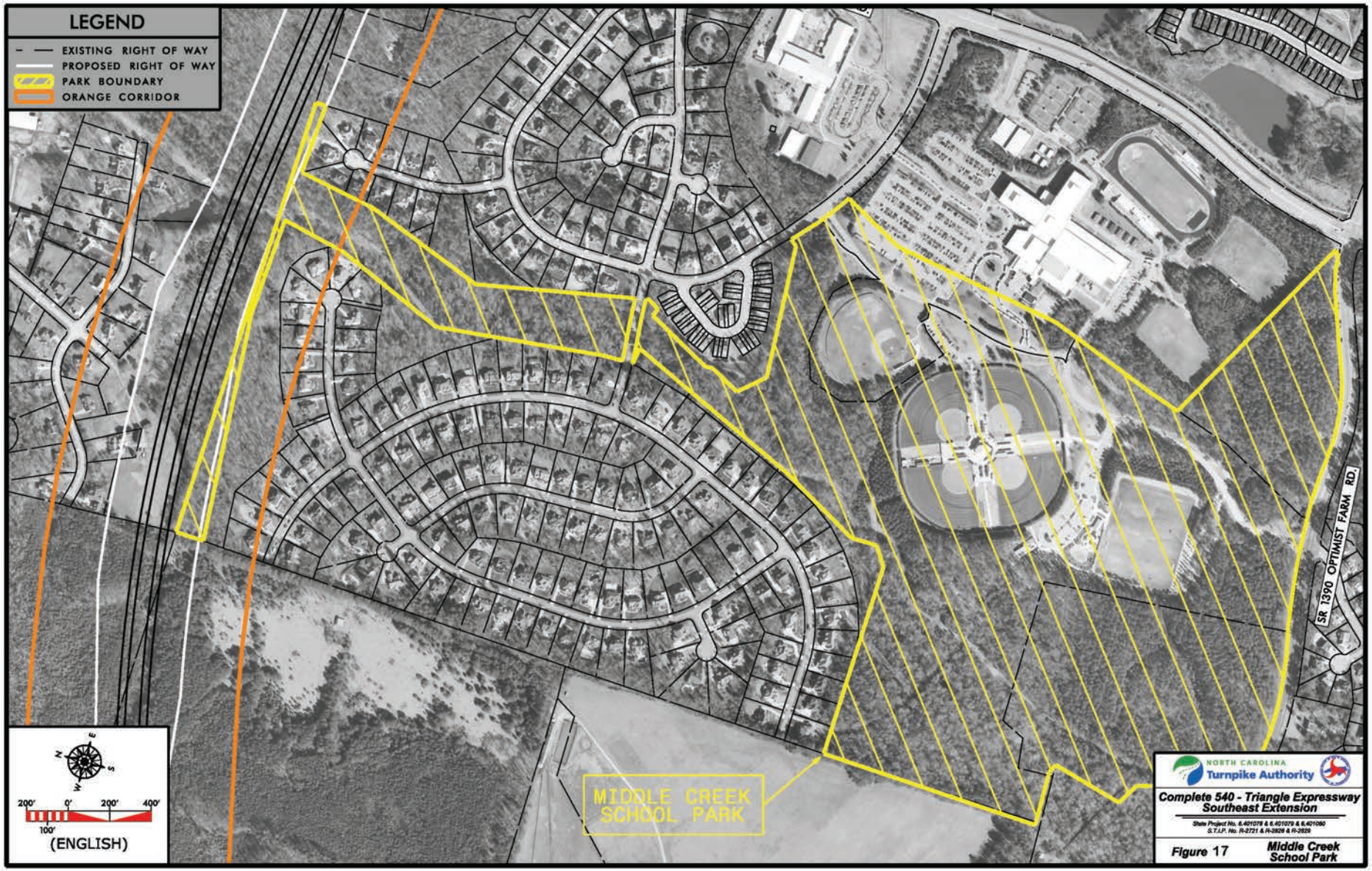



COMPLETE 540
Triangle Expressway Southeast Extension
DR. L. J. FAULHABER FARM
FIGURE 13
US 401 FAYETTEVILLE RD.
DR. L. J. FAULHABER FARM
LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
CUT
TRANSITION
FILL
DELINEATED WETLAND
DELINEATED STREAM
HISTORIC BOUNDARY
RED CORRIDOR
INCOMPLETE PLANS
PRELIMINARY PLANS
100' 0 100' 200'
50'
(ENGLISH)

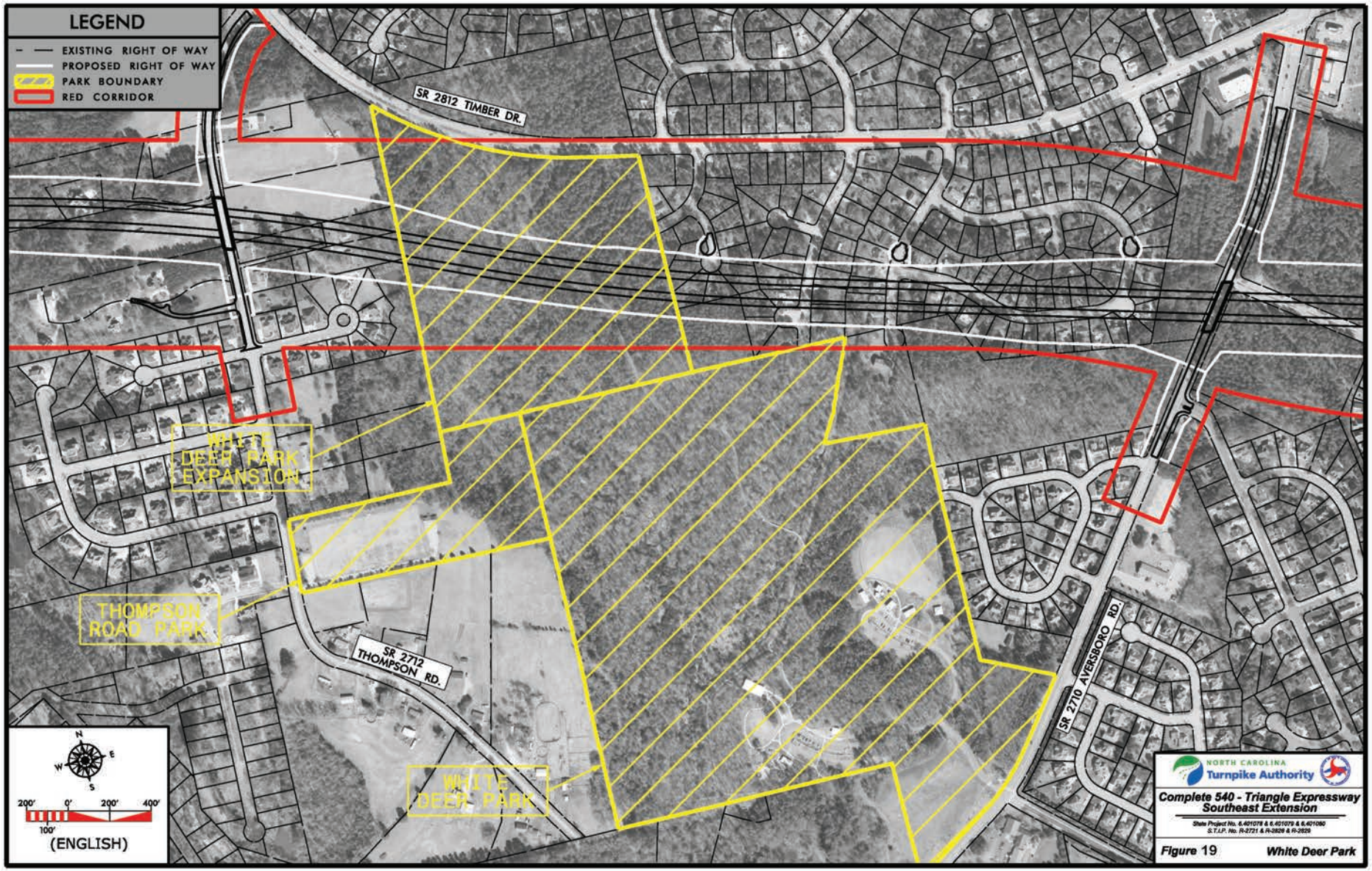

COMPLETE 540
Triangle Expressway Southeast Extension
BRYAN FARMS HISTORIC DISTRICT
FIGURE 14
WHITE OAK RD SR 2100
BRYAN FARMS HISTORIC DISTRICT
GEORGE BRYAN JR. HOUSE
RAND BRYAN HOUSE
C. P. BRYAN HOUSE
GEORGE AND JULIA BRYAN HOUSE
LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
CUT
TRANSITION
FILL
DELINEATED WETLAND
DELINEATED STREAM
HISTORIC BOUNDARY
RED CORRIDOR
INCOMPLETE PLANS
PRELIMINARY PLANS
200' 0' 200' 400'
100'
(ENGLISH)

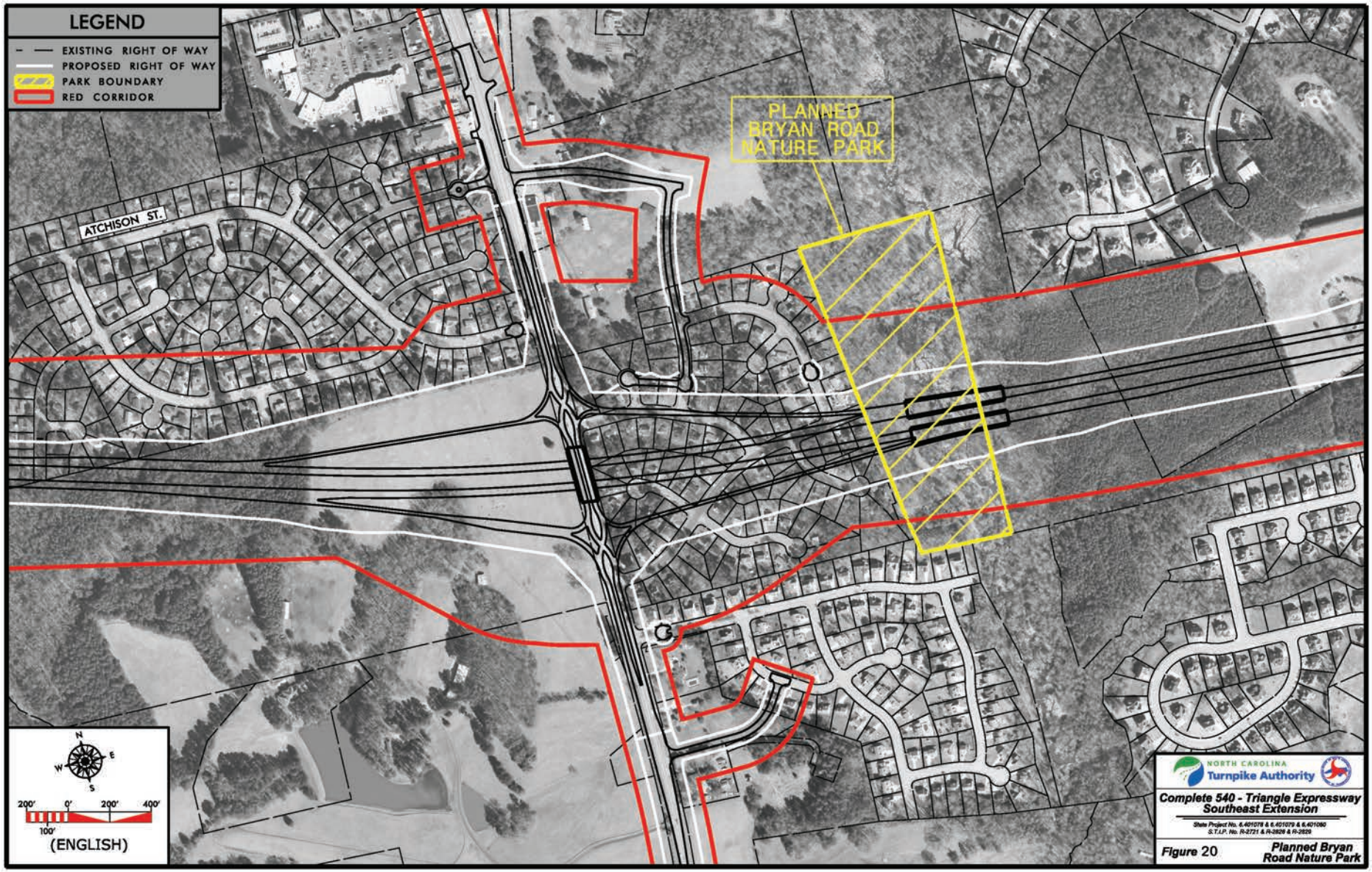

COMPLETE 540
Triangle Expressway Southeast Extension
BAUCOM–STALLINGS HOUSE
FIGURE 15
BAUCOM-STALLINGS HOUSE
LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
CUT
TRANSITION
FILL
DELINEATED WETLAND
DELINEATED STREAM
HISTORIC BOUNDARY
TAN CORRIDOR
INCOMPLETE PLANS
PRELIMINARY PLANS
100' 0' 100' 200'
50'
(ENGLISH)


COMPLETE 540
Triangle Expressway Southeast Extension
BAUCOM–STALLINGS HOUSE
FIGURE 16
BAUCOM - STALLINGS HOUSE
CLEMMONS EDUCATIONAL STATE FOREST
LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
CUT
TRANSITION
FILL
DELINEATED WETLAND
DELINEATED STREAM
HISTORIC BOUNDARY
TEAL CORRIDOR
INCOMPLETE PLANS
PRELIMINARY PLANS
200' 0' 200' 400'
100'
(ENGLISH)

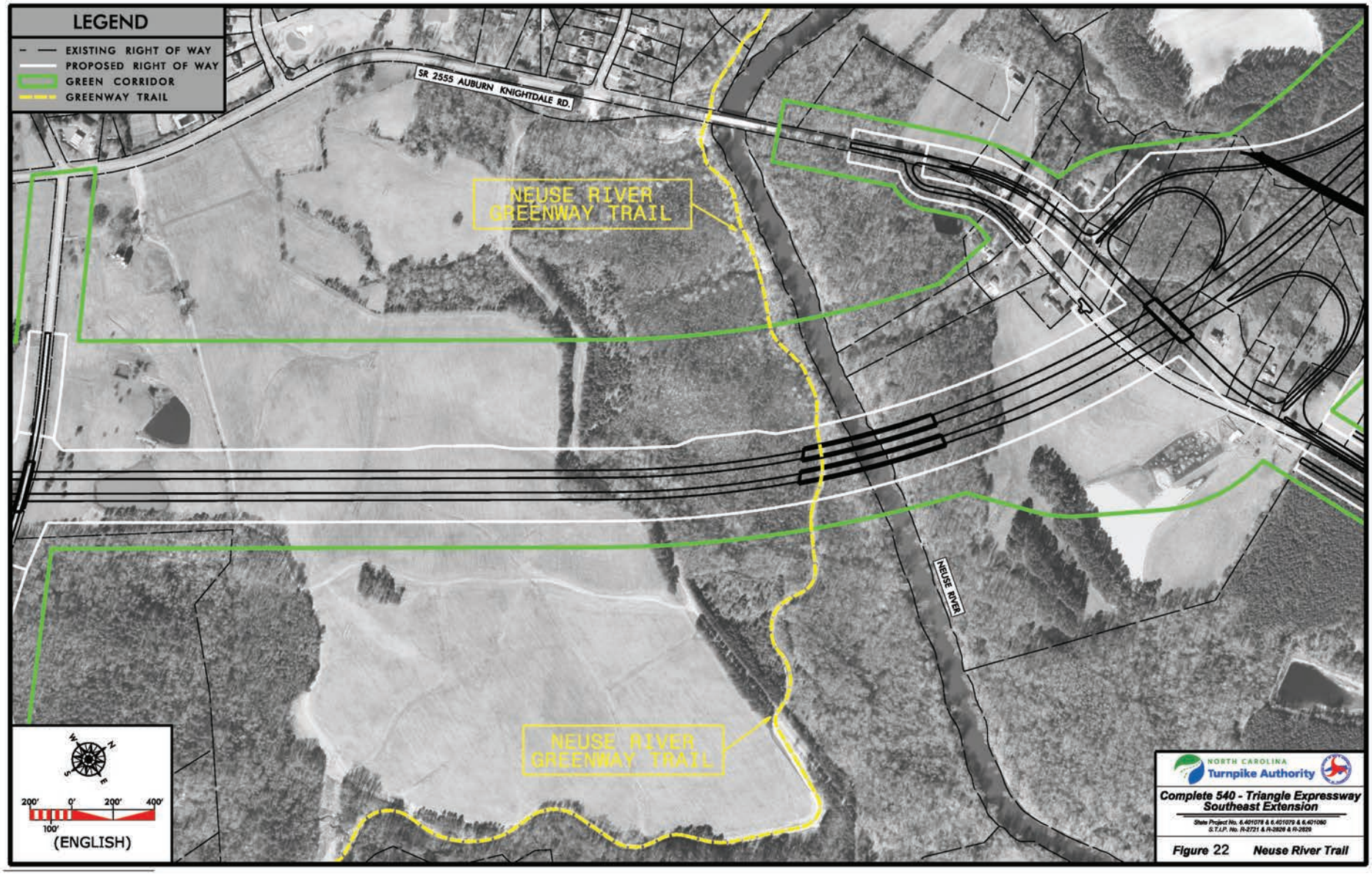

LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
ORANGE CORRIDOR
MIDDLE CREEK SCHOOL PARK
SR 1390 OPTIMIST FARM RD.
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 17
Middle Creek School Park

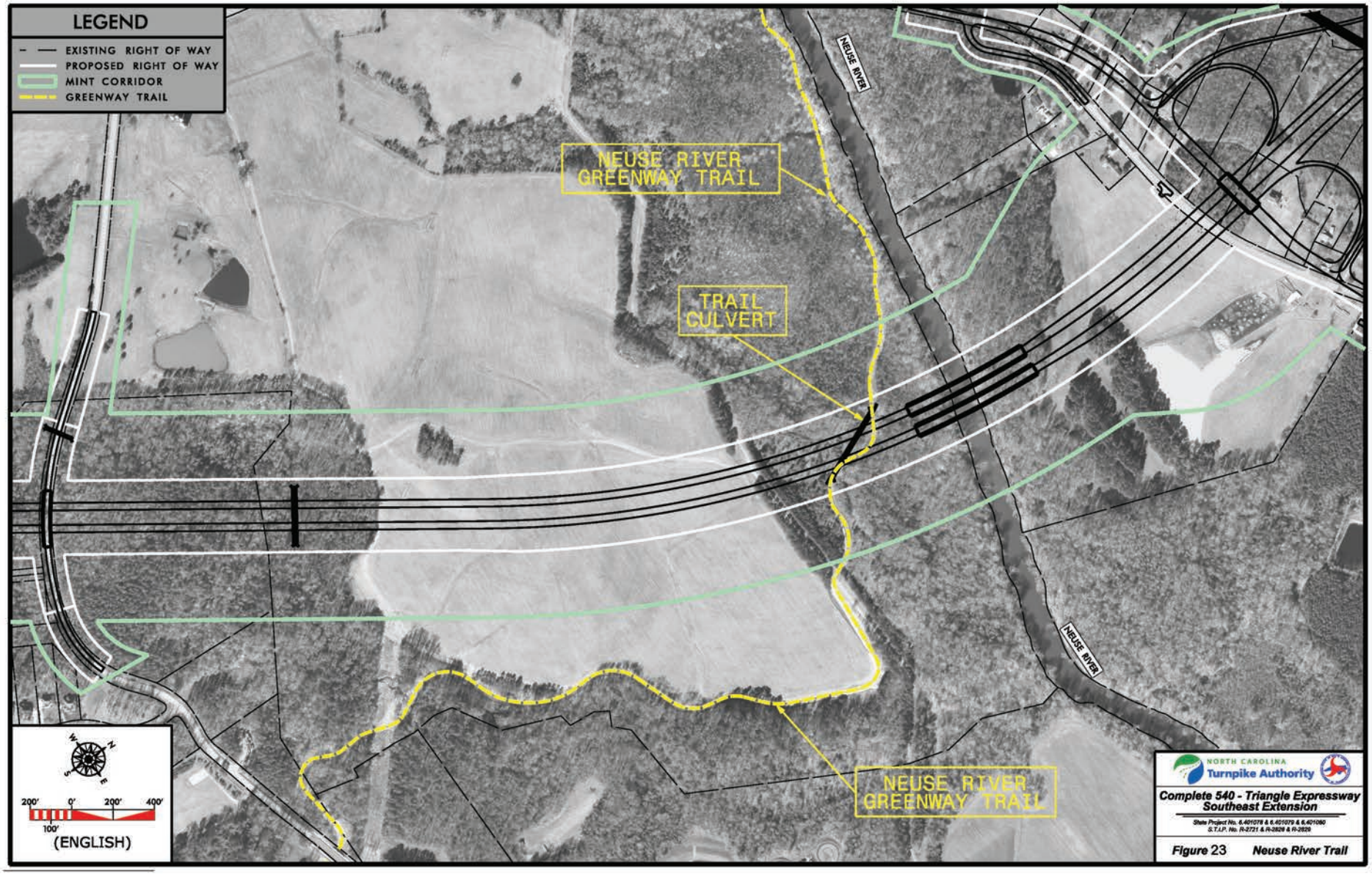

LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
PURPLE CORRIDOR
MIDDLE CREEK
PLANNED SUNSET OAKS PARK
N
W
E
S
200' 0' 200 400
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
State Project No. 6.401078 & 6.401079 & 6.401080
S.T.I.P. No. R-2721 & R-2828 & R-2829
Figure 18
Planned Sunset Oaks Park


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
RED CORRIDOR
SR 2812 TIMBER DR.
WHITE DEER PARK EXPANSION
THOMPSON ROAD PARK
SR 2712 THOMPSON RD.
WHITE DEER PARK
SR 2710 AVERSBORO RD.
N
E
S
W
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
State Project No. 6.401078 & 6.401079 & 6.401080
S.T.I.P. No. R-2721 & R-2828 & R-2829
Figure 19
White Deer Park

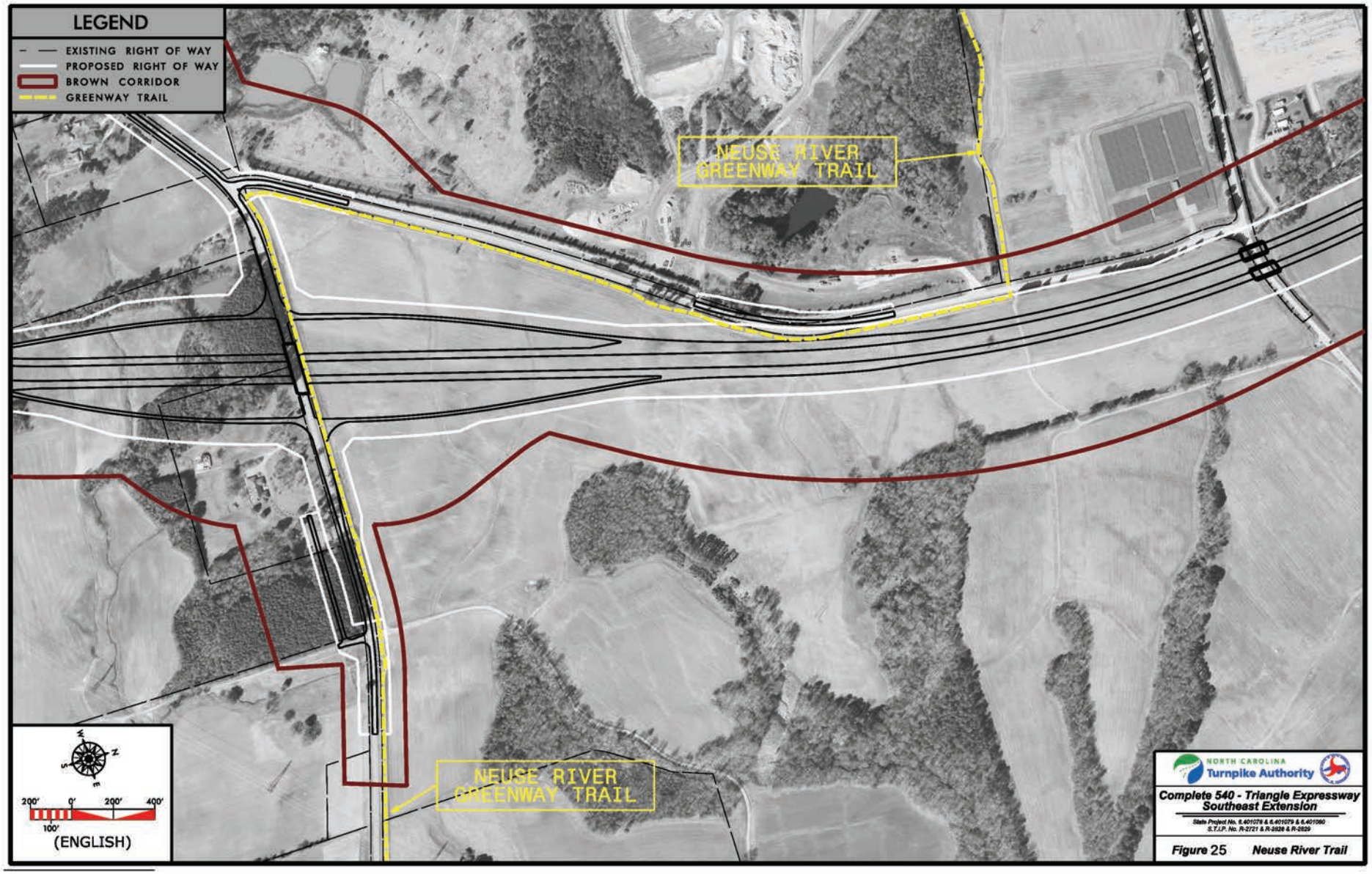

LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
RED CORRIDOR
PLANNED BRYAN ROAD NATURE PARK
ATCHISON ST.
N
E
S
W
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 20
Planned Bryan Road Nature Park


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PARK BOUNDARY
BROWN CORRIDOR
CLEMMONS EDUCATIONAL STATE FOREST TRAILS
CLEMMONS EDUCATIONAL STATE FOREST
W
S
N
E
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 21 Clemmons Educational State Forest


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
GREEN CORRIDOR
GREENWAY TRAIL
SR 2555 AUBURN KNIGHTDALE RD.
NEUSE RIVER GREENWAY TRAIL
NEUSE RIVER
NEUSE RIVER GREENWAY TRAIL
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 22 Neuse River Trail


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
MINT CORRIDOR
GREENWAY TRAIL
NEUSE RIVER GREENWAY TRAIL
TRAIL CULVERT
NEUSE RIVER
NEUSE RIVER
NEUSE RIVER GREENWAY TRAIL
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 23 Neuse River Trail


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
TAN CORRIDOR
GREENWAY TRAIL
NEUSE RIVER GREENWAY TRAIL
TRAIL CULVERT
NEUSE RIVER
NEUSE RIVER
NEUSE RIVER GREENWAY TRAIL
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 24 Neuse River Trail


LEGEND
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
BROWN CORRIDOR
GREENWAY TRAIL
NEUSE RIVER GREENWAY TRAIL
NEUSE RIVER GREENWAY TRAIL
200' 0' 200' 400'
100'
(ENGLISH)
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
Figure 25 Neuse River Trail

Attachment 1

Federal Aid #: **STP-0540(19)** *TIP#:* **R-2721** *Counties*: **Wake and Johnston**
STP-0540(20) **R-2828**
STP-0540(21) **R-2829**

CONCURRENCE FORM FOR ASSESSMENT OF EFFECTS

Project Description: Complete 540, Triangle Expressway Southeast Extension

On ***December 2, 2014***, representatives of the

- ☒ North Carolina Department of Transportation (NCDOT)
- ☒ Federal Highway Administration (FHWA)
- ☒ North Carolina State Historic Preservation Office (HPO)
- ☐ Other

Reviewed the subject project and agreed on the effects findings listed within the table on the reverse of this signature page.

Signed:

Mary Pope Furr — 12/10/2014
Representative, NCDOT — Date

[signature] — 12-10-14
FHWA, for the Division Administrator, or other Federal Agency — Date

Renee Gledhill-Earley — 12-10-14
Representative, HPO — Date

Federal Aid #: **STP-0540(19)** *TIP#:* **R-2721** *Counties*: **Wake and Johnston**
STP-0540(20) **R-2828**
STP-0540(21) **R-2829**

Property and Status	Alternative	Effect Finding	Reasons
John Strain House (WA 1236) DE Criterion C	Orange	No adverse effect	New facility will be elevated above Lake Wheeler Road. Noise impacts do not show substantial increase in decibel levels at house. No construction impacts or easements within or adjacent to historic boundary.
	Red	No effect	New facility will be at grade and behind dwelling. No construction impacts or easements within or adjacent to historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Panther Branch School (WA 1202) NR Criterion A	Orange	No adverse effect with environmental commitments	Sauls Road will be elevated above new facility. Noise impacts do not show substantial increase in decibel levels at former school (now used as meeting hall for the Juniper Level Baptist Church). Small (18-inch) retaining wall required to eliminate the need for permanent easements at school and across street but decorative treatments may be used on the wall surface, and designs for the wall will be reviewed by the HPO prior to finalization
	Lilac	No effect	Sauls Road will be elevated above new facility. Noise impacts do not show substantial increase in decibel levels at former school (now used as meeting hall for the Juniper Level Baptist Church). No construction impacts or easements within or adjacent to historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Dr. L.J. Faulhaber Farm (WA 4811) DE Criterion A	Red	Adverse effects	New facility bisects farm and requires demolition of contributing structures.
	All other alternatives	No effect	Property is not within the remaining study corridors
William & Lillie Willis House & Store (WA 4808) DE Criteria A&C	Red	No adverse effect	Construction along existing US 401 terminates at edge of historic boundary. No change in access for house and store. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Bryan Farms Historic District (WA 0335-0338) DE Criterion A	Red	Adverse effect	New facility and y-line improvements require construction within historic boundary and require use of agricultural fields which are contributing resources to the historic district.
	All other alternatives	No effect	Property is not within the remaining study corridors
Meadowbrook Country Club (WA 5104) NR Criterion A	Red	No effect	Improvements along existing I-40 will not result in construction impacts or easements within historic boundary.
	Lilac	No effect	Improvements along existing I-40 will not result in construction impacts or easements within historic boundary.
	Orange	No effect	Improvements along existing I-40 will not result in construction impacts or easements within historic boundary.

	All other alternatives	No effect	Property is not within the remaining study corridors
Yeargan House (WA 0328) DE Criterion C	Red	No effect	Improvements along y-line will not result in construction impacts or easements adjacent to or within historic boundary.
	Lilac	No effect	Improvements along y-line will not result in construction impacts or easements adjacent to or within historic boundary.
	Orange	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Utley-Council House (WA 0599) NR Criterion C	Purple	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Thomas Store (WA 0594) DE Criteria A&C	Purple	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Jones-Johnson Farm (WA 0570) DE Criteria A&C	Purple/Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
J. Beale Johnson House (WA 0566) NR Criterion C, Local Landmark	Purple/Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Grady Rowland House (WA 1126) DE Criterion C	Blue	No adverse effect	House will be 10 feet above and approximately 400 feet from new facility thereby decreasing visual and auditory impacts. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Jones-Ellington House (WA 1176) DE Criterion C	Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Joseph M. Blalock Farm (WA 1174) DE Criterion A	Blue	No adverse effect	Noise impacts do not show substantial increase in decibel levels at farm. No construction impacts or easements within or adjacent to historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Dr. Nathan Blalock House (WA 1172) NR Criterion C, Local Landmark	Blue	No adverse effect	New facility will be in a 25 foot cut section therefore there will be no substantial increase in decibel levels at the house. Improvements along y-line will not result in construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Weathers Store (WA 1184) DE Criteria A&C	Blue	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Britt's Store (WA 0341) DE Criteria A&C	Blue	Adverse effect	Y-line improvements require demolition of contributing structures.
	Lilac	Adverse effect	Y-line improvements require demolition of contributing structures.
	Modified Blue and Lilac	No adverse effect with environmental commitments	Y-line improvements follow existing radius of curve and will not impact structures. However, the addition of a curb along Benson and Ten Ten roads will hamper parking for business. Additional parking may need to be provided so need to coordinate with the property owner and HPO to discuss parking plan.

	All other alternatives	No effect	Property is not within the remaining study corridors
Wayland Poole House (WA 0315) NR Criterion C	Red	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Mount Auburn School (WA 0302) DE Criteria A&C	Red	No adverse effect with environmental commitments	Noise impacts show substantial increase in decibel levels at former school because new facility 30 feet above historic property. Will need to coordinate with property owner and HPO to investigate noise reduction/soundproofing measures. Y-line improvements include resurfacing and improving access in front of former school. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Penny House (WA 0289) DE Criterion C	Green	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Teal	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Red	No adverse effect	Realignment of Rock Quarry Road will move roadway away from historic property and leave house at end of a long driveway. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

W.A. Gowers Farm (WA 0290) DE Criteria A&C	Brown	No adverse effect	Y-line improvements include ditch and shoulder work in front of farm. No construction impacts or easements within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Gower-Johnson House (JY 0281) DE Criterion C	Brown	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Baucom-Stallings House (WA 0287) DE Criterion C	Brown	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Teal	No effect	No construction impacts or easements adjacent to or within historic boundary.
	Tan	Adverse effect	New facility bisects house tract and requires demolition of contributing structures.
	All other alternatives	No effect	Property is not within the remaining study corridors

George Williams Farm (WA 4163) DE Criterion A	Orange	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors
Gerald Cochran House (WA 7107) DE Criterion C	Orange	No effect	No construction impacts or easements adjacent to or within historic boundary.
	All other alternatives	No effect	Property is not within the remaining study corridors

Initialed: NCDOT MPA FHWA DB HPO Rye

FHWA Intends to use the HPO's concurrence as a basis for a "de minimis" finding for the following properties, pursuant to Section 4(f):

Attachment 2

Town of Garner

900 7th Avenue · Garner, North Carolina 27529
Phone (919) 772-4688 · Fax (919) 662-8874 · www.GarnerNC.gov

January 9, 2012

Mr. Steve DeWitt, P.E., Chief Engineer
North Carolina Turnpike Authority
1578 Mail Service Center
Raleigh, NC 27699-1578

Re: Town of Garner Parks and Recreational Facilities

Dear Mr. DeWitt:

This letter is to advise you of the Town of Garner's position regarding the impacts of the "Red Corridor" on our park and recreation facilities as it relates to Section 4(f) of the federal Transportation Act of 1966. The following park facilities, all of which are owned, operated, and maintained by the Town of Garner and are addressed in the 2007 Comprehensive Parks and Recreation, Open Space & Greenways Master Plan, were evaluated:

1) White Deer Park;
2) White Deer Park Expansion Parcel;
3) Bryan Road Nature Park;
4) Thompson Road Park;
5) Lake Benson Park;
6) South Garner Park; and
7) Centennial Park.

White Deer Park is a significant recreational resource for the Town of Garner. It is a public park used for outdoor and nature based programming, and offers fitness opportunities for residents with over 2 miles of walking/jogging trails and greenways. Primary uses include outdoor and nature programs, facility and shelter rentals, walking/jogging trails, picnicking, nature observations, education programs for local schools, playground areas, arboretum, energy and resource conservation model (solar panels, rain gardens, recycled water). I view this award winning park facility, coupled with Lake Benson Park, as Garner's signature passive recreation centerpiece. This vital recreational resource has many amenities and activities requested by our citizens that simply cannot be provided by any other Town facility. This park has greenways, nature trails, picnic shelters, playgrounds, and preservation of forested areas; nature and environmental education programming; incorporates nature study areas and wildlife habitats; preserved the quality of open spaces and wildlife habitats, birding trails, greenway connectivity to surrounding neighborhoods and other recreational areas. Impacts to this park would result in a significant loss of park and recreational resources for the Town of Garner.

The **White Deer Park Expansion Parcel** contains the town's first mile of greenway, known as the South Garner Greenway. The South Garner greenway connects numerous neighborhoods, several elementary schools, local businesses, and several existing parks. This public greenway is a significant recreational resource that offers people accessible places to walk, bike, or jog. Impacts to this facility would be significant as this important greenway provides connectivity to the Town's our mile central loop that serves many neighborhoods in central Garner.

Bryan Road Nature Park is currently undeveloped. When this public park is developed, when coupled with the public Mahler's Creek Greenway, the site will offer scenic passive recreational opportunities for area residents. The Town envisions this park facility as a significant recreational resource that will provide walking/jogging trails, picnicking, nature observation areas, and environmental educational programs for local school age children in the future. Impacts to these planned public spaces would result in the significant loss of planned park and recreational resources for the future of the Town of Garner. Town leaders have wisely planned ahead to ensure that future generations have protected public land for parks and recreation and environmental education uses.

Thompson Road Park is a significant recreational resource that is used for public athletic programming and field rentals. The primary use is for football and soccer athletic programming and field rentals for the general public. This is a significant facility for athletic programing and as such is central to the Town's ability to provide our citizens with youth and adult playing fields for soccer and football. In the future this park has the potential to provide connectivity between existing town greenways and nearby schools and neighborhoods. Impacts to this park would result in a significant loss of park and recreational resources for the Town of Garner.

Lake Benson Park contains significant amounts of public open space that is mainly used for passive recreational activities including trails used for walking and jogging; nature observations, fishing, boating, and special events. Without question this park is a significant recreational resource for the Town and is considered the crown jewel of our park facilities. Lake Benson is a vital public recreation resource used for all town-sponsored large festivals and events such as the July 3rd Independence Day Celebration, White Deer Dash 5K Road Race, Goblins in the Park and the Easter Holiday Extravaganza. All of these events are open to the general public. It also has shelter rentals, walking/jogging trails, picnicking areas, nature observation areas, playgrounds, fishing, and boating, kayaking and camping opportunities available for use by the general public. I cannot begin to describe the significance of this essential park facility. Our community has fully embraced this park in every way in terms of making use of its facilities. It is home to our July 3rd Independence Celebration which is truly a family event for not only the Garner community but for the region as well. This park, along with the adjoining White Deer Park, is truly the crown jewel of the Town's park system. We have no other facility that provides the range of passive recreation uses that is found in Lake Benson Park. Impacts to this park would result in a significant loss of park and recreational resources for the Town of Garner, Wake County, and the entire region.

South Garner Park is a significant recreational resource that is used for public athletic programming, facility rentals, local, regional and national tournaments, walking and hiking. Primary uses include local athletic softball and soccer practices, games and tournaments. It has three softball fields, a multipurpose field, concessions area, tennis courts, a hiking trail and a large playground. The existing hiking trail connects surrounding neighborhoods to the park as well. This park provides vital playing fields which are critical to our athletic programming needs

for the youth and adults of the entire community. Impacts to this park would result in a significant loss of park and recreational resources for the Town of Garner.

Centennial Park is a significant recreational resource that is used for public athletic programming, facility rentals, local, regional and national tournaments; walking, jogging and shelter rentals. The primary use of the facility is for soccer practices, games and local and regional tournaments. The park features soccer fields, a picnic shelter, playground and a paved walking trail. As the Town's main public soccer complex, Centennial Park is critical to the Town's ability to provide quality playing fields for the public as well hosting local and regional tournaments. Impacts to this park would result in a significant loss of park and recreational resources for the Town of Garner, Wake County, and the entire region.

I hope this letter adequately explains the various activities and uses that each of the abovementioned parks provide and the significance and importance that each one has with regard to the Town's mission to deliver quality recreational activities and programming to the Garner public and to the public of the region. Please do not hesitate to contact me if you have questions and need additional information.

Sincerely,

Hardin Watkins

Hardin Watkins
Town Manager

Attachment 3

North Carolina Department of Agriculture & Consumer Services
N.C. Forest Service

Steven W. Troxler
Commissioner

Scott Bissette
Assistant Commissioner

100 Years of Protecting, Managing & Promoting North Carolina's Forests

May 5, 2015

Kristen B. Maseman
Project Manager
LOCHNER
2840 Plaza Place, Suite 202
Raleigh, NC 27612

Dear Ms. Maseman:

The North Carolina Forest Service respectfully submits comments requested by your office on the potential adverse impacts of the proposed I-540 highway and associated easement corridor in Southeast Wake County transecting the Clemmons ("Clemmons") Educational State Forest (ESF) property. You specifically requested comments on two proposals traversing Clemmons that only differ by the proposed north-south orientation of the interstate highway through the perimeter versus the interior of Clemmons. As you have already documented Clemmons acreage loss for both proposals, our comments below address impacts going beyond the respective land losses that would apply to implementing either proposal. I will preface our comments by noting that no public highway presently crosses through Clemmons at this time, thus all 827 acres of this property are contiguous and accessible from the facility's main office without leaving the property.

The construction and opening of I-540 through Clemmons could adversely impact this educational forest in many ways including but not limited to:

- **Loss of Working Forests and Implemented Master Plan Actions:** All of the N.C. Forest Service educational state forests and state forests engage in master planning of their property's forestland assets and other resources. When tree harvests occur, the forest receipts generated by these timber sale(s) are used to maintain and improve facility infrastructure as well as generate new forests through site preparation, tree seedling planting, and in-stand management. For example, Clemmons presently has a number of acres planted in long-leaf pine, a forest cover that dominated the coastal plain in pre-colonial times. A recovery effort is presently underway at Clemmons to demonstrate the ecological importance of this forest type to forestland owners and visitors to the ESF.
- **Ranger Patrol and Fire Control of property:** Splitting the forest property in two could create new ranger patrol and fire control issues. Longer distance on-property and off-property travel routes established and traveled to conform to the interstate corridor may increase personnel time and fuel costs for needed property inspections and access control. In addition, wildfire ignitions would likely increase due to flammable debris (smoking materials) tossed from moving vehicles; vehicle fires

that occur on the road shoulder or grassy right-of-way corridor; and vehicles causing fires due to the catalytic converter coming in contact with cured light fuels. These ignitions can easily spread to the adjacent ESF forests and require N.C. Forest Service initial attack once the fire exceeds the hose lays of responding structure fire-fighting engines. Additional staging of forest fire-fighting equipment on the Clemmons property may be required during times of drought when forest fuels adjacent to the interstate are more available for ignition.

- **Recreational Losses and Associated Safety and Security issues:** The interstate would disrupt the trail system serving the western portion of the Clemmons property. The trail system would need to be rerouted under the interstate or a portion of the trail would be cut-off and potentially abandoned from the Clemmons property located west of the proposed interstate corridors. Having a trail system located adjacent to or crossing under the interstate highway generates concerns over the interstate corridor being used as an access area for illegal hunting, dumping of white goods and other trash, homeless campsites, and release of unwanted (abandoned) pets. In addition, trash and debris thrown from moving vehicles are potential projectiles that can strike recreationists using trail access corridors under the interstate highway. Trash and other debris that are deposited directly on the ESF property or are blown onto the property would need to be collected and hauled away for proper landfill disposal. The Clemmons staff does not have the personnel resources needed to periodically remove trash and debris that collects on ESF property adjacent to the proposed interstate corridors.
- **Water Resource and Aquatic Concerns:** The Clemmons property contains a substantial portion of Beddingfield Creek's headwaters. Numerous first and second-order streams originate on the ESF property and discharge into the main stem of the creek. During 2014, the N.C. Division of Water Resources added Beddingfield Creek to the 303(d) list of impaired streams. The creek is ecologically unique in that it does represent a stream where anadromous fish species using the Neuse River can move upstream unobstructed into the headwaters of Beddingfield Creek to complete their life cycle. In addition, this creek has been previously documented as containing a viable population of the Least Brook Lamprey (*Lampetra aepyptera*), a primitive fish species known to inhabit a limited number of streams in the region. This Lamprey species was collected in the early 2000s by a cooperative effort between the N.C. Forest Service and then N.C. Division of Water Quality. The Museum of Natural Science's resident ichthyologist made a positive identification of this lamprey species. The collected specimens are still part of the museum's fish fauna collection. The introduction of non-point source pollutants from interstate construction and highway maintenance in the form of sediment, nutrients, vehicle fuels and fluid contaminants, and the seasonal use of sand and salt brine for highway treatments would have an unknown impact on the larger aquatic community of Beddingfield Creek. Catastrophic fuel spills from large vehicle accidents and subsequent runoff to creek waters and subsequent mortality impacts to aquatic species would also be a concern. The potential adverse impacts to anadromous and lamprey species that may utilize Beddingfield Creek's headwaters to complete their life cycle should be investigated and the findings and potential impacts of highway contaminants considered prior to siting the interstate corridor. Depending on the design of the highway drainage system, Beddingfield Creek and its tributaries may be more susceptible to an increase in creek flow velocity and discharge, which could cause increased in-channel scouring and bank erosion

leading to down-cutting of the stream bed and a further disconnect of stream waters from the floodplain.

- **Wildlife Concerns:** The interstate corridor would introduce noise and light pollution that could deter wildlife from accessing this portion of the Clemmons property. In addition, wildlife travel corridors (e.g., stream and riparian corridors) may also be disrupted due to construction and maintenance of the interstate.
- **Risks Associated with Prescribed Fire as a Forest Management Tool**: As noted above, all agency-managed forestlands are "working forests." As such, an important in-stand management tool is the use of prescribed fire to reduce buildup of hazardous fuel loading, recycle nutrients in the dead detritus and duff layers that are part of the forest floor, eliminate unwanted invasive or nuisance tree species, and create new understory vegetation, some of which can serve as natural foot plots for wildlife. Some tree species (e.g., long-leaf pine) need fire to complete their life cycle. Thus, the use of prescribed fire is an important management tool. The use of prescribed fire may need to be curtailed, particularly around the interstate due to visibility concerns that may arise with ground-level smoke impairing driver visibility on a high-speed interstate. The N.C. Forest Service's certified burn staff uses detailed burn plans supported by smoke modeling outputs to determine the optimum time to burn; however, there will be times when ground-level smoke can impair visibility. With the presence of an interstate in close proximity to the ESF, the risks of using prescribed fire on the Clemmons property would have to be re-evaluated to minimize the risk of ground level smoke leading to visibility and safety issue on the interstate highway.

To reiterate, the concerns listed above apply to either interstate proposal (i.e., interior or perimeter transect options) that would transect the Clemmons property. We also understand the identified acreage impact numbers associated with each corridor proposal are specific to the highway itself, including road shoulders and right-of-way easements. The proposed interstate corridors identified on the maps delivered with your request encompass considerable more acreage that would not be a part of the NCDOT easement.

We appreciate the opportunity to provide these comments and would ask that you contact Mike Huffman, Forest Supervisor at 919-553-5651 should clarification or additional information be needed.

Best Regards,

Scott Bissette

Scott Bissette
Assistant Commissioner
N.C. Forest Service
N.C. Department of Agriculture and Consumer Services

North Carolina Department of Agriculture & Consumer Services
N.C. Forest Service

Steven W. Troxler
Commissioner

Scott Bissette
Assistant Commissioner

100 Years of Protecting, Managing & Promoting North Carolina's Forests

May 12, 2015

Kristen B. Maseman
Project Manager
LOCHNER
2840 Plaza Place, Suite 202
Raleigh, NC 27612

Dear Ms. Maseman:

The North Carolina Forest Service (NCFS) submitted comments requested by your office on the potential adverse impacts of the proposed 540 Triangle Expressway Southeast Extension and associated easement corridor in Wake County transecting the Clemmons ("Clemmons") Educational State Forest property in a letter dated May 5th, 2015. I wanted to follow up on that letter with a few additional points and a correction. We inadvertently referred to the project in the former letter as the I-540 highway as opposed to the 540 Triangle Expressway Southeast Extension ("540 Extension"). My apologies for any confusion this may have caused.

We also thought it may be helpful to provide you with a short history of Clemmons as it was our first Educational State Forest and set the precedent for the other six that were to follow. Needless to say, the property is extremely important to us, in part because of its historical value but also due to its proximity to Raleigh, our great state's capital. Clemmons was established in 1976 with a primary purpose of providing outdoor educational and recreational opportunities to the public. Formal (NCFS Ranger-led) educational courses are presented to school and other youth groups (kindergarten through high school) on forestry, natural resources, water quality, and forest ecology. Formal summer workshops provide opportunities to teachers and other educators to gain knowledge in techniques for teaching outdoor and environmental education in their classrooms. Additionally, the general public has access to self-guided educational trails and displays throughout the Educational State Forest. Clemmons is also very much an actively-managed forest, including the extensive restorations of Longleaf pine communities that are currently underway on the property. This provides a unique opportunity for educating the general public on forest management by letting them see forestry in action. Additionally, many visitors to Clemmons come primarily to simply enjoy the trails, woods, ponds, and relative solitude that are available to them at this unique property.

In regards to the loss of Working Forests, we think it's important to note that a recovery effort is presently underway at Clemmons to demonstrate the historic and ecological importance of the Longleaf Pine to forestland owners and visitors to the Educational State Forest. Both the Tan and Brown Corridors would adversely impact these activities. The proposed Brown Corridor would also directly disrupt approximately 1,500 – 2,000 feet of the trail system serving the western portion of the Clemmons property. As this section of trail is one of the more remote areas of the

Educational State Forest, the presence of a major road would greatly affect the current aesthetics (quiet and seclusion) that are currently enjoyed by recreational users.

Both the Tan and Brown Corridors also have the potential to impact aquatic resources and stream hydrology/morphology, not only through direct impacts on Clemmons property, but also due to off-site impacts to inflowing tributaries upstream of Clemmons Educational State Forest. The Brown Corridor appears to have a larger footprint within the Beddingfield Creek watershed, and so would likely have a greater impact on water resources and wildlife than the Tan Corridor.

Additionally, as noted in the May 5th letter, both proposed corridors would impact fire control and prescribed fire activities. However, we thought it important to note that it would be more significant for the Brown Corridor, again, due to its larger footprint within the Educational State Forest.

Thank you for your consideration of these additional points. Please contact Michael Huffman, Forest Supervisor, at 919-553-5651 if you need any additional information.

Best Regards,

Scott Bissette

Scott Bissette
Assistant Commissioner
N.C. Forest Service
N.C. Department of Agriculture and Consumer Services

Pc Michael Good
Kevin Harvell
David Lane
Scott Bissett

Maseman, Kristin

Subject: FW: I 54-

From: Huffman, Michael P [mailto:michael.huffman@ncagr.gov]
Sent: Thursday, July 16, 2015 10:59 AM
To: Maseman, Kristin
Cc: Good, Michael; Swartley, Bill; Pittman, Kevin; Kimes, James
Subject: Re: I 54-

Ms. Maseman,
The Watershed Extension Loop Trail is a significant recreational resource as it is the only long range trail in the area with a significant amount of hiking traffic. All of our trails main purpose is to educate the public about their natural resources and how we manage them and the benefits we receive daily from them, while providing recreation supporting a healthy lifestyle.

The construction of the trail used state appropriated funds, with no specific recreational trail funds. We did use a piece of equipment and personnel that were paid from a federal grant program pertaining to wildfire mitigation. As a means to learn how to use the equipment, the trail served as a perfect tool for the new personnel and equipment to be utilized in becoming familiar with its use to begin that program implementation statewide.

If you need further information let me know. I will be out of the office, but can be reached on my state cell at 919-218-9060.

Michael Huffman
Forest Supervisor
Clemmons Educational State Forest
N.C. Forest Service
N.C. Department of Agriculture and Consumer Services
919-553-5651/Office
919-218-9060/State cell
"We can not change the direction of the wind, but we can adjust the sails..."

Attachment 4

THE TOWN OF
Holly
Springs

October 21, 2010

Jennifer Harris, PE
North Carolina Turnpike Authority
1578 Mail Service Center
Raleigh, NC 27699-1578

Re: Triangle Expressway Southeast Extension (I540)
Town of Holly Springs Comments

Dear Jennifer,

Thank you for meeting with us on October 4th about this project. We have attached a spreadsheet of Holly Springs' comments for the alternative alignments that are presently out for public comment. These comments support the position that we expressed in our meeting with you – that Holly Springs supports the orange (originally protected) corridor.

At our meeting you also indicated that we could meet with you in a separate forum – along with our transportation consultants and yours – to discuss the orange alignments' proposed intersection with both Kildaire Farm Road and Holly Springs Road (one intersection). We would like to go ahead and set that meeting up at your earliest convenience. Thank you.

Sincerely,

Stephanie L. Sudano, PE
Director of Engineering

SLS/dra

cc: Mayor Sears
Carl G. Dean, Town Manager
Chuck Simmons, Assistant Town Manager
Gina Clapp, AICP, Director of Planning & Zoning
Correspondence 13394

P.O. Box 8
128 S. Main Street
Holly Springs, N.C. 27540
www.hollyspringsnc.us

(919) 552-6221

Fax: (919) 552-5569

Mayor's Office Fax:
(919) 552-0654

TOWN OF
Holly Springs

Resolution No.: 10-27
Date Adopted: Sept. 21, 2010

RESOLUTION STATING THE TOWN OF HOLLY SPRINGS TOWN COUNCIL'S POSITION REGARDING THE ALIGNMENT OF THE SOUTHERN PHASE OF I-540

WHEREAS, on May 6, 2008, the Holly Springs Town Council adopted Resolution 08-26 expressing its fervent support for the construction of the I-540 Western Wake Expressway; and

WHEREAS, the proposed I-540 Western Wake Expressway has been a fundamental transportation facility underpinning for more than 20 years of local land use and transportation decisions of the Town of Holly Springs and other local governments of southwestern Wake County; and

WHERAS, the Town of Holly Springs historically has utilized the protected I-540 corridor proposed in earlier designs to plan for both existing and future development in Town; and

WHEREAS, the change to relocate the corridor south to connect to Bass Lake Road would have an adverse impact on our community, due to access issues and the cost of relocating both residential and commercial properties from said corridor; and

WHEREAS, additional traffic generated on Holly Springs Road would negatively impact the area around a proposed interchange and Holly Springs Road would not be adequate to handle the increased traffic volume; and

WHEREAS, the delay of the construction of the I-540 Western Wake Expressway is particularly injurious to the Town of Holly Springs when weighed against the much-needed NC 55 improvements that have not been constructed in anticipation of a 2008 start of I-540 Western Wake Expressway construction;

NOW THEREFORE BE IT RESOLVED that the Town Council of the Town of Holly Springs hereby expresses its adamant opposition to any option for the construction of the I-540 Southern Wake Expressway that utilizes Bass Lake Road as a potential alternative for the southern phase of I-540; and

BE IT FURTHER RESOLVED that the Town Council supports use of the original protected corridor design as illustrated in orange on N.C. Transit Authority maps as the preferred choice for the development and construction of the I-540 Southern Wake Expressway.

Adopted this, the 21st day of September, 2010.

ATTEST:

Dick Sears, Mayor

[X] Joni Powell, CMC, Town Clerk
[ ] Linda R. Harper, CMC Deputy Town Clerk

Office *of* the Mayor
128 S. Main Street • P.O. Box 8 • Holly Springs, NC 27540 • (919) 557-3901 • (919) 552-0654 *fax*
dick.sears@hollyspringsnc.us • www.hollyspringsnc.us

I540 Comments

	Comment
	BLUE CORRIDOR
1.	Conflicts with all of the Town's long range plans developed over the past 15 years (since corridor protection began), including: Comprehensive Plan Vision 2010, Long Range Water Master Plan, Long Range Sewer Master Plan, Long Range Reclaimed Master Plan, Holly Springs Pedestrian Transportation Plan, Long Range Greenway Plan, Long Range Bicycle Plan
2.	The Town has significant existing (and proposed too) investment in this corridor in major water, sewer, and reclaimed utility lines that will have to be relocated and replaced with great expense - both initial capital expense and perpetual operating expenses (as relocation and replacement would require new pumping stations)
3.	Town's Fire Department and Wake County EMS Headquarters would have to be relocated
4.	This alignment would severely impact both vehicular (including bus) and pedestrian transportation to 3 of the town's 6 public schools (Holly Ridge Elementary, Holly Ridge Middle, Holly Springs Elementary); this doesn't even include preschools and/or daycares. There are at least two of these directly in the alignment that would have to be relocated. (Note: the maps prepared by NCTA only indicate 2 of these public schools: there are 2 schools located to the east of the proposed interchange (Holly Ridge Elementary and Holly Ridge Middle) and 1 school to the west (Holly Springs Elementary). Holly Springs Road is a vital auto and pedestrian access route for all of these schools. Locating the interchange at this location would be very dangerous to students, parents, and caregivers accessing the schools daily.
5.	There are 2 minority churches significantly impacted (to extent of relocation probably) - one at Earp and Bass Lake Road intersection and one further south off of Bass Lake Road; there is also another future church site (Moravian Church) that would be impacted/eliminated near the Fire Department and EMS headquarters.
6.	Corridor passes through one of the very few remaining minority areas in the town and would completely divide and likely eliminate the population/area; The proposed corridor would bisect this long established neighborhood. In addition, the Town of Holly Springs has provided CDBG Scattered Site Single-Family Rehab assistance to many homes located along Bass Lake Road within the proposed corridor. This is an expenditure of federal and state funds to assist residents with housing. There has also been the expenditure of federal Farmers Home funding for utilities to serve the homes.
7.	Town's only funeral home would be eliminated
8.	Wipes out a 50 acre tract of land at the headwaters of Bass Lake; this land was set aside for preservation 2009 by Triangle Land and Conservation easements located within this area (Jeff Suggs)
9.	Passes over the headwaters of Bass Lake, a historical landmark and a valued park. The dam for this lake was rebuilt within the past 10 years by the Town with a Cleanwater Management Trust Fund grant; portions are subject to a Nature Conservancy easement; the Town has put into place special 100' buffers for all land tributary to this lake; this is a very valuable environmental resource for the region.
10	Town has worked hard to created connectivity between neighborhoods - vehicular, bicycle, and pedestrian - through planning and infrastructure construction; this corridor creates a division through this area negates those efforts
11	Parallels Middle Creek which is a very important protected stream/water feature with a large watershed; paralleling streams has very negative environmental consequences and may be impossible to permit.

13383

I540 Comments

	Comment
	BLUE CORRIDOR
12	This corridor would require relocation/elimination of many homes and the division of many neighborhoods; some are Sunset Oaks North, Sunset Oaks South, Brackenridge various phases; Sunset Ridge North, Sunset Forest, Holly Park, Remington, Westview, Brook Manor, Sunset Ridge South, Spring Meadow, Dogwood, and Old Mills Lake. All but two of these have developed over the past 18 years, so are relatively new. In addition, many of the older "non-subdivision" homes that comprised the original Holly Springs minority population will be relocated/eliminated as well.
14	There is a Montessori school on HS Road near its intersection with Bass Lake Road that is not shown, but will be impacted and possibly eliminated.
15	In addition to the above referenced impact to Bass Lake, the greenway system around Bass Lake would also be impacted. Town recently received federal funding to complete one section of the greenway loop.
16	The long range transportation plans - developed carefully and collaboratively by the Town, the county, the MPO, NCDOT, and other municipalities over the past 15 years - have guided development and row dedication of roads to support the orange corridor - not at all this corridor
17	This corridor is not under corridor protection and development approvals and building permits continue to be processed, increasing the undesirability of this corridor as well as the resulting impact of construction in this corridor
19	This corridor, while on the books, delays development of properties (this is problematic especially in this economic climate) AND the ability of individuals who happen to own homes in the corridor and need to sell their homes; we would like to encourage quick and expeditious elimination of alternatives in order to alleviate these two scenarios.
20	Corridor would introduce a second major physical barrier/division in our small Town. The 55 Bypass currently divides the western part of town from center and east portions. It is a hurdle that is difficult and expensive to cross with utilities. It has proven impossible because of expense to cross for pedestrians and bicycles, which is of extreme detriment to the Town's efforts at encouraging a healthy, multi-modal community.
21	There are 2 private daycare centers that are located within the actual corridor/interchange boundaries at Holly Springs Road that would have been relocated.
22	The Town has planned pedestrian, bicycle and auto connectivity between neighborhoods since development began in the early 90s. The proposed corridor impacts an existing greenway along Middle Creek that connects Windcrest and Bridgewater and provided connection to the northeast side of Middle Creek for future development. The corridor would impact the construction of a major roadway connection between Sunset Ridge North and Woodcreek over Middle Creek. The corridor also impacts land that has been dedicated to the Town on the north side of Middle Creek for a park and community center.
23	The maps prepared by the NCTA do not show the new Wake County Public School- Herbert Akins Elementary School located at the corner of Herbert Akins Road and James Slaughter Road. The proposed corridor impacts the school campus.
24	Maple Ridge Apartments (federally subsidized housing project) and also Timber Springs Apartments (same) would be impacted/eliminated by this corridor.
25	The corridor alignment impacts/eliminates a large portion of the Westview Neighborhood. This neighborhood was developed in partnership with the Town of Holly Springs who received a $250,000 CDBG Infrastructure Grant to construct roads and utilities for the neighborhood. Many homeowners in Westview have received a portion of a $150,000 down payment assistance grant from the NCHFA.

13383

I540 Comments

	Comment
	BLUE CORRIDOR
26	Concern that the proposed blue corridor and interchange at Holly Springs Road would have a tremendous impact to the quality of life of residents by bisecting the Town and directing a tremendous volume of traffic onto Holly Springs Road at a location that has not been planned for this level of volume. This location is very near to the center Village Town District, which the Town has been working for years to develop as the heart of our town.
27	This corridor, while on the books, delays development of properties (this is problematic especially in this economic climate) AND the ability of individuals who happen to own homes in the corridor and need to sell their homes; we would like to encourage quick and expeditious elimination of alternatives in order to alleviate these two scenarios.

13383

	Comment
	ORANGE CORRIDOR
1.	Minority church at Lockley Road does not look like it is impacted; this is a good thing.
2.	Corridor has been preserved by the Town since 1997 NCDOT request for Corridor Protection....the corridor protection guidelines have been carefully and stringently followed by the Town to make expense and impact of acquisition and construction less expensive.
3.	Some of the ROW has already been acquired, and we believe this is of great benefit.
4.	This corridor is consistent with all of the Town's long range plans developed over the past 15 years (since corridor protection began), including: Comprehensive Plan Vision 2010, Long Range Water Master Plan, Long Range Sewer Master Plan, Long Range Reclaimed Master Plan, Holly Springs Pedestrian Transportation Plan, Long Range Greenway Plan, Long Range Bicycle Plan
5.	Town wants to insure that Kildaire Farm Road, which is a major access road, ties into interchange or nearby to preserve full access northward
6	Town has carefully planned and minimized the needed greenway/pedestrian/bike and vehicular connections through this corridor by carefully guiding development of adjacent lands. All of the infrastructure (transportation and other) that has been planned and installed to support these minimal number of crossings would no longer function as designed and infill of the preserved corridor would likely be awkward to develop. This careful planning will reduce construction costs and environmental impacts along this corridor.
7	This corridor and the proposed interchange at Kildaire Farm Road is consistent with the Town's long range planning efforts and locations for activity nodes, development densities, roadway design, and infrastructure to meet the demands of a highway interchange and location. Because Holly Springs is a relatively small town with limited growth potential due to the limiting feature of Progress Energy Lands to the west, the impact of the other corridors on the Town as a whole is proportionally very great. The impact of the orange corridor has been well planned to complement the Town as a whole.
8	Development of the roadway in this corridor complements the past planning and investment (and proposed too) by the Town in this area of water , sewer, and transportation infrastructures
9	The Town believes this corridor alignment has the least environmental impact, based upon our knowledge of the Town; the crossing of Middle Creek is essentially perpendicular which is desired as this is a major stream with a very large drainage basin.
10	This corridor would not impact or require the removal and/or displacement of many homes (maybe none) in Holly Springs
11	Town plans have long centered around this corridor, and the Town has directed development in a manner to make the construction of this through Town minimally invasive to our community. This has been achieved by planning transportation connections to complement I540 at this location and to link property on both sides with connections.
12	This corridor essential runs between Apex and Holly Springs - almost along the municipal boundaries - we see this as a plus as it does not divide a community like at least one of the other proposed corridors.
13	The long range transportation plans - developed carefully and collaboratively by the Town, the county, the MPO, NCDOT, and other municipalities over the past 15 years - have guided development and row dedication of roads to support the orange corridor.
14	This corridor is under corridor protection and development approvals and building permit requests continue to be handled under the corridor protection act, increasing the desirability of this corridor as it is protected

	Comment
	PURPLE CORRIDOR
1	Will impact/eliminate Town parkland south of Sunset Oaks south and planned walking trails and other passive recreation along Middle Creek - a major water feature and environmental treasure in south Wake County.
2	The long range transportation plans for the municipality and the county have guided development and row dedication of roads to support the current orange alignment - not needed intersection improvements for this route.
3	Conflicts with all of the Town's long range plans developed over the past 15 years (since corridor protection began), including: Comprehensive Plan Vision 2010, Long Range Water Master Plan, Long Range Sewer Master Plan, Long Range Reclaimed Master Plan, Holly Springs Pedestrian Transportation Plan, Long Range Greenway Plan, Long Range Bicycle Plan
4	This corridor would require relocation/elimination of many homes and the possible division of many neighborhoods; some in Holly Springs' jurisdiction only are Sunset Oaks North, Sunset Oaks South, Brackenridge various phases; In addition, there are many other homes not in subdivisions that would be impacted
5	The long range transportation plans - developed carefully and collaboratively by the Town, the county, the MPO, NCDOT, and other municipalities over the past 15 years - have guided development and row dedication of roads to support the orange corridor - not at all this corridor
6	This corridor, while on the books, delays development of properties (this is problematic especially in this economic climate) AND the ability of individuals who happen to own homes in the corridor and need to sell their homes; we would like to encourage quick and expeditious elimination of alternatives in order to alleviate these two scenarios.
7	This alignment would severely impact both vehicular (including bus) and pedestrian transportation to 3 public schools that some Holly Springs children attend in south Cary. The main transportation route to these schools is down Optimist Farm Road which is being bisected by this route.
6	Town has worked hard to created connectivity between neighborhoods - vehicular, bicycle, and pedestrian - through planning and infrastructure construction; this corridor negatively impacts one of the significant neighborhoods (only 8 years old) that has been planned and developed carefully to create the neighborhood atmosphere that is the Town's goal.
9	Parallels Middle Creek which is a very important protected stream/water feature with a large watershed; paralleling streams has very negative environmental consequences and may be impossible to permit.
10	This corridor would require relocation/elimination of many homes and the division of several neighborhoods such as Sunset Oaks North, Sunset Oaks South, Brackenridge, Talicud Trail within Holly Springs' jurisdiction only. This is a very negative consequence of this alignment especially when both corridors (and buffers on adjacent developments) have been protected for the orange alignment. This alignment is brand new and there has been no preservation or buffer protection for the neighborhoods that have been developed in the area of the corridor.
11	This corridor is not under corridor protection and development approvals and building permits continue to be processed, increasing the undesirability of this corridor as well as the resulting impact of construction in this corridor

	Comment
	PURPLE CORRIDOR
12	Plan as shown does not provide transportation connectivity along Optimist Farm Road which is a major transportation route in an area of SW Wake county that is limited in its primary route connectivity.

	Comment
	OTHER GENERAL COMMENTS
1	All communities impacted by this project have carefully and diligently planned for the orange protected corridor, and protected the corridor. There would be tremendous negative impact to each of them in many areas such as utility infrastructure, socio-economic, community, transportation, development, quality of life, and environment. We believe that the detrimental effect of switching from this corridor is great.
2	We support the orange corridor as a more direct east/west route that complements the east/west transportation system of those individuals travelling across the state.
3	Towns likes (from west to east) want to find the most direct route; like the least circuitous\ route from Asheville to Wilmington
4	Thank you for meeting with us and opportunity to submit comments on the corridors.