NCDOT TIP #U-5774
NC 54 Corridor Improvements
Purpose and Need Report

May 2017

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Acronyms and Abbreviations

ACS	American Community Survey
ADT	average daily traffic
ATT	American Tobacco Trail
CEQ	Council on Environmental Equality
CFR	Code of Federal Regulations
CHT	Chapel Hill Transit
CSX	CSX Transportation freight rail service
DATA	Durham Area Transit Authority
DCHC	Durham-Chapel Hill-Carrboro
D-O	Durham-Orange counties
DSA	demographic study area
FFS	free flow speed
FHWA	Federal Highway Administration
FS	feasibility study
LOS	level of service
MAP-21	Moving Ahead for Progress in the 21st Century Act
MPO	metropolitan planning organization
NCDOT	North Carolina Department of Transportation
NCRR	North Carolina Railroad
NCTN	North Carolina Transportation Network
NEPA	National Environmental Policy Act
NHS	National Highway System
RDU	Raleigh Durham International Airport
RTP	Research Triangle Park
SHC	Strategic Highway Corridors
STC	Strategic Transportation Corridors
STIP	State Transportation Improvement Program
STRAHNET	Strategic Highway Network
UNC	University of North Carolina at Chapel Hill

1. INTRODUCTION

In accordance with the National Environmental Policy Act of 1969 (NEPA), an Environmental Assessment will be prepared for the proposed NC 54 Corridor Improvements project. The environmental document is intended for use as an informational document by the decision-makers and the public. As such, it represents a disclosure of relevant environmental information concerning the proposed action.

The content of this document conforms to the Council on Environmental Quality (CEQ) guidelines, which provide direction regarding implementation of the procedural provisions of NEPA, and the Federal Highway Administration's (FHWA) *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (Technical Advisory T6640.8A, 1987).

The project purpose and need drives the process for alternatives consideration and in-depth analysis. CEQ regulations require that an environmental document address the "no action" alternative and "rigorously explore and objectively evaluate all reasonable alternatives." Furthermore, a well-justified purpose and need is vital to meeting the requirements of NEPA, Section 4(f) (49 U.S.C. 303), the Executive Orders on Wetlands (E.O. 11990) and Floodplains (E.O. 11988), and the Section 404(b)(1) guidelines.

2. PROPOSED ACTION

The North Carolina Department of Transportation (NCDOT) proposes to improve the NC 54 corridor from US 15/US 501 in Chapel Hill to NC 55 in Durham. The project is approximately 9.2 miles long (see Figure 1). Improvement strategies may include, though not be limited to, widening of portions of the existing roadway facility, multimodal accommodations, traffic control, access management, intersection improvements, grade separations, interchange upgrades, and signal timing modifications.

This proposed action (referred to as "project" from this point forward) is included in the current *NCDOT 2016-2025 State Transportation Improvement Program (STIP),* as well as the *NCDOT 2018-2027 Draft STIP*, as Project Number U-5774.

2.1 SUMMARY OF NEED FOR THE PROPOSED ACTION

The need to improve the NC 54 corridor, from US 15/US 501 in Chapel Hill to NC 55 in Durham, is discussed in further detail below:

- **Decreased Mobility in the NC 54 Corridor**
  Paralleling I-40, the NC 54 corridor is an important multimodal travel corridor in the Triangle area. It provides regional access to large employment centers including Research Triangle Park (RTP) and the University of North Carolina at Chapel Hill (UNC) and its hospitals. It plays a substantial role delivering transit service between Chapel Hill, Durham, and Raleigh.

  Within the project study area, NC 54 is a two- to six-lane principal arterial roadway with varying levels of pedestrian and bicycle accommodations. The roadway has no control of access and includes 19 signalized and 27 unsignalized intersections, as well as numerous

commercial and residential driveway connections. Lack of access control, with numerous street and driveway connections to adjacent development, substantially reduces mobility through corridor and its ability to move travelers reliably, unimpeded, safely, and efficiently. Further, within the corridor, pedestrian and bicycle activity is limited due to heavy traffic, high speeds, inadequate and unsafe cross-street connectivity, and lack of continuity and connectivity of pedestrian and bicycle facilities. Furthermore, there is a growing local demand for multimodal mobility options in the project study area, including bicycle and pedestrian access and connectivity to existing and planned transit services.

- **Increasing Congestion due to Roadway Capacity Deficiencies**
  The Transportation Research Board defines congestion as "travel time in excess of that normally incurred under light or free-flow conditions." The DCHC MPO's Congestion Management Plan identifies Level of Service (LOS) E and F as "unacceptable." Capacity analysis determines operating conditions at intersections and expressway/ freeway components, and assigns a (LOS) with letter designations from A to F. LOS A represents the best operating conditions, while LOS F is the worst. LOS E and F conditions are characterized by substantial travel delay, with increased potential for accidents and inefficient operation of motor vehicles.

  Traffic capacity analysis completed for the NC 54 corridor indicates that congested (LOS E or F) conditions are occurring at more than 75 percent of unsignalized intersections and at about 16 percent of signalized intersections within the project study area under existing conditions. With traffic volumes along the corridor forecast to increase between 10 percent and 30 percent from current volumes to design year (2040) volumes, congestion along the corridor will continue to deteriorate without improvements. Capacity analysis for the future no-build condition indicates that all intersections (signalized and unsignalized) would have one or more failing movements during a peak period by 2040, but more importantly 40 percent of signalized intersections would operate at an overall LOS E or F.

- **Critical Crash Rate Exceeding State Average**
  The crash rate for the section of NC 54 in Durham County is double the Statewide Average and the Critical Crash Rate (CCR). Having crash rates that consistently exceed the CCRs indicates an overall safety problem on this facility.

  The CCR is a statistically-derived number, greater than the average rate, which serves as a screening measure to identify locations where crash occurrence is higher than it should be for a given facility type and for which safety measures should be considered. According to NCDOT crash data, over the course of a five year analysis period (from February 2011 to January 2016), of the total 1,593 crashes occurring within the project study area and along NC 54, 854 were rear-end collisions and 353 were angle crashes. Since facilities with high traffic volumes and closely-packed vehicles often equate to higher rear-end collision levels, the fact that over half of these crashes are rear-end collisions is a clear indicator of congested conditions.

  Angle crashes suggest issues at specific intersections. At seven intersections within the project study area, 50 or more crashes occurred in the past five years. There are also several pedestrian and cyclist crashes, which could suggest a need for improved pedestrian and bicycle facilities and connections.

2.2 PURPOSE OF PROPOSED ACTION

The purpose of the proposed project is to improve traffic operations along NC 54 between US 15/US 501 and NC 55 by reducing congestion, while improving mobility and accessibility for all users of the NC 54 corridor.

2.3 POTENTIAL SECONDARY BENEFITS

In addition to addressing the primary needs, the potential exists for the following other desirable outcomes as a result of the proposed action:

- **Multimodal Accessibility and Safety:** Incorporation of bicycle and pedestrian facilities, as well as transit accommodations, into the U-5774 project, as planned by the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) and local governments, has the potential to improve multimodal accessibility and safety throughout the corridor.
- **Vehicular Safety:** Due to higher than average crash rates and critical crash rates along the NC 54 corridor, improvements to the roadway and its intersections offer the potential to reduce the number and severity of vehicle crashes along the roadway.

3. PROJECT DESCRIPTION

3.1 HISTORY OF PROJECT

The *NC 54/I-40 Corridor Study* was completed by DCHC MPO in December 2011 and provides a transportation-land use master plan for the section of NC 54 from US 15/US 501 to I-40 at Exit 273. The study recommends specific improvements to roadway, pedestrian and bicycle, and transit facilities and services.

In addition, a feasibility study was completed by the NCDOT in 2012 (FS-1005C), which proposed widening of the section of NC 54 from I-40 at Exit 273 to NC 55.

The proposed action is listed in the DCHC MPO *2040 Metropolitan Transportation Plan*, the DCHC MPO *2016-2025 Metropolitan Transportation Improvement Program*, and is included in the NCDOT 2016-2025 STIP as project number U-5774.

3.2 PROJECT SETTING

The project limits fall within Orange and Durham counties, both part of the Piedmont region of central North Carolina. The topographies of Orange and Durham counties are characterized as generally flat with some rolling hills. Rolling topography within the project study area is divided by the substantial natural systems of Little Creek, New Hope Creek, and Third Fork Creek, all of which flow into Jordan Lake. Generally, elevations range from approximately 250 feet to nearly 400 feet above mean sea level.

The Town of Chapel Hill is in the southeastern part of Orange County. The population of Chapel Hill in 2010 was approximately 57,000. The City of Durham, the county seat, is in the southwestern part of Durham County. In 2010, the population of Durham was approximately 228,000. Chapel Hill and Durham, along with Raleigh (North Carolina's state capital), make up

the three corners of the Research Triangle, so named in 1959 with the creation of Research Triangle Park (RTP), a research park between Durham and Raleigh.

Chapel Hill and Durham have a typical mix of urban land uses that include office/institutional properties, residential neighborhoods, and commercial development. Chapel Hill is home to the University of North Carolina at Chapel Hill (UNC) and UNC Health Care. Durham is home to North Carolina Central University and Duke University, including its extensive medical center.

Paralleling I-40, the NC 54 corridor is an important travel corridor in the Triangle area. It provides regional access to large employment centers including RTP and UNC and its hospitals. It plays a substantial role delivering transit service between Chapel Hill, Durham, and Raleigh.

3.3 PROJECT STUDY AREA

The project study area, shown in Figure 1 (found at the end of this document), is located mostly in Durham County, with the western part of the project study area in Orange County. Durham County is bordered by Orange County to the west, Wake County to the southeast, Chatham County to the south, Person County to the north, and Granville County to the northeast.

In the southeastern part of Orange County, the western terminus of the project study area begins within the Town of Chapel Hill at the interchange of US 15/US 501 and NC 54. The project travels east along NC 54 across the Orange and Durham County boundary, in a largely developed and urbanized area of mixed-use business and residential properties. Between Downing Creek Parkway and Huntingridge Road, NC 54 travels through the natural system of Little Creek. Continuing between Huntingridge Road and I-40, the area along NC 54 is largely developed as mixed-use with residential and commercial properties. Just east of I-40, NC 54 travels through the natural system of New Hope Creek. Past the natural system, NC 54 travels through a mixed-use area surrounding the intersection of NC 54 and NC 751. Development discontinues just beyond the intersection of NC 54 and Garrett Road, where NC 54 travels through the natural system of Third Fork Creek. Low-density residential and mixed-use development resumes beyond this system through the remainder of the project, where it terminates at the intersection of NC 54 and NC 55, in the City of Durham. The project is approximately 9.2 miles in length.

3.4 EXISTING ROAD NETWORK

Primary US and NC routes in or around the project study area are classified as follows:

US 15/US 501

US 15 is a north/south route that begins at Walterboro, South Carolina, travels through central North Carolina, Virginia, Maryland, Pennsylvania, and ends at the New York-Pennsylvania border in Lawrenceville, Pennsylvania. US 15 is one of the original United States highways from 1926.

US 501, a spur of US 1, is a north/south route that begins at Myrtle Beach, South Carolina. Traveling through central North Carolina, US 501 proceeds to Virginia where it ends in the Town of Buena Vista.

US 15 and US 501 converge for a 108-mile section, from Laurinburg, North Carolina, to Durham, North Carolina. This overlapping route travels through the project study area in Chapel Hill and intersects with NC 54 at the western terminus of the project (US 15/US 501 interchange with NC 54).

NC 54

NC 54 is an east/west North Carolina state highway. The 55-mile route begins in Burlington at US 70, travels through Carrboro, Chapel Hill, Durham, Cary, and ends in Raleigh.

Within the project study area, NC 54 intersects with several primary routes including US 15/US 501 (at NC 54 Exit 16), NC 751, and NC 55, which is immediately adjacent to the NC 55 interchange with I-40 (I-40 Exit 273).

NC 751

NC 751 is a north/south North Carolina state highway. The 24-mile route begins at US 64 near Jordan Lake State Recreation Area and travels to US 70 Business near Durham. The route travels through the approximate midpoint of the project study area where it intersects with NC 54.

NC 55

NC 55 is an east/west North Carolina state highway that extends from I-85 in Durham, to Oriental in Pamlico County. NC 55 travels through the project study area where it intersects with I-40 and NC 54 at the eastern terminus of the project.

4. TRANSPORTATION SYSTEMS

4.1 RELATIONSHIP TO THE INTERSTATE SYSTEM

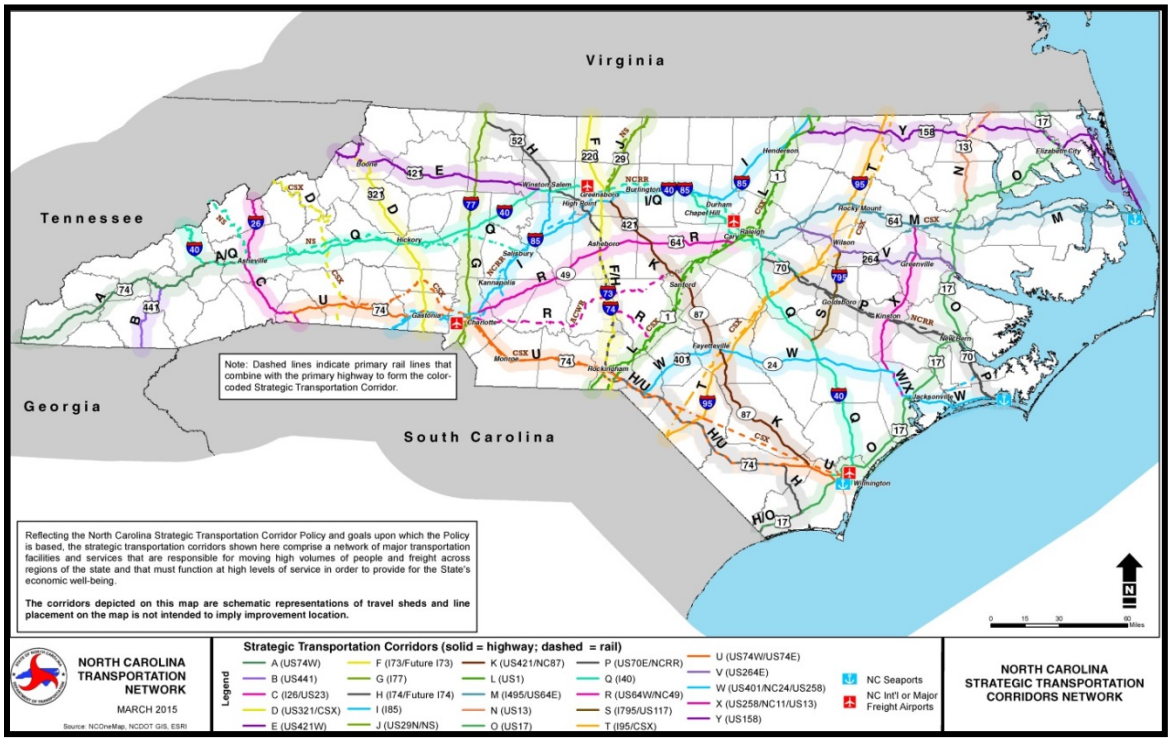
I-40 is an east-west interstate facility which spans the United States from Barstow, California, to Wilmington, North Carolina. Within the project study area, I-40 and NC 54 are parallel and intersecting routes. At the eastern terminus of the project, I-40 lies just north of NC 54 and travels west in parallel with NC 54. I-40 travels over NC 54 with a grade separation, just east of the intersection of I-40 with Fayetteville Road (SR 1118). Continuing west to northwest, I-40 intersects with NC 54 with an interchange facility (I-40 Exit 273). From this intersection, the

routes depart for nearly 30 miles before intersecting once again in Burlington, North Carolina where NC 54 terminates.

4.2 NORTH CAROLINA STRATEGIC TRANSPORTATION CORRIDORS

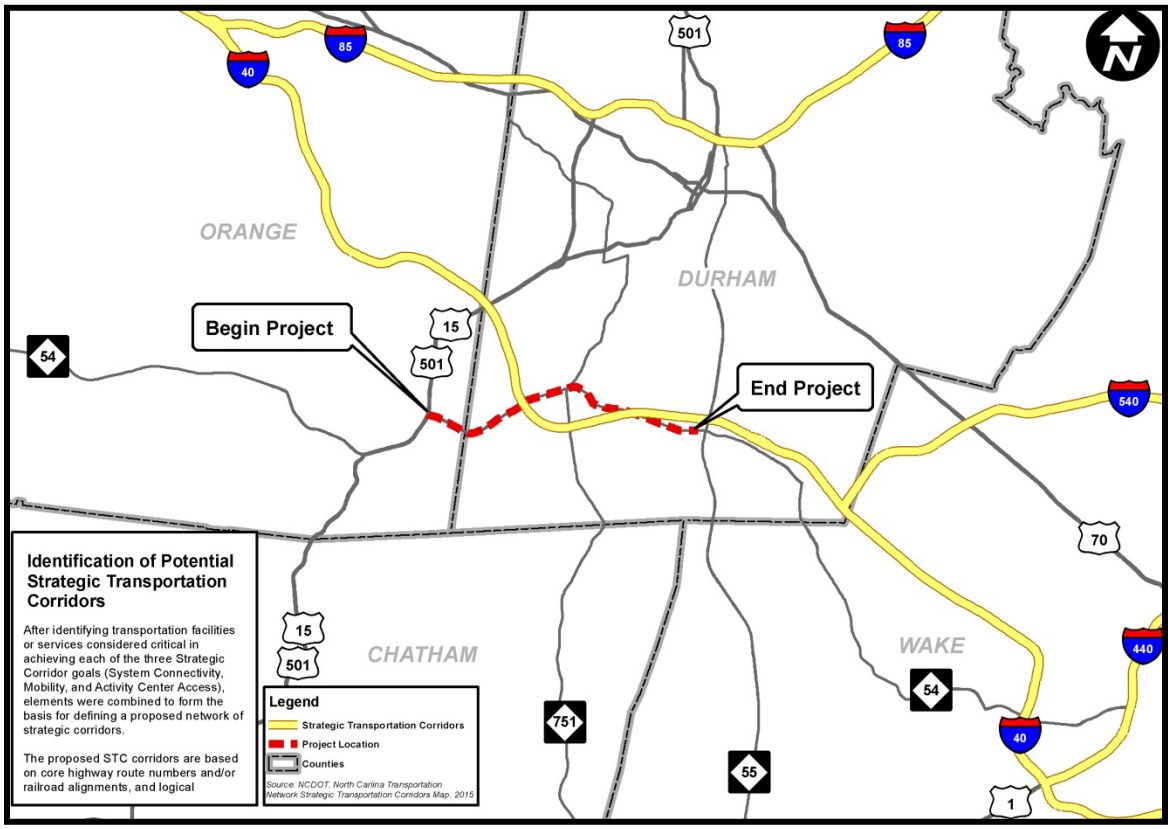
The North Carolina Transportation Network and Strategic Transportation Corridors (STC) form the state's core network of multimodal transportation corridors. Preserving these facilities and services supports the state's goals for economic development and will guide long-term planning at statewide, regional, and corridor levels. These 25 strategic corridors move most of the state's freight and people, link critical centers of economic activity to international air and sea ports, and support interstate commerce, and they are considered the state's highest priority when analyzed within the framework of regional or local transportation plans. They must operate well to help North Carolina attract new businesses, grow jobs, and catalyze economic development. Exhibit 1 illustrates the North Carolina Strategic Transportation Corridors Network.

Exhibit 1: North Carolina strategic transportation corridors



While NC 54 is not identified as a strategic highway corridor within the Strategic Transportation Corridors Network, it does run parallel to and intersect with I-40, a strategic highway corridor. Exhibit 2 illustrates the Strategic Transportation Corridors within the project vicinity and the relationship of NC 54 to them.

Exhibit 2: Strategic transportation corridors within the project vicinity

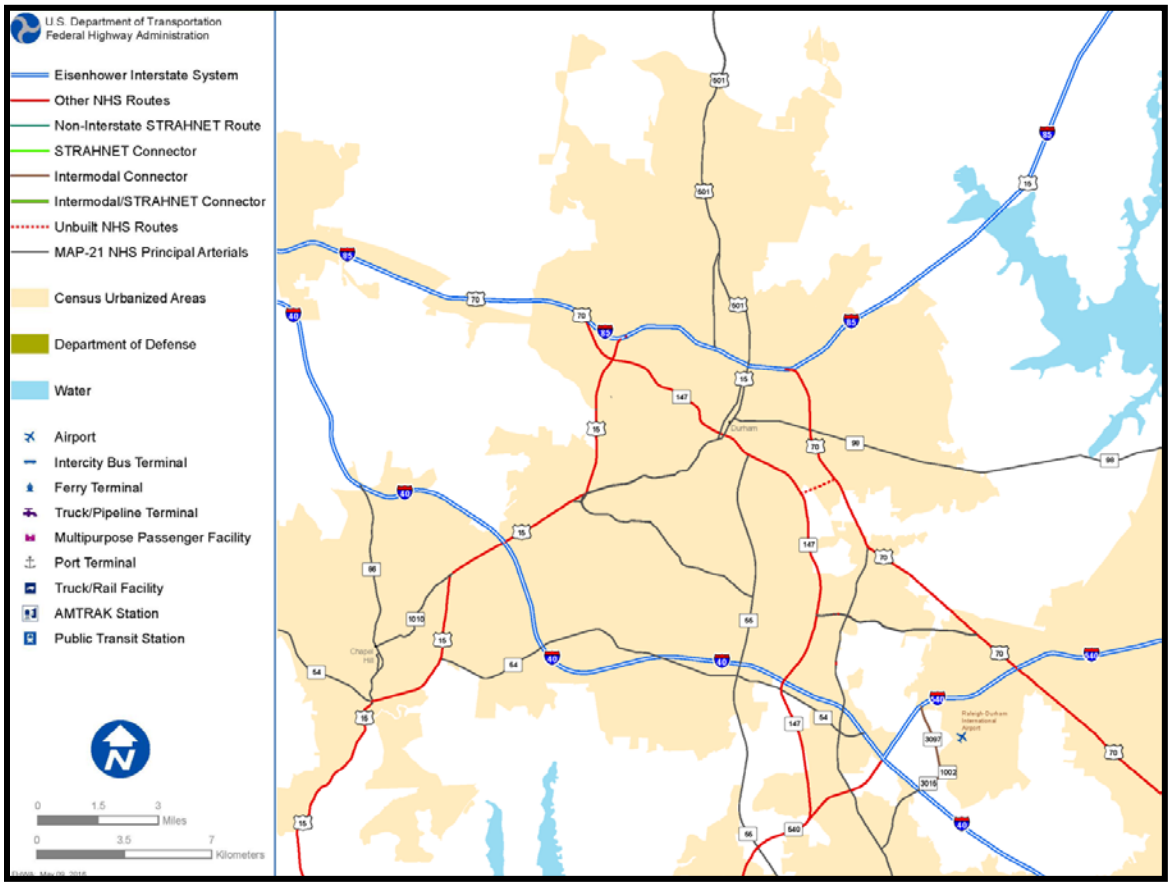


4.3 NATIONAL HIGHWAY SYSTEM

The Code of Federal Regulations (CFR), Title 23, Part 470, Section 107 (23 CFR 470.107), defines the federal-aid highway system, which includes the Interstate System and the National Highway System (NHS). The NHS includes approximately 160,000 miles of roadway that are important to the nation's economy, defense, and mobility (FHWA NHS Website: www.fhwa.dot.gov/planning/nhs/).

The Moving Ahead for Progress in the 21st Century Act (MAP-21) was signed into law on July 6, 2012. MAP-21 restructured core highway formula programs and incorporated the NHS Program into the new core formula program structure. NC 54 is identified as a MAP-21 Principal Arterial within the NHS from US 15/501 in Chapel Hill to I-40 in Durham (see Exhibit 3).

Exhibit 3: National Highway System; Durham, North Carolina



5. MODAL INTER-RELATIONSHIPS

5.1 RAILROADS

A CSX Transportation (CSX) freight rail service travels adjacent to the eastern terminus of the NC 54 project corridor. The CSX "SDS"-branch is a single track that runs parallel to NC 55, oriented north-south. The branch travels from Durham to just south of Cary where it merges with the CSX "S" branch. The freight line currently carries an average of two trains per day at an average speed of 10 miles per hour (to be updated in the near future as current data is made available). Figure 2 (found at the end of this document) illustrates the existing CSX SDS-branch in relationship to the NC 54 project study area.

5.2 AIRPORTS

Raleigh Durham International Airport (RDU) is located in Wake County, east of the Town of Morrisville and northwest of the City of Raleigh. RDU serves the Research Triangle Region of the state, a multi-county area that includes the state capital of Raleigh, the City of Durham, and towns of Chapel Hill and Cary, as well as many other large towns and small communities within the central area of the state. The RDU website states the airport supports over 400 flights per day.

According to airport-data.com, the airport's largest runway is a lighted concrete facility, 10,000 feet in length and 150 feet in width having weight limitations of 75,000 pounds for a single-wheeled aircraft; 190,000 pounds for dual wheeled aircraft; 335,000 pounds for dual tandem wheeled aircraft; and 750,000 pounds for dual-dual tandem wheeled aircraft. The airport also provides two smaller asphalt runways.

RDU is located approximately 5.5 miles east of the eastern terminus of the project just north of NC 54. NC 54 serves as an alternative to I-40 and provides access to the airport via NC 540/I-540, Airport Boulevard, and Aviation Parkway.

5.3 PUBLIC TRANSPORTATION

The section of NC 54 between US 15/US 501 and roughly a mile east of I-40 is a major transit corridor, providing connections between local and regional origins and destinations. This corridor is increasingly playing a substantial role in the delivery of transit service between Chapel Hill, Durham, and Raleigh. Regional transit routes connect with major destinations in Durham and Chapel Hill by traveling through the project study area.

Chapel Hill Transit

Chapel Hill Transit (CHT) provides public transportation services to residents and visitors of the Chapel Hill, Carrboro, and UNC communities, and connects and coordinates with other transportation means within the Research Triangle area, providing an alternative for local and regional travel. These services include fixed-route busing and park-and-ride facilities. CHT is the second largest transit system in the state, providing over seven million rides per year. The towns of Chapel Hill and Carrboro plus UNC share the annual operating and capital costs associated with CHT, offering a fare-free system to riders.

Eleven CHT bus stops fall within the project study area and are interchangeable with GoTriangle services.

GoTriangle

GoTriangle (formerly known as the Triangle Transit Authority or TTA) provides transit service to the general public with bus routes serving the Triangle Region's Durham, Orange, and Wake counties to include the towns of Hillsborough, Chapel Hill, Morrisville, Cary, Apex, Knightdale, Zebulon, Garner, Fuquay Varina, Wake Forest, and the RDU Airport, the cities of Durham and Raleigh, and locations between. Within the study limits, sixty-four (64) GoTriangle bus stops fall within the project study area, some of which are interchangeable with CHT services.

The GoTriangle-planned Durham-Orange (D-O) light rail project (STIP Project TE-5205), including passenger stations, is proposed in close proximity to and within the project study area. The *Triangle Transit Light Rail Record of Decision* identifies Alignment 2A as the preferred alternative, which would generally follow NC 54, I-40, US 15/US 501, and the North Carolina Railroad (NCRR) corridor in downtown Durham and east Durham. The alignment begins at the UNC Hospitals, runs parallel to US 15/US 501, proceeds east along the south side of NC 54 until crossing NC 54 with a grade-separation just east of the NC 54 intersection with Downing Creek Parkway, then travels north along I-40, parallels US 15/US 501, turns east toward the Duke University campus along Erwin Road, and then follows the NCRR corridor parallel to NC 147

through downtown Durham, before reaching its eastern terminus near Alston Avenue and NCCU. Stations are planned within the project study area at Friday Center and Woodmont

GoDurham

GoDurham (also known as the Durham Area Transit Authority or DATA) is operated by GoTriangle and provides transit service to the general public with bus routes serving the City of Durham. GoDurham bus stops within the project study area are quantified as part of the overall GoTriangle system discussed above.

5.4 PEDESTRIAN AND BICYCLE ACCOMMODATIONS

Pedestrian and bicycle facility continuity varies greatly within the NC 54 project study area. The western and more urbanized portion of the project study area near Chapel Hill offers a combination of existing sidewalks, bicycle lanes, greenway/shared-use paths, and a greenway underpass that provides connectivity from facilities on the south side of NC 54 to facilities on the north side of NC 54 (near the Meadowmont subdivision). Traveling east, beyond the intersection of NC 54 and Barbee Chapel Road, connectivity and availability of facilities becomes intermittent to non-existent. Within the developed area surrounding the intersection of NC 54 and NC 751, pedestrian facilities appear, though intermittently. Between the intersection of NC 54 and Fayetteville Road (SR 1118) and the eastern terminus of the project at the intersection of NC 54 and NC 55, pedestrian facilities are intermittent.

Town of Chapel Hill

The *Chapel Hill Bike Plan* was adopted on June 9, 2014, as a component of the town's *Chapel Hill 2020 Comprehensive Plan*. The plan supports the goals of the *Chapel Hill 2020 Comprehensive Plan* to provide safe connections between neighborhoods, schools, commercial areas, parks, rural bikeways, and farms that promote exercise and environmentally friendly modes of transportation. The bike plan identifies the challenges to developing bicycle facilities in Chapel Hill as terrain, low level of street connectivity, and a lack of bicycle infrastructure on major roads. Within the project study area, the plan calls for enhanced crossings at on/off ramps of the NC 54 and US 15/US 501 interchange, as well as complete lighting at the interchange. Additionally, the plan identifies the NCDOT's NC 54 Corridor Improvements project as a redevelopment opportunity that includes bicycle facility treatments.

The Town of Chapel Hill adopted the *Greenways Master Plan* on May 29, 2013. The plan provides recommendations for priority greenway segments and new opportunities; considers greenway connectivity with neighboring jurisdictions; integrates relevant planning efforts such as adopted bicycle, pedestrian, and parks and recreation plans; and includes the *Chapel Hill 2020 Comprehensive Plan* to encourage a more active bicycle and pedestrian friendly community. A prominent greenway trail, currently in use and identified in the plan, is the Meadowmont/East 54 trail, which lies within the western portion of the project study area and provides bicycle and pedestrian accommodations to destinations along and beyond NC 54.

In June 2016, the Town of Chapel Hill initiated a Mobility and Connectivity Plan to recommend connections to significant destinations, close gaps in walkability, and encourage healthier and more active behavior in residents and visitors. The study will be an overall network exercise, looking at bicycle, pedestrian, and greenway connectivity throughout the town. The Mobility and Connectivity Plan will initiate preparation of a pedestrian plan and will complement existing

adopted plans, including the *Chapel Hill Bike Plan* and the *Greenways Master Plan*. Further, the study will consider the planned D-O Light Rail Transit Project to identify gaps in the current walkability network to and from stops. The plan is expected to be completed in 2017.

City of Durham

The City of Durham's Transportation Department is currently updating its bicycle and pedestrian plans, and consolidating them into one document. The City of Durham's *Comprehensive Bicycle Plan* was adopted in 2006. The purpose of the bicycle plan is to increase mode share and safety for all kinds of cyclists, thereby improving the overall quality of life in Durham. The plan provides a comprehensive approach toward identifying existing bicycle needs and deficiencies, presents a new route network to address those deficiencies, examines optimal design and policy improvements, and identifies implementation strategies for the development of quality bicycle facilities and programs. The plan recommends various bicycle improvements along NC 54 (within the project study area) from the Orange/Durham county line to I-40, from I-40 to Fayetteville Road, and from Fayetteville Road to NC 55. However, the recommended projects within the NC 54 project study area are not prioritized within the "Top 20 On-Street Bicycle Projects" identified in the plan.

The *DurhamWalks! Pedestrian Plan* was adopted in 2006. The purpose of the pedestrian plan is to assess existing pedestrian infrastructure, recommend safe and accessible pedestrian networks (sidewalks, trails, intersections), and recommend new pedestrian-related programs and policies. The plan was revised in 2011 to give greater weight to sidewalks near schools and parks/recreation centers and to update some of the other criteria information, such as the location of crashes involving pedestrians. The 2011 priority list identified 235 proposed sidewalk projects and assigned them a priority ranking. The sidewalks projects identified within the NC 54 study corridor are ranked as numbers 59, 60, and 61, respectively: NC 54 from Highgate Drive to Fayetteville Road, NC 54 from Fayetteville Road to Barbee Road, and NC 54 from Barbee Road to NC 55.

The City of Durham's *Durham Trails and Greenways Master Plan* was adopted in 2011. The trails and greenways plan includes goals, policies, and recommendations for developing the trails and greenways system in Durham. Incorporating the *Durham Trails and Greenways Plan* and the *Durham Comprehensive Plan*, the *Durham Parks and Recreation Master Plan* was adopted in 2013. It establishes a guide to direct the operations of the Department of Parks and Recreation in facility development for 10 years and in recreational programming for the next 5 years. The plan lists future greenway projects and identifies the following within the NC 54 project study area: Crooked Creek Trail (from NC 54 to Scott King Road), and Herndon Creek Trail (from Scott King Road to NC 54).

5.5 PARK-AND-RIDE FACILITIES

NC 54 is a major transit corridor that provides many important local and regional connections. The project study corridor caters to several transit routes, both current and proposed, and is increasingly playing an important role in accommodating traffic and maintaining mobility between minor and major destinations. NC 54 between US 15/US 501 and NC 55 serves eleven (11) CHT bus stops, and sixty-four (64) GoTriangle bus stops, and therefore, is amenable for park-and-ride strategies. Also, GoTriangle's D-O Light Rail Transit Project, including passenger

stations, is proposed in close proximity to and within the project study area, making this section of NC 54 ideal for park-and-ride system implementation.

A well-implemented park-and-ride system adds benefits to the current and future transportation system along NC 54, and supplements traditional bus transit. Park-and-ride facilities offer people the opportunity to benefit from public transportation for a portion of their travel needs. These facilities strengthen public transportation by increasing ridership, and they contribute positively to the overall development of the project study area by reducing vehicle miles traveled, improving air quality, and reducing traffic congestion.

The *Orange County Comprehensive Plan* serves as a guide to the county's growth and development through 2030. A draft of the plan was made available for public review in 2008; the plan is yet to be adopted. One of the key implementation strategies of this comprehensive plan is the development of park-and-ride lots that would encourage use of public transportation to travel to and from work.

The DCHC MPO's *2040 Metropolitan Transportation Plan* also focuses on strategies to enhance traffic flow, improve transit service, develop public transportation, and strengthen inter-modal connectivity. One of the key objectives of this plan is to develop regional park-and-ride system for cars and bicycles to support transit services and encourage ridesharing. Within the NC 54 corridor, at the Friday Center an existing park-and-ride facility will also support the proposed D-O Light Rail Transit Project station. In addition, within the NC 54 corridor, the transportation plan identifies potential park-and-ride locations at Leigh Village (also serving as a proposed D-O Light Rail Transit Project station) and the NC 751 and NC 54 retail center. Furthermore, the plan suggests plausible park-and-ride locations at Gateway Center and Patterson Place, Southpoint Auto Park Boulevard, Renaissance Parkway Target, Governors Village retail center, and Oak Creek Village. While these locations are not directly within the project corridor, they offer the potential of facilitating demand to destinations associated with NC 54, while also alleviating parking demand at the Friday Center.

6. LOGICAL TERMINI

Federal Highway Administration regulations (23 CFR 771.111(f)) require that logical termini be established during the development of all highway improvement projects. Logical termini are defined as rational endpoints for a transportation improvement and the review of environmental impacts. The most common termini are points of major traffic generation, especially intersecting roadways. This is due to the fact that in most cases, traffic generators determine the size and type of facility being proposed.

Paralleling I-40, the NC 54 corridor is an important travel corridor in the Triangle area. The project limits begin at the western terminus of the NC 54 and US 15/US 501 interchange. The western terminus serves as a gateway to the employment centers such as UNC and its hospitals. The project continues to its eastern terminus at the intersection of NC 54 and NC 55. The corridor and its intersection with NC 55 serve as a gateway to RTP. Both termini are located at prominent intersections and provide access to major employment centers, with the overall corridor playing an important role delivering transit service between Chapel Hill, Durham, Raleigh, and regional destinations.

The proposed transportation project will address impacts to environmental resources on a broad scope and be a usable and reasonable improvement, even if no additional transportation improvements are made beyond the project limits. In addition, the project will not restrict the consideration of other transportation improvements in the foreseeable future.

7. LAND USE PLANNING

7.1 POPULATION TRENDS

Between 2000 and 2010 the populations of Durham County and Orange County grew by 19.8 and 13.2 percent, respectively. The Demographic Study Area (DSA) outpaced both of the counties within the project study area, with an increase of 28.6 percent in the same period. This population increase within the DSA represents a notable population growth of 2.5 percent annualized during the census period of 2000-2010. Table 1 shows the population changes within the DSA, Durham County, Orange County, and North Carolina between 2000 and 2010. The DSA is illustrated in Figure 3, found at the end of this document.

Table 1: Population change, 2000 – 2010*

Area	Population		Change from 2000 to 2010	
	2000	2010	Difference	% Change
Demographic Study Area	28,745	36,969	8,224	28.6
Durham County	223,305	267,587	44,282	19.8
Orange County	118,236	133,801	15,565	13.2
North Carolina	8,049,313	9,535,483	1,486,170	18.5

Sources: Minnesota Population Center. National Historical Geographic Information System: Version 2.0. Minneapolis, MN: University of Minnesota 2011. Census 2000/Census 2010 Time Series Tables Geographically Standardized

Table 2 compares 2010 population (as described in Table 1) with 2035 population projections for Durham County, Orange County, and statewide. In Durham and Orange counties, population growth to year 2035 is predicted to outpace statewide growth.

Table 2: Population change, 2010 – 2035*

Area	Population		Change from 2010 to 2035	
	2010	2035	Difference	% Change
Durham County	267,587	408,936	141,349	52.8
Orange County	133,801	174,888	41,087	30.7
North Carolina	9,535,483	12,122,640	2,587,157	27.1

Source: NC Budget and Management 2035 projections

7.2 LAND USE PLANS AND ZONING

Several jurisdictions have control of land use planning within the project study area. The DCHC MPO, Durham County, and Chapel Hill include NC 54 in land use plans and studies. The project

is consistent with local planning documents for NCDOT and Orange and Durham counties, as discussed below.

7.2.1 NCDOT

A feasibility study (FS-1005C) was completed in 2012 for the widening of NC 54 from I-40 to NC 55. The study recommends a four-lane divided curb and gutter section that would accommodate the projected design year (2035) traffic volumes. An additional 30 feet of right-of-way (ROW) is also recommended for transit pullouts at some intersections, as well as a grade-separated pedestrian bridge at the intersection of the American Tobacco Trail (ATT) in Durham.

7.2.2 Durham-Chapel Hill-Carrboro Metropolitan Planning Organization

The *NC 54/I-40 Corridor Study* was completed in December 2011 by the DCHC MPO. The area from the interchange at NC 54 and US 15/US 501 east to the interchange of NC 54 and I-40 is covered in this study. This study develops a vision for a multi-modally based corridor that would serve regional and local travel through an expanded network of streets, bus routes, and pedestrian and bicycle facilities and enhancements. High-density, mixed-use land uses are proposed around the existing corridor and the planned D-O Light Rail Transit Project stations to promote non-automobile based travel and to provide location-efficient alternatives for housing and transportation. Recommendations for pedestrian and bicycle improvements, including an off-road shared-use path from East. Barbee Chapel Road in Chapel Hill to the I-40 interchange, are made in this plan.

7.2.3 Chapel Hill

The NC 54 corridor is included as one of the town's focus areas in the *Chapel Hill Comprehensive Plan 2020*. The focus areas are described as most likely to change in the future due to vacant land, underdeveloped sites, and their location along transportation and transit corridors. Recommendations include focusing on density around the Friday Center and the proposed light rail stops (with density stepping down away from transit stops and towards existing residential) and maintaining the green gateway along NC 54.

UNC has begun an update to the University's Master Plan, which could result in proposals for new development and redevelopment along the Chapel Hill portion of the corridor.

7.2.4 Durham County

The Durham County Comprehensive Plan includes a future land use map designating the area on the western side of the NC 54 / I-40 interchange as a 'Suburban Transit Support Area'. The area is intended to be developed in a manner consistent with the Compact Neighborhood Tier which promotes "high density and intensity infill, redevelopment, and new development that integrates a mix of uses through an urban fabric". Suburban Transit Support Areas are designated for the intersection of NC 54 and NC 55 and for the area around the NC 54 and Fayetteville Road intersection. A variety of uses are classified for the remainder of the corridor, including commercial, recreation, office, and low and medium density residential. Mixed use zoning

overlay district standards are planned by the Durham planning staff for the Leigh Village D-O Light Rail Transit Project station in 2017.

7.2.5 Greenways

Several greenways are proposed within the project study area. The *Chapel Hill Greenways Master Plan* includes a recommendation for constructing a greenway along Little Creek, which would include a section that would go from Pinehurst Drive to NC 54. A potential connection to the ATT along NC 54, via the shared use path proposed in the *NC 54 / I-40 Corridor Study,* would be included with this proposed trail.

Greenway recommendations are made throughout Durham County by the *Durham Trails and Greenways Master Plan*. This includes recommendations for four new greenways and trails that would start within the project study area. These trails include the New Hope Creek Trail, the Third Fork Creek Trail, the Crooked Creek Trail, and the Northeast Creek Trail.

7.3 ECONOMIC DEVELOPMENT

Within the project study area, there are several business parks, including the East 54 and Meadowmont developments in Chapel Hill, and the Quadrangle and the Palladian Corporate Center in Durham. Smaller business centers are present at various major intersections throughout the project.

Data from the 2010-2014 American Community Survey (ACS) 5-Year Census shows the percentage of the population below the poverty level was 16.8 percent for Orange County and 18.1 percent for Durham County, compared to 12.2 percent statewide.

There are several developments proposed or in the process of being constructed within the vicinity of the project. The Glen Lennox redevelopment, the Station at East 54, and the Tri-Cities Medical Building are proposed in Chapel Hill. Chapel Run and The Meadows at Southpoint are under construction in Durham.

The Glen Lennox mixed-use site, on the north side of NC 54 in Chapel Hill, will include 1.7 million square feet of space, including 1,200 dwelling units. Demolition and reconstruction of fire station #2 and construction of a four-story office building are proposed as part of the Station at East 54 on the corner of Hamilton Road and Prestwick Road, just south of NC 54 in Chapel Hill. A 60,000 square foot medical building, Tri-Cities Medical Building, has been approved by Chapel Hill, but is not yet under construction at the southwest corner of NC 54 and Barbee Chapel Road. A 105 unit residential development, Chapel Run, is currently under construction on the north side of NC 54 between Farrington Road and George King Road in Durham. A 175 unit townhome community, The Meadows at Southpoint, is currently under construction at the southeast corner of NC 54 and Barbee Road in Durham.

7.4 TRANSPORTATION PLANS

7.4.1 Durham-Chapel Hill-Carrboro Metropolitan Transportation Improvement Program

This proposed project is listed in the FY2016-2025 Metropolitan Transportation Improvement Program, adopted on September 9, 2015.

7.4.2 Chapel Hill 2020 Comprehensive Plan

The Town of Chapel Hill adopted the Chapel Hill 2020 Comprehensive Plan on June 25, 2012. The plan recognizes six "Future Focus Areas" in Chapel Hill where changes may most likely occur to vacant land, underdeveloped sites, and their locations along transportation and transit corridors. The plan identifies NC 54 as one of these Future Focus Areas and describes it as a "mid-term priority". A next step with NC 54 includes focusing "additional efforts, in partnership with property owners in the area, to identify sections to rezone and to provide enhanced connectivity for bicycles, transit, pedestrians, and vehicles using the complete streets approach".

7.4.3 North Carolina State Transportation Improvement Program

The STIP identifies the allocation of funds for all projects, programs, and services statewide, covering highways, rail, aviation, public transportation, ferries, and bicycle and pedestrian accommodations. The STIP consists of the fiscally-constrained projects identified in the NCDOT 5-Year Work Program, as well as prioritized projects included in the 10-Year Program and Resource Plan.

Potential STIP projects are identified by priority projects included in comprehensive transportation plans or long-range transportation plans prepared by RPOs or MPOs. The proposed action is listed in the NCDOT 2016-2025 STIP and draft NCDOT 2018-2027 STIP as project number U-5774. The project is partially funded, receiving both state and federal funding, and divided into 10 STIP sections shown in Table 3 below.

Table 3: STIP U-5774 project sections

Section	Description	ROW (FY)	Construction (FY)	Cost
U-5774A	Upgrade interchange at US 15 / US 501..	Unfunded	Unfunded	$14,800,000
U-5774B	US 15 / US 501 in Orange County to SR 1110 (Barbee Chapel Road) in Durham County. Upgrade roadway corridor and convert at-grade intersection with SR 1110 to interchange.	2023	2024	$41,900,000
U-5774C	Upgrade roadway from SR 1110 (Barbee Chapel Road) to I-40.	2023	2024	$26,700,000
U-5774D	Falconbridge Road. Convert at-grade intersection to interchange (included in U-5774F).	-	-	-
U-5774E	SR 1110 (Farrington Road). Convert at-grade intersection to grade separation (included in	-	-	-

Section	Description	ROW (FY)	Construction (FY)	Cost
	U-5774F).			
U-5774F	I-40 / NC 54 interchange improvements.	Unfunded	Unfunded	$94,100,000
U-5774G	Upgrade roadway corridor from I-40 to NC 751.	Unfunded	Unfunded	$32,000,000
U-5774H	Upgrade roadway corridor from NC 751 to SR 1118 (Fayetteville Road).	2023	2025	$21,600,000
U-5774I	Upgrade roadway corridor from SR 1118 (Fayetteville Road) to SR 1106 (Barbee Road).	Unfunded	Unfunded	$33,600,000
U-5774J	Upgrade roadway corridor from SR 1106 (Barbee Road) to NC 55.	Unfunded	Unfunded	$30,600,000
Source: North Carolina Department of Transportation 2018-2027 Draft STIP.				$295,300,000

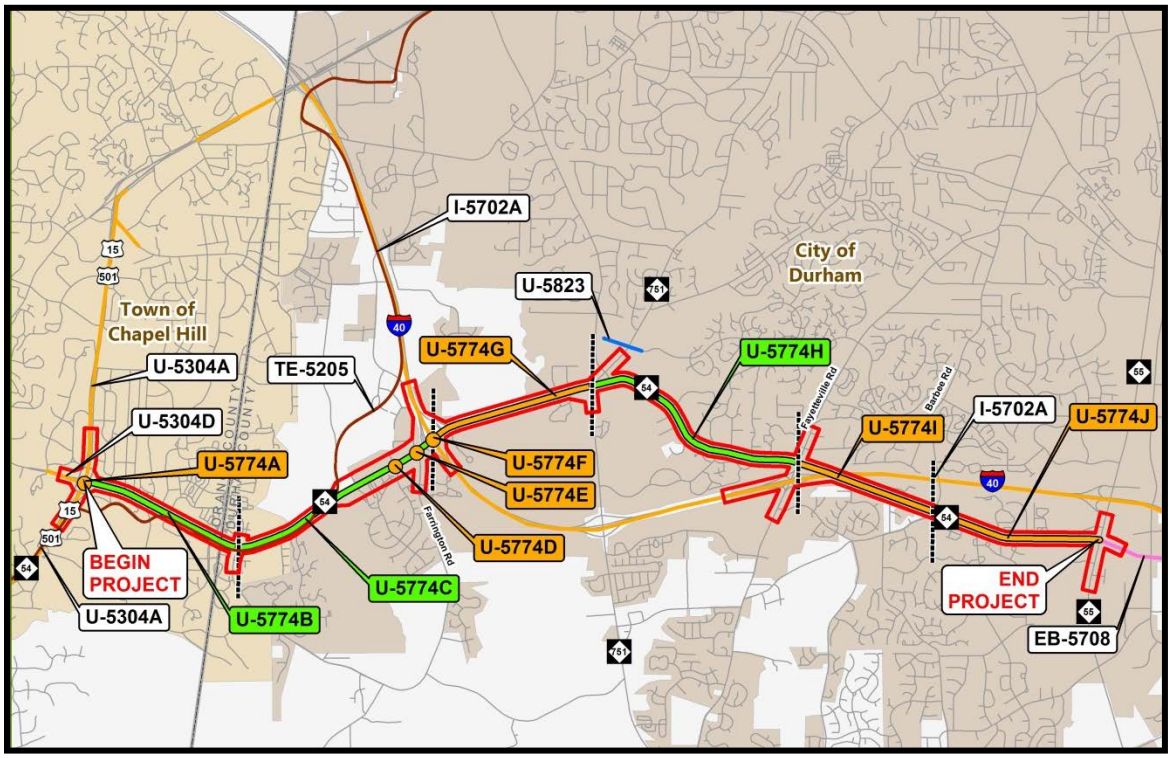
In addition to the proposed NC 54 Corridor Improvements project, other major STIP projects within the vicinity of the project study area that are funded for either planning, right-of-way acquisition, and/or construction are listed in Table 4 and shown on Exhibit 4.

Table 4: Other STIP projects in the vicinity of the project study area

STIP Project No.	STIP Description	ROW (FY)	Construction (FY)
U-5304A	US 15/US 501. From NC 86 (South Columbia Street) to SR 1742 (Ephesus Church Road) in Chapel Hill. Capacity improvements and possible interchange at SR 1902 (Manning Drive), with sidewalks, wide outside lanes, and transit accommodations.	2024/2025*	Unfunded
U-5304D	US 15/US 501. NC 54 (Raleigh Road). Interchange improvements.	2023	2024
I-5702A	I-40 construct managed lanes from US 15/US 501 in Durham County to NC 147.	2026	2026
U-5823	Woodcroft Parkway extension from SR 1116 (Garrett Road) to NC 751 (Hope Valley Road) in Durham. Construct roadway on new alignment.	2020	2021
TE-5205	D-O light rail line. From UNC hospitals in Chapel Hill to NC 55 (Alston Avenue) in Durham County. Construct light rail system.	-	Unfunded
TG-5255B	Establish neighborhood transit center in south Durham in connection with Southpoint park-and-ride facility.	-	-
EB-5708	NC 54. NC 55 to RTP western limit in Durham. Construct sections of sidewalk on south side.	-	2017

*Partially funded
Source: North Carolina Department of Transportation 2018-2027 Draft STIP

Exhibit 4: STIP projects in vicinity of project study area



8. TRAFFIC OPERATIONS AND ANALYSIS

8.1 EXISTING ROADWAY CHARACTERISTICS

The following is a description of characteristics for major roadways in the project study area.

US 15/US 501 and NC 54 enter the project study area from the south as a four-lane divided highway with a raised median and posted speed limit of 45 miles per hour (mph). NC 54 departs the shared facility at the interchange of US 15/US 501, NC 54, and Raleigh Road where it travels east. US 15/US 501 continue north through the project study area.

NC 54 is accessed by driveways and signalized and unsignalized at-grade intersections within the project study area; however, interchanges exist at US 15/US 501 and at I-40. The project begins with the interchange of NC 54 and US 15/US 501 (at NC 54 Exit 16). East of this interchange, NC 54 is a six-lane median divided highway with intermittent curb and gutter, no control of access, and a speed limit of 35 mph. As NC 54 approaches West Barbee Chapel Road, the speed limit transitions to 45 mph. NC 54 continues as a six-lane divided highway until just west of the intersection with East Barbee Chapel Road where the typical section transitions to a four-lane median divided highway. East of the interchange with I-40 (Exit 273), NC 54 transitions to a two-lane undivided highway, with various miscellaneous widening to accommodate turn lanes. The project study area ends just east of the intersection of NC 54 and NC 55. There are 19 signalized intersections along NC 54 within the project study area, and many access points for minor side streets, businesses, and residences.

As a principal arterial providing access to southwest Durham County and the Town of Chapel Hill, the NC 54 corridor is characterized by heavy congestion and long traffic queues, especially during morning and evening commute hours. Intersection queues for eastbound and westbound through traffic can stretch over 1,000 feet from the intersections.

Farrington Road enters the project study area from the south as a two-lane undivided facility, with no control of access and a posted speed limit of 35 mph. As Farrington Road approaches NC 54, it widens to four lanes to accommodate turn lanes, and includes curb and gutter on one side and sidewalks on both sides. North of the signalized intersection with NC 54, Farrington Road transitions to a two-lane undivided facility, no control of access, and a speed limit of 45 mph, before exiting the project study area to the north.

During the pm peak hour, traffic at the Farrington Road and NC 54 intersection can extend almost one-half mile beyond the intersection. This intersection is one of the most congested within the project study area, due to its close proximity to the NC 54 and I-40 interchange (just east of the NC 54 and Farrington Road intersection).

I-40 enters the project study area from south of the interchange with NC 54 as a six-lane divided facility, three lanes in each direction, with a concrete barrier, full control of access, and a speed limit of 65 mph. Acceleration and deceleration lanes are included at the ramps for the interchange with NC 54. The movement for I-40 westbound to NC 54 westbound is provided by a loop, while all other movements are provided by ramps. I-40 exits the project study area to the north of the interchange with NC 54.

Along with the intersection of NC 54 and Farrington Road, the interchange of I-40 and NC 54 is one of the most congested intersections within the NC 54 study corridor. Traffic often backs up onto westbound I-40 within the interchange area. The close proximity of Farrington Road to the I-40 and NC 54 interchange leads to congestion in queuing problems, as Farrington Road and the I-40 eastbound ramps are only 300-feet apart. Seven lanes of traffic at this intersection, heavy approach delays, and long queues make this intersection, and the adjacent NC 54 and Farrington Road intersection, difficult for commuters during peak hours.

NC 55 enters the project study area from the south as a four-lane undivided facility, two lanes in each direction with a shared two-way continuous left-turn lane, with curb and gutter, sidewalk on the southbound side, no control of access, and a posted speed limit of 45 mph. Intermittent widening along the facility accommodates turn lanes. The sidewalk and curb and gutter end just north of the intersection with NC 54. NC 55 continues north through the interchange at I-40 (Exit 278) and exits the project study area to the north. There are five signalized intersections along NC 55 within the project study area, and many access points for minor side streets and businesses.

8.2 EXISTING AND FUTURE YEAR NO-BUILD TRAFFIC VOLUMES

A traffic forecast for the NC 54 corridor and STIP Project U-5774 was prepared in January 2017 for the following scenarios:

- 2016 Base Year No-Build Alternative (Existing Conditions)
- 2040 Future Year No-Build Alternative

- 2040 Future Year Build Alternative

Table 5 shows the existing (2016) and projected future (2040) No-Build average daily traffic (ADT) volumes for NC 54 within the project study area.

Table 5: Existing (2016) and future year (2040) no-build traffic volumes

Section	Existing ADT (2016)	Future ADT (2040)
NC 54 – US 15/501 to Friday Center Drive	46,900-49,400	57,000-60,700
NC 54 – Friday Center Drive to Farrington Road (SR 1109)	46,800-47,500	51,000-53,800
NC 54 – Farrington Road (SR 1109) to I-40	55,600	71,400
NC 54 – I-40 to NC 751 (Hope Valley Road)	16,600-18,800	18,000-21,900
NC 54 – NC 751 (Hope Valley Road) to Rollingwood Drive	17,500-18,800	19,400-21,500
NC 54 – Rollingwood Drive to Fayetteville Road (SR 1118)	19,900-24,000	22,700-27,400
NC 54 – Fayetteville Road (SR 1118) to Barbee Road (SR 1106)	14,000-16,200	18,000-20,400
NC 54 – Barbee Road (SR 1106) to NC 55	17,400-22,000	21,500-27,100

Source: Traffic Forecast Report TIP Project No. U-5774 NC 54 Widening (AECOM 2017)

8.3 YEAR 2016 AND 2040 NO-BUILD CAPACITY ANALYSIS

Traffic capacity analyses were completed for the 2016 existing and 2040 future year no-build scenarios in May 2017. The following planned projects anticipated to be implemented by 2040 were included in the No-Build scenario and analysis:

- I-40 was upgraded to an 8-lane cross-section within the project study area.
- The new intersection of George King Rd with NC 54 was included.
- The intersection of SR 1791 (Mt Moriah Road) and US 15/501 was converted to a right-in/right-out configuration.

The Highway Capacity Manual (Transportation Research Board, 2010) characterizes the traffic carrying ability of a roadway by level of service (LOS), which is described with letter designations A through F. Table 6 describes the traffic conditions generally associated with each LOS designation. LOS A represents ideal low-volume traffic operations (i.e., free flow conditions) and LOS F represents over-saturated high-volume traffic operations (i.e., congestion).

Table 6: Level of service definitions

Level of Service	Traffic Flow Conditions	Delay (seconds)	
		Signalized Intersection	Unsignalized Intersection
A	Free flow. Individuals are unaffected by other vehicles and operations are constrained only by roadway geometry and driver preferences. Maneuverability within traffic stream is good. Comfort level and convenience are excellent.	0-10	0-10
B	Free flow, but the presence of other vehicles begins to be noticeable. Average travel speeds are the same as in LOS A, but there is a slight decline in freedom to maneuver and level of comfort.	10-20	10-15
C	Influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Multilane highways with a free flow speed (FFS) above 50 mph, the speeds reduce somewhat. Minor disruptions can cause serious local deteriorations and queues will form behind any significant traffic disruption.	20-35	15-25
D	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.	35-55	25-35
E	Operating conditions at or near the capacity level, usually unstable. The densities vary, depending on the FFS. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily. Most multilane highways with FFS between 45 and 60 mph per vehicle mean speeds at capacity range from 42 to 55 mph, but are highly variable and unpredictable.	55-80	35-50
F	Breakdown flow. Traffic is over capacity at points. Queues form behind such locations, which are characterized by extremely unstable stop-and-go waves. Travel speed within queues are generally less than 30 mph.	>80	>50

Note that the delays associated with LOS for signalized intersections are different from those associated with unsignalized intersections. The *Highway Capacity Manual* explains that drivers perceive that a signalized intersection is designed to carry higher traffic volumes and therefore expect to experience greater delays at signalized intersections. A signalized intersection is described by a single LOS. Unsignalized intersections are assigned a LOS for each minor movement.

8.3.1 Roadway Segments

Between US 15/501 and I-40, NC 54 varies from a four- to six-lane median divided facility with numerous at-grade intersections. Traffic flow along this section of NC 54 is generally controlled

by signalized intersections. East of I-40, the following two-lane roadway segments were analyzed:

- Leigh Farm Road to Biscayne Drive
- Woodcroft Shopping Center to Rollingwood Dr/Highgate Dr
- East of SR 1118 (Fayetteville Rd) to SR 1110 (Barbee Rd)
- SR 1110 (Barbee Rd) to Residence Inn Boulevard

All two-lane roadway segments are currently operating at LOS E and are projected to operate at LOS E in 2040.

8.3.2 Intersections

Unsignalized and signalized intersections along NC 54 were analyzed. Table 7 summarizes the LOS for existing (2016) and projected future (2040) No-Build conditions at unsignalized and signalized intersections in the NC 54 corridor between US 15/501 in Chapel Hill and NC 55 in Durham. The summary is based on the LOS that reflects the worst condition between am and pm peak hours for each intersection. As shown, 21 of 27 unsignalized intersections currently experience delays that would be categorized as LOS E or F. In 2040, all but one unsignalized intersection in the corridor would be at LOS F.

There are currently 19 signalized intersections along NC 54 within the project study area, with three (16 percent) operating at an overall LOS E or F. It should be noted that Table 7 shows the overall signalized intersection LOS, and 16 of the 19 signalized intersections operate with overall LOS D or better; however, 15 of these currently have one or more individual movements operating at LOS E or worse during one or both peak periods. In 2040, eight of 20 signalized intersections, or 40 percent, would operate at overall LOS E or F; however, all of the signalized intersections would have one or more individual movements operating at LOS E or worse during at least one peak period.

Table 7: Intersections – existing and future level of service

Intersections	Existing LOS (2016)	#	Future LOS (2040)	#
Unsignalized intersections	D or Better	6	D or Better	1
	E	1	E	0
	F	20	F	26
Signalized intersections	D or Better	16	D or Better	12
	E	2	E	2
	F	1	F	6

Source: NC 54 Corridor Improvements Draft Capacity Analysis (AECOM, 2017)

8.4 CRASH ANALYSIS

A crash analysis summary was prepared by AECOM for the period from February 1, 2011, to January 31, 2016, for the area along NC 54 from US 15/US 501 in Chapel Hill to NC 55 in

Durham. Table 8 compares the project study area crash data by type. Table 9 compares the project study area crash data with statewide and critical crash rates.

Table 8: NC 54 crash type summary

Type	Number of Crashes (Percent of Crashes)	
	NC 54 (Orange County)	NC 54 (Durham County)
Total	156 (100%)	1,437 (100%)
Fatal	0 (0%)	0 (0%)
Non-fatal (injury)	51 (32.69%)	287 (19.97%)
Night	30 (19.23%)	281 (19.55)
Wet	21 (13.46%)	235 (16.35)
Rear-end, slow or stop	83 (53.21%)	771 (53.65%)
Angle	23 (14.74%)	336 (23.38%)
Sideswipe, same direction	17 (10.90%)	135 (9.39%)
All other crash types	33 (21.15%)	195 (13.58%)

Source: U-5774 NC 54 Corridor Improvements, Crash Analysis (AECOM 2016)

Table 9: NC 54 crash rate analysis

Route	Crash Rate	Statewide Rate	Critical Rate*
NC 54 (Orange County)	161.77	264.81**	292.60
NC 54 (Durham County)	527.46	259.47***	275.71

Source: U-5774 NC 54 Corridor Improvements, Crash Analysis (AECOM 2016)

* Based on the statewide crash rate (95% level of confidence)
** 2012-2014 statewide crash rate for urban NC routes with 4 or more lanes and no control of access
*** 2012-2014 statewide crash rate for urban NC routes

As noted in Table 8, 156 crashes are reported along the subject portion of NC 54 in Orange County and 1,437 crashes were reported along the subject portion of NC 54 in Durham County over the three year analysis period. The crash rate for the section of NC 54 in Durham County is nearly double the statewide average and the critical crash rate. Having crash rates that consistently exceed the critical crash rates indicates an overall safety problem on this facility.

In addition, the crash data highlights the most frequent type of crash as rear-end collisions, a common indication of a congested roadway. Angle crashes are the second most prevalent crash pattern on NC 54 in Durham County within the project study area, which suggests issues at specific intersections. Fifty or more crashes occurred in the past five years for the following intersections:

- NC 54 at Huntingridge Road
- NC 54 at Farrington Road
- NC 54 at I-40 Eastbound Ramp
- NC 54 at Garrett Road
- NC 54 at Fayetteville Road
- NC 54 at Barbee Road

- NC 54 at NC 55

Within the project study area, there were thirteen pedestrian crashes and four cyclist crashes on NC 54. Two of the cyclist crashes occurred at the intersection of NC 54 and Friday Center Drive. The Friday Center is an extension of UNC, with many classes and conferences being held at this location, so there could be a higher than normal percentage of students who ride bikes in this area. Two pedestrian crashes occurred at the NC 54 and Hamilton Road intersection, which is surrounded by a mix of residential and retail facilities on both sides of the road. The mix of land uses could be the contributing factor for the pedestrian crashes at this location.

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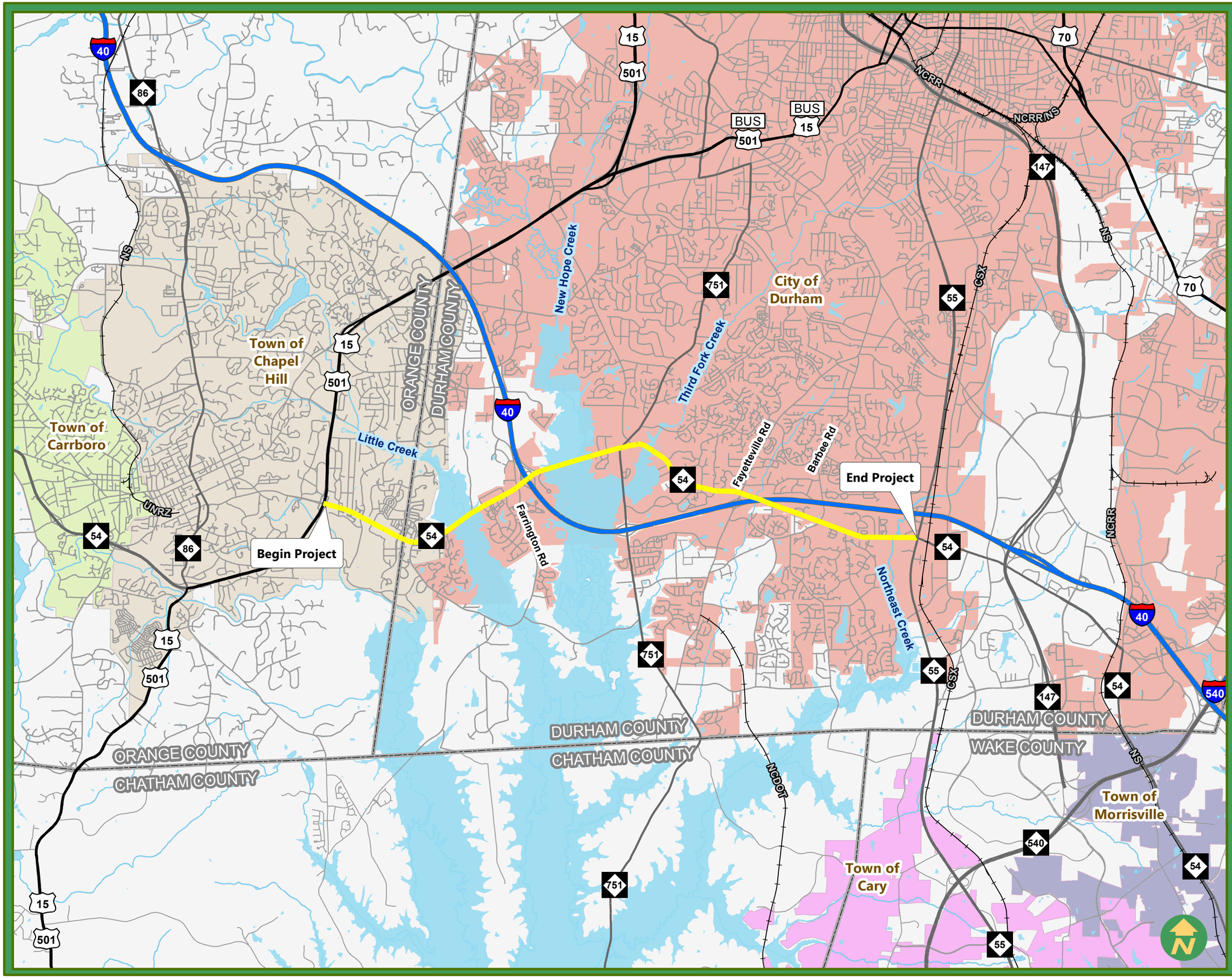
FIGURES

NC 54 Improvements from US 15-501 to NC 55 NCDOT STIP U-5774

Figure 1: Vicinity Map



Legend

- TIP Project U-5774
- Interstate
- US Highway
- NC Highway
- State Road
- Railroad
- Streams
- Water

Municipal Boundary

- Carrboro
- Cary
- Chapel Hill
- Durham
- Morrisville
- County

0 1 2 Mile

0 6,000 12,000 Feet

NC Transportation

May 2017

This map is for reference only.
Sources: Data was received by NC Department of Transportation, ESRI, NCFPM, AECOM

NC 54 Improvements from US 15-501 to NC 55 NCDOT STIP U-5774

Figure 2: Railroads & Transit

NC Transportation

May, 2017

This map is for reference only.
Sources: Data was received by NC Department of Transportation, ESRI, NCFPM, AECOM

Legend

- Project Corridor
- Project Study Area
- Proposed Durham-Orange LRT Alignment
- Proposed Durham-Orange LRT Station
- Existing Transit Stop
- CSX SDS Rail Branch
- Interstate
- US Highway
- NC Highway
- State Road
- Railroad
- Streams
- Water

Municipal Boundary

- Carrboro
- Cary
- Chapel Hill
- Durham
- Morrisville
- County

0 0.5 1 Miles

N

Proposed D-O LRT Farrington Road Rail Operations and Maintenance Facility

Begin Project

End Project

Town of Chapel Hill

City of Durham

ORANGE COUNTY

DURHAM COUNTY

New Hope Creek

Third Fork Creek

Little Creek

Farrington Rd

Fayetteville Rd

Barbee Rd

Northeast Creek

NCDOT - DD Branch

CSX - SDS Branch

40 15 501 751 54 86 55

NC 54 Improvements from US 15-501 to NC 55 NCDOT STIP U-5774

Figure 3: Demographic Study Area

Legend

- TIP Project U-5774
- DSA
- DCIA
- Interstate
- US Highway
- NC Highway
- State Road
- CSX SDS Rail Branch
- Railroad
- Streams
- Water

Municipal Boundary

- Carrboro
- Cary
- Chapel Hill
- Durham
- County

0 0.5 1 Mile

0 5,000 10,000 Feet

NC Transportation

May 2017

This map is for reference only.
Sources: Data was received by NC Department of Transportation, ESRI, NCFPM, AECOM