
NC 54 Pedestrian and Bicycle Corridor Safety Study

Final Report

PREPARED FOR

NCDOT, Office of Mobility and Safety
750 N. Greenfield Parkway
Garner, NC 27529
919.814.5000

PREPARED BY



Venture 1
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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NC 54 Pedestrian and Bicycle Corridor Safety Study Team

Mark Aldridge, NCDOT

Hanna Cockburn, NCDOT

Chuck Edwards, NCDOT

Brian Mayhew, NCDOT

David Phipps, NCDOT

Brian Thomas, NCDOT

Tina Moon, Town of Carrboro

Zachary Hallock, Town of Carrboro

Kumar Neppalli, Town of Chapel Hill

Jomar Pastorelle, Town of Chapel Hill

Bergen Watterson, Town of Chapel Hill

Bill Webster, Town of Chapel Hill

Donnie Rhoads, Chapel Hill Police Department

Nick Pittman, Chapel Hill Transit

Kurt Stolka, University of North Carolina at Chapel Hill

Lauren Blackburn, VHB

Joe Seymour, VHB



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Introduction

This section describes the study’s purpose, context, and schedule. The study began in Fall 2018 and concluded in December 2019. The study area is a 4.5-mile section of NC 54 from Manning Drive in Chapel Hill to Old Fayetteville Road in Carrboro.

1.1 Study Purpose

The purpose of the NC 54 Pedestrian and Bicycle Corridor Safety Study (hereafter “the study”) was to develop a consensus framework for NC 54 that utilizes a systems-based approach to address bicycle and pedestrian safety through short and medium-term improvements. Neighboring institutional, municipal, and private stakeholders have inquired of the North Carolina Department of Transportation (NCDOT) for specific safety and bicycle and pedestrian improvements at intersections and locations along the corridor. This study sought to collectively address those requests through a cohesive set of recommendations for bicycle, pedestrian, and transit safety improvements.

The study was funded by the NCDOT Traffic Safety Unit. The Traffic Safety Unit manages NCDOT’s Highway Safety Improvement Program and partners with stakeholders to implement and evaluate strategies to reduce fatal and serious injury crashes on North Carolina’s roadways. The Study Team, facilitated by VHB, included staff from the Town of Carrboro, Town of Chapel Hill, Chapel Hill Transit, University of North Carolina at Chapel Hill,

NCDOT Division 7, and the NCDOT Integrated Mobility Division. Together, the Study Team focused on four primary activities:

- Assess existing multimodal travel conditions and development within the corridor;
- Identify priority locations for considering short and medium-term traffic and safety impacts;
- Develop bicycle, pedestrian, and transit safety improvements within the corridor, from immediate to up to (ten) 10-year implementation timeframes;
- Conduct public outreach initiatives through the planning process.

1.2 Study Context

NC 54 between Manning Drive in Chapel Hill and Old Fayetteville Road in Carrboro provides essential local and regional transportation for a full range of transportation services and modes. The roughly 4.5-mile section of NC 54 is a four-lane partial access-controlled principal arterial highway that experiences daily vehicle volumes from 18,000 (western study limits) to 45,000 (eastern study limits) (Figure 1). It is a unique section of roadway between an urban-to-rural transition to the west and increasing congestion and complex lane configurations to the east.

There are grade separated interchanges at Jones Ferry Road, NC 86/US15-501/S Columbia Street, and Smith Level Road, and numerous signalized and unsignalized full and limited movement intersections and access points along the corridor. Multifamily housing, commercial properties, schools, and recreational assets like parks and greenways, and frequent bus service create demand for walking and bicycling trips. These conditions create a challenging environment for safe pedestrian crossings and access to transit.

As Chapel Hill, Carrboro, Orange County, and the University of North Carolina (college and medical facilities) have grown, the function of NC 54 has continued to evolve. Much of the corridor’s multifamily housing predates the widening of NC 54 (between Old Fayetteville and NC 86), and it now fronts a regionally significant and high-volume roadway with high operating speeds. Many of the corridor’s residents are dependent on Chapel Hill Transit (CHT) service for access to services and employment and cross the four-lane median divided roadway at unmarked crossing locations to reach or return from transit stops. The Towns of Carrboro and Chapel Hill are expanding access to greenways and park systems along NC 54, and the Towns are also exploring new bicycle connectivity across NC 54 at key interchange and intersection locations. The transportation function of NC54 is confronting priorities of mobility, accessibility, and safety for all modes.

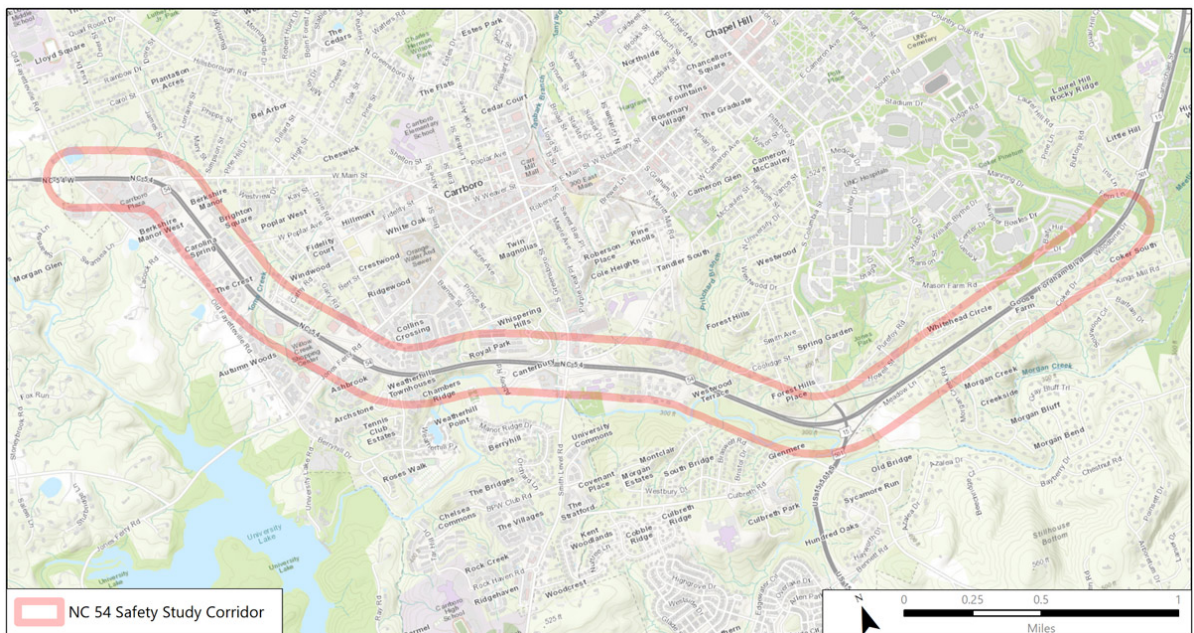


Figure 1 - NC 54 Safety Study Project Area

1.3 Schedule and Outreach Program

The study schedule was approximately twelve months, from Fall 2018 to December 2019. The study team met four (4) times during the project. The team met initially to review the scope of the project and participate in a field assessment. The team met a second time to review initial data analysis findings. The study team met a third time to discuss an approach to selecting countermeasures sites for priority consideration, as well as to prepare for an initial public workshop. The team met a fourth time to review proposed countermeasure recommendations and prepare for the second public workshop.

The study outreach included community workshops, one hosted in Carrboro in April 2019 and the second hosted in Chapel Hill in November 2019. To further engage the public, a project website was developed to provide general updates about the project, provide access

to an online interactive mapping tool, and to provide a link to a survey asking the public to provide input on bicycle and pedestrian transportation safety problems, potential solutions, and priorities for NC54.

2

Study Area Background

This section summarizes the corridor’s transportation infrastructure, operations, crash history, relevant plans, and results from the field review. Additional details and analyses are included within the Existing Condition Report in the Appendix.

2.1 Transportation Infrastructure

The NC 54 study area from Manning Drive to Old Fayetteville Road is a 4-lane median divided state highway with the federal functional classification of principal arterial. It is a partial access-controlled highway with a posted speed of 45MPH and 12’ travel lanes. While the lane and median cross section largely remain consistent throughout the corridor, the width of shoulders and presence of curb and gutter changes. There are 28 intersections in the NC 54 study area. Four intersections are signalized: Manning Drive, West Poplar Ave, Main Street, and Old Fayetteville Road. There are three interchanges at NC 86/US 15/501, Smith Level Road, and Jones Ferry Road. The remaining intersections are stop-controlled with either right in/right out access or right out/left in access. There are median openings at several intersections along the corridor that allow full access: Kings Mill Road, Morgan Creek Road, Laurel Ridge/Kingswood Road, and Oleander Road.

The corridor lacks consistent and connected linear pedestrian facilities, and crossing accommodations are present only at signalized intersections. Sidewalks are mostly limited to connecting transit stops to more densely developed residential and commercial centers along the corridor, except for those at West Main Street and Old Fayetteville. Sidewalk segments are typically 5’ wide and 100’ long with curb ramps at intersections. There are also few dedicated bicycle facilities along the corridor. There are partial, parallel, and perpendicular facilities, such as the Morgan Creek Greenway, to NC 54 that connect to larger bicycle networks in Carrboro and Chapel Hill.

2.2 Traffic Operations

AADT volumes were highest closer to Chapel Hill, near the eastern end of the corridor. AADT volumes peak at 40,000 vehicles per day east of Columbia Street, and it decreases as it moves to the west to an AADT volume of 20,000 vehicles per day, west of Jones Ferry Road. Observed pedestrian crossing counts were highest near the eastern and middle portions of the corridor, at locations with elevated AADTs, observed speeds, and Chapel Hill Transit service (Figure 2). Traffic speeds are higher than the posted speed limit along most of the corridor, posing risk for serious injury or fatal crashes with pedestrians who frequently cross

the road. 85th percentile speeds measured were highest east of Columbia Street in the eastbound direction (Figure 3).

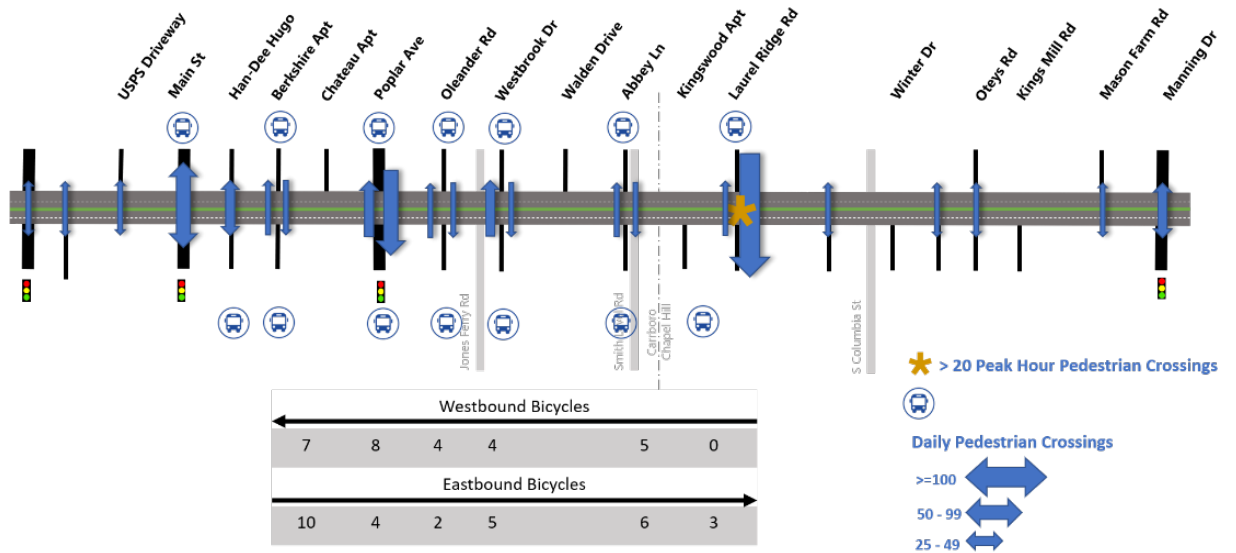


Figure 2 - Daily Pedestrian Crossings and Bicycle Volumes

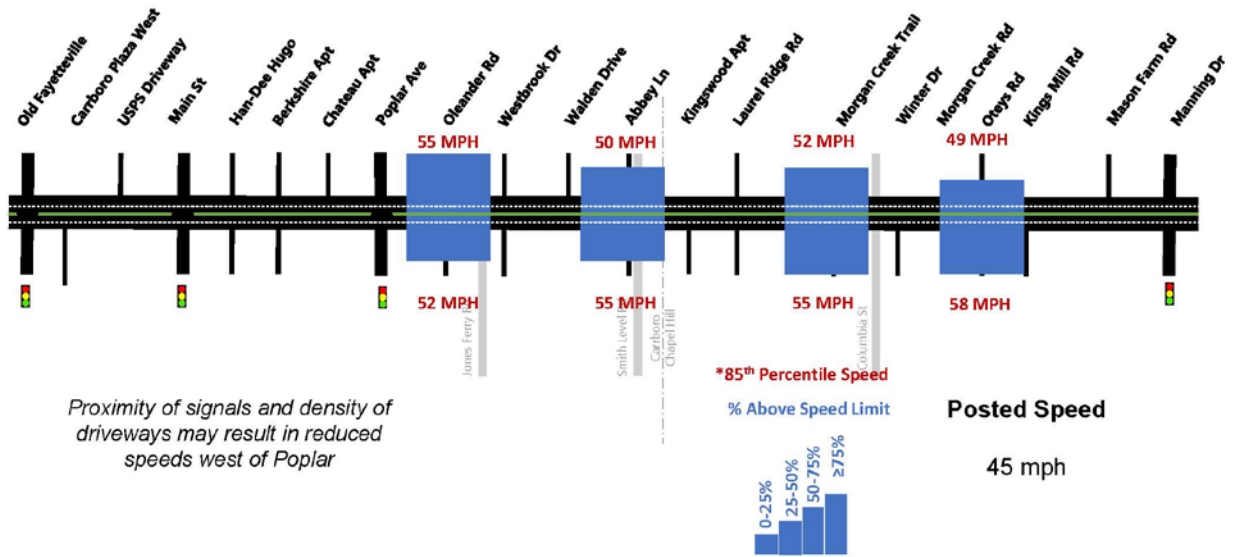


Figure 3 - Vehicle Speed - 7 Day Average

2.3 Safety and Crash Analysis

Ten-year crash data (12/01/2008 – 11/30/2018) was obtained from the NCDOT for NC 54 from SR 1107/SR 1937 (Old Fayetteville Road) to SR 1902 (Manning Drive). All reported crashes within the study limits and within 350 feet of the road centerline were reviewed. During this period, there were 18 reported bicycle and pedestrian crashes of 787 overall reported crashes (Figure 4). While none of the NC 54 crash rates exceed the statewide average for similar facilities, the conditions and locations of the bicycle and pedestrian crashes provided direction for improving safety. A majority of bicycle and pedestrian crashes occurred in the daylight, on clear days, and during off-peak hours. For pedestrian crashes, 75% occurred while the pedestrian was attempting to cross the roadway, while the remainder occurred when the pedestrian was walking along the shoulder of the road. All the cyclist crashes occurred when the cyclist was traveling straight in the travel lane. Just over half of crashes occurred in an intersection.

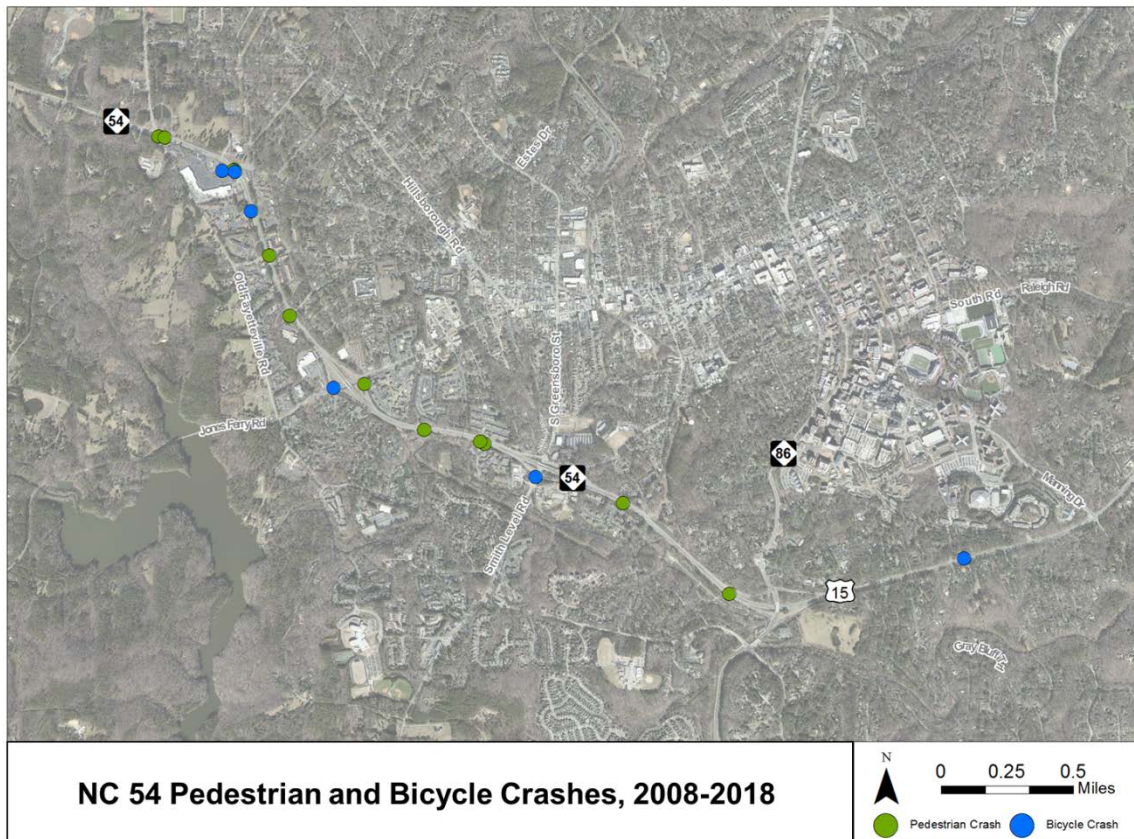


Figure 4 - NC 54 Pedestrian and Bicycle Crashes, 2008 - 2018

2.4 Relevant Plans

There are numerous studies and plans for the study area from the Towns, the Durham Chapel Hill-Carrboro MPO, and NCDOT that seek to improve safety, operations, and non-motorized connectivity along and across the corridor. These plans are detailed in the Appendix. Three of the most relevant plans include the Town of Carrboro's pending 2019 Bicycle Plan Update, Town of Chapel Hill Greenways Plan, and TIP Project U-5304A/B/E. The Town of Carrboro's bicycle plan seeks to improve bicycle crossings at major intersections like Old Fayetteville Road, Jones Ferry Road, and Smith Level Road and develop parallel shared-use paths along NC 54. The Town of Chapel Hill's Greenway Plan has recommended the extension of the Morgan Creek Greenway east from NC 86/US 15 501 along NC 54 to Oteys Road and beyond. Finally, the TIP projects of U-5304A/B/E seek to improve the interchanges and intersections of Manning Drive and NC-86/US 15 501 and widen NC-54 from NC-86 to Raleigh Road; the ultimate cross section and design is to be determined.

2.5 Field Visit

On January 30, 2019, the Study Team met at the Chapel Hill Public Library for a project kick-off meeting and to prepare for a multi-hour field visit of the corridor. The Study Team noted several positive and negative features of the corridor from the perspective of improving multimodal safety. Negative issues that could affect safety outnumbered the corridor's positive features. The Study Team noted the lack of adequate lighting, and that existing lighting was positioned to light the roadway and not pedestrian crossing locations. Vehicle speeds were reported above the posted limit during off-peak periods, and the roadway's topographical changes made visibility poor near locations like West Main Street and Oteys Road. The Study Team also noted the lack of overall connected pedestrian and bicycle facilities both along and for crossing the roadway, despite the presence and observation of pedestrians crossing NC 54. Observations from the field visit supported the development of the conceptual improvements, and they are detailed in the Appendix.

3

Development of Conceptual Improvements

This section summarizes the Study Team’s process for the identification of priority locations and the corresponding development of conceptual safety improvements.

3.1 Approach to Identifying Sites

The Study Team employed a multi-pronged approach to identifying locations along the corridor for improvements. These included identification of bicycle and pedestrian hot spots, systemic analysis (application of risk factors to the network), and a systems approach that incorporated planned network improvements. The results of these analyses led the Study Team to focus on several signalized and unsignalized locations for evaluation of improvements such as new traffic controls, addition of pedestrian signal phases, and other countermeasures designed to improve pedestrian visibility.

A detailed review of existing pedestrian and bicycle networks and planned improvements revealed gaps in the non-motorized network and opportunities to address both mobility and safety. These improvements included parallel networks, internal connections between private sites (i.e. multifamily developments) facilities like sidewalks and transit, and crossing locations that supported access to transit and greenways, among other paths of travel across the corridor. The results from the analysis of network connectivity—existing, planned, and potential—is illustrated in Figure 5 below. Several important non-motorized connections are proposed by local agencies but are scheduled for beyond the 10-year implementation timeframe for this study. These locations include the next phase of the Morgan Creek Greenway system across Smith Level Road and approaching NC 54 at Oteys Road.



Figure 5 - Network Connectivity

3.2 Alternatives Testing

After the identification of priority locations, the Study Team developed and tested a range of pedestrian and bicycle safety improvements to determine impacts on vehicular operations. Improvements, including new traffic signals and added pedestrian phases to existing signals, were tested against “No Build” scenarios (i.e. no changes to the operations of the location) using both present day roadway volumes and estimated 10-year future year traffic volumes. Each improvement was evaluated for its effect on intersection LOS, vehicle delay, and vehicle queues. Results varied depending on the tested improvement; while some crash countermeasures produced varying levels of delay and extended vehicle queues, like the introduction of a new signal, others did not have significant effects, like the addition of lighting and pedestrian signal heads. These results are detailed in the Appendix.

3.3 Review of Draft Concepts

The draft conceptual improvements were reviewed with both the Study Team and during a public workshop. Modifications and additional information were incorporated into the conceptual illustrations when deemed to improve non-motorized and vehicular safety, support mobility, and be implementable within the study’s scope. Comments from the public and institutional and governmental stakeholders are included in the Appendix. The final recommendations are described in Section 4 below.

4

Recommended Improvements and Future Study

This section describes the recommended safety improvements at locations across the corridor, identifies issues and projects for continued study, and explores pathways for project implementation.

4.1 Recommended Improvements

After review of the anticipated safety benefits and interaction and impacts on other modes, the following improvements were identified for nine locations. The locations were selected based on crash history and risk for severe injury pedestrian crashes. These improvements were recommended for several reasons such as improved pedestrian and bicycle mobility to established crossing locations, reduced risk for severe crashes, and/or feasibility for implementation within a 10-year window. Other improvements under consideration beyond the near-term implementation program are noted in Section 4.2 for future study. The images accompanying each site's recommendations are not to scale and are for conceptual planning purposes only.

4.1.1 Manning Drive

Recommendations:

- Install pedestrian signal heads on the south leg of the intersection.

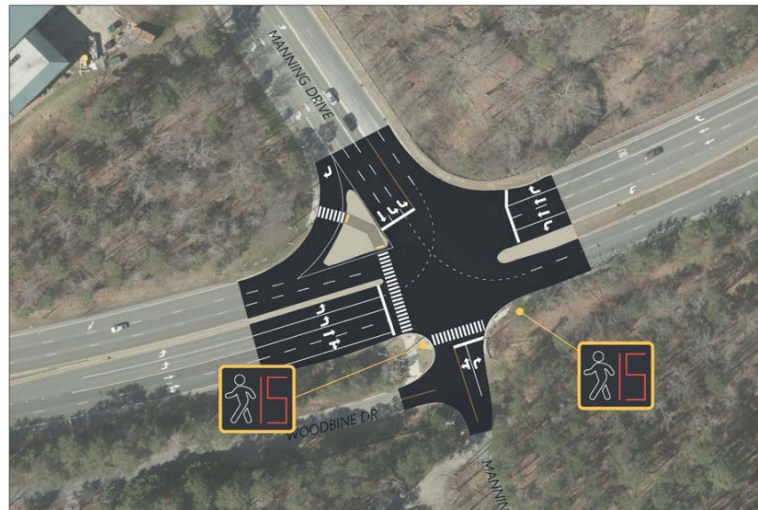


Figure 6 - Manning Drive

4.1.2 Kingswood/Laurel Ridge

Recommendations:

- Modify the intersection from full access to signalized left-in, right-out intersection
- Add high visibility crosswalks at realigned crossing
- Relocate bus stops to support near-side crossings and modified intersection
- Increase overhead lighting near crossings at intersection



Figure 7 - Kingswood/Laurel Ridge

4.1.3 Smith Level Road

Recommendations:

- Add high visibility crosswalk markings and pedestrian signal phases across all legs of NC 54 eastbound ramps
- Install pedestrian signal heads on the four corners of the Smith Level Road and NC 54 eastbound ramps



Figure 8 - Smith Level Road

4.1.4 Abbey Lane

Recommendations:

- Modify the intersection from unsignalized left-in, right-out intersection to a two-phase traffic signal
- Add high visibility crosswalks at realigned crossing
- Relocate bus stops to support near side crossings and modified intersection
- Extend sidewalks to relocated bus stops
- Increase overhead lighting near crossings at intersection



Figure 9 - Abbey Lane

4.1.5 Westbrook Drive

Recommendations:

- Modify the intersection from unsignalized left-in, right-out intersection to signalized condition;
- Add high visibility crosswalks at realigned crossing;
- Relocate bus stops to support near side crossings and modified intersection;
- Extend sidewalks to relocated bus stops;
- Increase overhead lighting near crossings at intersection.



Figure 10 - Westbrook Drive

4.1.6 Jones Ferry Road WB Ramps

Recommendations:

- Add high visibility crosswalk markings, pedestrian phases, and pedestrian signal heads across all legs of the NC 54 westbound ramps;
- Add pedestrian refuge island across Jones Ferry Road;
- Reduce vegetation on northwest corner of NC 54 WB onramp to improve visibility of crossing pedestrians.

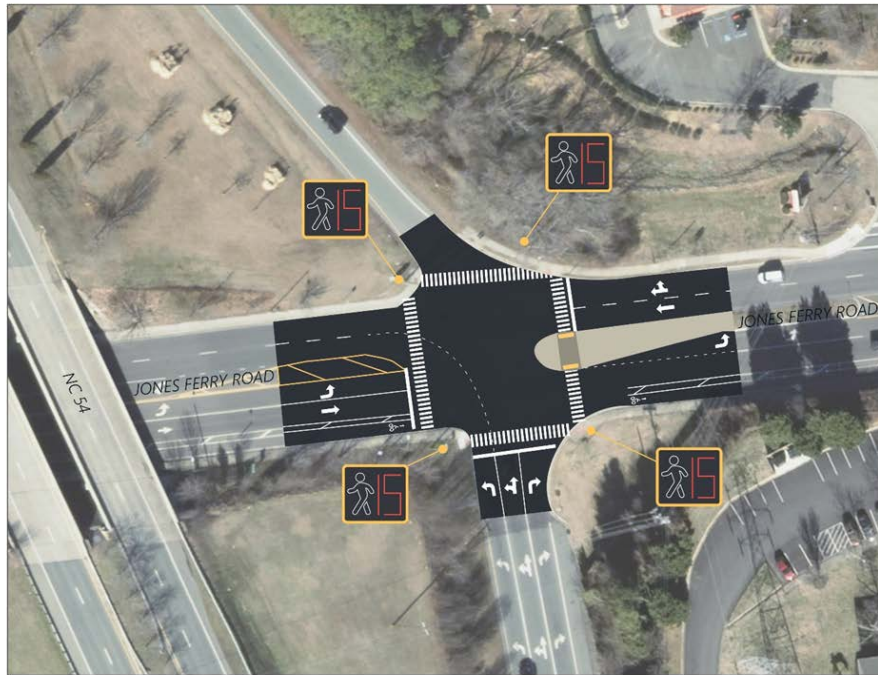


Figure 11 - Jones Ferry Road WB Ramps

4.1.7 W Poplar Ave

Recommendations:

- Add high visibility crosswalk markings across all legs;
- Add pedestrian signal heads on the southeast and southwest corners;
- Extend sidewalk on southeast corner of W Poplar Ave to existing bus stop;



Figure 12 - W Poplar Ave

4.1.8 W Main St

Recommendations:

- Transition existing crosswalk markings to high visibility continental crosswalk markings.



Figure 13 – W Main Street

4.1.9 Old Fayetteville Road

Recommendations:

- Implement Leading Pedestrian Interval (LPI) to improve vehicle yielding at crosswalk.



Figure 14 - Old Fayetteville Road

4.2 Locations and Potential Improvements for Future Consideration

4.2.1 Oteys Road

The Study Team evaluated Oteys Road and determined that it may be a good candidate for an at-grade or grade separated crossing location for further study in the future. Currently, Oteys Road lacks formal pedestrian facilities or bus service on either approach to NC 54; and these are key factors in establishing a marked crossing for NC54. While that location is included in long range connectivity and greenway plans, the Town of Chapel Hill does not have near-term (within the next 10 years, for the purposes of this study) plans to build a formal pedestrian network at Oteys Road. At such time a pedestrian or greenway network is established at Oteys Road, then NCDOT and the Town may re-evaluate opportunities for a crossing.

4.2.2 NC 86/US 15/501 Interchange Bicycle Connectivity

During the public engagement phases, comments supported exploring ways to improve North/South bicycle connectivity across the US 15/501 interchange and connect to the Morgan Creek Greenway system. Bicycling across the overpass was perceived as uncomfortable, and getting to/from the existing bicycle lanes on the overpass to/from the greenway was seen as a barrier. The Study Team looked at potential improvements to address those concerns. One such option includes a lane reduction/consolidation on the overpass that would support the conversion of the existing bicycle lanes to a two-way separated bicycle lane and a bicycle-oriented transition from NC-86 to the Morgan Creek Greenway on the southern side of the overpass. This and other potential bicycle network improvements should be considered within the upcoming TIP U-5304A, US 15-501/NC 54 interchange project.

4.2.3 Smith Level Road Bicycle Connectivity

Participants also noted challenges to North/South bicycle connectivity along Smith Level Road under NC 54 during the public engagement phases. This study recommends that the Town of Carrboro and NCDOT evaluate the potential for a lane reduction/consolidation of Smith Level Road from just south of the Eastbound ramps through the underpass. Such a lane reconfiguration could support the extension of the existing bicycle network through the intersection, providing an essential link between the network within Carrboro's urban center, the Morgan Creek Greenway, housing, and schools.

4.2.4 W Main Street Shared-Use Path Crossing

The Town of Carrboro is in the final stages of completing an update to its comprehensive bicycle master plan. As of Fall 2019, the draft recommendations included a shared-use path along the north side of NC 54 from Smith Level Road to W Main Street. It is recommended that the Town of Carrboro and NCDOT consider and evaluate options for bicycle connectivity across this signalized intersection. Considerations should include whether bicyclists will be

required/expected to dismount and cross as pedestrians, or if bicyclists will have separate crossing area (e.g. green painted with dotted lines parallel to the marked crosswalk).

4.2.5 Old Fayetteville Road Shared-Use Path Crossing

The same recommendation for the consideration of bicycle crossing treatments applies to the anticipated shared-use path at Old Fayetteville as noted for W Main Street above in 4.2.4.

4.3 Implementation

NCDOT will evaluate each of the site-specific improvements for eligibility through the Highway Safety Improvement Program (HSIP) and other implementation opportunities such as Division 7 operations and maintenance programs. Recommendations such as those shown at currently uncontrolled intersections (i.e., Westbrook Drive, Kingswood/Laurel Ridge) may be considered as individual projects. The NCDOT SPOT/TIP process may also be considered for improvements that do not meet criteria for safety programs.

4.3.1 Coordinating and Updating Local Plans

It is recommended that the institutional and governmental entities impacted by this study's findings incorporate the recommended projects in their respective transportation plans. For example, the study's recommendations of formal signalized crossings at Abbey Lane and Westbrook Drive would likely support improved connections and greater utilization of the expanding Morgan Creek Greenway system. Municipalities could also incorporate the study's recommendations into a reprioritization of projects based on local interests. Including this study's recommendations in existing bicycle, pedestrian, transit, multimodal, or greenway plans could take the form of an update or amendment. This plan coordination would also support future project development and implementation between the local units of government and institutions with NCDOT.

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