NC 54 Pedestrian and Bicycle Corridor Safety Study

Existing Conditions Report

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Introduction

This section describes the study's purpose, context, and schedule. The study began in Fall 2018 and is scheduled for completion in Fall 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") is to develop a consensus framework and vision for NC 54 that utilizes a systems-based approach to address multimodal safety and mobility 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 multimodal improvements at intersections and segments along the corridor. This study seeks to collectively address those requests through a cohesive set of safety and multimodal recommendations.

The study is funded by the NCDOT Traffic Safety Unit. The Traffic Safety Unit works with the State's 14 highway divisions to implement and evaluate strategies to reduce crashes on North Carolina's roadways. The Study Team, led by VHB, includes staff from the Town of Carrboro, Town of Chapel Hill, Chapel Hill Transit, University of North Carolina at Chapel Hill, NCDOT Division 7, NCDOT Public Transportation, and the NCDOT Division of Bicycle and Pedestrian Transportation. Together, the Study Team will focus on four primary activities:

- Assess existing multimodal travel conditions and development within the corridor;
- Synthesize and summarize short and medium-term traffic and safety impacts;
- Develop and plan strategies for multimodal safety improvements within the corridor, from immediate to up to (ten) 10-year implementation timeframes;
- Conduct public outreach initiatives through the planning process, including presenting the recommended strategy to NCDOT and local elected officials.

1.1.1 Schedule

The study is scheduled for approximately twelve months, with draft improvement concepts expected in late summer of 2019. The study incorporates two community workshops and tools--such as interactive mapping and a survey--for citizens to provide input on transportation problems, potential solutions, and priorities. The Study Team will also meet regularly with key stakeholders to help guide the study's consultants.

- Phase 1 – Data Collection & Outreach Tools - Early 2019
- Phase 2 – Existing Conditions & First Public Workshop - Spring 2019
- Phase 3 – Improvement Concept Development & Future Year Analyses – Summer 2019
- Phase 4 – Second Public Workshop & Improvement Concepts – Late Summer 2019, and Draft Report – Fall 2019

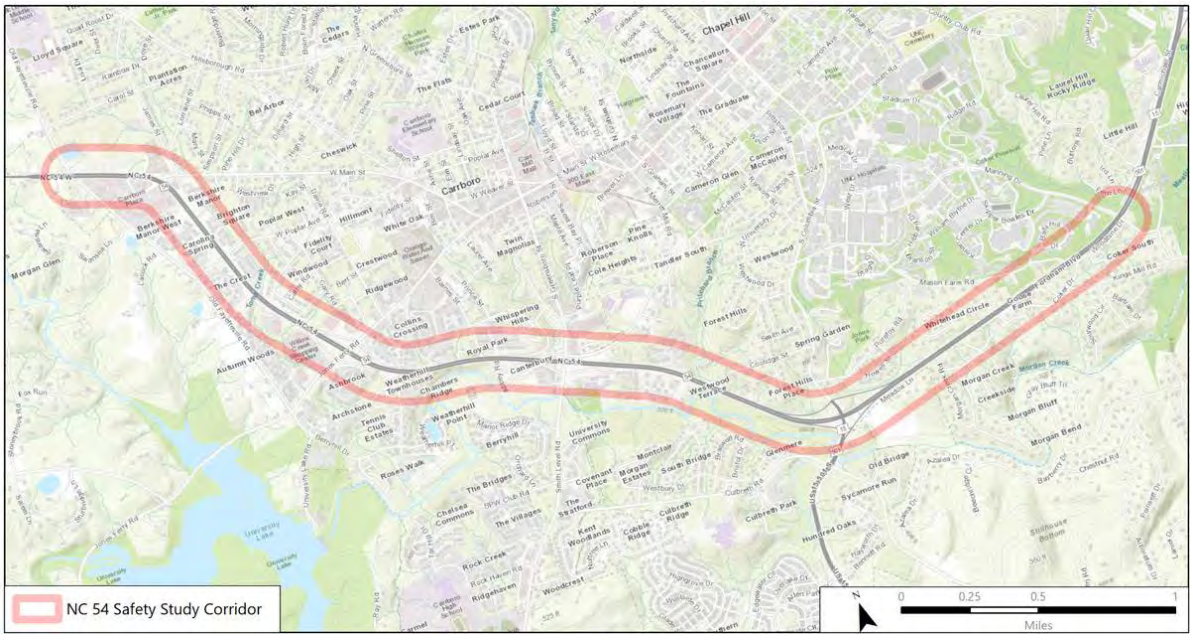


Figure 1 - NC 54 Safety Study Project Area

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.

The corridor's challenges are multifaceted. There are grade separated interchanges at Jones Ferry Road, NC 86/US 15-501/S Columbia Street, and Smith Level Road, and numerous signalized and unsignalized full and limited movement intersections and access points. Multifamily housing, commercial properties, schools, and recreational assets like parks and greenways, and frequent transit service line the corridor. 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. Without adequate pedestrian or bicycle facilities, many of the corridor's residents without vehicles are dependent on Chapel Hill Transit (CHT) service for access to services and employment and must cross the four-lane median divided roadway at unmarked crossing locations. 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 roadway is now in a position to serve—at times—competing priorities of mobility, accessibility, and safety for all modes.

2

Transportation Infrastructure

This section describes the existing roadway, intersection, pedestrian, and bicycle infrastructure along the corridor. There are significant planned improvements in the corridor that would expand vehicle capacity, transit, and non-motorized facilities.

2.1 Roadway Design Elements

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. The roadway cross section changes From Manning Drive east to NC 86, the roadway's paved shoulders are approximately 4′ wide with a side ditch, and the grass median is approximately 24′ wide. Between NC 86 and Jones Ferry Road, the paved shoulder varies between 6′ to 12′ wide, the grass median remains at 24′ wide, and curb and gutter is present on the west-bound direction. Finally, between Jones Ferry Road and Old Fayetteville Road, the paved shoulder varies between 5′ to 10′ wide, curb and gutter alternates with ditch between the east and west-bound directions, and the grass median is 24′ wide.

The corridor from Old Fayetteville Road to NC 86 was widened in the mid-1990's from a 2-lane, undivided minor arterial with 10′ wide shoulders (4′ paved sections) to its existing cross section.

2.2 Intersections

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.

2.3 Pedestrian Facilities

The corridor lacks consistent and connected linear pedestrian facilities, and crossing accommodations are present only at signalized intersections. Sidewalks are mostly limited to collocated transit stops along the corridor, except for those at West Main Street and Old Fayetteville. Where transit stops and sidewalks are collocated, the sidewalk segments are typically 5' wide and 100' long with curb ramps. Sidewalk sections are located along NC 54 at the following locations:

- Kingswood Road/Laurel Ridge Road, both sides of roadway
- Abbey Lane, both sides of roadway
- Westbrook Drive, both sides of roadway
- Oleander Road, both sides of roadway
- West Poplar Ave, both sides of roadway and along the northern side of West Poplar Ave
- Berkshire Apartments, both sides of roadway
- West Main Street, both sides of roadway
- Old Fayetteville Road, extending north and south on east side of Old Fayetteville Road.

Pedestrian crossing facilities on NC 54 are limited to the four signalized intersections noted above. The signalized intersections all include marked crosswalks (on most legs of intersection), pedestrian actuated signal heads, curb ramps, and truncated domes. The crosswalks at Manning Drive and Old Fayetteville Road are high visibility material and continental patterns, and the crosswalks at West Poplar Ave and West Main Street are standards parallel bar patterns. Pedestrian crossing islands are located at the Manning Drive, Old Fayetteville Road, and West Main Street intersections between the thru lanes and channelized right turn lanes.

2.4 Bicycle Facilities

There are few dedicated bicycle facilities along the corridor. While bicycles are legally permitted to use NC 54, the roadway volumes and operating speeds discourage bicycle travel in the lane or shoulder for the vast majority of bicyclists. There are partial, parallel, and perpendicular facilities to NC 54 that connect to larger bicycle networks in Carrboro and Chapel Hill.

- Bicycle lanes are present for 500' east of the Old Fayetteville Road intersection. These lanes connect to lanes that extend north and south along Old Fayetteville Road.
- A north-bound buffered bicycle lane extends along Jones Ferry Road under the NC 54 overpass

- Bicycle lanes are present along both sides of Smith Level Road south of the east-bound NC 54 ramps. The lanes end approximately 775' south of the NC 54 east-bound ramps.
- The Morgan Creek Trail greenway parallels NC 54 west of Laurel Ridge/Kingswood Road and continues east, ending to the east of NC 86/US 15/501.
- Bicycle lanes are present along NC 86/US 15/501 on both sides of the roadway. The lanes extend from Southern Village to the south of NC 54 to North Medical Drive at the UNC Hospital Campus.

2.5 Planned and Committed Improvements

There are four projects in the 2018-2027 State Transportation Improvement Program (STIP) within the corridor. These include:

- U-5304A: A statewide project for interchange improvements at US 15-501 and NC 86 along NC 54. Right of way is scheduled for 2024, and construction is scheduled for 2026.
- U-5304B: A statewide project for capacity improvements on NC 54 with sidewalks, wide outside lanes, and transit accommodations on US 15-501 between NC 86 (Columbia Street) and NC 54 (Raleigh Road). Right of way is scheduled for 2024, and construction is scheduled for 2026. Potential cross sections include widening to six lanes with a superstreet configuration and a widening to eight lanes with a traditional configuration.
- U-5304E: A statewide project to convert the at-grade intersection of US 15-501 and NC 54 at SR 1902 (Manning Dr) to an interchange. Right of way is scheduled for 2024, and construction is scheduled for 2026.
- U-6071: A regional project for intersection improvements at Old Fayetteville Road and NC 54. Right of way is scheduled for 2024, construction is scheduled for 2026, and the project development is in coordination with R-5821. This project was removed from consideration in Fall 2019.

3

Corridor Travel Characteristics

This section summarizes travel characteristics throughout the study corridor, including current average annual daily traffic volumes (AADTs) and associated trends; access point density; traffic speeds; and relevant attributes for pedestrian, bicycle, and transit modes.

3.1 Average Annual Daily Traffic (AADT)

Turning Movement Counts (TMCs) were collected for 28 intersections along NC 54, from Old Fayetteville Road to Manning Drive. The TMCs were collected on a typical day in November 2018 for a 16-hour period (6:00 AM – 10:00 PM). The AADT volumes were obtained from the TMCs. No seasonal factor was applied to estimate the AADT. Figure 2 shows the estimated AADT volumes.

AADT volumes on NC 54 are 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 at it moves to the west to an AADT volume of 20,000 vehicles per day, west of Jones Ferry Road.

3.2 Access Points

Except for Carrboro Plaza in the western end of the study corridor, there are no commercial driveways within the study corridor. Most of the access along NC 54 are pertinent to multifamily properties. The access points are considered as two-way stop-controlled (TWSC) intersections in the Level-of-Service analysis performed in Chapter 4.

Figure 2 - Estimated AADT for NC 54

3.3 Traffic Speed

In conjunction with traffic volume data, the Study Team collected traffic speed data for four segments of NC 54 for seven days. The posted speed limit along the entire corridor is 45 mph, but an analysis of the speed shows 85th percentile speeds between 49 and 55 mph.

3.4 Transit Service

Chapel Hill Transit operates ten routes along or through the NC 54 corridor, including three express routes that run during peak hours. Most stops are equipped with shelters, benches, and bus pull-outs to increase accessibility for passengers.

3.5 Pedestrian and Bicycle Volumes

The Study Team collected pedestrian and bicycle volumes along the corridor. These counts were taken as part of the TMCs, classification counts, and pedestrian counts collected at bus stops. The pedestrian and bicycles counts highlight significant activity areas, including sites of high pedestrian crossings. Figure 3 shows the daily pedestrian crossings at each intersection. Pedestrian crossing counts exceeded 20 pedestrian during the AM peak hour and in the hours before the PM peak hour at the combined Kingswood Apartment/Laurel Ridge Road location.

Observed bicycle volumes were far lower than the pedestrian levels and were concentrated in the western portion of the corridor. Bicycle volumes were highest in the lower vehicle volume and lower vehicle travel speed section near Berkshire Apartments. This may be due to bicyclist comfort, connection to the Carrboro bicycle facilities, access to destinations, other factors, or a combination thereof. As noted above, there are no dedicated bicycle facilities along NC 54 aside from wide paved shoulders.

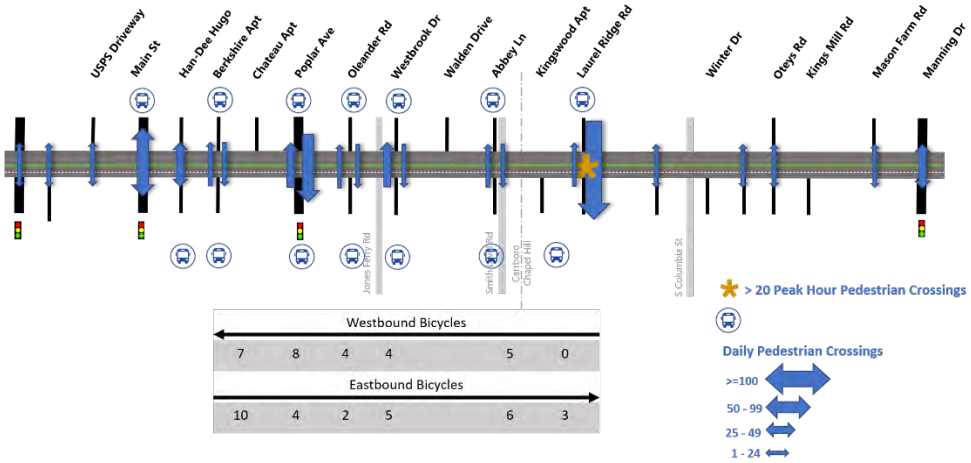


Figure 3 - Daily Pedestrian Crossings and Bicycle Volumes

4

Traffic Operations and Quality of Service

This section describes the Level-of-Service (LOS) for vehicles, transit, pedestrians, and bicycles at different locations along NC 54. LOS, when combined with other measures, allow for evaluation of a corridor's performance relative to prime operating conditions.

There are a variety of ways to measure the performance of a transportation facility. Transportation professionals typically rely on guidance from the Highway Capacity Manual, which describes performance from the traveler point of view that is designed to be useful to roadway operators, decisions makers, and community members. Individuals may travel along NC 54 by personal vehicle, walking, bicycling, or transit, each of which can be quantitatively measured using standard criteria such as delay, average speed, percent time spent following, and other measures. The dominant form of transportation currently along NC 54 is by automobile. As a result, this section covers traffic operations along the corridor on a corridor basis (i.e., distinguishable segments with common roadway characteristics), as well as by individual intersections. Due to the high volume of pedestrian and bicycle trips, and the number of bus routes along the corridor, and concern for future non-motorized safety and mobility, a multimodal level-of-service analysis was completed.

The conventional concept of level-of-service (LOS) can be summarized—at least qualitatively—in Figure 4 below. More detailed, qualitative tables are presented in subsequent sections. Generally, LOS D is acceptable in most rural and suburban situations. In

some highly urbanized settings, or where there are unacceptable environmental/community impacts, excessive costs, or other policy or planning objectives, LOS E can be appropriate.

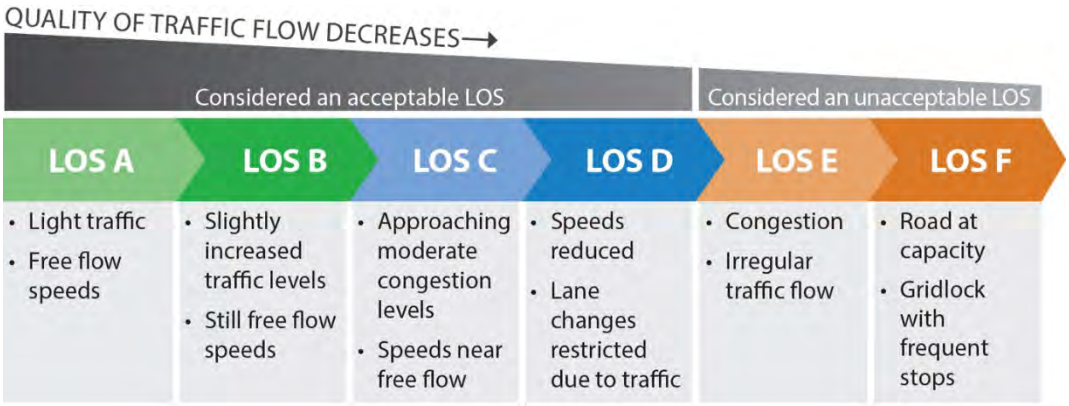


Figure 4 - Level-of-Service Description

4.1 Multimodal Level-of-Service Analysis

The multimodal level-of-service analysis (MMLOS) was completed using the Highway Capacity Software Version 7 (HCS 7). The NC 54 corridor was divided into six segments, each assessed for LOS in the PM peak hour. As part of the analysis, all six segments were classified as Urban Street. This allowed for a thorough examination of all modes along the corridor.

4.1.1 Vehicular Level-of-Service

Vehicular LOS is calculated by estimating the average speed of vehicles along the segment and comparing it with the Base Free-Flow Speed. This analysis takes into account various roadway characteristics, such as number of lanes, shoulder width, median, number of access points, and downstream intersection operations. Figure 5 shows the LOS for each segment during the PM peak hour. Most segments are operating above LOS E.

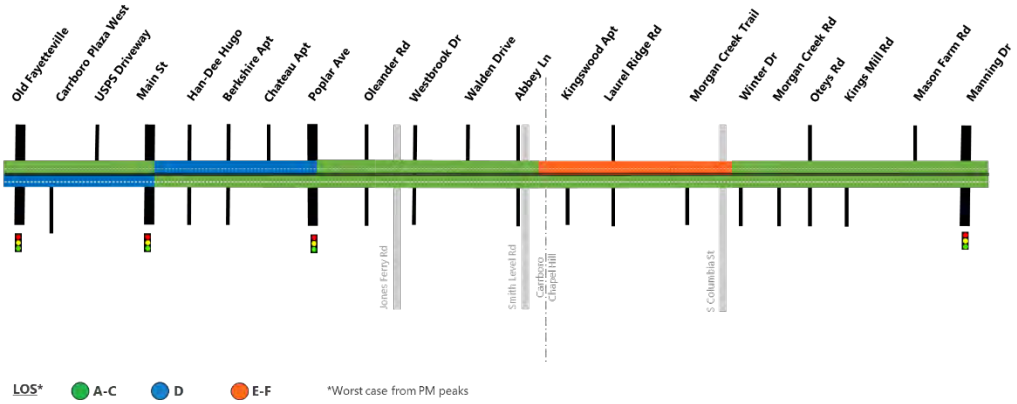


Figure 5 - Vehicular LOS – Segments

4.1.2 Pedestrian Level-of-Service

Factors included in the Pedestrian LOS analysis are outside travel lane width, shoulder width, sidewalk presence and width, traffic volume, distance to the nearest intersection, and speed of vehicles in the outside travel lane. Sidewalks are only located at intersections along NC 54; therefore, pedestrian LOS for segments have an unaccepted LOS score. Figure 6 shows the Pedestrian LOS for NC 54 segments. Pedestrian LOS is at or below E throughout most of the corridor.

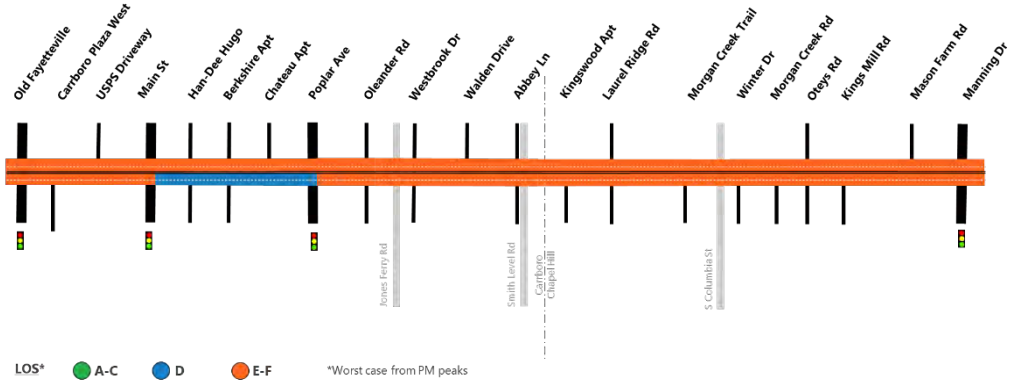


Figure 6 - Pedestian LOS – Segments

4.1.3 Bicycle Level-of-Service

The HCS has a thorough procedure to estimate LOS for bicycles. This procedure takes into account the volume and speed of traffic in the outside lane, heavy vehicle percentage, pavement condition, and bicycle lane, shoulder and outside lane widths. Most of the NC 54 corridor has ample shoulder width, which produced a satisfactory LOS for bicycles, as shown in Figure 7. However, this LOS does not translate to what actual bicycle riders have experienced in this corridor. Therefore, for the purpose of this study, a different methodology was used to score the bicycle mode known as Bicycle Level of Traffic Stress.

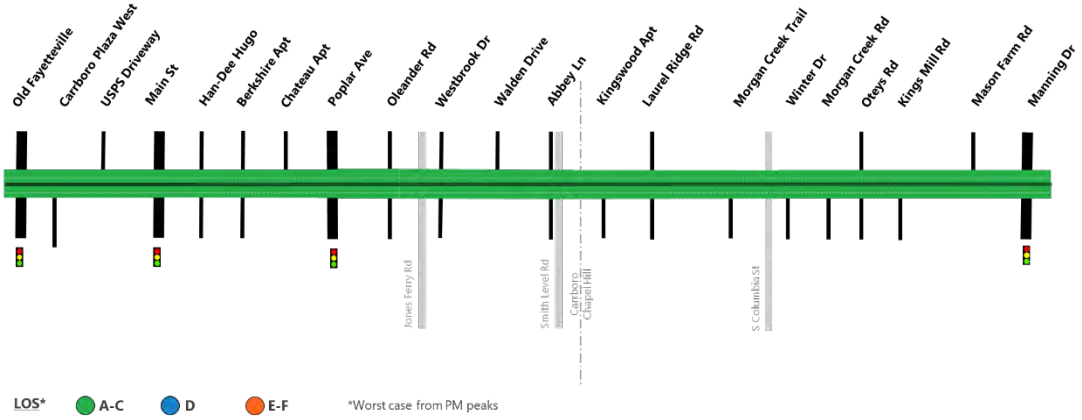


Figure 7 - Bicycle LOS – Segments

Bicycle Level of Traffic Stress

The Study Team included a comparative measure of bicycle accessibility known as Bicycle Level of Traffic Stress (LTS) to evaluate the NC 54 corridor. Whereas the MMLOS for bicycles, heavily weights the presence of wide shoulders in determining performance, LTS considers the combination of vehicle speed, roadway lane configuration, and the existing bicycle facilities (if any) to identify how comfortable a road is to bicycle upon. Roadways with the level of LTS 3 and 4 are limited to bicyclists who are confident riders in higher speed mixed traffic environments; LTS levels 1 and 2 are the where the majority of bicyclists would feel comfortable.

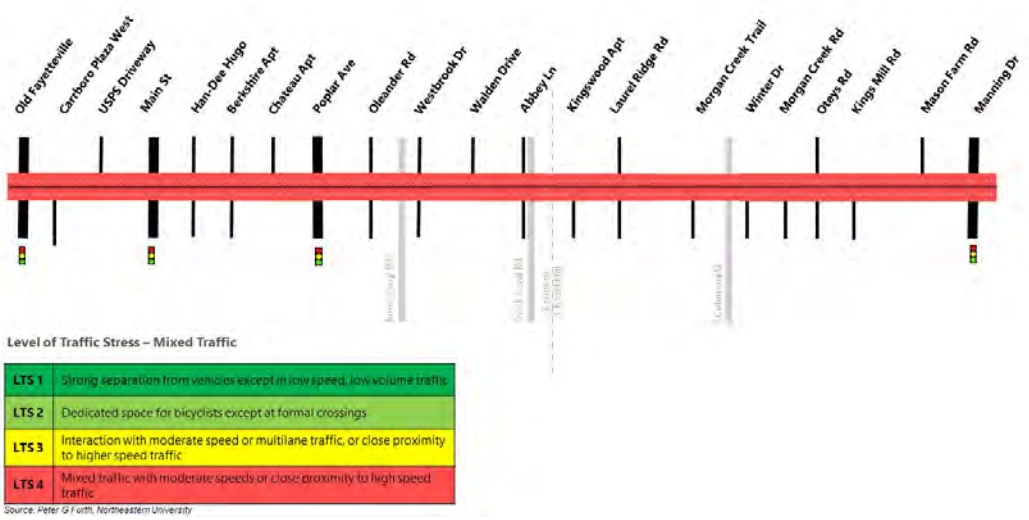


Figure 8 - Level of Traffic Stress

The prevailing LTS level for the NC 54 study area is 4, meaning it generates the highest stress levels for bicyclists and supports few riders (Figure 8). This evaluation contradicts the MMLOS bicycle score, though it may be understood as more accurately representing the experience of riding along NC 54. As seen in the corridor's Travel Characteristics, reported weekday bicycle volumes along NC 54 did not surpass 20 at any observed location.

4.1.4 Transit Level-of-Service

Similar to the other modes, HCS 7 provides a LOS scoring for transit service that takes into consideration bus travel speed, amenities at bus stops, excess wait time and on-board crowding. Bus travel speed in this corridor is affected by the high number of bus pull-outs, which increases the bus delay. The high number of bus routes along the corridor is correlated to the high number of high-density land uses along NC 54. Figure 9 shows the LOS for the transit mode. No LOS was provided for the NC 54 segment east of NC 86 since Chapel Hill Transit does not offer any service in that area.

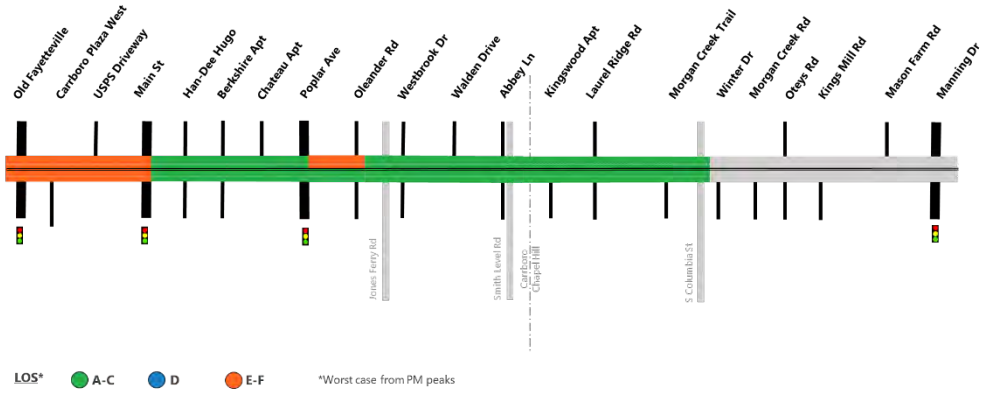


Figure 9 - Transit LOS

4.2 Vehicular Level-of-Service at Intersections

Peak hour LOS measures the adequacy of the intersection geometrics and traffic controls of a particular intersection or approach for the given turning volumes. Levels of service range from A through F, based on the average control delay experienced by vehicles traveling through the intersection during the peak hour. Control delay represents the portion of total delay attributed to traffic control devices (e.g., signals or stop signs). The engineering profession generally accepts LOS D as an acceptable operating condition for signalized intersections in urban areas and LOS C for rural areas.

At unsignalized intersections, LOS E is generally considered acceptable only if the side street encounters delay. Nevertheless, side streets sometimes function at LOS F during peak traffic periods; however, the traffic volumes often do not warrant a traffic signal to assist side street traffic.

Intersection LOS analysis for vehicles was performed using HCS 7. The existing (2019) scenario analysis utilized the current signal plans from the NCDOT. Two signalized and 5 unsignalized intersections were operating at an unacceptable LOS, as shown in Figure 10.

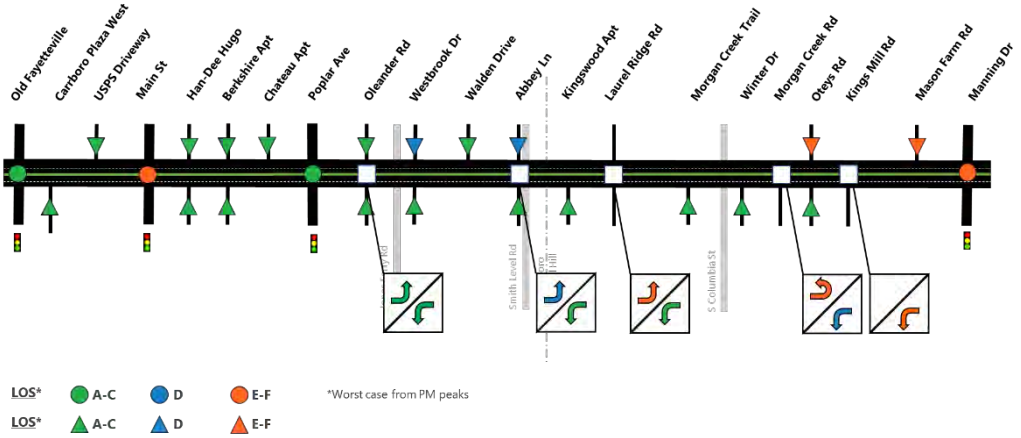


Figure 10 - Vehicular Intersection LOS

4.3 Pedestrian Crossing Delay at Intersections

Similar to vehicular delay, the pedestrian crossing delay was analyzed for signalized and unsignalized intersections using HCS 7. Pedestrian crossings at unsignalized intersections are predominant near bus stops due to the CHT route schedule. This creates a pedestrian platoon crossing effect at unsignalized intersections that exacerbates the crossing delays. Figure 11 and Figure 12 show the pedestrian LOS and estimated delay at various intersections, respectively. The highest pedestrian crossing delay experienced on NC 54 is located on Morgan Creek Trail, where a pedestrian would have to wait an average 23 minutes before finding an acceptable gap to cross NC 54 in the PM Peak period.

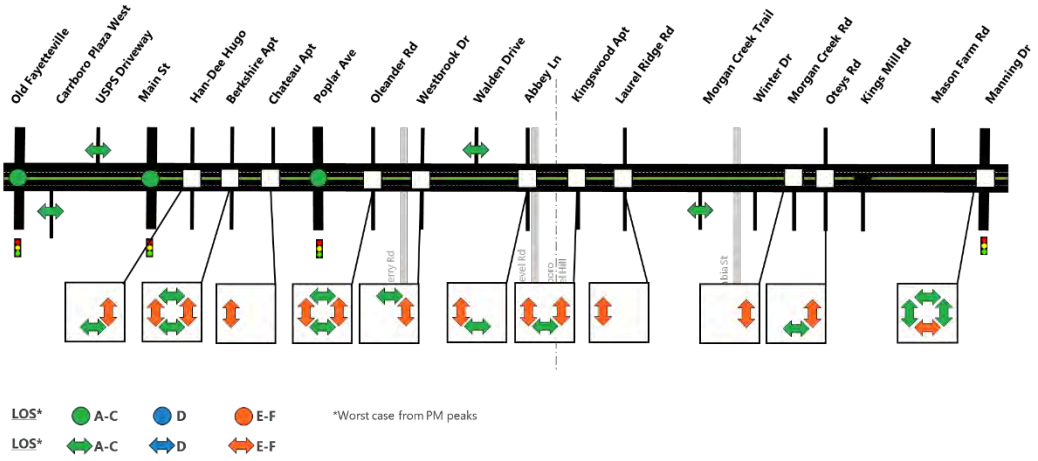


Figure 11 - Pedestrian Intersection LOS

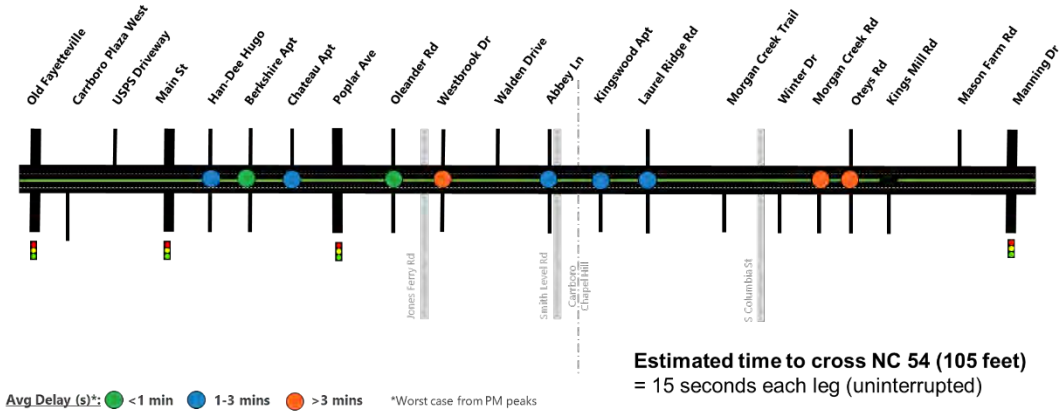


Figure 12 - Average Pedestrian Delay Crossing NC 54

5

Safety

This section details the results of a 10-year analysis of vehicle crash data for NC 54 from SR 1107/SR 1937 (Old Fayetteville Road) to SR 1902 (Manning Drive). An overview of all vehicle collisions was followed by an in-depth look at bicycle and pedestrian crashes on the corridor.

5.1 Crash Analysis

Ten-year crash data (12/01/2008 – 11/30/2018) was obtained from the NCDOT Traffic Engineering Accident Analysis System (TEAAS) along NC 54 from SR 1107/SR 1937 (Old Fayetteville Road) to SR 1902 (Manning Drive). For the analysis, all reported crashes within the study limits and within 350 feet of the road centerline were reviewed.

The crash rates are reported in Table 1. None of the NC 54 crash rates exceed the statewide average for similar facilities. Additionally, all crash rates observed for NC 54 along the project corridor are below the statewide critical crash rate.

Table 1 - NC 54 from SR 1107/SR 1937 (Old Fayetteville Road) to SR 1902 (Manning Drive) Crash Rates (12/01/2008- 11/30/2018)

Rate	Crashes	Crashes per 100 MVM	Statewide Crash Rate*	Critical Crash Rate
Total	787	147.11	245.45	256.69
Fatal	3	0.56	0.73	1.43
Non-Fatal Injury	254	47.48	72.42	78.57
Night	175	32.71	60.13	65.74
Wet	138	25.79	40.03	44.62

Source: 2015-2017 statewide crash rate for urban 4-lane undivided routes in North Carolina (95% level of confidence).

Table 2 displays the total number of crashes for each crash type observed along the study corridor. The predominant crash type on the study corridor was rear end crashes, which comprised 49% of all crashes. Left-turn crashes and sideswipes occurred second-most frequently, making up about 11% of total crashes each.

Table 2 - Crash Type Summary

Crash Type	Crashes	%
Angle	53	7%
Animal	51	6%
Backing Up	5	1%
Fixed Object	6	1%
Head On	4	1%
Left Turn	88	11%
Movable Object	6	1%
Other Collision	7	1%
Other Non-Collision	7	1%
Overturn/Rollover	3	0%
Parked Vehicle	2	0%
Pedalcyclist	3	0%
Pedestrian	8	1%
Ran Off Road	54	7%
Rear End	385	49%
Right Turn	16	2%
Sideswipe	87	11%
Unknown	2	0.3%

The crash maps below show that the intersection with the greatest total crashes over the ten-year period was NC 54 and NC 86/Columbia Street, followed by NC 54 and Manning Drive (Figure 13, Figure 14, Figure 15). That most crashes occurred in the eastern half of the corridor is unsurprising as the AADT for NC 54 is around 40,000 at Manning Drive but decreases to the west, down to about 20,000 AADT near Old Fayetteville Road.

The crash maps were created by grouping crashes together by intersection and section. All crashes within 150' of an intersection were included in that intersection's count, while crashes outside that limit were grouped by section.

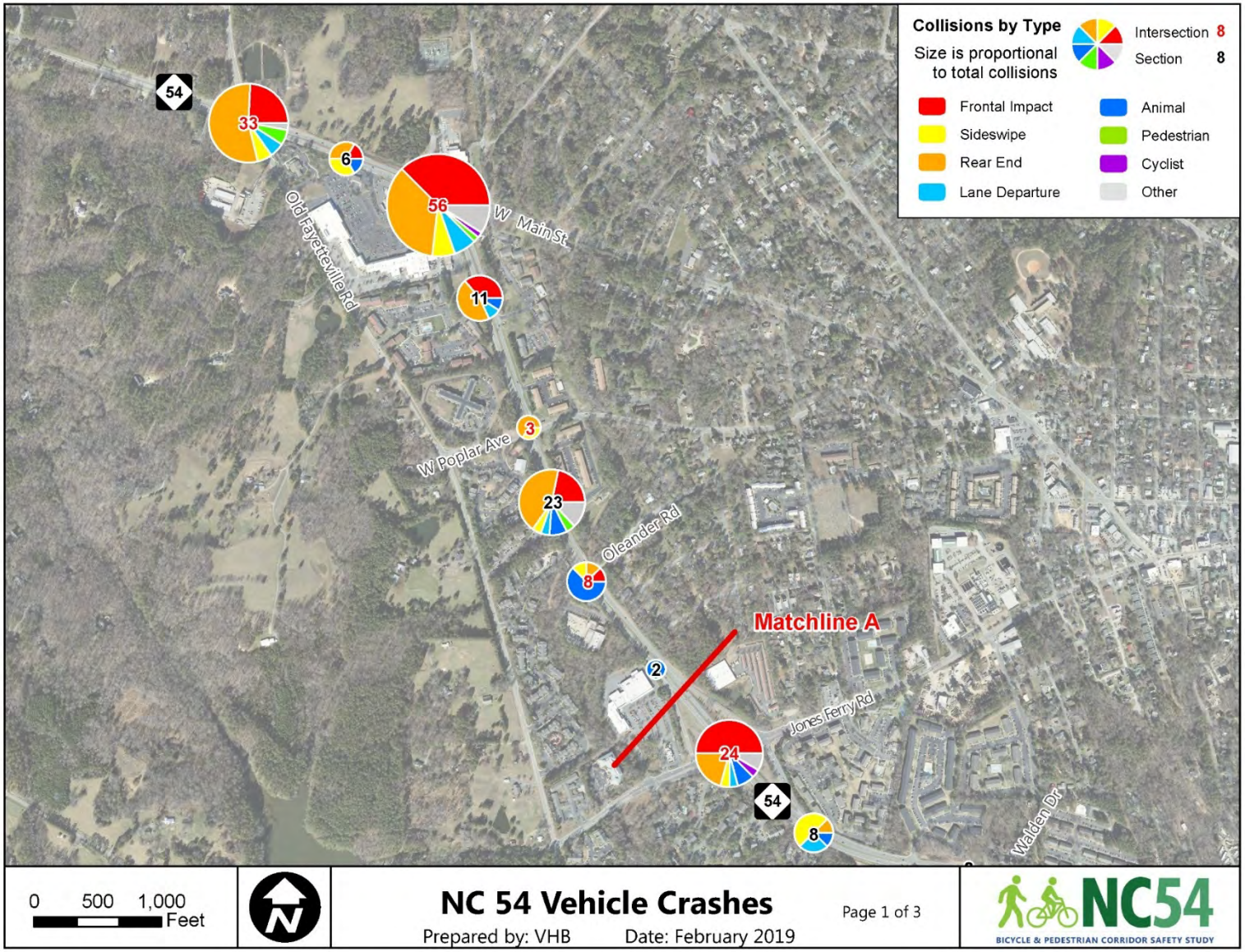


Figure 13 - Crash Analysis, Segment 1

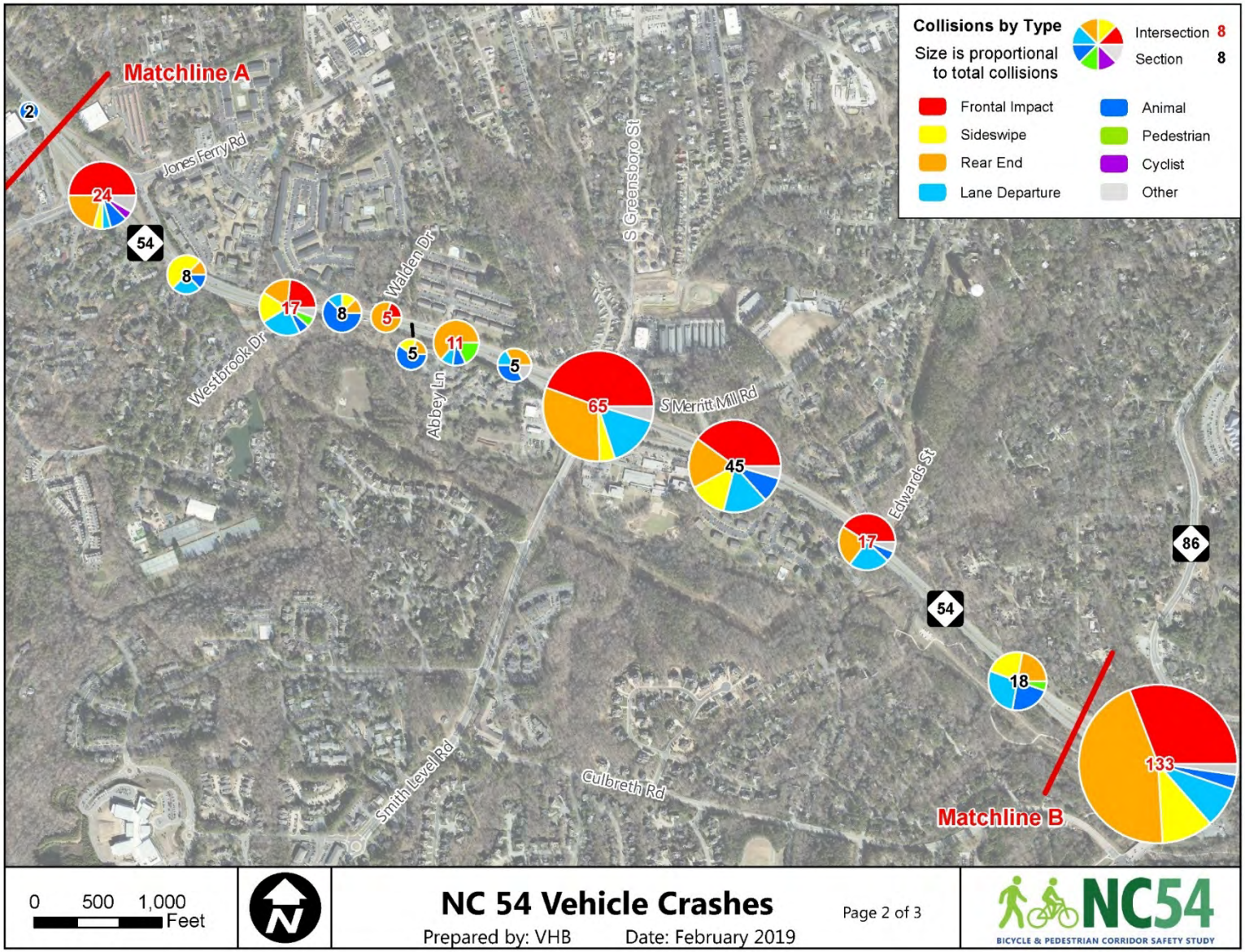


Figure 14 - Crash Analysis, Segment 2

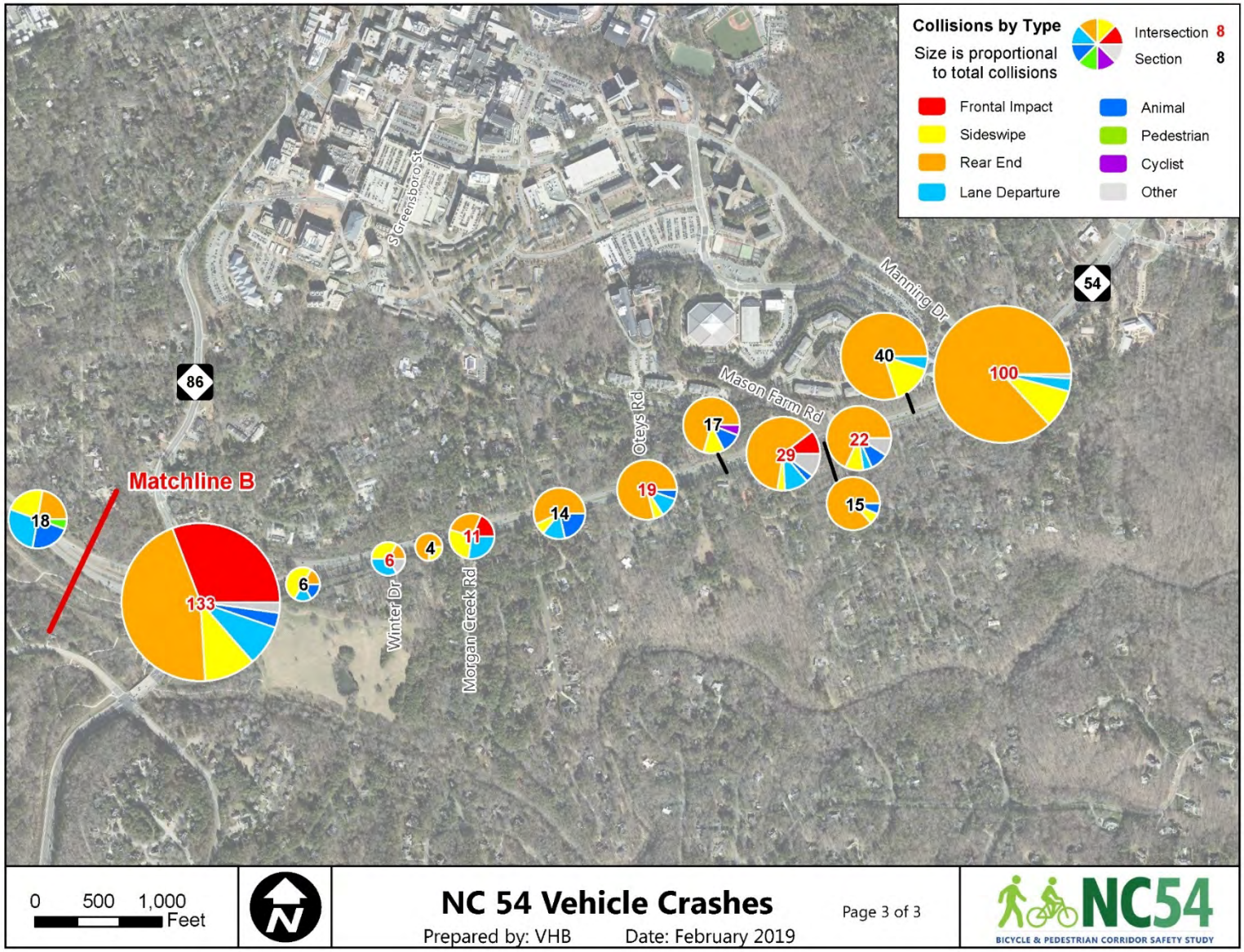


Figure 15 - Crash Analysis, Segment 3

5.2 Bicycle and Pedestrian Crash Analysis

After the overview analysis of all vehicle crashes, bicycle and pedestrian crashes were looked at in-depth. Crash reports for all bicycle and pedestrian crashes were reviewed for characteristics like time of day, lighting, weather, severity, whether the crash was located at an intersection and pedestrian/cyclist action before the crash. The results are laid out in Table 3.

There were 12 total pedestrian crashes and 6 total bicycle crashes between 2008-2018. There were two fatal crashes, both of which involved pedestrians. 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.

While there were some shared characteristics between crashes, there were few specific, distinguishable patterns. This is due in part to the small number of total crashes and the limitations of the information available in the crash reports.

Table 3 - Bicycle and Pedestrian Crash Summary

Collision Summary																						
	Type of Collision		Cyclist/Pedestrian Action			Intersection		Time of Day			Lighting				Weather			Severity					
Date	Bicycle	Pedestrian	Crossing Roadway	Walking in Shoulder	Cyclist Traveling Straight	Yes	No	AM Peak (7am - 10am)	PM Peak (4pm - 7pm)	Off-Peak	Dark - Lighted	Dark- Not Lighted	Dusk	Daylight	Clear	Cloudy	Rain	K: Fatal	A: Severe Injury	B: Evident Injury	C: Possible Injury	O: No Injury	Total
2008		1	1				1			1		1				1		1					**1**
2009	1	2	2		1	2	1		1	2	2		1		2		1				2	1	**3**
2010		2	1	1		2		1		1				2	2				1	1			**2**
2011	1	1		1	1	1	1	1		1				2	1	1			1	1			**2**
2012		2	2			1	1			2	1	1			1		1	1			1		**2**
2013		1	1			1			1		1				1				1				**1**
2014		1		1		1				1				1	1						1		**1**
2015	1				1		1		1					1	1					1			**1**
2016		1	1			1		1						1	1					1			**1**
2017	2	1	1		2	1	2	1		2	1			2	1	2			1	1		1	**3**
2018	1				1		1			1				1	1					1			**1**
Total	**6**	**12**	**9**	**3**	**6**	**10**	**8**	**4**	**3**	**11**	**5**	**2**	**1**	**10**	**12**	**4**	**2**	**2**	**4**	**6**	**4**	**2**	**18**

6

Relevant Plans

This section summarizes existing plans relevant to the project section of NC 54. Each summary includes an overview of the plan and specific information in the plan affecting the NC 54 Bicycle and Pedestrian Safety Study project corridor. The composite map at the conclusion of this section includes the noted planned transportation improvements (Figure 16).

6.1 Pedestrian and Bicycle Plans

6.1.1 Town of Carrboro Comprehensive Bicycle Transportation Plan

This plan (2009) is a comprehensive bicycle plan that aims to provide Carrboro Town residents with safe, convenient, and efficient opportunities to bike. It identifies bicycling needs and obstacles, recommends a bike network that meets those needs, and identifies implementation strategies. The plan refers to the project corridor in several of its recommendations for priority corridor roadway improvements.

- NC 54 and Smith Level Road: suggests providing colored bicycle lanes at the intersection to clearly delineate space meant for bicycles.
- NC 54 and South Greensboro Street: recommends restriping the road and constructing colored bicycle lanes across on and off ramps.
- NC 54 and Old Fayetteville Road: recommends the installation of bicycle signal loop indicators and bicycle crossing signage.
- NC 54 and Jones Ferry Road: recommends restriping roadway and painting colored bicycle lanes across on and off ramps and installing bicycle crossing signage on off-ramps.
- NC 54 and W Poplar Ave: recommends installing bicycle loop detectors on both sides of NC-54 and installing bicycle crossing signage on NC-54.

The Town of Carrboro had begun the process of updating its bicycle plan in spring 2019 with potential completion in late 2019.

6.1.2 Town of Chapel Hill Greenways Plan

This plan (2013) was originally adopted in 2006. The plan's purpose is to guide decision-making related to the Town's greenways and open space. This update to the plan is meant to provide specific recommendations for developing priority greenway segments and integrate planning efforts for bicycle, pedestrian, and parks and recreation plans.

Recommendations along the NC 54 project corridor include the proposed extension of the Morgan Creek Trail from the Merritt Pasture trailhead to NC 54 and along NC 54 up to Meadow Lane. The plan update also proposes the expansion of the Meeting of the Waters Creek trail along NC 54, from Mason Farm Road to Carmichael Street.

6.1.3 Morgan Creek Trail Design Study- Phase III

This plan lays out the design of the Morgan Creek Trail expansions to the east and west of its current extent. The project was presented for public comment in February 2017 and updated in October 2017. Continuation of the greenway is contingent upon Town of Chapel Hill funding and improvements to NC 54.

The study proposes expanding Morgan Creek Trail approximately 0.70 miles along the south side of NC 54 to Oteys Road. This expansion is meant to connect the Kings Mill and Morgan Creek neighborhoods, and the original plan anticipated a future crosswalk/at-grade crossing project on NC 54 at Oteys Road.

The update to the plan in October 2017 advised building the pedestrian crossing concurrently with the trail expansion, dependent on the ability to address NCDOT's safety and flow concerns. The update also recommended expanding the trail further west to Mason Farm Road.

6.2 Regional and Long-Range Transportation Plans

6.2.1 DCHC 2045 Metropolitan Transportation Plan

The Durham Chapel Hill Carrboro (DCHC) Metropolitan Transportation Plan (MTP) Transportation Improvement Program (TIP) (2018) identifies highway, public transportation, bicycle, and pedestrian projects to be completed within DCHC's boundaries in the next 25 years. The 2045 MTP includes three mid-term projects along the project corridor (construction anticipated in 2026):

- U-5304A: Interchange improvements at NC 54 and NC 86.
- U-5304B: Capacity improvements with sidewalks, wide outside lanes, and transit accommodations on NC 54 between NC 86 (Columbia Street) and Raleigh Road. Potential cross sections include widening to six lanes with a superstreet configuration and a widening to eight lanes with a traditional configuration.
- U-5304E: Convert at-grade intersection of NC 54 at Manning Drive to interchange.

6.3 Corridor and Intersection Studies

6.3.1 DCHC US 15-501 Corridor Study Traffic Analysis

This plan (2014) analyzed existing and future traffic patterns for US 15-501 from the NC 54 interchange in Orange County to the US 64 interchange in Chatham County. The plan looked at four future scenarios to compare possible improvement outcomes.

Two of the future scenarios assumed interchange improvements at NC 54/US 15-501 involving the reconfiguration of the NC 54 westbound ramp with an added loop ramp on the western side of the interchange. Synchro analysis indicated this improvement would significantly improve operations at the interchange, from LOS E and F (during AM and PM peak hours, respectively) to LOS A and B.

6.3.2 NC 54 West Corridor Study

This plan (2018) focuses on NC 54, from Old Fayetteville Road in Carrboro west to the I-85/I-40 interchange in Graham and lays out a vision for the corridor and surrounding communities for the next 25 years.

The plan recommends intersection improvements at Old Fayetteville Road and NC 54 and a shared use path extending west along NC 54 from that intersection (located on either the north or south side of NC 54 dependent on future designs). A median U-turn intersection at NC 54 and Old Fayetteville Road was determined to be the most appropriate based on size, cost, and access restrictions. This intersection type would reduce the number of signal phases and left turn conflict points while increasing the efficiency and safety of the intersection for all users.

6.4 Other Plans

6.4.1 Town of Chapel Hill Mobility and Connectivity Plan

The plan (2017) looks at implementation actions to achieve the Town's goal of a 35% transit, bicycling, and walking commute share in Chapel Hill by 2025. It notes that NC 54/US 15-501/Fordham Boulevard is a particular area of concern because of the severity of bicycle and pedestrian crashes, and because it received the most comments of concern from the public.

The plan recommends placing a Pedestrian Hybrid Beacon (PHB) on NC 54 at Oteys Road to allow bicyclists and pedestrians to safely cross and access trails and residential neighborhoods to the south. It further identifies a multi-use underpass at the same place as a potential future project. The plan also recommends extending Morgan Creek trail between Merritt's Pasture and Oteys Road on the southern side of NC 54 and an overland connector along Morgan Creek Rd; construction of a trail along the north side of NC 54 from Oteys Road to Christopher Road is also proposed.

6.4.2 University of North Carolina Campus Master Plan

This plan (2018) is a comprehensive, long-range plan that identifies the University's vision for its campus for the next 10 to 20 years. It lays out a plan to align the physical campus with the University's strategic framework, "The Blueprint for Next."

The plan incorporates the (now cancelled) Durham-Orange Light Rail into its vision, anticipating the light rail will be a major source of convenient, multimodal access for campus visitors. Accordingly, the University has designated the area around the Mason Farm Road light rail stop as the Campus South "potential innovation and convergence hub."

6.4.3 Chapel Hill North-South Bus Rapid Transit (BRT)

This plan (2016) was a thirty-month study that analyzed potential bus rapid transit (BRT) investment alternatives for the study corridor, which runs along NC 86 and US-15-501 South within the Town limits. The outcome of the plan was a locally preferred alternative, which will undergo design review in the 2018-2019 Project Development phase of the project.

The plan identifies BRT stops north and south of the NC 54/NC 86 interchange At these locations, the BRT is anticipated to operate in mixed traffic with transit signal priority rather than in a dedicated lane.

6.4.4 Orange County Transit Plan

This plan (2017) was developed by representatives from Orange County, the Towns of Chapel Hill, Carrboro, and Hillsborough, the University of North Carolina, and GoTriangle to improve transit options throughout Orange County and strengthen regional transit connections. The plan examines ways to improve the transit network through enhanced bus service and facilities and the addition of light rail.

The plan identifies a PHB on NC 54 as part of its FY2018-2020 Program of Access Improvements to "allow transit riders to safely access destinations along NC 54 in Carrboro." The plan also identifies improved service along US 15-501 and NC 54 as a 5-year goal for Chapel Hill.

6.4.5 Chapel Hill Short Range Transit Service Plan

The plan outlines short-term recommendations for CHT to improve service and attempts to identify a preferred alternative for the agency's bus routes. It resulted in five unchanged routes, the modification of fifteen routes, and the elimination of four routes. Route B serves NC 54 (Fordham Boulevard) along the project corridor from Mason Farm Road to Raleigh Road.

In the preferred alternative, the route between Manning Drive and Raleigh Road would be deleted and Route B would only travel on NC 54 between Manning Drive and Mason Farm Road. Additionally, service would be reduced to 30 minutes during peak hours, but operate all day. No new stops are planned for the segment of NC 54 from NC 86 to Manning Dr.

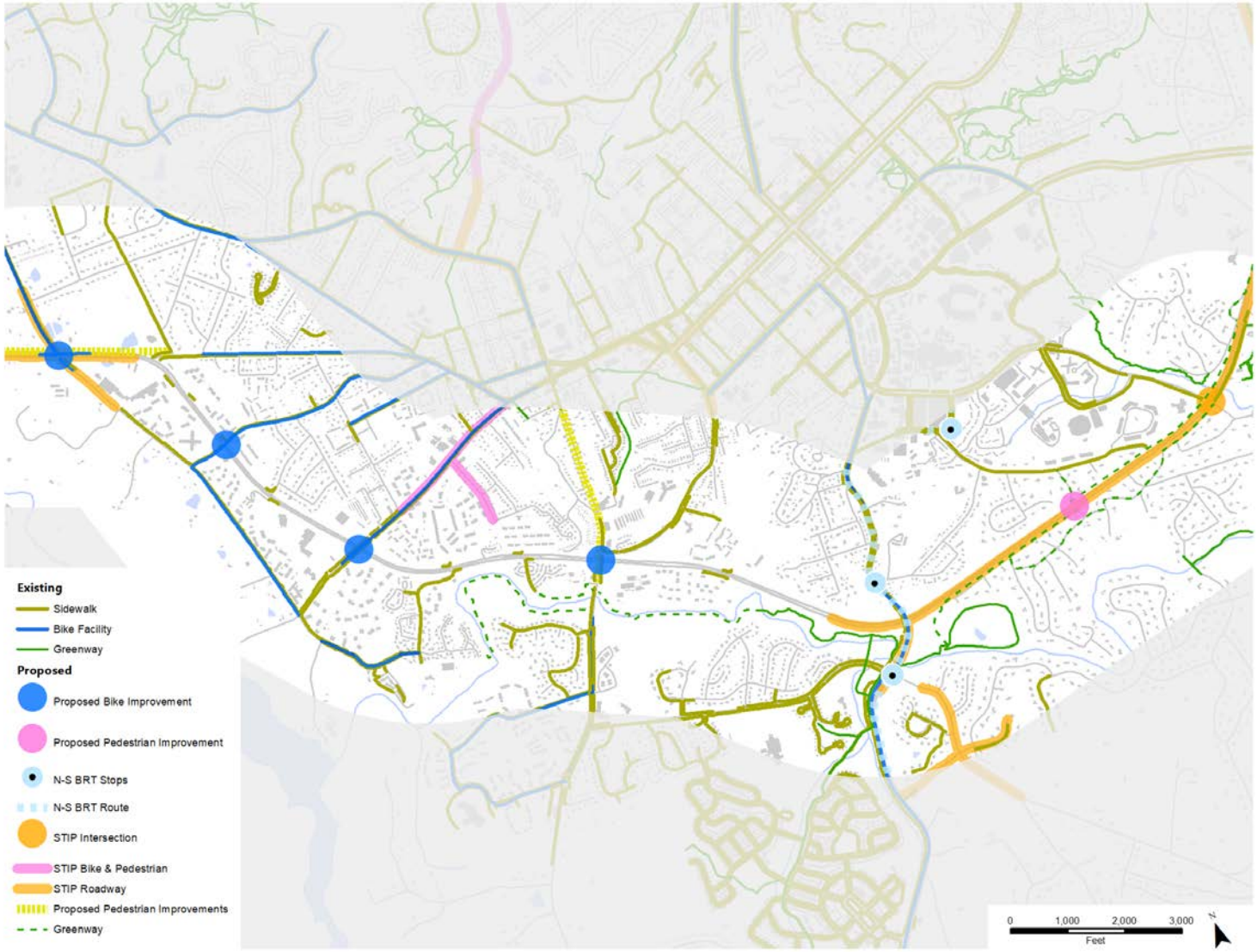


Figure 16 - Planned Improvements

7

Field Visit Results

This section summarizes the results from the field visit the Study Team conducted on January 30, 2019. Observations at each of the six sites included recommendations for near-term and medium-term improvements.

7.1 Objectives and Schedule

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. Before departing, VHB presented an overview of the study's history, purpose, and project schedule. VHB also described the corridor's characteristics and planned projects. After reviewing the field visit stop locations, the Study Team boarded a CHT vehicle and departed for the first site.

Figure 17 - Study Team on CHT vehicle during field visit

The six field visit sites were selected based on factors including bicycle and pedestrian crash history, segment and cross section typology, adjacent land uses, and preference from NCDOT and the Study Team members. Those locations included signalized intersections, interchanges, high ridership transit areas, commercial areas, single family home and multifamily neighborhoods. Sites were also chosen to avoid duplicative roadway and safety conditions.

Once at the specified site, the Study Team explored the area for approximately 30 minutes. Members recorded detailed notes on each site in their packet; each packet contained a checklist of features, land use characteristics, and traffic issues—among others—to observe. The field visit observations are included below.

7.2 Observations

7.2.1 General Observations

The Study Team noted several positive and negative features of the corridor from the perspective of improving multimodal safety. With regard to positive features, the corridor included transit stops with amenities such as shelters, benches, and connecting sidewalks with nearby intersections. Additionally, the intersections of Jones Ferry Road, West Poplar Ave, Old Fayetteville, Manning Drive, and West Main Street had pedestrian signal heads and crosswalks across most legs of the intersection.

Negative issues that could affect safety outnumbered the corridor's positive features. First, 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 included below area recorded from the perspective of the Study Team during the visit.

7.2.2 Site 1 - Manning Drive at NC 54

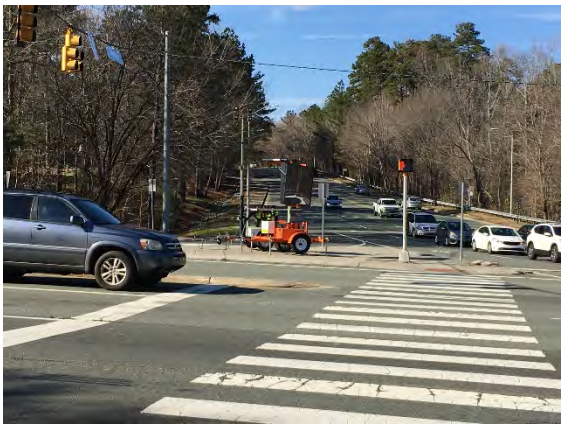
Site observations included:

- No sidewalk present (south side). Steep slope along Manning Dr. Drainage below guardrail. Very unsafe crossing in any direction.
- Overhead tree canopy on north west corner. Free flow RT lane? If so, move pedestrian crossing nearer to beginning of radius to improve pedestrian conspicuity.
- Could add yield line at pedestrian crossing on right turn slip lane for emphasis. Bike loop signage is faded. Consider moving pedestrian crossing to north to improve visibility for south bound traffic.

Figure 18 - Manning Drive Field Map

- No pedestrian signal head on south east corner. Long green phase on NC 54. No sidewalk to the south on Manning Dr. No advance yield line on Manning Drive headed west to NC 54.

- Mysterious curb cuts on Manning Drive north of intersection. Bike markings are faded at Manning Drive north. Overhanding trees may limit visibility of pedestrians on north west side of intersection



Manning Drive at NC 54 Intersection Looking North

Manning Drive at NC 54 Intersection Looking Northeast

7.2.3 Site 2 – Oteys Road at NC 54

Site observations included:

- Very steep slope. No visual cues to NC 54 traffic to expect bike ped crossings. No bike ped facilities and network on either side of road.
- Recommend Zig Zag crossing in median to reduce conflict with high speed right turns.
- Crest limits sight distance for east bound traffic (west of intersection). Street lighting in place.
- HAWK/PHB signal at intersection? Future Morgan Creek greenway area. Signal impacts gaps (from east)

Figure 19 - Oteys Road Field Map

- Broad median, high curb, and higher travel speeds. Street lighting at four comers. Low density walkable neighborhoods. Paved shoulder on NC 54 east ends well before Oteys Rd.
- Long crossing time, high speeds, and no pedestrian facilities
- Rise heading east make visibility to cross. No pedestrian lighting.

Oteys Road at NC 54 Intersection Looking East

Oteys Road at NC 54 Looking North

7.2.4 Site 3 – Kingswood Apartments/Laurel Ridge at NC 54

Site observations included:

- Consider near side bus stops, (see notes), consider left over for pedestrian refuge. Restripe existing bus lane as right turn acceleration lane
- Consider zig zag concept and moving bus stops.
- Talked to people who said dangerous at dark.
- No bus shelter on north side of NC 54. Three pedestrians crossed during visit. Pedestrians using median to stage crossing.
- Need sidewalk with ramps connectivity for bus stops. Rocky goat path in the median, south side connecting to bus stop.
- Consider left over.
- How necessary are bus pullouts?
- 1/4 mile to Morgan Creek Trail parking lot and poor sight distance

Figure 20 - Kingswood Apartments Field Map

Kingswood Apartments at NC 54 Looking West

Kingswood Apartments at NC 54 Looking East

7.2.5 Site 4 – Jones Ferry Road, North and South, at NC 54

Site observations for the north side included:

- Good sight distance to east and west. Right turns and poor sight distance. Place crossing to the north? Some people crossing at BP gas station.
- Consider adding crosswalk on east left of Jones Ferry Road, use island as refuge. Consider remarking crosswalks across ramp to promote pedestrian visibility to right turn motorists. Obtain ROW for sight triangle and vegetation management in North east quad.
- Overhead tree canopy produces shade at pedestrian ramp. Add pedestrian signals. Replace pedestrian sign removed for fiber optical install.
- Revisit crossing configuration on north side of Jones Ferry Road. Consider no right turn on red.
- No pedestrian heads. Vegetation on south west corner block visibility. Existing street light on south west corner.

Figure 21 - Jones Ferry Road North Field Map

Jones Ferry Road Looking East towards NC 54 West On-Ramp

Jones Ferry Road Looking South towards NC 54 Ramps

Site observations for the south side included:

- Is this a State bike route? Is there lighting under bridge? Mismatch of bus stop. North bound bike lane plus separation.
- No marked crossing [across Jones Ferry Rd]
- Conflict with on ramp and crosswalk.
- Lighting on westside. No crosswalks across Jones Ferry.
- Sidewalks with curb ramps. Bus stop south of intersection. Crosswalks across Jones Ferry Road at shopping center south of ramps.

Figure 22 - Jones Ferry Road South Field Map

7.2.6 Site 5 – Carrboro Plaza/West Main Street at NC 54

Site observations included:

- Crosswalk could be better with two padded white lines. Degraded low viz crosswalks
- Short crossing time for Main St. No protected left for the cross streets so [vehicles] cross in front of pedestrians . Bus stop away from intersection but close to ABC store.
- Curb cuts across plaza driveway but crosswalks on sidewalk. No sidewalks along NC 54.
- Foot traffic in median. Remove detectable domes to nowhere on southwest corner of intersection. Detectable plates in poor condition in similar location. Bus stop in front of ABC store.
- High crest and sun in drivers' eyes at intersection. Needs protected left from Main St.

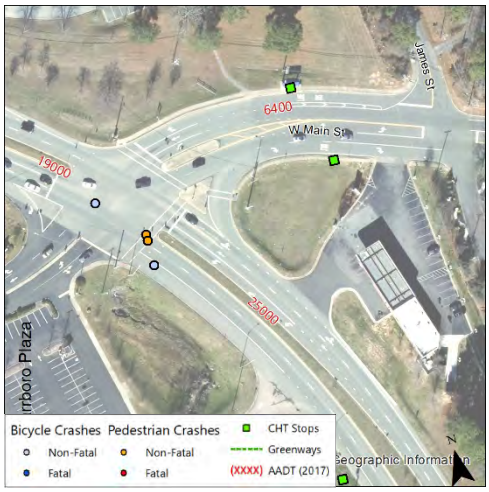
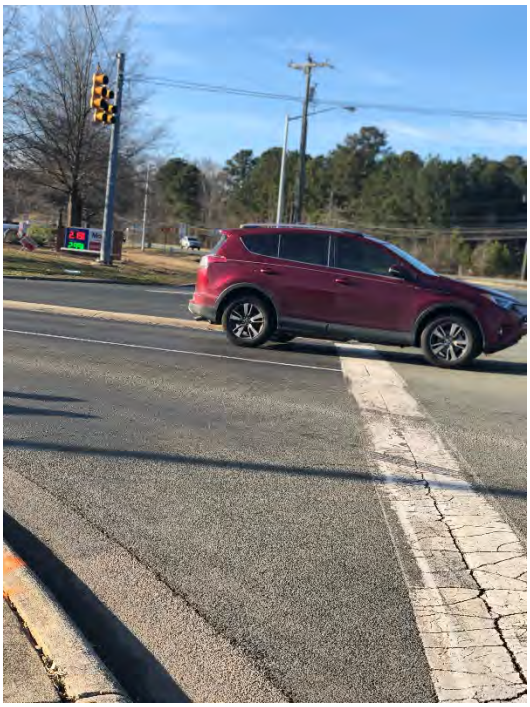


Figure 23 - Carrboro Plaza Field Map

West Main Street and NC 54 Intersection Looking Northeast



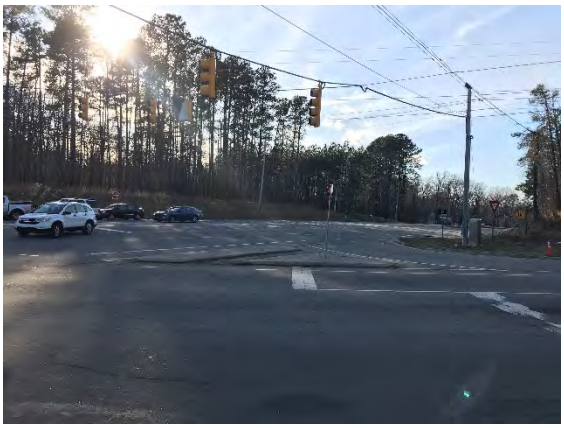
Entrance to Carrboro Plaza at NC 54 Looking West

7.2.7 Site 6 – Old Fayetteville Road at NC 54

Site observations included:

- No crosswalks at porkchop on north side of intersection. Look into peak hour "No Turn on Red" signage. Re-evaluate signal timing for protected turns and when WALK phase is on.
- No lighting. Pedestrian crossing on NC 54 on permissive Ø, may not be readily visible to SB Old Fayetteville left turn traffic.
- Blank out sign? Left turn on permissive phase during pedestrian phase. This is a long left turn, can turning vehicles see pedestrians?
- Two stage crossing on NC 54 east of intersection.

Figure 24 - Old Fayetteville Road Field Map



Old Fayetteville Road and NC 54 Intersection

NC 54 Looking East from Old Fayetteville Road

8

Public Engagement

This section summarizes the process for sharing the study with the community and receiving feedback on issue identification. The results from the community open house, survey, and interactive map are described and explored.

8.1 Outreach Efforts

The public engagement for Phase 2 consisted of a community open house, public survey, and an interactive map. The Study Team presented preliminary findings and existing conditions at the open house in late April. Attendees were able to ask questions, share first-hand experiences, and provide potential improvements along the corridor. The Study Team also released a survey to gather input on travel experiences and behavior along the corridor. Additionally, the Study Team created an interactive map on the project website that allowed community members to contribute geo-located comments on current issues, potential assets and opportunities, and quick fixes. The three outreach options supported the Study Team's understanding of how people travel along NC 54 as well as major issues, assets, and opportunities along the corridor. All public engagement boards, comments, and responses are included in the Appendix.

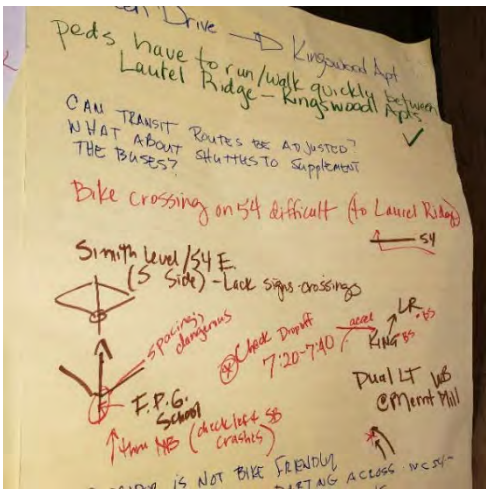
8.2 Community Open House

The first Community Open House took place on April 29th at Carrboro Century Center Hall. During this open house, attendees were presented with preliminary findings of the corridor separated into five segments including the segment's traffic volumes, land use, socioeconomic conditions, crashes, pedestrian crossing volumes, and other transportation performance metrics (See Appendix for the exhibits). Approximately 25 attendees commented on the five segments which resulted in several high-level themes included below:

- The **pedestrian facilities** along the corridor are inadequate and incomplete, and this includes facilities for crossing NC 54 at signalized and unsignalized locations;
- **Lighting** could be improved across the corridor, and it would serve as a benefit for all roadway users;
- Pedestrians cross NC 54 at uncontrolled crossing locations, often to access **transit service** (bus stops). Drivers and pedestrians note that crossings in the eastern end of the corridor are especially unsafe.
- The **bicycle infrastructure** along NC 54 is seen as inadequate and unsafe, and there is interest in creating bicycle facilities to connect to and travel across NC 54;
- There are numerous locations across the study area where lane configurations, signal timing, roadway speed, and roadway geometry combine to create **hazardous conditions for roadway users**. The locations include on and off ramps, turning lanes, main intersections, and acceleration and deceleration lanes.

These themes as well as comments and first-hand perspectives of attendees aided the Study Team in understanding the current conditions and will help shape the recommended safety improvements for pedestrians, bicyclists, transit uses, and motorists.

Community Open House



Open House Comment Sheet

8.3 Public Survey

A survey was open from late March to mid-May 2019 to gather community input on experiences traveling the study corridor, and the survey received 720 responses. The survey was publicized at bus stops and apartment complexes along the corridor as well as through local partner distribution on social media and town websites. Survey questions included the following:

- For what purpose(s) do you most often travel along NC 54? (Select all that apply)
- During a typical week of travel along the corridor, how often do you use these types of transportation?
- When do you feel most unsafe traveling on the corridor? (Select all that apply)
- To what destinations, within approximately ½ mile of the corridor, do you regularly travel? Be as specific as possible.
- What potentially unsafe travel behaviors have you observed along the corridor? (Select all that apply)
- List locations near the corridor where you feel most unsafe when walking, bicycling, or driving. Examples may include specific shopping centers or bus stops.

8.3.1 Survey Results

The public survey provides insight into where people are going when travelling along NC 54, what transportation modes they are using, and safety concerns while travelling.

Where people are going

All respondents regularly utilize the corridor. When answering the question *"For what purpose(s) do you most often travel along NC 54?"* respondents answered:

- **78%** I live near the corridor
- **60%** I pass through this area on my way to another destination
- **46%** I visit people or places near the corridor
- **37%** I work near the corridor
- **2%** Other

A word cloud correlating size to frequency for the open-ended question *"To what destinations, within approximately ½ mile of the corridor, do you regularly travel?"* is shown below (Figure 25), with the highest frequency destinations as Carrboro (238), UNC (198), Carrboro Plaza (77), home (74), bus (63).

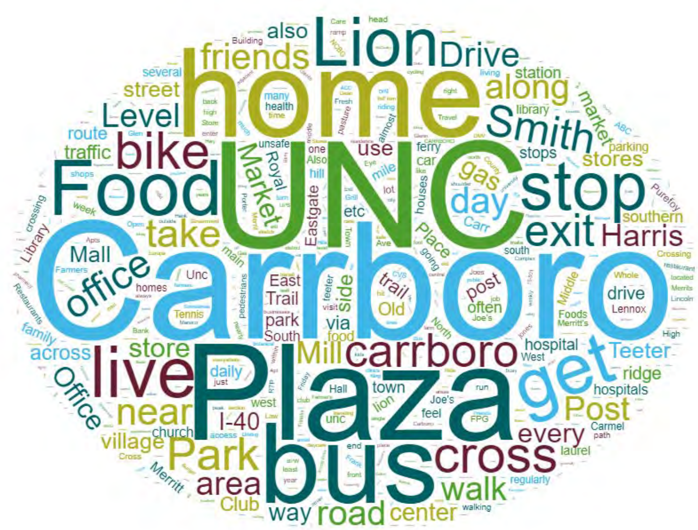


Figure 25 - Word Cloud of destination responses to NC 54 online survey

How people use the corridor

Respondents answered the question "*During a typical week of travel along the corridor, how often do you use these types of transportation*," selecting most days of the week or every day at the following rates:

- **Drive Alone** 51%
- **Bus (Chapel Hill Transit)** 26%
- **Walk** 20%
- **Other** 17%
- **Carpool** 9%
- **Bicycle** 5%

While over half of the respondents answered that they drive alone most days of the week or more, the highest response rate for the question "*When do you feel most unsafe traveling on the corridor*," is walking during low light or dark conditions.

Safety Concerns

The survey inquired about both unsafe conditions and unsafe travel behaviors respondents have observed along the corridor. The most popular responses to the question *"When do you feel most unsafe traveling on the corridor"* include low-light or dark conditions (walking, driving, and bicycling), as well as walking to or from a bus stop and walking during the day. Exact response rates are:

- **39%** Walking during low light or dark
- **36%** Driving during low light or dark
- **32%** Walking to or from a bus stop
- **30%** Walking during the day
- **26%** Bicycling during low light or dark
- **25%** Bicycling during the day

In addition to unsafe conditions, the potentially unsafe travel behaviors identified most frequently include pedestrians crossing and walking along the corridor, as well as drivers speeding and turning quickly. Exact response rates are:

- **72%** Pedestrians crossing the road outside of marked crosswalks
- **70%** Pedestrians walking on the edge or shoulder of the roadway
- **70%** Drivers speeding
- **54%** Drivers turning quickly or entering the roadway unexpectedly

Survey participants were also asked to identify specific safety concern locations. The most frequent location included reference to bus stops, followed by Laurel Ridge Apartments, Kingswood Apartments, followed by Jones Ferry Road (Figure 26). These responses correlate with areas of high pedestrian crossing activity.

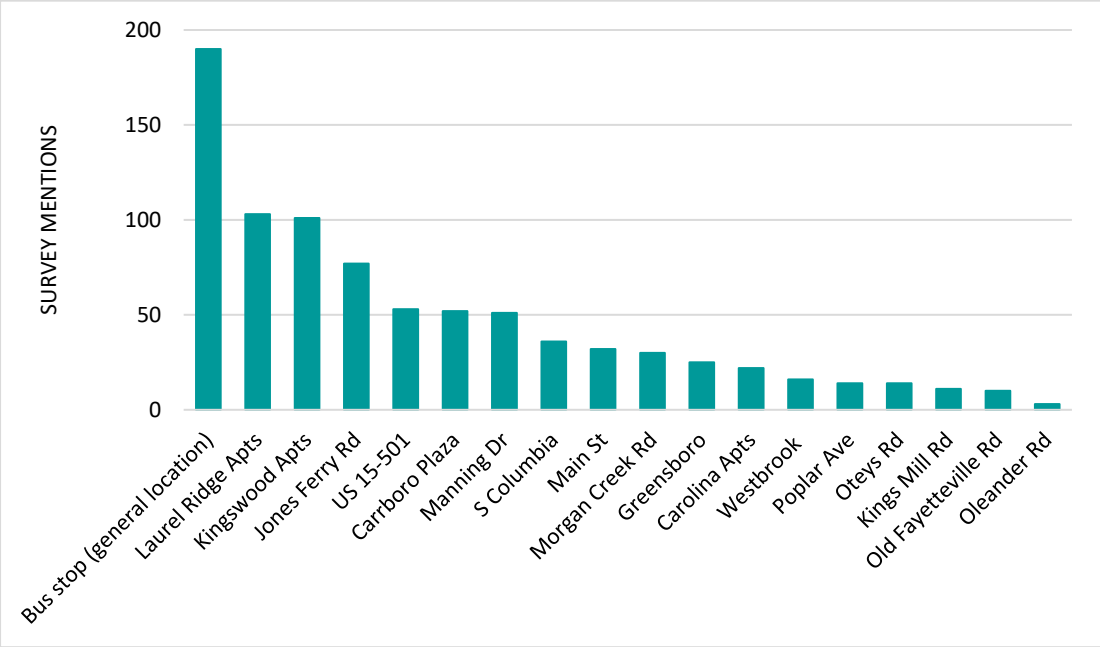


Figure 26 - Frequency of Safety Location Concerns

8.4 Interactive Map

As a part of the community engagement, the project website contained an interactive map where users submitted comments about specific issues and locations along the corridor (Figure 27). Map comments fall within four categories: Assets, Current Issues, Opportunities, and Quick Fixes. Most comments were clustered around the multifamily housing locations near the center of the corridor.

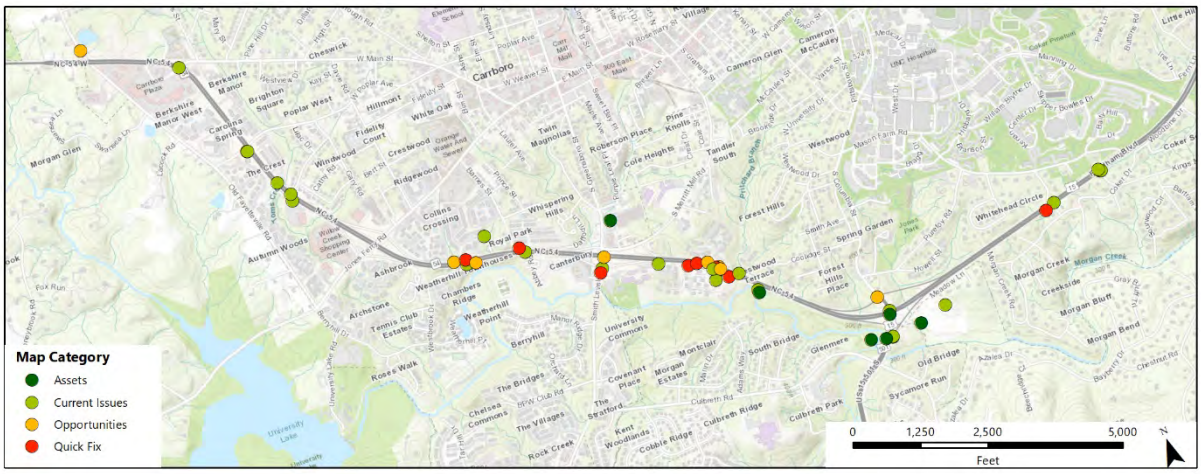


Figure 27 - Interactive Map

Key highlights from each category included:

- **Assets:** Mixed-use developments; greenway access points; public open spaces.
- **Current Issues:** Lack of dedicated and safe bicycle and pedestrian infrastructure resulting in dangerous behavior.
- **Opportunities:** Pedestrian bridges to connect bus stops; replacing dirt paths with sidewalks.
- **Quick Fixes:** Add crosswalks and stoplights at bus stops; level manholes that cause drivers to swerve to avoid.

The interactive map also allowed contributors to identify the mode for their issue identification. While most comments were focused on pedestrians (47%), other modes were addressed at the following frequencies: bicycles (18%), vehicles (18%), buses (10%), general comments (6%). Figure 28 below illustrates the distribution of the comments by category and mode.

The geo-located comments revealed hot spots where the majority of comments were made:

- **Intersection of Kingswood Apartments and NC 54** (15 comments): high vehicle speeds, lack of pedestrian infrastructure, need for a crosswalk and stoplight.
- **Ramps going on/off NC 54 onto 15-501 and Smith Level Road** (8 comments): lack of safe crossings or paths along ramp exits for pedestrians and bicyclists, need for sidewalk along 15-501.
- **Intersection of Westbrook Drive and NC 54** (5 comments): lack of pedestrian infrastructure to connect apartment complexes to bus stops. Multiple requests for a pedestrian bridge to connect the two sides of NC 54.
- **Intersection of Oteys Road and NC 54** (3 comments): large number of bicyclists and pedestrians using Oteys Road to go north, lack of safe crossing.

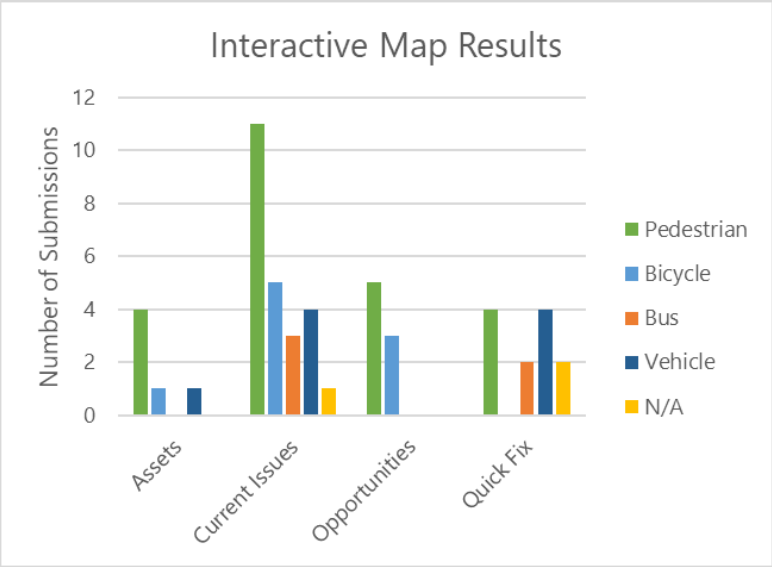


Figure 28 - Interactive Map Distribution

9

Conclusions and Next Steps

This section summarizes the key safety issues identified during review Phases 1 and 2 and describes improvement opportunities.

9.1 Key Issues

The corridor lacks a cohesive vision for its land uses and roadway configuration, which presents challenges to pedestrians, bicyclists, transit users, and motorists. Resolving the vision incongruence will require a uniform application of countermeasures along the corridor to present a consistent and anticipated travel experience for all users. Key issues identified during the initial phase of the study included:

- **Pedestrians crossing multilane high speed roadways at unmarked locations without accommodations**. Several of the highest pedestrian crossing locations are at uncontrolled intersections or at midblock locations. Signalized intersections with marked crosswalks and sidewalks are near the ends of the corridor and not at locations with concentrated multifamily housing. Residents between the distant signalized intersections are—by virtue of poor alternatives like sidewalk and bicycle connectivity—dependent on transit for their mobility needs. Crossing the four lane median divided highway is a rational, though unsafe, means to accessing transit services or resources across the roadway.
- **Few alternative parallel bicycle and pedestrian routes.** While the paved shoulder along the corridor may serve as a bicycle facility for vehicular cyclists, it is not an adequate facility for the vast majority of cyclists. The existing bicycle networks in both Chapel Hill and Carrboro do not contain parallel roads that could provide comparable access. Given the corridor's high AADT and travel speeds, an on-road bicycle facility is unlikely. There are also few parallel pedestrian facilities for residents along the corridor east of West Poplar Ave. While planned greenways to the south of the corridor will provide parallel connectivity, residents on the northern side of the corridor have fewer options.
- **Transit routing supports crossing NC 54**. The current route configuration and schedule for the corridor's CHT routes impart significant additional wait times for riders who wish to board and alight on the same side of the road. Transit riders appear to prefer alighting at the stop opposite their origin stop and crossing NC 54 at uncontrolled locations instead of continuing to ride a bus for 30-45 minutes more before it returns to their origin stop.
- **High vehicle speeds and volumes along a regionally significant arterial**. NC 54 is a regionally significant roadway that experiences volumes over 40,000 AADT and

that will likely increase with the region's growth. While travel speeds are lower during peak periods due to congestion, observed vehicle speeds during off-peak periods regularly exceed the posted speed limits, and pedestrian crossing volumes are highest during the AM and PM off-peak periods.

- **The corridor study area will undergo significant modifications to its transportation infrastructure**. The communities of Carrboro and Chapel Hill and the NCDOT are planning to improve greenways, transit service, and roadway facilities in the study area within a 10-year window. These include changes to intersections, potential roadway widening, median redesign, Bus Rapid Transit routing and stations, and parallel multi-use paths and greenways. The projects have different sponsors and timelines, which underscores the critical role of coordinating implementation to support consistent and sustained safe bicycle and pedestrian access throughout the corridor, especially given multimodal investments.

9.2 Opportunities for Potential Improvements

Improvement opportunities were identified from the study's initial phases. These opportunities include:

- Improve crossing visibility, accessibility, and timing improvements near high activity centers, either at grade or grade separated;
- Complete gaps in the pedestrian and bicycle networks through both internal neighborhood connections and across barriers such as NC 54;
- Optimize transit routing and scheduling improvements to discourage crossing roadway to board/alight bus and realignment of existing bus stops to reduce vehicle conflicts;
- Identify potential parallel pedestrian and bicycle facilities and strategies for continuing non-vehicular facilities through and across NC 54 to nearby destinations;
- Improve roadway and pedestrian-focused lighting improvements;
- Deploy median treatments to support two-phased pedestrian crossings (with and without the use of beacons and signals) and improve vehicular safety;
- Conduct speed management throughout the unsignalized eastern section of the NC 54 corridor;
- Coordinate long range land use and transportation plans between NCDOT and the Towns of Chapel Hill and Carrboro.

9.3 Next Steps

The Study Team concluded Phase 1 and Phase 2--Data Collection and Existing Conditions--respectively, with the analysis of public comments from the April 2019 Community open house and survey. Next, in Phase 3, the Study Team will conduct hot spot, systemic, and systems-based analyses of the corridor to identify and prioritize locations for improvements.

Then, the Study Team will develop conceptual improvements that include short and medium-term operational and infrastructure options to improve multimodal mobility, accessibility, and safety. The proposed concepts will focus on operational improvements and countermeasures that can be implemented in a 5 to 10-year timeframe. Such projects usually require little or no new roadway right-of-way (ROW) acquisition and have minimal potential for environmental or community impacts. The concepts will be packaged in four sets of alternatives including combinations of operational and safety improvements. Phase 3 is scheduled for completion in Summer 2019.

Phase 4 will build upon the development of improvements from Phase 3 through presentation of concepts the public and further refinement. After addressing comments from the public, the Study Team will select the preferred countermeasure package, identify funding sources, and develop an implementation plan. The final draft report is anticipated in late Fall 2019.