STARS Ridge St- W Main St/ W Water St Intersection Study

Final Report

April 20, 2026

Prepared by

Prepared for

Ridge St- W Main St/ W Water St Intersection Study

FINAL REPORT

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1. INTRODUCTION

1.1 Background

The Virginia Department of Transportation (VDOT) and Transportation Mobility and Planning Division (TMPD) and the City of Charlottesville identified the need to study safety and operational challenges at the Ridge Street/ Ridge McIntire Road and W Main Street (BUS US 250E)/ W Water Street/ South Street West (Ridge Street and W Main Street/W Water Street) intersection in Charlottesville, Virginia. This intersection is a Culpeper District recommended location based on the significant congestion and high pedestrian crashes. W Main Street (BUS US-250E) is identified as a PSI segment and was previously a SMART SCALE project that was subsequently cancelled due to funding constraints. VTrans need at the study intersection includes Congestion Mitigation, Transportation Demand Management (Non-Limited Access), intersection safety improvement, pedestrian and bicycle infrastructure improvements, pedestrian access, bicycle access, and transit access. South on the study intersection, Ridge Street is a two-lane undivided principal arterial, and Ridge McIntire Road is a four-lane divided principal arterial north of the intersection. W Main Street is a two-lane undivided principal arterial, while W Water Street is a two-lane undivided major collector. South Street West is a one-lane, one-way westbound minor collector. All approaches have a posted speed limit of 25 mph.

VDOT has initiated this Strategically Targeted Affordable Solutions (STARS) study to evaluate operational and safety conditions at the Ridge Street and W Main Street/ W Water Street intersection. This STAR study focuses on assessing measures to reduce congestion, and recommending possible spot improvements to address congestion, safety and access management issues. The year 2024 daily traffic volumes along the corridors approaching the study intersection are as follows:

- 10,900 vehicles per day (veh/day) on W Main Street (BUS US-250E)
- 20,800 vehicles per day (veh/day) on Ridge Street
- 21,400 vehicles per day (veh/day) on Ridge McIntire Road
- 7,900 vehicles per day (veh/day) on W Water Street
- 1,700 vehicles per day (veh/day) on South Street West

1.2 Purpose of Study

The primary goal of this study is to determine and assess measures to reduce congestion, recommend possible adjustments to signal phasing and/or spot improvements to alleviate congestion and address safety as well as access management issues. This study will include an Operational and Safety Analysis which will include analysis of existing and future congestion and safety issues along the corridor. In addition, the study will also be used as a guiding document for VDOT and the City of Charlottesville to determine deficiencies in the network under present and short-term conditions. Once preferred improvements are selected for the Build condition, a detailed line-item cost estimate will be developed using VDOT Cost Estimate Workbook (CEWB) to facilitate promotion to the VDOT Six-Year Improvement Plan (SYIP).

The ***operational*** issues intended to be addressed by this study include existing and future projected congestion at the study intersection. This congestion is due to the intersection being heavily utilized by passenger vehicles, transit, pedestrians and bicyclist. Reduction in intersection delays would mitigate congestion, improve mobility, and reduce travel time.

This study also intends to address existing and future ***safety*** concerns at the study intersection. During the recent five-year period (2019-2024), 171 crashes resulting in 88 property damage only, 11 visible injuries, 10 pedestrian and 5 bicycle related crashes were reported within the Study Area with no fatalities. The types of crashes frequently reported included angle and rear-end. These crash types are typically associated with reoccurring congestion. Reduction in congestion within the Study Area may have a corresponding safety benefit, in terms of reduction in number of crashes.

The Study Area serves a mix of office, commercial, retail and residential uses and provides key access to downtown Charlottesville. This study also intends to address ***access*** deficiencies within the limits of the study corridor by identifying and documenting driveway locations and their spacing, with the objective of recommending access management improvements in the context of *VDOT Access Management Standards for Entrances and Intersections*.

1.3 Study Work Group

A study work group (SWG) includes local stakeholders, who provide local and institutional knowledge of the Study Area, review study goals and methodologies, provide input on key assumptions, and review and approve proposed improvement concepts developed through the study process. The key members included in the SWG represent the following Agencies:

- VDOT Culpeper District Office and TMPD
- City of Charlottesville
- Thomas Jefferson Planning District Commission
- WSP Team

1.4 Study Area

The Study Area is centered on the intersection of Ridge Street, W Main Street (BUS US-250E), and W Water Street in Charlottesville, Virginia. This key intersection accommodates a diverse mix of local and regional traffic, including pedestrians, bicyclists, and transit users. W Main Street (BUS US-250E) serves as a vital east-west corridor, linking the University of Virginia with downtown Charlottesville. Ridge Street/Ridge McIntire Road functions as a crucial north-south route, connecting residential neighborhoods with commercial hubs, while W Water Street and South Street West carrying lower traffic volumes, play an essential role in facilitating local access and business activity. The Study Area for this project is shown in **Figure 1.** The Study Area includes the following intersections:

Intersections

The following seven (7) intersections are included in the Study Area:

- Ridge Street at W Main Street/W Water Street (Signalized)
- W Main Street (BUS US -250E) at 4th Street NW (Signalized)
- Ridge Street at Monticello Avenue (Signalized)
- Ridge McIntire Road (BUS US-250E) at Preston Avenue (Signalized)
- South Street West at 2nd Street NW (Unsignalized)*
- W Water Street at 2nd Street NW (Unsignalized)*
- Ridge Street/5th Street SW at Cherry Avenue/ Elliot Avenue (Signalized)*
  - *Intersections to be included for modeling purpose only, no MOEs will be reported.

Figure 1: Study Area

RIDGE ST/ BUS 250 (W MAIN ST) - W WATER ST
INTERSECTION STUDY
Charlottesville, VA

2 Data Collection and Inventory

A field review of the Study Area was conducted on Friday, March 7, 2025, to verify existing conditions, traffic control devices and to observe driver behavior. In addition to the field review, existing traffic volume data was collected from a combination of turning movement counts and vehicle classification tube counts. Crash data was provided by VDOT Power Bi while existing traffic signal timing plans were provided by the City of Charlottesville.

The following subsections summarize collected data and field review observations.

2.1 Literature Review

Below is a list of existing approved projects to be implemented and constructed prior to the 2045 No-Build conditions:

- 6th Street Redevelopment
  - Redevelopment with two mixed use office, parking and residential (47 units)
- Westhaven Redevelopment
- South First Street – Phase 2
  - Redevelopment with mixed use office and residential (113 units)
- Rugby Ave Shared Use Path Project
- Monticello Ave/ 2nd Street Pedestrian Improvements
- Pedestrian Improvements at Preston Ave/ Harris St

Below is a list of additional studies provided by the City of Charlottesville and VDOT recently completed within the area:

- 5th – Ridge – McIntire Multimodal Corridor Study
- TJPDC's Move Safely Blue Ridge Safety Plan
- 10th and Page Development Study

2.2 Field Review Observations

Field observations were conducted at the project Study Area on Friday, March 7, 2025, to assess traffic operations, roadway geometrics, safety, queuing, vehicle-pedestrians and vehicle-vehicle interaction conflicts, transit stops, parking, human factors and existing signage and pavement markings within the field. A memorandum was prepared to summarize observations that could potentially lead to improved safety conditions for road users. The field review memorandum has been provided in **Appendix B-1**.

2.3 Phase 1 Public Engagement

An origin-destination assessment of the area using StreetLight Data was conducted to determine where best to send a public survey. Once the area was determined, the Phase 1 public engagement went live on March 24, 2025, and lasted for two weeks closing on April 7, 2025. The purpose of Phase 1 public engagement was to gather public input about the existing conditions along the corridor, and to get their initial feedback on areas of concerns (congestion, safety, multi-modal facilities). VDOT provided the results of this initial public survey are provided in **Appendix B-2**.

2.4 Environmental Justice Analysis

The Ridge Street/W Main Street (BUS US 250E)/West Water Street Study Area is located in downtown Charlottesville, Virginia and encompasses portions of Ridge Street/Ridge McIntire Road and the connecting intersections with Monticello Avenue, W Main Street (BUS US 250E), South Street West, West Water Street, and Preston Avenue. The Study Area is a main thoroughfare for the City of Charlottesville and consists primarily of commercial development and associated infrastructure. Based on the United States Census Bureau American Community Survey (ACS) Block Group Data and the Virginia Department of Environmental Quality's (DEQ) Virginia EJScreen+ mapping tool[1], a total of three (3) individual Census Block Groups are located within the Study Area.

According to the City of Charlottesville's Open Data Portal[2], the total population within the three census block groups equals approximately 3,503, averaging 42.5 percent as a minority population, and 46.27 percent as a low-income community.

2.4.1 Minority Populations

Based on Virginia EJScreen+, **Table 1** below outlines minority population percentages for the three individual Census Block Groups within the Study Area. Minority population percentages range from less than 37.8 percent to 52.04 percent.

Table 1: Percent Minority Population per Block Group

Census Block Group	Total Population	Percent Minority Population
515400004011	1,612	52.04%
515400010001	898	<37.8%
515400010002	993	<37.8%
	3,503 (Total)	**42.5% (Average)**

According to the Virginia Environmental Justice Act, Section 2.2-234, a community of color (i.e. minority population) consists of any geographically distinct area where the population of color, expressed as a percentage of the total population of such area, is higher than the population or color in the Commonwealth expressed as a percentage of the total population of the Commonwealth (37.8%, 2014-2018 ACS). The percent minority population within the project impact area does not exceed that of the Commonwealth.

2.4.2 Low Income Communities

Based on Virginia EJScreen+, **Table 2** below outlines the percentage of low-income communities for individual Census Block Groups within the Study Area. A community is categorized as low-income if 30 percent or more of the population is below 80 percent of the local Area Median Income (AMI) and under two times the United States Department of Health and Human Services designated Federal Poverty Level (FPL). The percentages of low-income communities within the Study Area range from less than 30 percent to 57.05 percent of the population.

[1] VDEQ (Virginia Department of Environmental Quality) ACS (American Community Survey). 2018. VA EJScreen+ Mapping Application. Updated September 2024. Accessed March 11, 2025. VA EJScreen+

[2] City of Charlottesville Open Data Portal. US Census Block Group Area 2010. Updated February 19, 2025. Accessed March 11, 2025. US Census Block Group Area 2010 | City of Charlottesville

Table 2: Percent Low Income per Block Group

Census Block Group	Percent of Low-Income Communities
515400004011	57.05%
515400010001	51.76%
515400010002	<30%
Average	**46.27%**

Table 3 below shows average household income data from the 2023 ACS 5-Year Estimate for individual Census Tracts within the Study Area. Median household income ranges from $63,125[3] to $99,688[4], which exceed the 2025 Health and Human Service Guidelines. These guidelines state that a family of four is considered at the poverty level if the median household income is $32,150 or below.

Table 3: Median Household Income per Census Tract

Census Block Group	Census Tract	Percent of Low-Income Communities
515400004011	4.01	$63,125
515400010001	10	$99,688
515400010002		
	Average	**$81,406.50**

While median household incomes within the Study Area are above the federal poverty level, individual households may earn less than the reported average. Overall, low-income communities are not documented within the Study Area.

2.4.3 Analysis Summary

Minority populations are present within Census Block Group 515400004011, located within the southern portion of the Study Area, near the intersection of Ridge Street and Monticello Avenue. Future transportation improvements in this area and the surrounding area should consider potential impacts to minority populations, including major traffic disruptions, community, or emergency services disruptions, or more than minor amounts of temporary or permanent right-of-way acquisition. The majority of the Study Area is not directly situated within residential areas, or commercial areas potentially owned by minority populations, and improvements in these areas would likely not result in disproportionate burden on minority populations. However, in accordance with IIM-ED- 714.1[5], future improvements requiring residential or commercial displacements, or relocations associated with the improvements could result in a Disproportionately High and Adverse Effect (DHAE) to minority populations.

Low-income communities are present within Block Groups 515400004011 and 515400010001, which encompass the majority of the Study Area. Projects requiring major traffic disruptions, community, or emergency services disruptions, or more than minor amounts of temporary or permanent right-of-way acquisition could result in impacts to low-income communities, however, based on the commercial-nature and median household income in the Study Area, future improvements would likely not result in a DHAE or disproportionate burden on low-income communities unless residential or commercial displacements were required.

Impacts to both minority populations and low-income communities can often be minimized or mitigated through early public outreach, careful consideration of multiple alternatives, evaluation of the impacts associated with each alternative, and transparent communication with landowners in the Study Area. The full analysis report is in **Appendix B-3**.

2.5 Traffic Volume Data

2.5.1 2024 Existing Traffic Volumes

Existing traffic volume data within the Study Area was collected on Tuesday, November 19, 2024 - Wednesday, November 20, 2024.

- 8-hour turning movement classification counts were collected from 6:00 AM – 10:00 AM and 3:00 PM – 7:00 PM at the following intersections:
  - Ridge St at W Main St/W Water St (Signalized)
  - W Main Street (BUS US -250E) at 4th Street NW (Signalized)
  - Ridge Street at Monticello Avenue (Signalized)
  - Ridge McIntire Street (BUS US-250E) at Preston Avenue (Signalized)
  - South Street West at 2nd Street SW (Unsignalized)
  - W Water Street at 2nd Street SW (Unsignalized)
- 48-Hour classification tube counts were collected at the following locations:
  - Ridge Street between Monticello Avenue and W Main Street
  - W Main St between 4th St SW and Ridge St
  - W Water St between 2nd St SW and Ridge St
  - South Street West between 2nd St SW and Ridge St (One Way)

Note: The Ridge St at Cherry Ave/ Elliot Ave traffic data was collected (in May 2024) during a previous study and was balanced with the traffic volumes collected in November 2024.

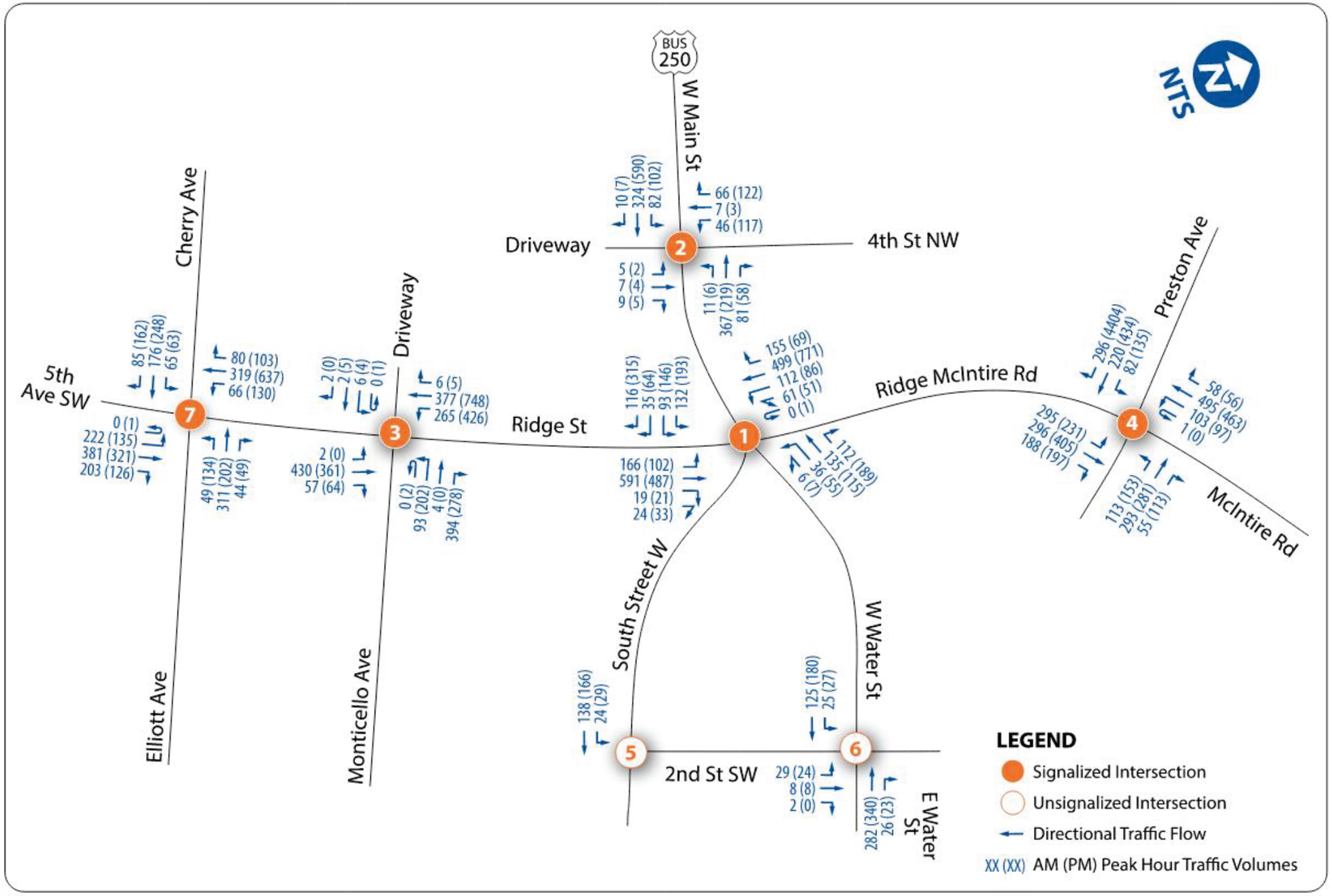
The field counts are enclosed with this report in **Appendix A-1** through **Appendix A-2**. Using the available TMC and tube count data, the traffic volumes were balanced, where appropriate, throughout the Study Area in preparation of the existing conditions operational analyses. Peak hour intersection volumes were adjusted to balance between consecutive intersections where no access points were located. However, volume imbalances were maintained between consecutive intersections where several access points were located. The existing (2024) balanced peak hour volumes are summarized in **Figure 2.**

[3] United States Census Bureau. ACS (American Community Survey) 5-year estimates. 2023. Census Tract 4.01; Charlottesville city; Virginia. Updated 2023. Accessed March 13, 2025. United States - Census Bureau Profile

[4] United States Census Bureau. ACS (American Community Survey) 5-year estimates. 2023. Census Tract 10; Charlottesville city; Virginia. Updated 2023. Accessed March 13, 2025. United States - Census Bureau Profile

[5] DEQ Virginia EJScreen+ reviewed in place of USEPA EJScreen in response to Executive Order 14151, "*Ending Radical and Wasteful Government DEI Programs and Preferencing.*"

Figure 2: Existing (2024) Balanced Peak Hour Traffic Volumes



VDOT STARS

RIDGE ST/ BUS 250 (W MAIN ST) - W WATER ST INTERSECTION STUDY

Charlottesville, VA

EXISTING PEAK AM (PM) HOUR VOLUMES

2.5.2 Heavy Vehicle Percentage

Heavy vehicle percentages were calculated for each movement at all study intersections during the overall Study Area AM and PM peak hours. The AM and PM peak hour heavy vehicle percentages for each intersection movement can be found in the traffic turning movement data found in **Appendix A-1**.

2.5.3 Seasonal Adjustment Factor

Due to the characteristics of the road and the amenities in the area, seasonal adjustment factors were not required for this study given the time of year the traffic volumes were collected.

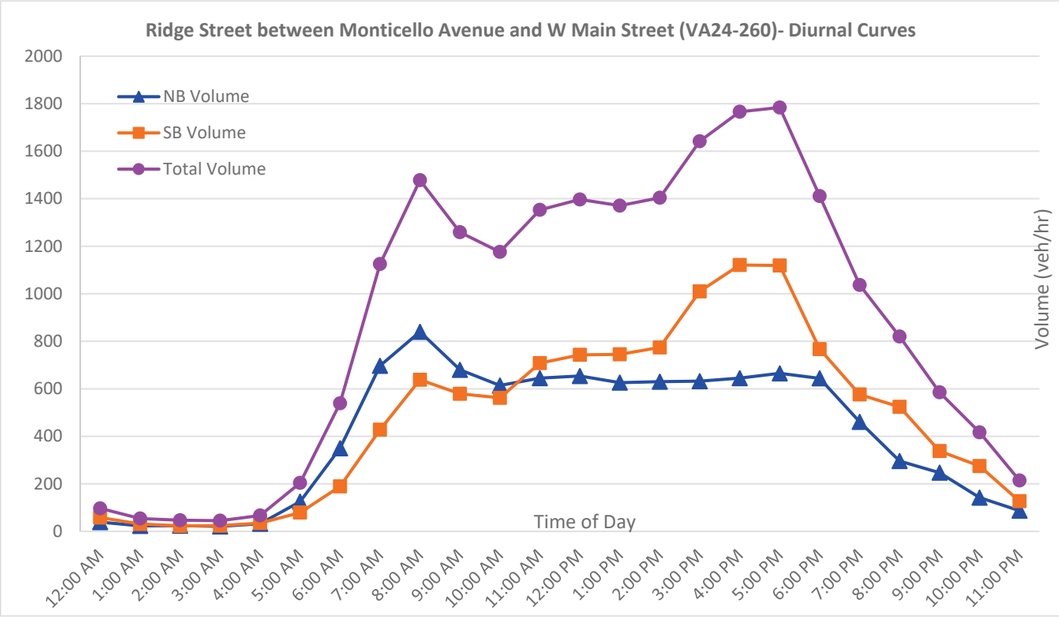
2.5.4 Peak Hour Determination

The overall AM and PM peak hours of the Study Area were determined by first reviewing whole Study Area and individual intersection peak hours. The Study Area and individual intersection peak hour volumes were compared to determine a common peak hour that best represents existing traffic conditions in the Study Area. 48-hour Average Daily Traffic (ADT) data was collected for four (4) segments over two days. All segments were collected between November 19, 2024, through November 20, 2024. The following subsections discuss the results of these efforts.

2.5.4.1 Ridge Street between Monticello Avenue and W Main Street

Bi-directional diurnal curves for 24-hour traffic volumes were developed for Ridge Street using the ADT data collected. **Figure 3** below shows the hourly variation of traffic volumes for Ridge Street between Monticello Avenue and W Main Street. It can be observed from **Figure 3** that the morning peak hour for Ridge Street between Monticello Avenue and W Main Street appears to be between 8:00 AM – 9:00 AM, and the evening peak hour appears to be between 5:00 PM – 6:00 PM.

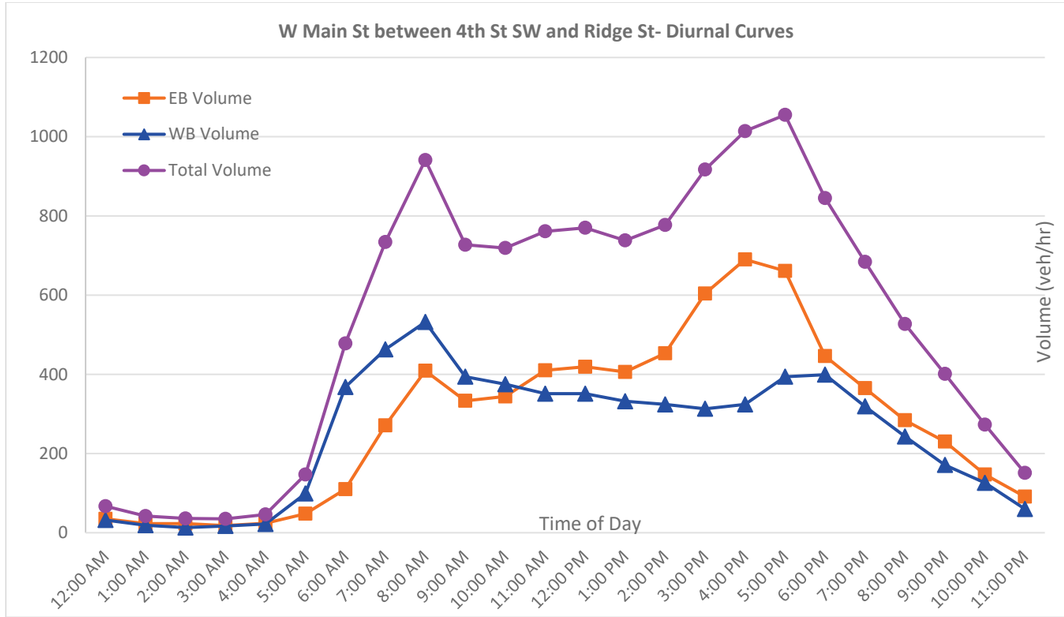
Figure 3. Diurnal Curves – Ridge Street between Monticello Avenue and W Main Street



2.5.4.2 W Main St between 4th St SW and Ridge St

Figure 4 shows the hourly variation of traffic volumes for the W Main St between 4th St SW and Ridge St. The traffic volume variation shown in **Figure 4** suggests that the morning peak hour is between 8:00 AM – 9:00 AM, while the evening peak hour is between 5:00 PM – 6:00 PM.

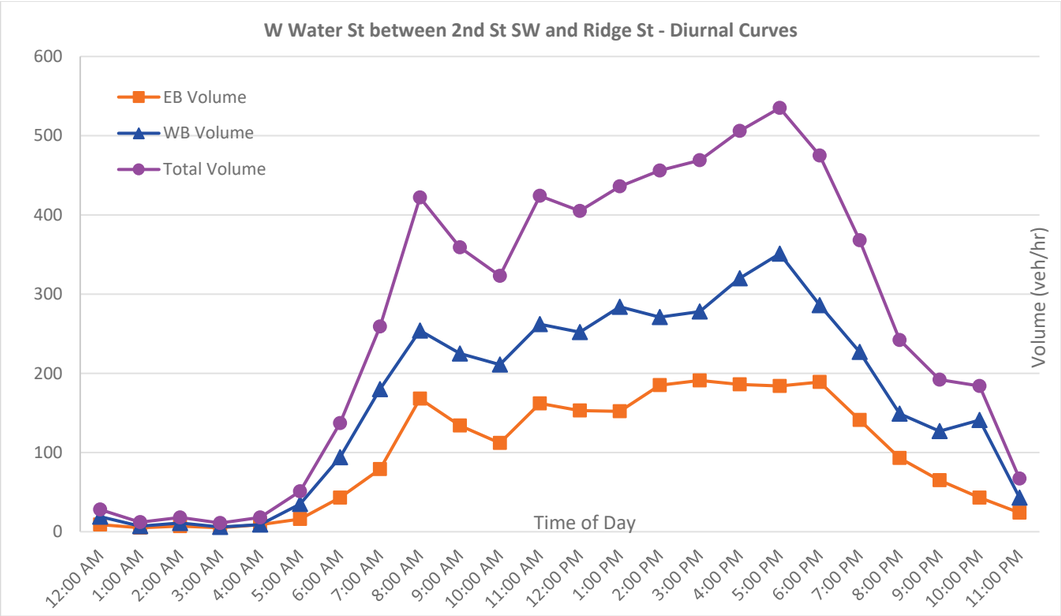
Figure 4. Diurnal Curves – W Main St between 4th St SW and Ridge St



2.5.4.3 W Water St between 2nd St SW and Ridge St

Figure 5 shows the diurnal curves for hourly traffic volume variation along W Water St between 2nd St SW and Ridge St. The morning peak hour as observed in **Figure 5** is between 8:00 AM – 9:00 AM, while the evening peak hour is between 5:00 PM – 6:00 PM.

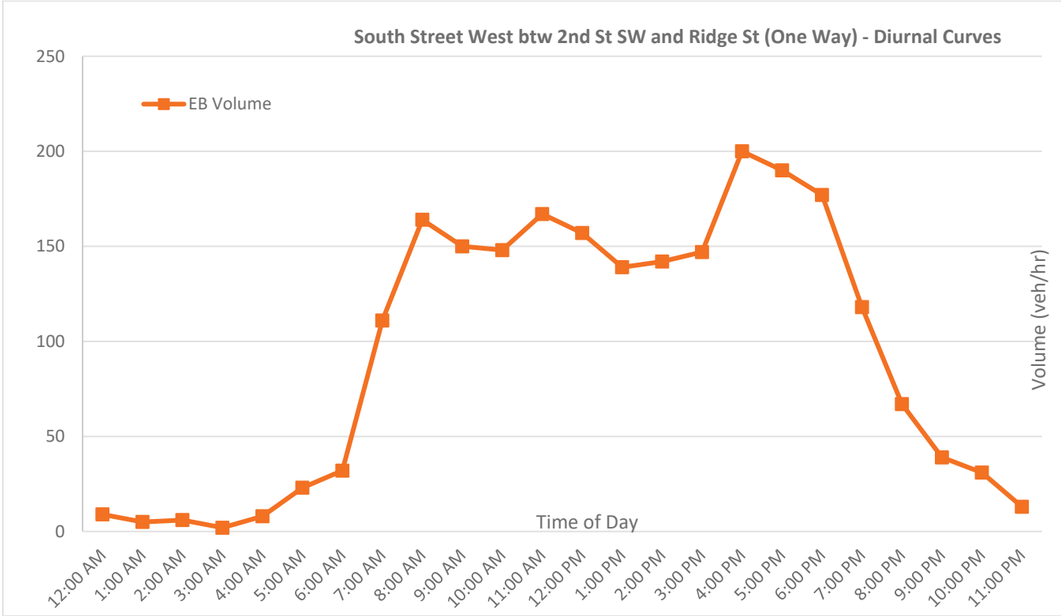
Figure 5. Diurnal Curves – W Water St between 2nd St SW and Ridge St



2.5.4.4 South Street West between 2nd St SW and Ridge St

South Street West is a one-way headed eastbound, therefore only one direction was analyzed for this segment. **Figure 6** shows the hourly variation of traffic volumes for South Street West between 2nd St SW and Ridge St. **Figure 6** illustrates that the morning peak hour is between 8:00 AM – 9:00 AM, and the evening peak hour is between 4:00 PM – 5:00 PM.

Figure 6. Diurnal Curves – South Street West between 2nd St SW and Ridge St



Next, individual intersection TMC data were reviewed to determine one common peak hour representing the highest hourly volumes. It was determined that the common peak hour of 8:00 AM – 9:00 AM best represents the volumes observed during the morning peak hour within the Study Area. This peak hour captures 99.5% of the volumes observed during the individual intersection peak hours as shown in **Table 4.**

Similarly, the common peak hour of 4:30 PM – 5:30 PM best represents the volumes observed during the evening peak hour within the Study Area. This peak hour captures 99.9% of the volumes observed during the individual intersection peak hours as shown in **Table 5.**

2.5.4.5 Recommendations

Based on the peak hour volume analysis for the Study Area, the following uniform peak hours are recommended for this study:

- AM Peak – 8:00 AM – 9:00 AM
- PM Peak – 4:30 PM – 5:30 PM

Table 4: Comparison of Intersection AM Peak Hour Volumes

INTERSECTION	COUNT DATE	AM PEAK					
		A	B	C	D	E	F
		OBSERVED PEAK HOUR	ENTERING VOLUME FOR OBSERVED PEAK HOUR (COLUMN A)	ENTERING VOLUME FROM 8:00 AM - 9:00 AM	% of COLUMN C TO COLUMN B	ENTERING VOLUME FROM 7:45 AM - 8:45 AM	% of COLUMN E TO COLUMN B
Ridge Street - W Main Street (BUS US -250E) - Water Street	11/19/2024	7:45 AM to 8:45 AM	2299	2294	99.8%	2299	99.2%
W Main Street (BUS US -250E) at 4th Street NW		8:15 AM to 9:15 AM	1038	1015	97.8%	1002	100.0%
Ridge Street at Monticello Avenue		7:45 AM to 8:45 AM	1644	1638	99.6%	1644	97.0%
Ridge McIntire Street (BUS US-250E) at Preston Avenue		8:15 AM to 9:15 AM	2476	2475	100.0%	2476	100.0%
South Street West at 2nd Street SW		8:15 AM to 9:15 AM	179	173	96.6%	171	100.0%
W Water Street at 2nd Street SW		8:00 AM to 9:00 AM	500	500	100.0%	459	99.8%
5th St-Ridge St at Cherry Ave-Elliott Ave	05/07/2024	7:30 AM to 8:30 AM	2035	2001	98.3%	2017	99.1%
VOLUME WEIGHTED % OF INTERSECTION VOLUMES			***10,171***	***10,096***	***99.3%***	***10,068***	***99.0%***

Table 5: Comparison of Intersection PM Peak Hour Volumes

INTERSECTION	COUNT DATE	PM PEAK					
		A	B	C	D	E	F
		OBSERVED PEAK HOUR	ENTERING VOLUME FOR OBSERVED PEAK HOUR (COLUMN A)	ENTERING VOLUME FROM 4:30 PM - 5:30 PM	% of COLUMN C TO COLUMN B	ENTERING VOLUME FROM 5:00 PM - 6:00 PM	% of COLUMN E TO COLUMN B
Ridge Street - W Main Street (BUS US -250E) - Water Street	11/19/2024	3:30 PM to 4:30 PM	2705	2705	100.0%	2603	96.2%
W Main Street (BUS US -250E) at 4th Street NW		3:30 PM to 4:30 PM	1235	1235	100.0%	1176	95.2%
Ridge Street at Monticello Avenue		4:15 PM to 5:15 PM	2106	2096	99.5%	2106	100.0%
Ridge McIntire Street (BUS US-250E) at Preston Avenue		4:15 PM to 5:15 PM	2970	2970	100.0%	2813	94.7%
South Street West at 2nd Street NW		4:15 PM to 5:15 PM	203	203	100.0%	186	91.6%
W Water Street at 2nd Street NW		4:45 PM to 5:45 PM	606	606	100.0%	595	98.2%
5th St-Ridge St at Cherry Ave-Elliott Ave	05/07/2024	4:15 PM to 5:15 PM	2318	2311	99.7%	2260	97.5%
VOLUME WEIGHTED % OF INTERSECTION VOLUMES			***12,143***	***12,126***	***99.9%***	***9,479***	***96.7%***

3 Existing Roadway Geometric Characteristics and Transit

3.1 Existing Roadway Geometry

The existing roadway geometry, signal and stop control, transit facilities, pedestrian and bicycle facilities, parking, pavement markings and signing, lane restrictions, and lane configuration were observed and documented as part of the Field Review conducted on Friday, March 7, 2025. The existing lane configuration, control type, bus stop locations and bicycle amenities can be found on **Figure 7.**

3.2 Access Management Spacing

3.2.1 Access Management Metrics

The existing intersection and entrance spacing in the Study Area was evaluated using the VDOT access management regulations in Appendix F of the *VDOT Road Design Manual*. Within the Study Area, Ridge Street and W Main Street have posted speed limits of 25 mph and are classified as the Principal Arterial. South Street West, W Water Street and 2nd Street SE have posted speed limits of 25 mph and are classified as Collector. VDOT access management regulations applicable to principal arterials and collector with ≤= 30 mph speed limit are listed below as shown in **Table 6**.

Principal Arterial

- Minimum spacing between a signalized intersection and another signalized intersection – 1,050 feet
- Minimum spacing between an unsignalized intersection or a full median crossover and a signalized intersection, an unsignalized intersection or a full median crossover – 880 feet
- Minimum spacing between a full access entrance or directional median and any intersection, full access entrance, or median crossover – 440 feet
- Minimum spacing between a partial access one – or two-way entrance and any type of entrance, intersection, or median crossover – 250 feet

Collector

- Minimum spacing between a signalized intersection and another signalized intersection – 660 feet
- Minimum spacing between an unsignalized intersection or a full median crossover and a signalized intersection, an unsignalized intersection or a full median crossover – 440 feet
- Minimum spacing between a full access entrance or directional median and any intersection, full access entrance, or median crossover –225 feet
- Minimum spacing between a partial access one – or two-way entrance and any type of entrance, intersection, or median crossover – 200 feet

Table 6: Minimum Spacing Standards for Commercial Entrances, Intersections, and Median Crossovers

Highway Functional Classification	Minimum Centerline to Centerline Spacing (Feet)				
	Legal Speed Limit (mph)	Spacing between Signalized Intersections	Spacing between Unsignalized Intersections and Full/Directional Median Crossovers and Other Intersections or Median Crossovers	Spacing between Full Access Entrances and Other Full Access Entrances, Intersections, or Median Crossovers	Spacing between Partial Access Entrances (one or two-way) and Other Entrances, Intersections, or Median Crossovers
Principal Arterial	≤=30	1050	880	440	250
Collector	<=30	660	440	225	200

Source: *VDOT Roadway Design Manual, Appendix F (Table 2-2)*

3.2.2 Access Management Results

The Study Area is located in an urban area where access points are densely distributed due to the high concentration of commercial and residential properties. As a result, most access points do not meet the minimum spacing guidelines established by VDOT. A total of 19 access points were analyzed along the following segments:

- Ridge Street between Preston Avenue and Monticello Avenue
- W Main Street (BUS US250E) between Ridge Street and 4th Street NW
- South Street West between Ridge Street and 2nd Street SW
- W Water Street between Ridge Street and 2nd Street SW
- 2nd Street SW between South Street W and W Water Street

Among them, only one access point on Ridge Street fully complies with the spacing standard. The vast majority, 18 out of 19 access points, are non-compliant, highlighting the challenges of access management in urban settings. Additionally, some access points, totaling 9, are compliant in only one direction, indicating that while they partially meet spacing requirements, they still pose potential safety and operational concerns in the opposite direction. These access points are shown graphically in **Appendix B-4** and identified as AP1 through AP19. The spacing of these points was analyzed to assess their compliance with the VDOT minimum spacing standards shown in **Table 6**. **Table 7** identifies the access points that do not have a minimum spacing standard; as well as those that are compliant with the spacing standard.

Table 7: Access Points Analysis for Study Area

Roadway	Number of Access Points	Per VDOT Spacing Guidelines		
		Compliant	Non-Compliant	Compliant in One Direction
Ridge Street	11	1	10	7
W Main Street (BUS-250E)	1	0	1	0
South Street West	4	0	4	1
W Water Street	2	0	2	1
2nd Street SW	1	0	1	0

Note: Refer to **Appendix B-4** for graphical presentation of access points.

Analysis of existing access points and their spacing reveals that the minimum spacing standards are not met for 18 out of 19 access points within vicinity of the study intersection, including full and partial access driveways, entrances, and intersections. The area is characterized by a dense urban environment with significant commercial and residential development, leading to closely spaced access points. The high concentration of access points increases the potential for vehicle conflict and reduces traffic flow efficiency. Implementing access management strategies, such as consolidating driveways or improving intersection control, could enhance intersection operations by minimizing conflict points and improving overall safety.

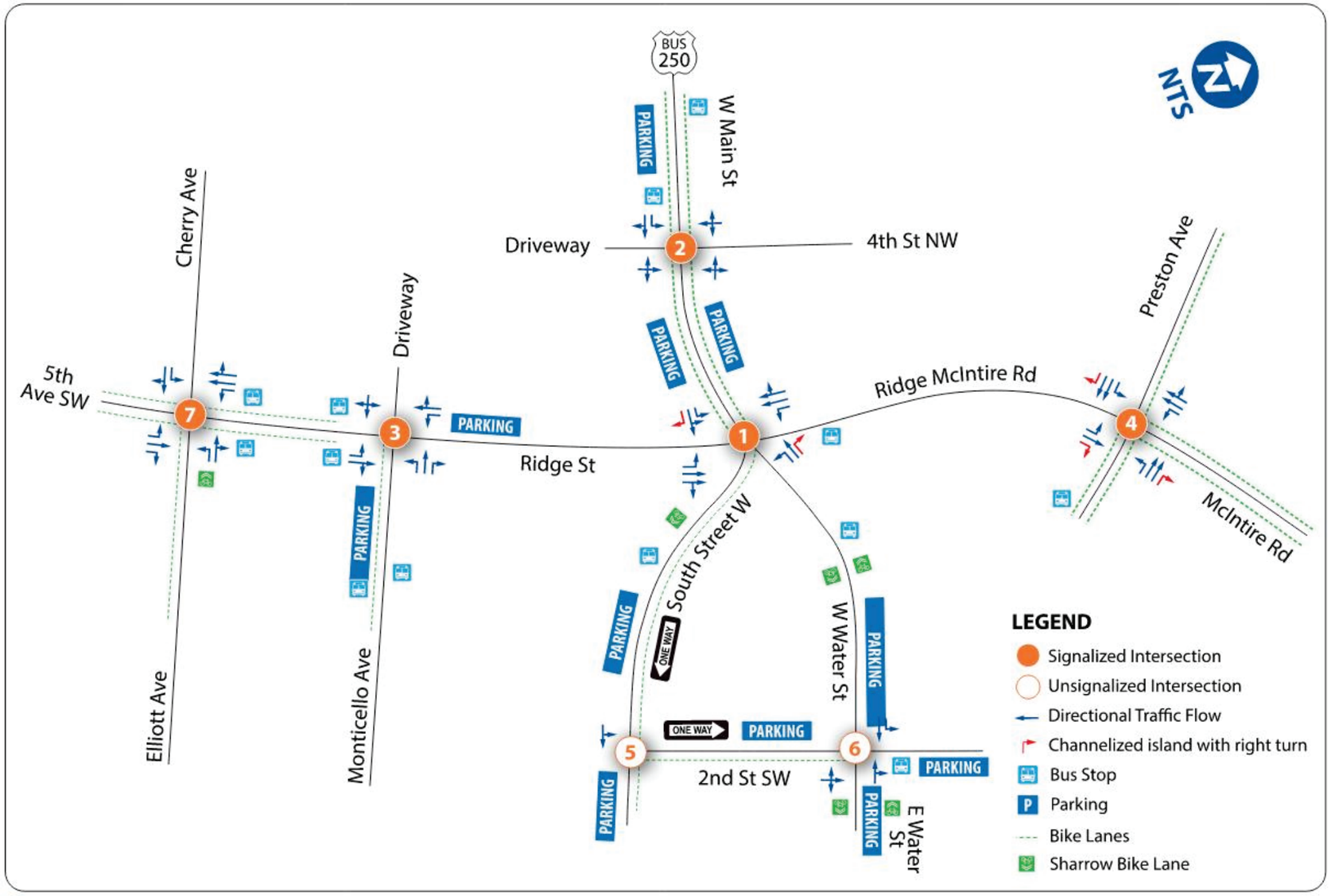
3.3 Existing Parking Facilities

This Study Area has on-street parking in four multiple locations which can be seen on **Figure 7**. A list of these locations can be seen below:

- W Main St between 4th St NW and Ridge St/ Ridge McIntire Rd (both side of the road)
- South Street West between Ridge St/ Ridge McIntire Rd and 2nd St SW (south side of the road only)
- W Water St between Ridge St/ Ridge McIntire Rd and 2nd St SW (north side of the road only)
- Ridge St between W Main St and Monticello Ave (west side only, in front of 207 Ridge St)

In addition to on-street parking, the north leg of the intersection of South Street West and 2nd St SW provides access to the AirGarage | Public Parking.

Figure 7: Existing (2024) Lane Configuration



VDOT STARS

RIDGE ST/ BUS 250 (W MAIN ST) - W WATER ST INTERSECTION STUDY

Charlottesville, VA

EXISTING LANE CONFIGURATION

3.4 Existing Transit Data

3.4.1 Charlottesville Transit

The surrounding area in Charlottesville is well-served by transit lines providing services to and from key locations within the City and beyond. Charlottesville Area Transit (CAT) operates several bus routes that connect various neighborhoods and important destinations.

The Downtown Transit Station, located near the Study Area serves as a central hub for Charlottesville Area Transit, therefore many bus routes pass through or near Ridge Street which provides regular transit access in the area. Currently, these bus routes provide service to the Study Area, with the following frequencies:

- Route 1 – PVCC/Woolen Mills – Every 60 minutes on weekdays
- Route 2 – 5th Street Station– Every 30 minutes on weekdays
- Route 3 – Southwood/Belmont– Every 60 minutes on weekdays
- Route 4 – Cherry Ave/Harris Rd– Every 30 minutes on weekdays
- Route 6 – Ridge St/Prospect Ave– Every 30 minutes on weekdays
- Route 7 – Emmet St/ Seminole Trail – Every 30 minutes on weekdays
- Route 8 – Preston Ave/Emmit St– Every 60 minutes on weekdays
- Route 9 – UVA Health/ YMCA– Every 30 minutes on weekdays
- Route 10 – Pantops– Every 60 minutes on weekdays
- Route 11 – Locust Ave/ Rio Rd– Every 60 minutes on weekdays
- Trolley – UVA/Downtown– Every 25 minutes on weekdays

To the west of this project off W Main Street is the Charlottesville Amtrak Station, which provides additional connectivity options. These bus routes along with the locations of the existing bus stops are presented in **Appendix B-5**. Combined, there are a total of 13 bus stops within the Study Area. Approximate bus stop locations can be seen on **Figure 7.**

3.5 Charlottesville City Schools and Government Service Buildings

The following are a list of Government service building within close proximity of the Study Area.

- Federal Building and US Courthouse (255 W Main Street)
- Albemarle County Office Building (401 McIntire Road)
- Charlottesville City Hall (605 E Main Street)
- Charlotteville Circuit Court (315 E High Street)
- Thomas Jefferson Planning District Office (401 E Water Street)
- Charlottesville Housing Authority (817 Hardy Dr)
- Charlottesville Public Works Building (305 4th Street NW)

Regarding educational institutions, there are multiple art institutes, but no immediately adjacent Charlottesville City schools near the Study Area, however the following schools are within a 1-mile radius of the Study Area:

- Buford Middle School (1000 Cherry Avenue)
- Trailblazer Elementary School (406 14th Street NW)
- Lugo-McGinness Academy (341 11th Street NW
- Summit Elementary School (1000 Belmont Avenue)
- Renaissance School (418 E Jefferson Street)

In addition to the City Schools, the University of Virginia's grounds are also approximately 1 mile from the Study Area. These locations are presented in **Appendix B-6**.

3.6 Existing Pedestrian and Bicycle Facilities

The City of Charlottesville's Master Plan includes several maps that pertain to bicycle and pedestrian facilities. These maps include the Biking and Walking Street and Trails Map, Biking and Walking Level of Traffic Stress Map, Bike Parking Map, and a City Trails Map. These can be found in **Appendix B-7**.

3.6.1 Existing Sidewalks, Crosswalks and Bicycle Lanes

Within the project limits, there is existing sidewalk along both sides of each Study Area segment. There are also existing crosswalks located at the intersections and midblock crosswalks within the project limits. There is limited buffer space between the sidewalks and travelled way on most of these segments. There are dedicated bicycle lanes and shared bicycle lanes as seen in **Figure 7** along the following streets:

- Ridge Street south of Oak Street (dedicated lanes on both sides)
- W Main Street (dedicated lanes on both sides)
- South Street West (dedicated contraflow lane on the north side and south sharrow lanes)
- W Water Street (sharrow lanes in both directions)
- Preston Avenue west of 4th Street NW (dedicated bike lanes on both sides)
- Preston Avenue between 4th Street NW and Ridge McIntire Road (dedicated bike lanes on the north side)
- Preston Avenue east of Ridge McIntire (dedicated bike lanes on both sides)
- McIntire Road north of Preston Avenue (dedicated bike lanes on both sides)
- Monticello Avenue between Ridge Street and Gleason Street (dedicated bike lanes on south side)
- Monticello Avenue between Gleason Street and 2nd Street SW (dedicated bike lanes on both sides)
- Elliot Avenue between Ridge Street and approximately 300 ft east of Ridge Street (dedicated bike lane on the southside, and a sharrow lane on the north side)
- Elliot Avenue between 300 ft east of Ridge Street and 1st Street S (dedicated bike lanes on both sides)
- Cherry Avenue west of Ridge Street (sharrow lanes on both sides)

4 Pedestrian and Bicycle Analysis

4.1 Pedestrian Level of Comfort (PLOC) and Bicycle Level of Traffic Stress (BLTS)

The study assessed the primary corridors and intersections within the Study Area by using the Pedestrian Level of Comfort (PLOC) and Bicycle Level of Traffic Stress (BLTS) methodology from Montgomery County, Maryland[6]. PLOC and BLTS represent a high-level performance rating of pedestrian and Pedestrian Level of Comfort (PLOC) and Bicycle Level of Traffic Stress (BLTS) bicycle facilities and is based on the level of comfort or discomfort experienced by pedestrians, bicyclists, and other sidewalk users.

4.1.1 Pedestrian Level of Comfort (PLOC)

The Montgomery County PLOC Methodology uses a basic four-point ranking system, while half-points add further nuance when additional data are available to refine the evaluation. For example, a crossing might be upgraded from a score of 3 to 2.5 if an additional safety or comfort treatment, such as lighting or a "No Turn on Red" sign, is present. Below is a summary of the ranking system with the lowest score being the most comfortable and desirable outcome*:*

- **PLOC 1 = Very Comfortable**
- **PLOC 1.5 = Comfortable**
- **PLOC 2 = Somewhat Comfortable**
- **PLOC 2.5 = Somewhat Uncomfortable**
- **PLOC 3 = Uncomfortable**
- **PLOC 3.5 = Very Uncomfortable**
- **PLOC 4 = Undesirable**

4.1.1.1 Segment Analysis

PLOC was assessed along Ridge Street from Preston to Monticello, and for one block along the intersecting segments. The following metrics were collected for the PLOC segment determination:

- **Segment data:**
  - General land use
  - Sidewalk condition and width
  - Posted Speed Limit
  - Buffer type and width
  - On-Street Buffer (Designated Parking Lane or Separated Bike Lane)
  - Traffic Volume or Roadway Classification

Figure 8 shows a map of the locations assessed along with the PLOC segment ratings. Additional evaluation results, corresponding to field measurements, speed limits, and observations, for the segments and crossings are presented in **Appendix B-8**.

Table 8 provides the PLOC rating for each of the segments analyzed. ***Preston Avenue*** was assigned an overall PLOC Level 4 (Undesirable) rating due to the narrow sidewalk width, lack of a buffer from traffic and the 35 mph speed limit. This criterion considers the stress associated with the total distance between the pedestrian and vehicular traffic.

Three (3) other segments were assigned an Overall PLOC Level 3 (Uncomfortable) rating (a portion of Ridge Street, W Main Street and W Water Street). In the segment between Preston Avenue and W Main Street, ***Ridge McIntire Road*** has a seven (7) to eight (8) foot wide sidewalk, but no buffer. ***W Main Street*** has varied sidewalk widths ranging from two (2) to eight (8) feet, varying buffer characteristics and poor sidewalk surface condition (particularly on the south side). ***W Water Street*** also has varying street characteristics with pathways varying from three (3) to eight (8) feet and buffers ranging from zero (0) to eight (8) feet. Sidewalk widths less than five (5) feet will make it difficult for people with disabilities to comfortably traverse this segment.

South Street W is considered a PLOC 2 (Somewhat Comfortable) given its consistent pathway width of five (5) feet or greater. However, there is no consistent sidewalk buffer on this corridor.

Table 8: Segment PLOC Rating

Segment	Location	Segment Final PLOC Rating			
		North Sidewalk	South Sidewalk	East Sidewalk	West Sidewalk
1	Ridge McIntire Road /McIntire Road (W Main to Preston)	-	-	PLOC 3	PLOC 3
2	Ridge Street (W Main to Monticello)	-	-	PLOC 2	PLOC 2
3	W Main Street (4th to Ridge)	PLOC 3	PLOC 3	-	-
4	W Water Street	PLOC 3	PLOC 3	-	-
5	South Street W	PLOC 2	PLOC 2	-	-
6	Preston Avenue	PLOC 4	PLOC 4	-	-

4.1.1.2 Crossing Analysis

Crossings are scored using different metrics, depending on whether they are uncontrolled (no stop sign or traffic signal present) or controlled (stop sign or traffic signal present). Factors considered in all crossing evaluations include crossing control, presence of a channelized right turn or interstate ramp, number of lanes crossed, highest posted speed limit of the intersection, median type and crosswalk type. Only signalized crossings are affected and scored by the presence of a "No Right Turn on Red" sign.

Table 9 provides the Crossing PLOC rating for each of the crosswalks analyzed. Six (6) of the crossings were assigned a PLOC 3 (Uncomfortable) rating (all approaches of Ridge McIntire Road at Preston Avenue, Ridge St at W Main Street/W Water Street south leg, and Ridge Street at Monticello Avenue east leg). Each of these are located at signalized crosswalks with complex elements such as more than five (5) total lanes crossed at once, narrow (less than six (6) feet) or no refuge islands, highly skewed approaches, or free-flow/yield-controlled channelized right-turns. Though not shown in the table, each of the channelized crossings at ***Ridge McIntire Street (BUS US-250E) at Preston***

[6] *Montgomery County Bicycle Master Plan Appendix D. (n.d.). http://montgomeryplanning.org/wp-content/uploads/2017/12/Montgomery-County-Bicycle-Master-Plan-Appendix-Web.pdf*

Avenue and ***Ridge Street at W Main Street/W Water Street*** are automatically considered PLOC 4 (Undesirable) as seen in **Figure 8**, since there are no signals or features that slow traffic or improve visibility of pedestrians.

Four (4) of the crosswalks were assigned a PLOC Level 2 (Somewhat Comfortable) rating at ***Ridge Street and W Main Street/ W Water Street*** (north, east and west legs) based on the presence of a high visibility crosswalk and 25 mph travel speed. However, this rating does not take into account the overall complexity of the intersection and lack of adequate waiting areas and accessible crossing features.

The intersection of ***W Main Street and 4th Street*** is considered a PLOC 1 (Very Comfortable). This intersection has pedestrian signals, high visibility crosswalk markings, 25 mph posted and few lanes to cross. However, it is important to note that this intersection functions more like a driveway as most of the cars entering and existing 4th Street are turning vehicles onto W Main Street. The current signal timing allows pedestrians to cross at the same time vehicles are turning. Though not within the study time period, there have been injury crashes involving pedestrians and turning vehicles at this location.

The mid-block crossing on ***Ridge McIntire Road at the McDonald's*** entrance received a PLOC of 1.5 (Comfortable) due to the number of travel lanes crossed and presence of a rapid flashing beacon. The mid-block crossing north of ***Staples*** received a PLOC 2 (Somewhat Comfortable) rating. However, the experience of crossing at these locations does not reflect that score. There is a steep grade in the northbound direction which increases actual travel speeds, the lanes are wide, and the median is narrow (less than six (6) feet), which makes these crossings feel less comfortable than the rating indicates.

Table 9: Crossing PLOC Rating

Int #	Crosswalk #	Location	Crossing Final PLOC Rating			
			North Leg	South Leg	East Leg	West Leg
1	1-8	Ridge McIntire Road (BUS US-250E) at Preston Avenue	PLOC 3	PLOC 3	PLOC 3	PLOC 3
2	9-12	W Main Street (BUS US -250E) at 4th Street NW	PLOC 1	PLOC 1	PLOC 1	PLOC 1
3	13-19	Ridge Street and W Main Street/W Water Street	PLOC 2	PLOC 3	PLOC 2	PLOC 2
4	20-22	Ridge Street at Monticello Avenue	PLOC 1	PLOC 1	PLOC 3	-
5	5a	Ridge McIntire Road Crossing @ McDonalds	PLOC 1.5	-	-	-
6	6a	Ridge McIntire Road Crossing @ Staples	PLOC 2	-	-	-

4.1.2 Bicycle Level of Traffic Stress (BLTS)

Bicycle Level of traffic stress (BLTS) is an approach that quantifies the discomfort people feel when they bicycle close to traffic. The methodology was originally developed in 2012 by the Mineta Transportation Institute and San Jose State University. The BLTS methodology assigns a numeric stress level to streets and trails based on the following criteria for evaluating traffic stress on road segments, intersection approaches and unsignalized crossings:

- **Segments:**
  - Number of traffic lanes.
  - Speed limit or prevailing speed
  - Frequency of on-street parking turnover
  - Presence of a bikeway facility (such as side paths, bike lanes, separated bike lanes, etc.)
- **Intersection Approaches:**
  - Presence of right turn lane(s)
  - Length of right turn lane
  - Turn lane configuration (bike lane shifts vs. bike lane continues straight)
- **Unsignalized Crossings:**
  - Width of cross street
  - Speed limit of cross street
  - Presence or absence of median refuge

The analysis applies a "weakest link" logic, wherein the stress level is assigned based on the lowest-performing attribute of the street. For example, even if a segment has mostly low-stress characteristics, the occurrence of one higher-stress attribute (for example, frequent bike lane blockage) dictates the stress level for the segment.

When a street has a moderate or high level of stress, this may indicate that bicycle infrastructure (like separated bike lanes or shared use paths) is needed to make it a place where more people will feel comfortable riding.

Montgomery County Bicycle Master Plan Bicycle Level of Traffic Stress Methodology expands the original 4-point ranking system to seven stress levels to accommodate the shared use paths and separated bike lanes.

The seven stress levels are described below:

- **BLTS 0 = None**
- **BLTS 1 = Very Low**
- **BLTS 2 = Low**
- **BLTS 2.5 = Moderate Low**
- **BLTS 3 = Moderate High**
- **BLTS 4 = High**
- **BLTS 5 = Very High**

Figure 9 includes the segments assessed along with the BLTS segment ratings. Additional BLTS evaluation results for both segments are presented in **Table 10**. The majority of the segments are considered a BLTS 3. Based on this analysis, bicycle facilities within the Study Area have a moderate high stress level, suitable for accommodating 1-10% of the population. This is largely due to the functional classification and traffic volumes of the roadways in the Study Area.

Table 10: BLTS Rating

Int #	Segment #	Location	Segment Final BLTS Rating			
			North	South	East	West
1 to 3	1-2	Ridge/McIntire (W Main to Preston)	-	-	BLTS 3	BLTS 3
2 to 3	3-5	W Main Street (4th to Ridge)	BLTS 2.5	BLTS 2.5	-	-
3	6-7	W Water Street	BLTS 3	BLTS 3	-	-
3	8	South Street West	BLTS 2	BLTS 2*	-	-
3 to 4	9-10	Ridge Street (W Main to Monticello)	-	-	BLTS 3	BLTS 3
1	11-15	Preston Avenue	BLTS 3	BLTS 3	-	-

*This rating is for the southbound shared bike lane

Bicycle Level of Traffic Stress was analyzed as part of the City's Bicycle and Pedestrian Master Plan (2015). That analysis revealed a BLTS 4 for most of the Study Area corridors. This is likely due to the use of a different methodology. Bicycle conditions have not changed on these corridors since that plan was adopted.

4.1.3 Analysis Summary

The average rating within this Study Area was BLTS 3 for bicycle facilities and PLOC 2.5 for pedestrian facilities. Improving the pedestrian sidewalk width, buffer width and installing medians ten (10) feet or wider would increase level of comfort of pedestrians walking through the corridor. Creating buffered or separated bike lanes along primary corridors particularly on Ridge Street would raise awareness of bicyclists in the area and increase the level of comfort biking through this corridor.

Figure 8: Existing (2024) Pedestrian Level of Comfort Analysis Results

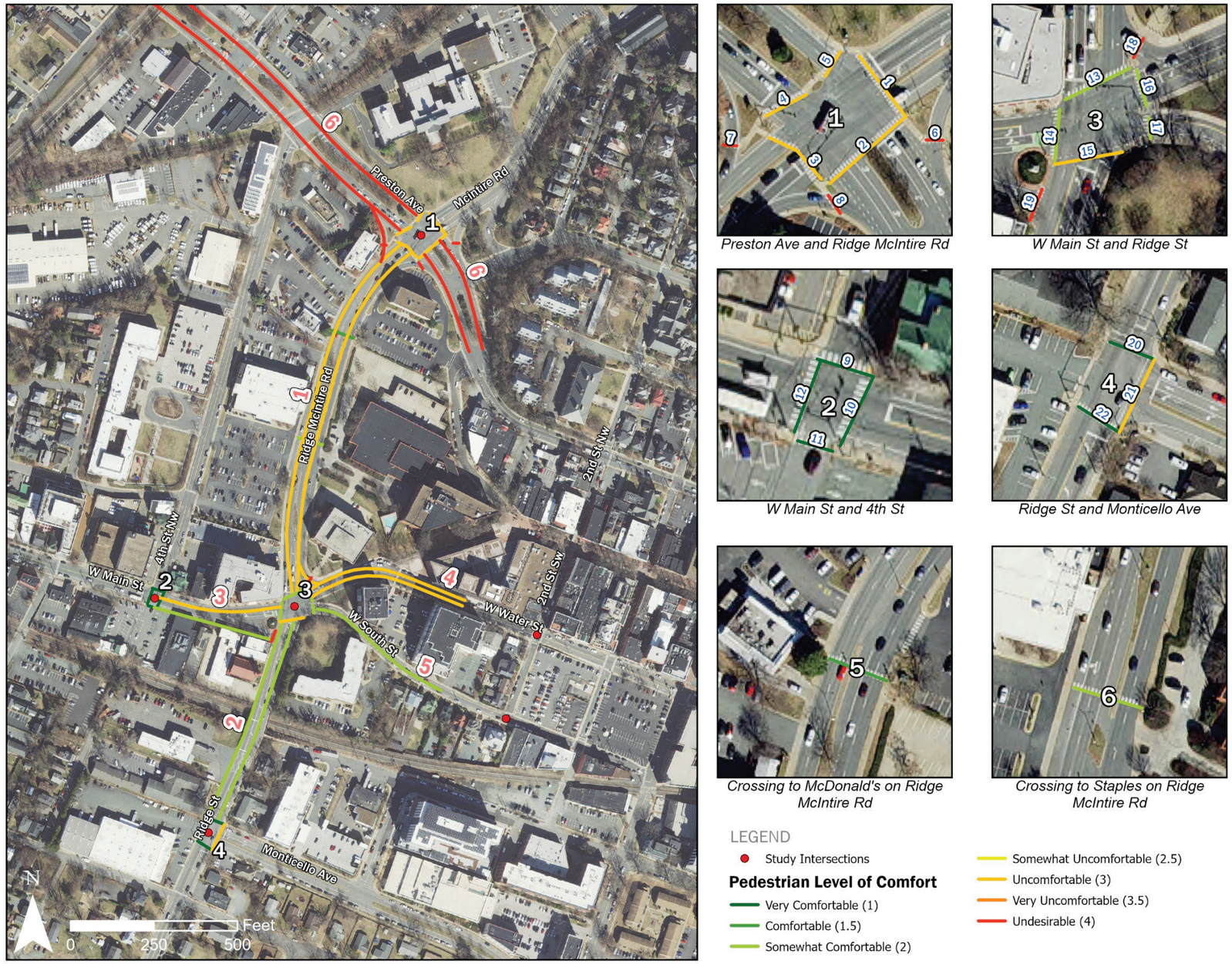


Figure 9: Existing (2024) Bicycle Level of Traffic Stress Analysis Results

4.2 HCM Methodology Quantitative Analysis

This study assessed intersections within the Study Area by using the Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) methodology defined in the *Highway Capacity Manual 6th Edition*. Chapter 19 Section 5 Pedestrian Methodology and Chapter 19 Section 6 Bicycle Methodology both outline the process to evaluate the quality of service for pedestrians and bicyclist traveling through a signalized intersection. PLOS/BLOS is measured on a scale of "A" through "F," with LOS A representing the best quality of service and LOS F representing the worst, based on the delay experienced at the intersection during the analysis period. Green, yellow and red colors were assigned to delay thresholds for each study intersection. **Table 11** presents the overall intersection delay graphically with color coding.

Table 11: Color Coding based on Crossing Delay

PLOS / BLOS Score	PLOS / BLOS	Color
≤ 1.50	A	
> 1.50 – 2.50	B	
>2.50 – 3.50	C	
>3.50 – 4.50	D	
>4.50 – 5.50	E	
>5.50	F	

There are five (5) signalized intersections within the Study Area that were evaluated for both PLOS for all existing pedestrian crossings and BLOS for all existing established bicycle lanes.

4.2.1 Pedestrian Level of Service (LOS)

PLOS was assessed at all existing crossings at five (5) signalized intersections. There were twenty (20) crossings that were analyzed. The following criteria were used for the pedestrian methodology:

- "Typical Pedestrian"
  - HCM Methodology reflects the average pedestrian and does not reflect the perception of those with disabilities
- Target Travel Modes
  - HCM Methodology reflects travel by pedestrian walking across one or more leg of a signalized intersection and does not cover other modes (such as scooters)

Delay in sec/person were reported for all crossings at the signalized intersections. **Table 12** and **Table 13** summarizes the AM and PM peak hour PLOS and delay, respectively, for each crossing at the signalized intersections within the Study Area.

The results from **Table 12** suggest that there are no crossings for the AM peak hour that had an overall PLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 12: Existing (2024) Pedestrian Level of Service AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.40	B	2.52	C	2.57	C	2.61	C	2.12	B
2	1 - B1	W Main Street (BUS US - 250) at 4th Street NW	2.09	B	2.16	B	1.98	B	1.90	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.15	B	1.72	B	2.30	B	2.24	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.07	C	3.00	C	2.64	C	2.76	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	0.60	A	1.40	A	0.60	A	1.28	A		

The results from **Table 13** suggest that there are no crossings for the PM peak hour that had an overall PLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 13: Existing (2024) Pedestrian Level of Service PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.35	B	2.35	B	2.61	C	2.54	C	1.87	B
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.13	B	2.17	B	2.04	B	1.97	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.14	B	1.72	B	2.12	B	2.12	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.02	C	2.79	C	2.67	C	2.65	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	0.60	A	1.42	A	0.60	A	1.28	A		

4.2.1.1 Summary

In summary, all of the PLOS results were LOS C or better. Furthermore, the delay value for all of the signalized intersections is shown in **Appendix B-8**.

4.2.2 Bicycle Level of Service (BLOS)

BLOS was assessed at all existing bicycle lanes for signalized intersections. There were nine (9) crossings that were analyzed. The following criteria were used for the pedestrian methodology:

- Shared or exclusive bicycle lanes
  - HCM Methodology evaluates the service or established bicycle lanes
- Target Travel Modes
  - HCM Methodology reflects travel by bicycle through the signalized intersection and does not cover other modes (such as motorized bicycles)

Table 14 and

Table 15 summarizes the AM and PM peak hour BLOS and delay, respectively, for each crossing at the signalized intersections within the Study Area. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

The results from **Table 14** suggest that there are no crossings for the AM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 14: Existing (2024) Bicycle Level of Service for AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.67	C	N/A	N/A	N/A	N/A	N/A	N/A	0.54	A
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	1.95	B	1.88	B	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	3.14	C	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.28	B	2.91	C	N/A	N/A	2.54	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.27	C	N/A	N/A	2.60	C	2.60	C		

The results from **Table 15** suggest that there are no crossings for the PM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

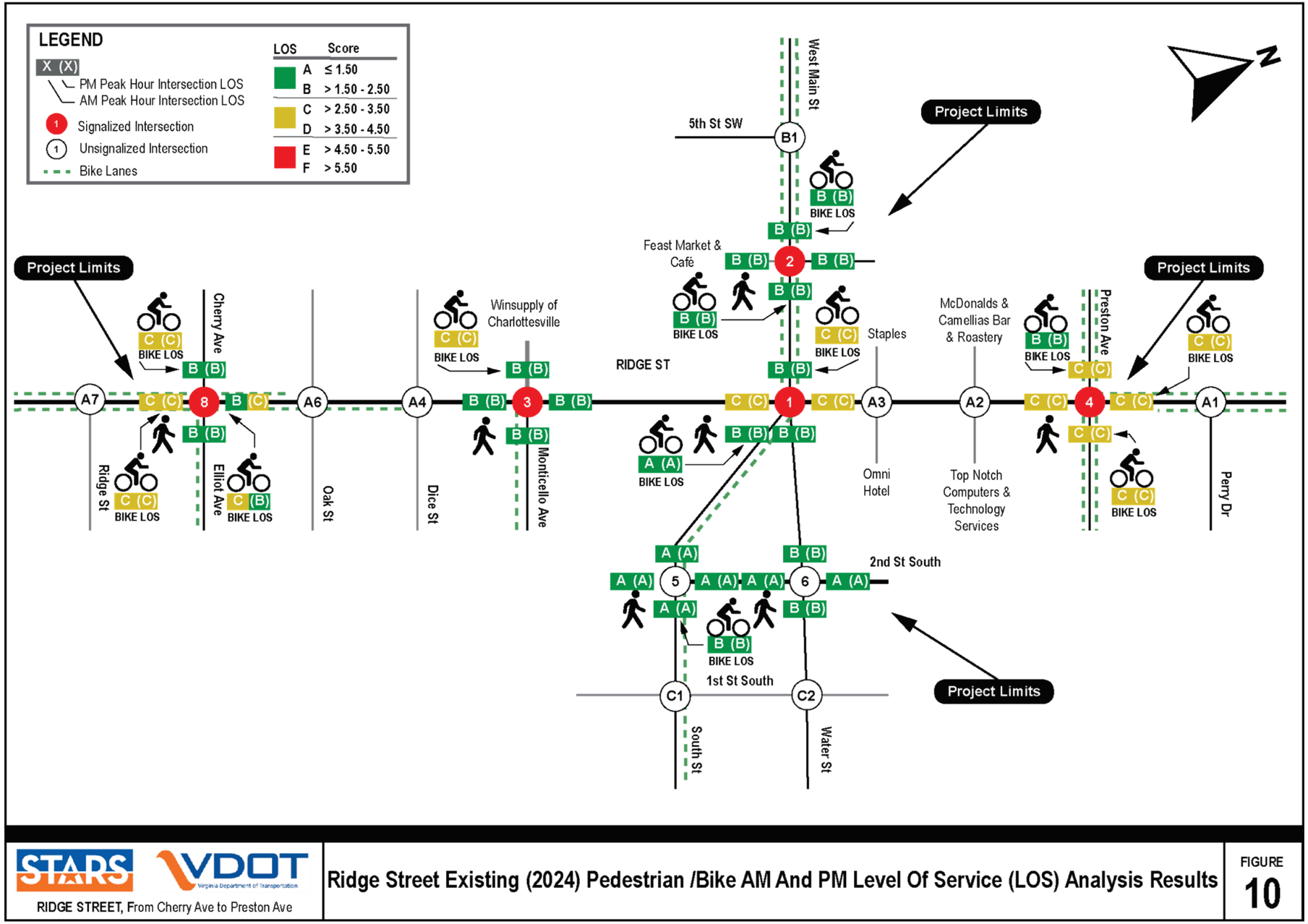
Table 15: Existing (2024) Bicycle Level of Service for PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.83	C	N/A	N/A	N/A	N/A	N/A	N/A	0.75	A
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	1.64	B	2.33	B	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	3.19	C	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.35	B	3.07	C	N/A	N/A	2.58	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.25	C	N/A	N/A	3.36	C	2.28	B		

4.2.2.1 Summary

Overall, all of the BLOS results were equal LOS C or better. Furthermore, the delay value for all the signalized intersections is a minimum of 18.9 sec/bicycle at eastbound West Main Street and 4th Street and the maximum delay of 38.7 sec/bicycle at westbound Ridge Street, Water Street, and South Street as seen in **Appendix B-8**. **Figure 10** also includes graphical with color coding the BLOS per crossing for both AM and PM peak hours.

Figure 10: Existing (2024) Pedestrian and Bicycle Level of Service (LOS) Analysis Results



5 Crash Analysis

Crash data for the most recent five (5) years (November 1, 2019 through October 31, 2024) was obtained from VDOT's Crash Analysis Tool. The crash data was evaluated to identify crash locations and patterns, severity of crashes, and likely causes for crashes. The crash data was examined to identify crash locations on which to focus during the Field Review conducted on Friday, March 7, 2025. The Field Review was conducted, with a particular focus on crash patterns, to evaluate conditions in the field that could be influencing the crash locations from the crash data.

The crash data analysis and field review data were used to identify factors that could potentially contribute to crashes and to make recommendations regarding improvements that could mitigate future crashes.

5.1 Regional Comprehensive Safety Action Plan: Move Safely Blue Ridge

Move Safely Blue Ridge (MSBR) is a regional effort by the Thomas Jefferson Planning District Commission (TJPCD) to reduce roadway crash fatalities and serious injuries using the ***Safe Streets for All (SS4A) Program***. This ongoing process will result in TJPDC's Regional Comprehensive Safety Action Plan. Solutions will be focused on four (4) major themes of roadway safety: engineering, education, enforcement, and emergency response. **Figure 11** shows the current plan timeline.

Figure 11: Move Safely Blue Ridge Safety Plan Timeline

This section will be modified pending advancement of the Move Safely Blue Ridge Safety Plan in spring of 2025.

5.2 Crash Data Analysis

5.2.1 Crashes by Year

There were 171 total crashes reported at the intersections and within the Study Area from November 2019 to October 2024. **Figure 12** outlines the number of crashes by year. Note that the 2019 and 2024 bars are striped since the data does not include a full calendar year.

Figure 12: Crashes per Year (2019 – 2024)

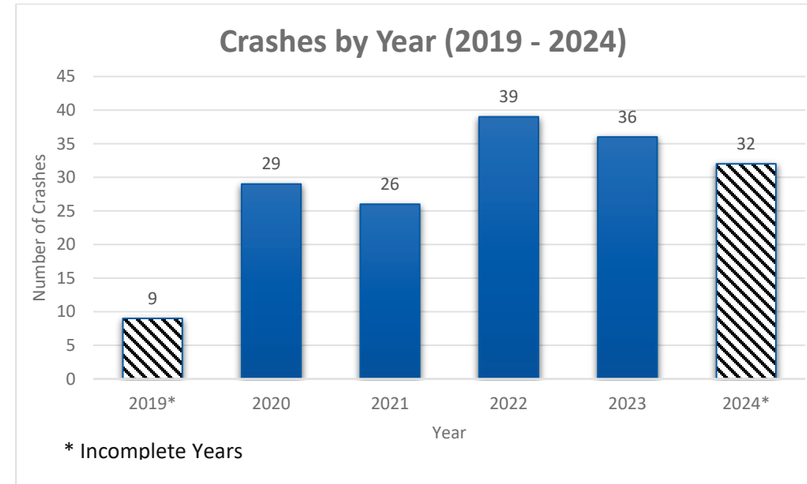


Figure 13 shows that the highest percentage of crashes were property damage (51%) and non-visible injuries (33%) occurred in the Study Area within the five (5) year period. There were 9% severe injuries and no fatalities.

Figure 13: Severity of Crashes (2019-2024)

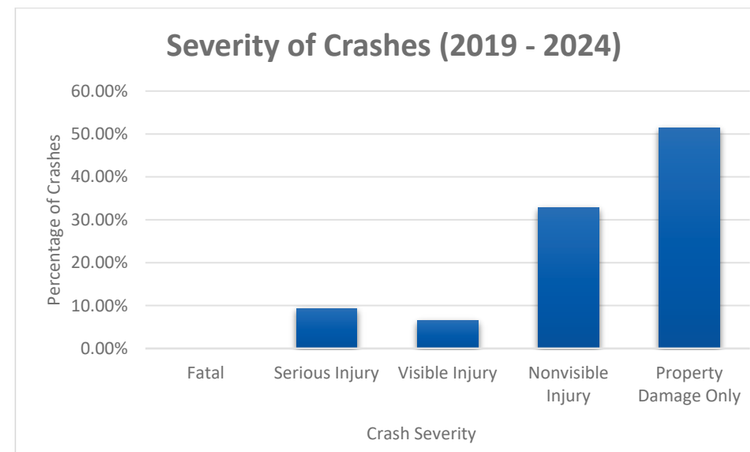
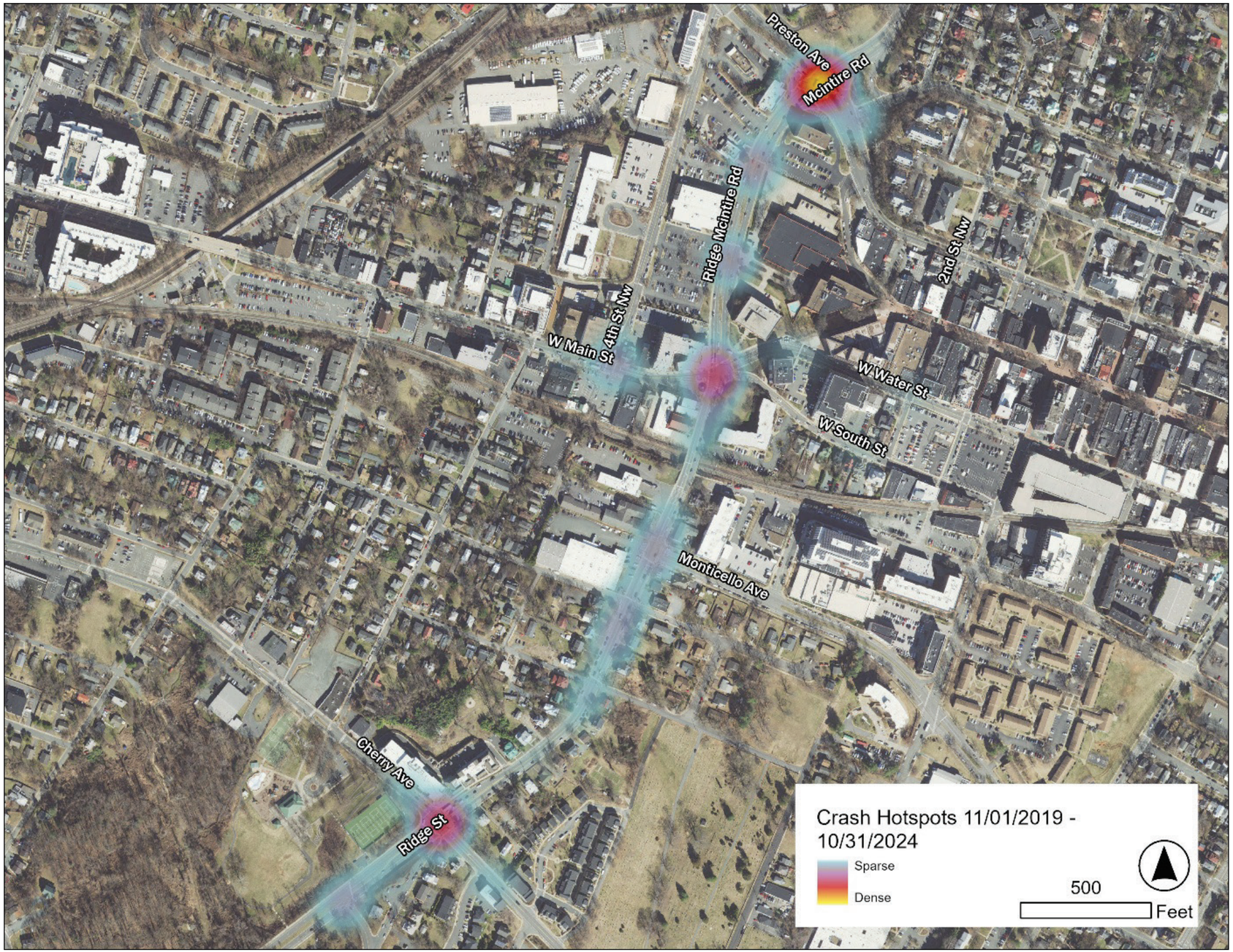


Figure 14 shows a heat map of the corridor over the five (5) year period. Based on the heat map, the Ridge McIntire Road and Preston Avenue intersection was shown to have the highest propensity of crashes, as indicated by the yellow closely followed by two (2) intersections in red: Ridge Street at W Main Street/W Water Street and Ridge Street at Cherry Avenue/Elliot Avenue.

Figure 14: Crash Heat Map for Study Area (2019 – 2024)



5.2.2 Crashes by Type and Time of Day

As shown in **Figure 15**, most crashes that occurred were angle crashes (55 crashes or 32%) followed by rear-end crashes (53 crashes or 31%), head on crashes (19 crashes or 11%), sideswipe same direction crashes (17 crashes or 10%), pedestrian crashes (10 crashes or 6%), and fixed object - off road crashes (8 crashes or 5%). The remaining crash types each accounted for less than 3% of the overall crashes. It is worth noting that the highest number of pedestrian-related crashes occurred at the intersections of W Main Street at 4th Street NW, followed by Ridge Street at W Main Street/W Water Street. The majority of pedestrian crashes occurred with vehicles making left-turn movements. Also, all of the head on crashes occurred at Study Area intersections with Preston Avenue at Ridge McIntire Road and Ridge Street at Cherry Avenue each having six (6) head on crashes, and Ridge Street at W Main Street/ W Water Street having four (4) head on crashes.

Figure 15: Type of Crashes (2019-2024)

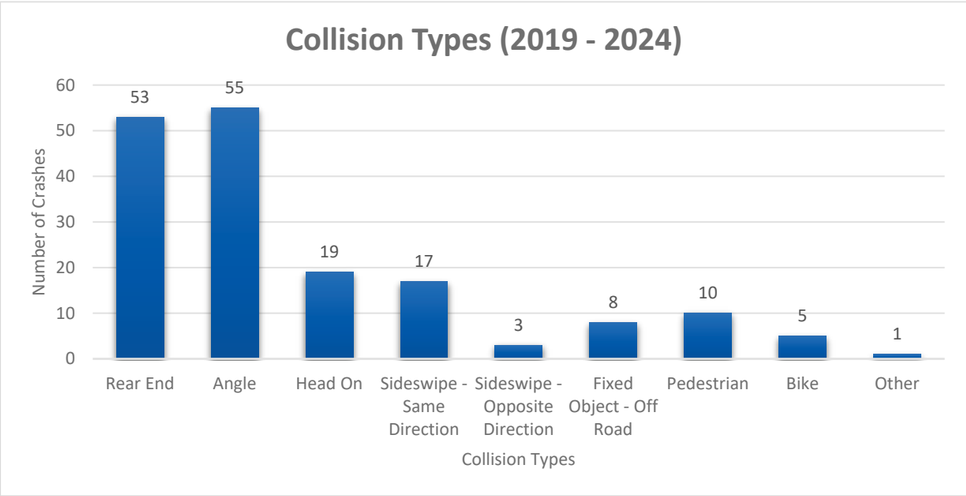
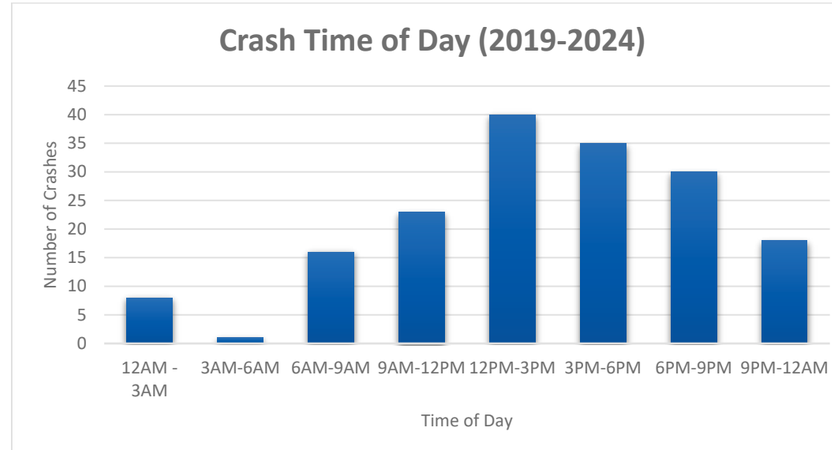


Figure 16 displays the number of crashes that occurred by time of day, presented in 3-hour increments. The highest frequency of crashes occurred from 12PM-3PM (23%), from 3PM – 6PM (20%), from 6PM – 9PM (18%), and from 9PM – 12AM (11%).

Figure 16: Number of Crashes by Time of Day (2019-2024)



Based on the crash data, **Table 16** includes the most prominent crash locations in the Study Area. Note that for the purposes of analyzing the most frequent crashes, not all crashes are included in the crash pattern analysis and therefore the total crashes within **Table 16** does not equal the total crashes observed over the five (5) year study period for the Study Area.

Table 16: Crash Patterns Within the Project Study Area

Location (Intersection, Segment)	Intersection/ Ramp	Most Prominent Crash Type(s)	Vulnerable Road User Crashes	Year(s)	Total Crashes (Highest Crash Type %)
Ridge McIntire Rd at Preston Ave	Signalized Intersection	Angle	n/a	2019 - 2024	43 Total (58% Angle)
Ridge St at Cherry Ave/Elliot Ave	Signalized Intersection	Rear End	n/a	2019 - 2024	40 Total (40% Rear End)
Ridge St at W Main St/W Water St	Signalized Intersection	Rear End; Sideswipe Same Direction	3 Ped, 3 Bike	2019 - 2024	27 Total (22% Rear End; 22% Sideswipe – Same Direction)
W Main St at 4th St	Signalized Intersection	Pedestrian; Rear End	4 Ped	2020 - 2024	9 Total (44% Pedestrian Crashes)
Ridge McIntire Rd	Segment	Rear End	1 Ped, 1 Bike	2019 - 2024	16 Total (44% Rear End)
Ridge St South of Monticello Ave	Segment	Rear End	1 Bike	2019 - 2024	16 Total (50% Rear End)

5.2.3 Crashes by Roadway and Weather Conditions

Figure 17 indicates the number of crashes by roadway surface conditions. Most crashes occurred during dry roadway conditions (78%). Wet conditions accounted for 20% of crashes. Snowy conditions accounted for 1% of crashes. Additionally, **Figure 18** shows that most of the collisions occurred under clear/ cloudy weather conditions (81%), followed by rainy weather conditions (14%).

Figure 17 : Number of Crashes by Roadway Surface Condition (2019-2024)

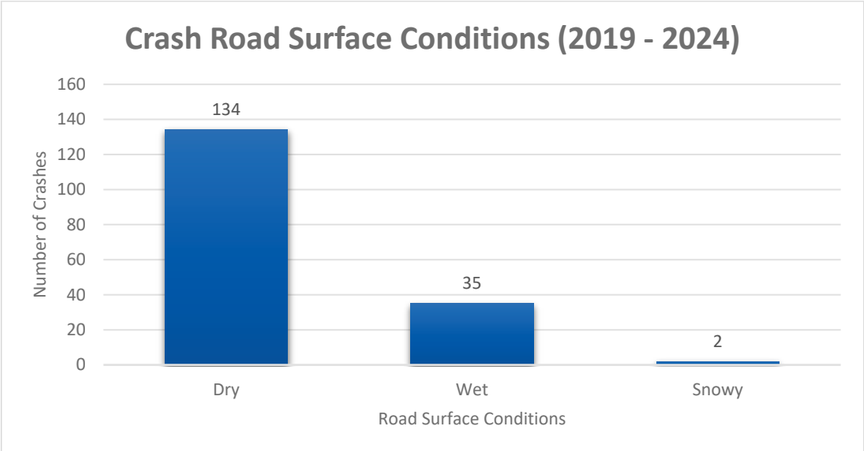
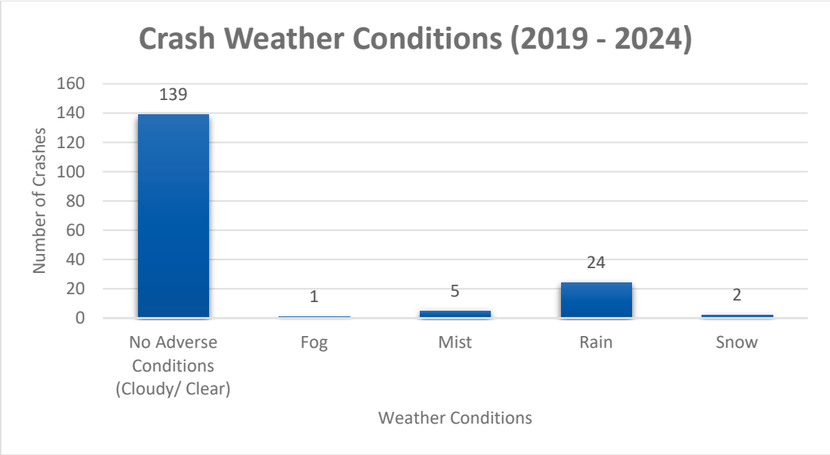


Figure 18: Number of Crashes by Weather Condition (2019-2024)



5.2.4 Crash Rate

The crash rates were calculated utilizing the rate calculations described in the **Highway Safety Manual (HSM)**. Corridors analyzed included: W Main Street, Ridge Street, and Ridge McIntire Road.

The crash rates for the different segments were calculated using the following equation:

$$R = \frac{C \times 100{,}000{,}000}{365 \times N \times V \times L}$$

Where:
R = Crash Rate for the road segment expressed as crashes per 100 million vehicle-miles of travel (VMT) vehicles
C = Total number of crashes in the study period
N = Number of years of data
V = Number of vehicles per day (both directions)
L = Length of the roadway segment in miles

The ***W Main Street corridor*** segment is from 4th Street to Ridge Street. The crash rates for the segment were compared to the statewide averages on comparable roadway segments (Urban Other Principal Arterial) for the most recent three (3) years available on (2020-2023) as shown in **Table 17**.

Table 17: Crash Rates (W Main Street)

Segment	Total Crash Rate (Per 100 MVM)		Statewide Average	Fatal Crash Rate (Per 100 MVM)		Statewide Average	Fatal + Injury Crash Rate (Per 100 MVM)		Statewide Average
5th Street SW to Ridge Street	436.88	≥	199.91	0	≤	0.98	242.71	≥	71.5

Source: VDOT Tableau Crash Summary Book for Statewide Crash Rates

The ***Ridge Street*** corridor was split into two segments: from W Main Street West/W Water Street to Dice Street and from Dice Street to Cherry Avenue/Elliot Avenue. The crash rates for the two segments were compared to the statewide averages on comparable roadway segments (Urban Other Principal Arterial) for the most recent three (3) years available on (2020-2023) as shown in **Table 18**.

Table 18: Crash Rates (Ridge Street)

Segment	Total Crash Rate (Per 100 MVM)		Statewide Average	Fatal Crash Rate (Per 100 MVM)		Statewide Average	Fatal + Injury Crash Rate (Per 100 MVM)		Statewide Average
W Main Street West/W Water Street to Dice Street	286.52	≤	345.46	0	≤	1.07	143.26	≥	118.66
Dice Street to Cherry Avenue/Elliot Avenue	645.27	≥	345.46	0	≤	1.07	322.63	≥	118.66

Source: VDOT Tableau Crash Summary Book for Statewide Crash Rates

The ***Ridge McIntire Road*** corridor segment is from Ridge Street to Preston Avenue. The crash rates for this segment were compared to the statewide averages on comparable roadway segments (Urban Other Principal Arterial) for the most recent three (3) years available on (2020-2023) as shown in **Table 19**.

Table 19: Crash Rates (Ridge McIntire Road)

Segment	Total Crash Rate (Per 100 MVM)		Statewide Average	Fatal Crash Rate (Per 100 MVM)		Statewide Average	Fatal + Injury Crash Rate (Per 100 MVM)		Statewide Average
Preston Avenue to Ridge Street	296.96	≥	171.06	0	≤	0.88	113.02	≥	51.41

Source: VDOT Tableau Crash Summary Book for Statewide Crash Rates

5.2.5 Crash Data Summary

The following observations were made for crashes that occurred during the five (5) year period:

- No fatal crashes occurred
- Angle crashes were the highest overall collision type (32%), the majority of these crashes happening during left-turning movements
- 10 Crashes (6%) involved pedestrians
- Five (5) crashes involved a bicyclist
- 36 crashes (21%) involved distracted drivers
- 19 Head on crashes (11%)

Crash diagrams can be found in **Appendix B-9**.

6 Existing Traffic Operational Analysis

6.1 Analysis Peak Periods

Weekday peak periods were identified from the count data for the arterial segments and for each study intersection. The common AM and PM peak hours for the overall network were determined based on the hourly variations in traffic volumes for each intersection, travel patterns along the study corridor and percentage of traffic during the highest hour.

6.2 Analysis Tools

The traffic operations analysis for the Study Area was conducted using software tools, such as Synchro 11 as well as SimTraffic, which is a companion microsimulation tool for Synchro. The traffic simulation analysis and methodology were performed per *Virginia Department of Transportation (VDOT) Traffic Operation and Safety Analysis Manual (TOSAM) – Version 2.0 guidelines*.

6.3 Measures of Effectiveness

The Measures of Effectiveness quantify the traffic flow through intersections and provides a basis for evaluating the performance of a transportation network. MOEs are reported based on the type of facility, as well as the analysis software utilized. Reported MOEs are consistent with VDOT *TOSAM* guidance *Version 2.0*. A summary of SimTraffic MOEs evaluated for the Study Area are presented below:

- Microsimulation Delay (seconds/vehicle)
- Maximum Queue Length (feet)

Level of Service (LOS) is a graded scale used to represent intersection delay (the delay associated with vehicles slowing in advance of an intersection, the time spent stopped on an intersection approach, the time spent as vehicles move up in the queue, and the time needed for vehicles to accelerate to their desired speed). It is important to point out that delay calculations from the Highway Capacity Manual (HCM) methodology (deterministic) and simulation (stochastic) are different, especially for congested conditions (e.g., queue spillover between intersections, etc.). Therefore, the LOS represented in the results tables do not necessarily provide information on congestion caused by complicated interactions between intersections. To provide a measurement/threshold for intersection operations, microsimulation delay has been translated to the same level of service used by the HCM methodology. LOS is measured on a scale of "A" through "F," with LOS A representing the best operating conditions and LOS F representing the worst, based on the delay experienced at the intersection during the analysis period.

Per the *TOSAM* guidance under Section 8.1.6, Level of Service (LOS) is not reported for intersections with SimTraffic as an analysis tool. Instead, the microsimulation delay is reported for individual intersection movements as well as the overall delay for the intersection. The overall intersection delay can be presented graphically by assigning color coding for ranges of microsimulation delay. This color coding as shown in **Table 20** is based on 2010 Highway Capacity Manual (HCM) delay thresholds and the associated LOS. Green, yellow and red colors were assigned to delay thresholds for each study intersection.

Table 20: Intersection Color Coding based on Intersection Delay

Signalized Intersection Delay Thresholds (sec/veh)	Unsignalized Intersection Delay Thresholds (sec/veh)	Color
< 10	< 10	
> 10 – 20	> 10 – 15	
>20 – 35	>15 – 25	
>35 – 55	>25 – 35	
>55 – 80	>35 – 50	
>80	>50	

Source of Delay Thresholds: Highway Capacity Manual 2010

6.4 Base Model Development and Calibration

6.4.1 Synchro/SimTraffic Model Calibration and Validation

To provide a more accurate representation of field conditions, the Existing Conditions *SimTraffic* model was calibrated to reasonably replicate balanced field observed traffic volumes. Observed queue lengths at intersections was calibrated qualitatively by visual observation of queues in the field and comparing them with queue lengths in SimTraffic. This calibration process is an essential part of the model development process because it ensures that the simulation reasonably replicates existing field conditions and can be used as the base for the evaluation of future scenarios. The calibration acceptability criteria and adjustments made in the simulation models are discussed below.

The calibration summary for the Existing Conditions AM and PM *SimTraffic* models is identified in **Table 21** with supporting documentation in the **Appendix B-10.** The calibrated Existing Conditions *SimTraffic* AM & PM models will be used as the starting point to simulate future conditions. All calibration measures identified below will be used in conjunction with each other in order to produce Existing Conditions models that closely replicate the field-collected data.

6.4.2 Synchro/Sim Traffic Model Parameters and Inputs

AM and PM peak hour base Synchro models were developed using the data discussed under **Section 1.5.1** and following the guidance in TOSAM. The SimTraffic input parameters were in accordance with *Section 7.6* of *VDOT TOSAM* and included one (1) seed interval and 4-15-minute recording intervals. To account for simulation variance, 10 simulation runs were conducted and averaged together and checked against VDOT's Microsimulation Sample Size Determination Tool as discussed in *Section 5.4* of the *VDOT TOSAM Version 2.0*. The SimTraffic model was calibrated using modifications to the simulation settings as needed for specific intersection movements.

6.4.2.1 Microsimulation Sample Size

In addition to conducting proper model calibration, determining and applying an appropriate number of microsimulation runs is an important step in developing accurate microsimulation results. WSP followed the guidelines provided in *Section 5.4* of the *VDOT TOSAM Version 2.0* and utilized the macro-enabled *VDOT Sample Size*

Determination Tool to finalize the number of SimTraffic runs necessary for correctly reporting arterial and intersection MOEs. Ten (10) SimTraffic microsimulation runs were initially recorded following the guidelines for SimTraffic Input Parameters found in *Section 7.6* of the *VDOT TOSAM Version 2.0*. The MOE, Average Travel Speed obtained from each of these ten (10) runs was then input into the VDOT Sample Size Determination Tool to verify that MOEs from these runs meet the required tolerance error and confidence interval. It was concluded that ten (10) runs were sufficient for both the AM and PM analysis for this network. Results of the VDOT Sample Size Determination Tool are included in the **Appendix B-11**.

6.4.2.2 Vehicle Input

Vehicle inputs within the Study Area were based on the hourly balanced flow maps developed from the turning movement counts (TMC) collected in November 2024 as discussed in **Section 1.5.1**. Prohibited illegal u-turns were removed from the network and were only retained where permitted for the model to better reflect existing conditions. Low volume movements, four (4) vehicles or less, that did not meet the calibration threshold were removed from the volume calibrations for both AM and PM, since it is difficult to adjust parameters for low volume movements. A small difference of one (1) vehicle can show that the threshold is not being met. With the removal of the lower volumes the threshold now reflects 95% ± as highlighted in orange in **Appendix B-10**.

6.4.2.3 Travel Time and Speeds

Due to the nature of this being an intersection study and not a corridor study, travel time runs and speeds were not required for calibrating the network.

6.4.2.4 Queue Length Observations

Queues were observed in the field on the day that volumes were collected on December 2, 2024 to better calibrate the model. All intersections were compared with existing observations and confirmed to reflect expected queue lengths from the field review. Queues were visually observed for all intersections and validated with SimTraffic results.

6.4.2.5 Signal Timings

Signal timing data was provided by the City of Charlottesville and was applied to the intersections within the Synchro model Study Area.

6.4.2.6 Driving Behavior

Driving behavior attributes for arterial operations remained at the default settings.

6.4.2.7 Simulation Runs

As discussed in **Section 5.4.2.1**, to account for simulation variance, 10 simulation runs were conducted using different random seeds and averaged together. *VDOT TOSAM* sample size determination tool was used to confirm that the outputs from the 10 runs showed a 95th percentile confidence level with a 10% tolerance. Speed and/or processed volumes were used as the metrics to determine the number of simulation runs needed.

6.4.3 Synchro/SimTraffic Model Calibration and Validation

To provide a more accurate representation of field conditions, the Existing Conditions *SimTraffic* model was calibrated to reasonably replicate balanced field observed traffic volumes. Observed queue lengths at intersections were calibrated qualitatively by visual observation of queues in the field and comparing them with queue lengths in SimTraffic. This calibration process is an essential part of the model development because it ensures that the simulation reasonably replicates existing field conditions and can be used as the base for the evaluation of future scenarios. The calibration acceptability criteria and adjustments made in the simulation models are discussed below. The volume calibration summary for the Existing Conditions AM and PM *SimTraffic* models is identified in **Table 21**.

Volume calibration calculations are included in **Appendix B-10**. Existing Conditions SimTraffic Outputs are included in **Appendix B-12**.

Table 21: Volume Calibration Summary

Peak Period	Calibration Measure	Evaluation	Criteria	Total Number Evaluated	Total Number Met	Percent Met	Target Criteria	Target Met
AM	Volume (vph)	Intersection Turning Movements in SimTraffic	Within ± 20% for < 100 vph Within ± 15% for ≥ 100 vph to < 300 vph Within ± 10% for ≥ 300 vph to < 1000 vph Within ± 5% for ≥ 1000 vph	52	48	92.31%	85%	Yes
PM	Volume (vph)	Intersection Turning Movements in SimTraffic	Within ± 20% for < 100 vph Within ± 15% for ≥ 100 vph to < 300 vph Within ± 10% for ≥ 300 vph to < 1000 vph Within ± 5% for ≥ 1000 vph	49	48	97.96%	85%	Yes

6.5 Intersection Operations: 2024 Existing Conditions

Traffic operations analyses were conducted using SimTraffic to evaluate overall performance of the study intersections within the corridor. SimTraffic run outputs were also used to report the maximum queues formed for each intersection approach. Operational analyses were performed at each of the study intersections for the Existing 2024 Conditions scenario.

Microsimulation Delay in sec/veh were reported from SimTraffic for all the signalized and unsignalized intersections. **Table 22** summarizes the AM and PM peak hour delay for each movement for the study intersections within the Study Area. SimTraffic output sheets are provided in the **Appendix B-12.**

The results from **Table 22** suggest that the following intersections operate with an overall delay value that exceeds 35 sec/veh for signalized. These thresholds were used for the existing conditions evaluation because these delays have the potential to increase to unacceptable delays in the future year conditions. Note that intersection delay is reported for each node back to the upstream node in each direction. For closely spaced intersections, delays may be limited due to the short distance between nodes/intersections.

Intersection 1 (SimTraffic Node 1) – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Microsimulation delay of 40.9 sec/veh during the PM peak hour

Intersection 2 (SimTraffic Node 2) – W Main Street at 4th Street NW

- Microsimulation delay of 37.0 sec/veh during the AM peak hour
- Microsimulation delay of 76.8 sec/veh during the PM peak hour

Table 22: Existing (2024) SimTraffic AM and PM Peak Hour Delay (veh/sec)

Intersection Number and Description	Lane Group	Eastbound		Westbound		Northbound		Southbound		Overall	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
		Delay	Delay	Delay	Delay	Delay	Delay	Delay	Delay	Delay	Delay
1: Ridge Street at W Main Street/ W Water Street	**Movement**	**W Main Street**		**W Water Street**		**Ridge Street**		**Ridge McIntire Road**		**Intersection**	
	To South Street West	49.8	32.4	70.2	36.9	11.7	27.1	26.3	54.9	**32.2**	**40.9**
	Left	53.2	31.0	76.9	40.0	35.0	32.4	25.3	54.0		
	Through	50.9	33.9	149.7	41.6	20.3	38.0	19.2	64.5		
	Right	4.2	13.7	7.7	2.1	22.1	34.0	18.4	65.1		
	Approach	**37.6**	**24.1**	**84.0**	**21.0**	**23.1**	**36.4**	**20.5**	**63.2**		
2: W Main Street at 4th St NW	**Movement**	**W Main Street**		**W Main Street**		**Parking Lot**		**4th Street NW**		**Intersection**	
	Left	34.5	112.1	55.2	49.7	13.4	17.8	16.3	22.1	**37.0**	**76.8**
	Through	31.9	116.0	50.2	32.4	10.0	20.7	13.3	15.1		
	Right	27.3	119.8	41.7	24.4	3.3	7.4	9.3	12.7		
	Approach	**32.3**	**115.5**	**48.8**	**31.2**	**8.2**	**14.7**	**12.4**	**17.4**		
3: Ridge Street at Monticello Avenue	**Movement**	**Parking Lot**		**Monticello Avenue**		**Ridge Street**		**Ridge Street**		**Intersection**	
	Left	37.3	28.6	35.6	48.8	35.5	---	37.5	33.5	**25.2**	**24.8**
	Through	22.4	17.2	23.4	---	22.9	42.4	22.6	8.3		
	Right	5.0	---	20.6	13.0	18.5	37.4	17.2	8.9		
	Approach	**28.2**	**21.5**	**23.4**	**27.5**	**22.4**	**41.6**	**28.7**	**17.4**		
4: Ridge McIntire Rd at Preston Avenue	**Movement**	**Preston Avenue**		**Preston Avenue**		**McIntire Road**		**McIntire Road**		**Intersection**	
	Left	29.5	27.8	25.3	27.5	36.1	33.0	20.1	23.0	**23.9**	**24.5**
	Through	37.2	35.5	35.0	32.7	28.8	33.6	23.3	27.1		
	Right	4.3	5.4	3.7	3.6	2.5	2.5	15.5	19.2		
	Approach	**20.3**	**22.0**	**29.0**	**25.0**	**24.9**	**26.2**	**22.2**	**25.8**		

Queue length, or the distance to which stopped vehicles accumulate in a lane at an intersection, is another performance measure of intersection operations. Lengthy queues may be indicative of intersection capacity or operational issues, such as absence of or insufficient dedicated turn lanes, inefficient signal timings or phasing. A queuing analysis was completed for the study intersections during the AM and PM peak hours. SimTraffic Maximum Queue Lengths in feet were reported for each lane. These queue lengths are based on an average of 10 simulation runs. **Table 23** provides a summary of the maximum queue lengths during the AM and PM peak hours as compared to the available storage bay lengths. The highlighted queue lengths in **Table 23** are the movements where the reported maximum queue length values exceed the storage length available for that turning movement. The SimTraffic output sheets including the maximum queue lengths are included in **Appendix B-12**.

The results presented in **Table 23** indicate that several intersection movements are experiencing heavy demand and queuing. Some of those intersections and the affected movements are summarized below:

Intersection 1: Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- The eastbound right-turn movement (existing storage bay length of 160-ft) on W Main Street showed a maximum queue length of 276-ft during the PM peak and queues spilling over into the shared lane.
- The eastbound left-turn movement (existing storage bay length of 180-ft) on W Main Street showed a maximum queue of 170-ft during the AM peak and 180-ft during the PM peak.
- The westbound left-turn movement (existing storage bay length of 160-ft) on W Water Street showed a maximum queue length of 160-ft during the AM peak.
- The northbound left-turn movement (existing storage bay length of 180-ft) on Ridge Street showed a maximum queue length of 188-ft during the AM and PM peak.
- The southbound left-turn movement (existing storage bay length of 145-ft) on Ridge McIntire Road showed a maximum queue length of 147-ft and 148-ft during the AM and PM peak, respectively.

Intersection 2: W Main Street at 4th Street NW

- The eastbound through movement on W Main Street experienced significant queuing in the PM peak, reaching 950 feet and extending past the upstream signal.
- The westbound through movement on W Main Street had a queue of 355 feet in the AM peak and 302 feet in the PM peak, with queuing extending to the Ridge Street intersection.

Intersection 3: Ridge Street at Monticello Avenue

- During the AM and PM peak period, the northbound through movement experienced queueing extending past the Dice Street intersection.
- The westbound left-turn movement (existing storage bay length of 190-ft) on Monticello Avenue showed a maximum queue length of 194-ft during the PM peak.
- During the PM peak period, the southbound through movement experienced queuing extending past the W Main Street intersection.

Intersection 4: Ridge McIntire Road at Preston Avenue

- The westbound left-turn movement (existing storage bay length of 90-ft) on Preston Avenue showed a maximum queue length of
- During the AM and PM peaks, northbound queuing on Ridge McIntire Rd reached 582 feet and 581 feet respectively, extending beyond the midblock crosswalk located at the median break. This queueing may pose safety concerns for pedestrians crossing at the midblock location.
- During the AM and PM peak period, the westbound left-turn movement on Preston Ave experienced queuing that exceeded the available storage bay (124 feet).
- During the AM and PM peak period, the southbound left-turn movement on McIntire Rd experienced queuing that exceeded the available storage bay (130 feet).

Table 23: Existing (2024) Conditions Summary of Maximum Queues (feet)

Intersection Number and Description	Lane Group	Eastbound			Westbound			Northbound			Southbound		
		Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)
1: Ridge Street at W Main Street/ W Water Street	Movement	W Main Street			W Water Street			Ridge Street			Ridge McIntire Road		
	Left	180	170	180	160	160	122	180	188	188	145	147	148
	Through	--	245	312	--	381	158	--	281	295	--	293	542
	Right	160	91	276	350	263	---	--	250	262	--	329	561
2: W Main Street at 4th Street NW	Movement	W Main Street			W Main Street			Parking Lot			4th Street NW		
	Left	170	153	153	---	355	302	---	41	37	---	118	226
	Through	---	348	950									
	Right												
3: Ridge Street at Monticello Avenue	Movement	Parking Lot			Monticello Avenue			Ridge Street			Ridge Street		
	Left	---	48	39	190	155	194	120	32	---	---	200	202
	Through				---	84	164	---	294	376	---	319	507
	Right				415	319	209					357	553
4: Ridge McIntire Road at Preston Avenue	Movement	Preston Avenue			Preston Avenue			Ridge McIntire Road			McIntire Road		
	Left	230	119	183	90	124	123	120	158	157	130	129	129
	Through	---	142	224	---	164	166	---	582	581	---	236	238
	Right	240	19	107	70	66	65	---	---	18	---	225	226
	Maximum queue nearly meets available storage length												
	Maximum queue meets or exceeds available storage length indicating queue spillover												

7 Traffic Forecasting

The existing traffic volumes were forecasted to the Interim Year 2045 and Future Year 2056, which was determined by the SWG for the improvements suggested by this study. Projecting the traffic volumes at the study intersection to the interim year and design year with an appropriate growth rate was the first step in developing future conditions analysis. The methodology that was followed for development of this growth rate is discussed below.

7.1 Traffic Forecasting Methodology

7.1.1 Pathways for Planning (P4P) Data

Pathways for Planning (P4P) is an interactive mapping and data analysis tool by VDOT, that shows a variety of data including route classification systems, traffic characteristics, safety, improvements, and forecasts. This is an internal VDOT database maintained by the Transportation Mobility and Planning Division (TMPD). The latest version of *Pathways for Planning (P4P) version 24.12* release date January 9, 2025. Outputs from Pathways for Planning include historic data from 2000 through 2023 and projected future year volume data from 2030 to 2045 in 5-year increments based on historical growth. Historic Data was filtered to exclude years 2020 and 2021 due to the COVID pandemic impacting traffic patterns and volumes. Linear growth rates for the Study Area were developed based on this data. Per the guidance provided in VDOT P4P, the minimum growth rate irrespective of the observed historic trends for a corridor shall be 0.5%. Water Street and South Street will have higher growth rates because they have more unused capacity, and as travel demands increase, they can absorb more traffic compared to already congested high volume roads. P4P historical growth rates are shown in **Table 24**.

Table 24: VDOT P4P Growth Rates

Roadway Segment	P4P Historical and Forecasted Volumes				
	2015 AADT	2023 AADT	2045 AADT	2056 AADT*	P4P Growth Rate
Ridge Street - From W Main St to Monticello Ave	21,202	20,789	23,076	24,219	0.50%**
W Main Street/ BUS US 250E - From 4th St SW to Ridge St	12,585	10,852	12,046	12,643	0.50%**
Ridge McIntire Road /BUS US 250E - From W Main St to Preston Ave	23,695	21,357	24,317	25,797	0.63%
W Water Street - From Ridge St to 1st Street SE	7,972	7,840	9,824	10,815	1.15%
South Street - From Ridge St to 2nd St SE	1,929	1,689	2,168	2,408	1.29%

* Calculated volume based on P4P growth rate calculator

** Actual growth rate is less than minimum recommended; applied minimum growth rate of 0.50%

Support documentation for P4P Growth Rate Outputs can be found in **Appendix B-13**.

7.1.2 Charlottesville-Albemarle Regional Model

The Thomas Jefferson Planning District Commission (TJPCD) outputs from the calibrated and validated Charlottesville-Albemarle Metropolitan Planning Organization (CA-MPO) Regional Travel Demand Model provides existing daily volumes and future daily volumes. These volumes are based upon the existing and programmed roadway network, land use, and socioeconomic factors for 2015 and future data for 2045. **Table 25** shows the post-processing AADTs for 2045 and 2056 as well as the linear annual growth rates from the CA-MPO Travel Demand Model.

Table 25: TDM Post-Processing Volumes and Growth Rates

Segment	TDM Output Volumes			
	2015 AADT	2045 AADT	2056 AADT*	TDM Linear Growth Rate
Ridge Street - From W Main St to Monticello Ave	15,837	16,046	16,123	0.04%
W Main Street/ BUS US 250E - From 4th St SW to Ridge St	12,026	12,244	12,325	0.06%
Ridge McIntire Road /BUS US 250E - From W Main St to Preston Ave	21,708	22,843	23,274	0.17%
W Water Street - From Ridge St to 1st Street SE	11,363	11,759	11,908	0.11%
South Street - From Ridge St to 2nd St SE	2,490	2,939	3,123	0.55%

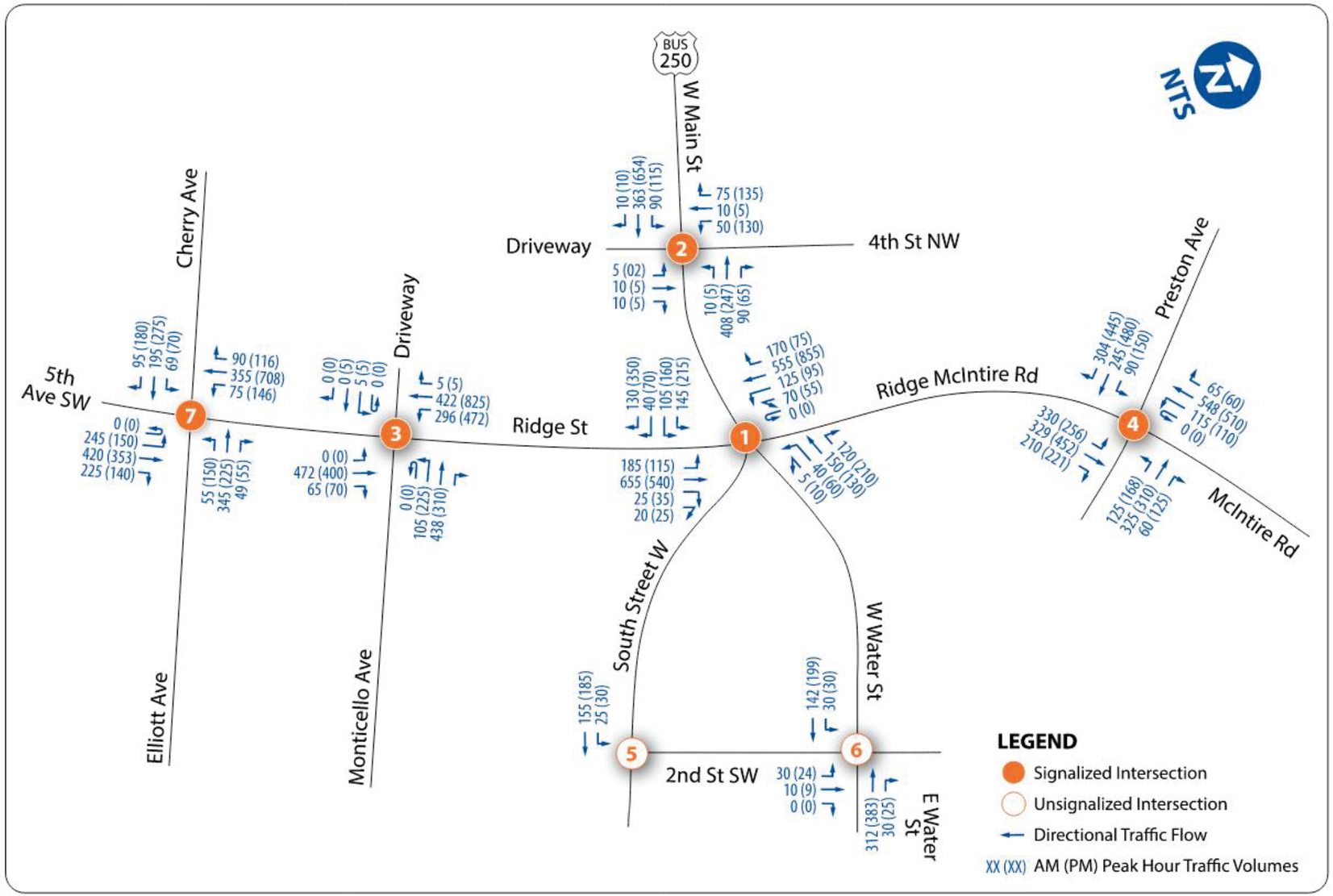
* Calculated volume based on growth rate

Support documentation for TDM Post-Processing Volumes and Growth Rate Outputs can be found in **Appendix B-14**.

7.2 Recommended Growth Rate and Projected Traffic Volumes

The recommended growth rate was determined by reviewing the Pathways for Planning (P4P) recommended growth forecasts, the Charlottesville-Albemarle Metropolitan Planning Organization (CA-MPO) Regional Travel Demand Model, and an understanding of the planned developments in the area. As discussed in **Section 1.1**, there are two sites to be redeveloped in the vicinity of the project that are expected to be constructed before the 2045. ***Based on the volumes and growth forecasts, an overall annual growth rate of 0.5% per year is recommended for all approaches to this intersection.*** The Traffic Forecasting Growth Rate Approval Form has been submitted with this Memorandum and can be found in **Appendix B-15**. Once approved by VDOT TMPD, this growth will be applied to all roadways within the No-Build and Build models. Project Interim 2045 peak hour volumes are shown in **Figure 19** and Project No Build 2056 peak hour volumes are shown in **Figure 20**.

Figure 19: Future Interim (2045) Balanced Peak Hour Traffic Volumes



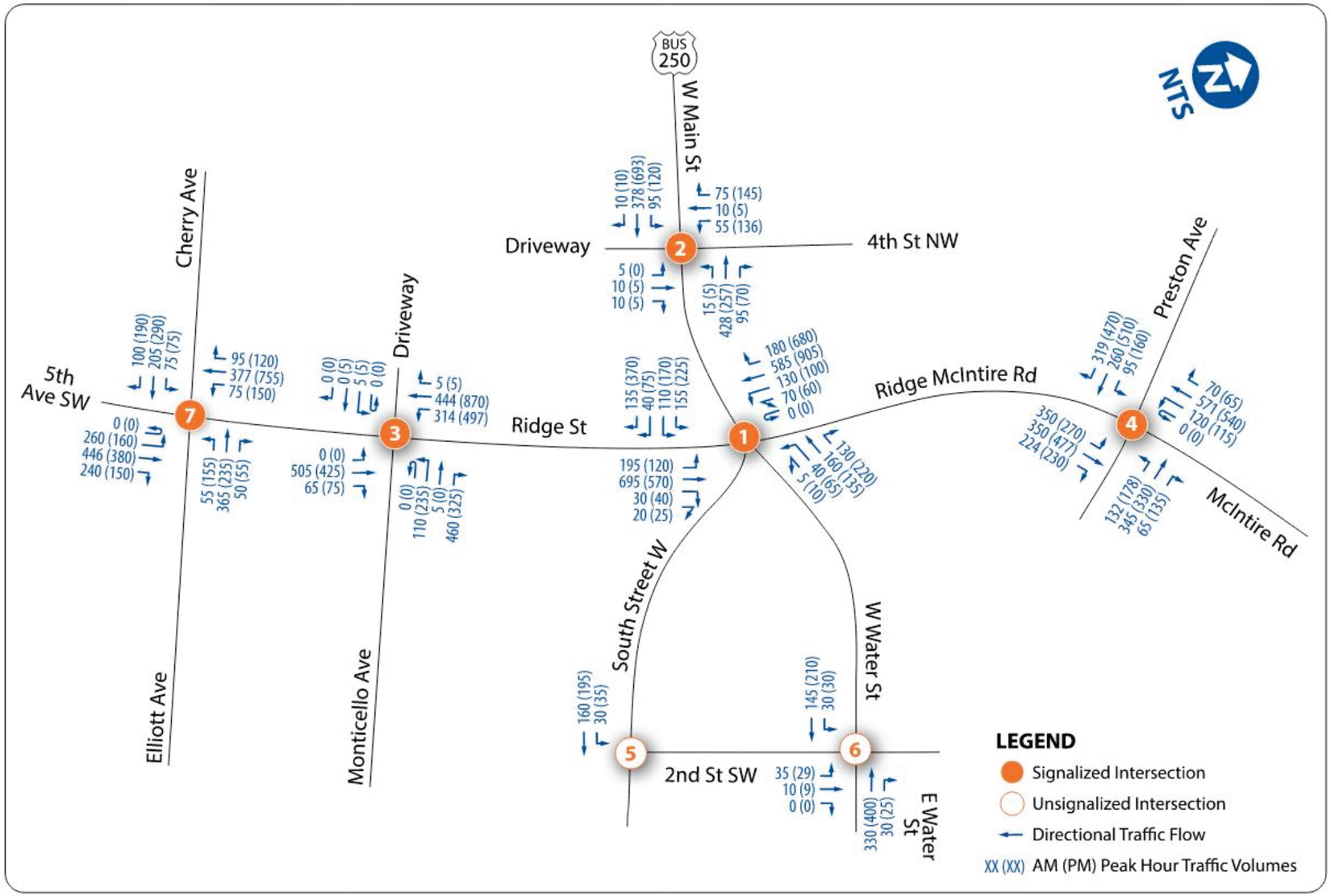
VDOT STARS

RIDGE ST/ BUS 250 (W MAIN ST) - W WATER ST INTERSECTION STUDY

Charlottesville, VA

2045 INTERIM YEAR PEAK AM (PM) HOUR VOLUMES

Figure 20: Future No Build (2056) Balanced Peak Hour Traffic Volumes



VDOT STARS

RIDGE ST/ BUS 250 (W MAIN ST) - W WATER ST INTERSECTION STUDY

Charlottesville, VA

2056 NO-BUILD DESIGN YEAR PEAK AM (PM) HOUR VOLUMES

8 2045 Interim No-Build Operational Analysis

Operational analysis was performed at each of the study intersections for the Interim 2045 No-Build Conditions using the methodology described in Section 3 of this report.

8.1 Intersection Operations: 2045 No Build Conditions

A traffic operational analysis was conducted using *SimTraffic* to evaluate overall performance of the study intersections and arterial segments within the corridor.

Microsimulation Delay in sec/veh was reported from *SimTraffic* for all the signalized and unsignalized intersections. **Table 26** provides a summary of the AM and PM peak hour delay for each movement for the study intersections along the study corridor. SimTraffic output sheets are provided in the **Appendix C-1**.

Note that intersection delay is reported for each node back to the upstream node in each direction. For closely spaced intersections, delays may be limited due to the short distance between nodes/intersections. The results from **Table 26** suggest that the following intersections operate with an overall delay value that exceeds 35 sec/veh for signalized and 25 sec/veh for unsignalized, which equates to LOS D or greater.

Intersection 1 (SimTraffic Node 1) – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Microsimulation delay of 59.4 sec/veh during the AM peak hour and 91.1 sec/veh during the PM peak hour

Intersection 2 (SimTraffic Node 2) – Parking Lot/4th St NW & W Main St

- Microsimulation delay of 40.1 sec/veh during the AM peak hour and 96.2 sec/veh during the PM peak hour

Intersection 3 (SimTraffic Node 3) – Ridge St & Parking Lot/Monticello Ave

- Microsimulation delay of 47.2 sec/veh during the AM peak hour and 32.0 sec/veh during the PM peak hour

Intersection 4 (SimTraffic Node 4) – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Microsimulation delay of 30.2 sec/veh during the AM peak hour and 89.0 sec/veh during the PM peak hour

Queue length, or the distance to which stopped vehicles accumulate in a lane at an intersection, is another performance measure of intersection operations. Lengthy queues may be indicative of intersection capacity or operational issues, such as absence of or insufficient dedicated turn lanes, inefficient signal timings or phasing. A queuing analysis was completed for the study intersections during the AM and PM peak hours. SimTraffic Maximum Queue Lengths in feet were reported for each lane. These queue lengths are based on an average of 10 simulation runs. **Table 27** provides a summary of the maximum queue lengths during the AM and PM peak hours as compared to the available storage bay lengths. The highlighted queue lengths in **Table 27** are the movements where the reported maximum queue length values either meet or exceed the storage length available for that turning movement. The SimTraffic output sheets including the maximum queue lengths are included in **Appendix C-1**.

The results presented in **Table 27** indicate that several intersection movements are experiencing heavy demand and queuing. Some of those intersections and the affected movements are summarized below:

Intersection 1 – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Eastbound left-turning movement (storage bay length of 180 ft) showed a maximum queue length of 180 ft during PM peak periods.
- Eastbound right-turning movement (storage bay length of 160 ft) experienced substantial queuing, reaching 303 ft in the PM peak.
- Westbound left-turning movement (storage bay length of 160 ft) showed a queue length of 160 ft in the AM peak.
- Westbound right-turning movement (storage bay length of 350 ft) showed a queue length of 329 ft in the AM peak.
- Northbound left-turning movement (storage bay length of 180 ft) showed a queue length of 188 ft in the AM and PM peak.
- Southbound left-turning movement (storage bay length of 145 ft) showed a queue length of 148 ft in the AM and PM peak.

Intersection 2 – Parking Lot/4th St NW & W Main St

- Eastbound left-turning movement (storage bay length of 170 ft) showed a maximum queue length of 153 ft during the AM and 154 ft. during the PM peak period.

Intersection 3 – Ridge St & Parking Lot/Monticello

- Westbound left-turning movement (storage bay length of 190 ft) showed a queue length of 196 ft in the PM peak.
- Westbound right-turning movement (storage bay length of 415 ft) showed a queue length of 536 ft in the AM peak.

Intersection 4 – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Eastbound left-turning movement (storage bay length of 230 ft) experienced substantial queuing, reaching 213 ft in the PM peak.
- Eastbound right-turning movement (storage bay length of 240 ft) experienced substantial queuing, reaching 236 ft in the PM peak.
- Westbound left-turning movement (storage bay length of 90 ft) showed a queue length of 124 ft in the AM and PM peak.
- Westbound right-turning movement (storage bay length of 70 ft) showed a queue length of 60 ft and 66 ft in the AM and PM peak.
- Northbound left-turning movement (storage bay length of 120 ft) showed a queue length of 157 ft in the AM and PM peak.
- Southbound left-turning movement (storage bay length of 130 ft) showed a queue length of 129 ft. during the AM peak and 130 ft during the PM peak.

Table 26: No-Build (2045) SimTraffic AM and PM Peak Hour Delay (veh/sec)

Intersection	Lane Group	Eastbound		Westbound		Northbound		Southbound		Overall	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
		Delay	Delay	Delay	Delay	Delay	Delay	Delay	Delay	Delay	Delay
1: Ridge Street at W Main Street/ W Water Street	Movement	W Main Street		W Water Street		Ridge Street		Ridge McIntire Road		Intersection	
	To South St W	43.5	30.2	213.8	43.6	22.8	33.7	51.5	192.5	59.4	91.1
	Left	42.1	30.3	227.8	48.8	42.2	42.3	52.2	186.2		
	Through	40.1	32.1	309.5	47.7	26.6	38.0	48.8	190.3		
	Right	39.9	50.4	55.2	3.4	24.5	33.8	57.5	198.0		
	Approach	40.9	39.5	203.0	25.3	29.6	38.3	51.0	190.6		
2: W Main Street at 4th St NW	Movement	W Main Street		W Main Street		Parking Lot		4th Street NW		Intersection	
	Left	43.9	152.7	54.9	62.4	16.0	---	15.9	26.2	40.1	96.2
	Through	37.4	153.9	51.5	30.8	13.8	19.5	16.0	25.3		
	Right	30.4	144.0	45.9	23.7	4.3	8.2	9.1	17.0		
	Approach	38.6	154.1	50.8	29.6	10.7	14.5	12.1	21.6		
3: Ridge Street at Monticello Avenue	Movement	Parking Lot		Monticello Avenue		Ridge Street		Ridge Street		Intersection	
	Left	41.2	34.0	47.6	52.8	---	---	53.4	51.2	47.2	32.0
	Through	---	19.1	45.9	---	52.1	44.0	18.9	11.4		
	Right	---	---	64.6	22.1	45.6	39.7	13.9	13.4		
	Approach	41.2	25.9	61.4	34.9	51.3	43.4	33.2	26.1		
4: Ridge McIntire Rd at Preston Avenue	Movement	Preston Avenue		Preston Avenue		Ridge McIntire Road		McIntire Road		Intersection	
	Left	28.6	56.8	32.2	38.2	55.1	43.7	23.6	165.6	30.2	89.0
	Through	37.1	67.2	35.9	34.4	35.9	36.4	27.2	170.8		
	Right	17.7	210.9	4.0	4.0	2.9	2.7	21.2	149.4		
	Approach	27.0	124.7	31.2	28.9	35.6	30.5	26.1	167.9		

Table 27: No-Build (2045) Conditions Summary of Maximum Queues (feet)

Intersection Number and Description	Lane Group	Eastbound			Westbound			Northbound			Southbound		
		Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)
1: Ridge Street at W Main Street/ W Water Street	**Movement**	**W Main Street**			**W Water Street**			**Ridge Street**			**Ridge McIntire Road**		
	Left	180	143	180	160	160	152	180	188	188	145	148	148
	Through	---	163	303	---	475	242	---	336	300	---	536	857
	Right	160	163	303	350	329	71	---	251	236	---	536	857
2: Parking Lot/4th St NW & W Main St	**Movement**	W Main St									W Main St		
	Left	170	153	154	---	354	309	---	45	36	---	114	253
	Through	---	451	956	---			---			---		
	Right	---			---			---			---		
3: Ridge St & Parking Lot/Monticello Ave	**Movement**	Parking Lot									Monticello Ave		
	Left	---	34	41	190	170	196	120	---	---	---	201	204
	Through	---			---	289	254	---	756	395	---	202	205
	Right	---			415	536	258	---			---	202	205
4: Ridge McIntire Rd/McIntire Rd & Preston Ave	**Movement**	Preston Ave									Preston Ave		
	Left	230	110	213	90	124	124	120	157	157	130	129	130
	Through	---	258	1271	---	221	236	---	345	337	---	323	865
	Right	240	24	236	70	60	66	---	96	43	---	296	852
	Maximum queue nearly meets available storage length												
	Maximum queue meets or exceeds available storage length indicating queue spillover												

9 2045 Interim No-Build Pedestrian and Bicycle Analysis

9.1 Pedestrian Level of Comfort (PLOC) and Bicycle Level of Traffic Stress (BLTS)

In the 2045 Interim No-Build Condition, the Pedestrian Level of Comfort and the Bicycle Level of Traffic Stress do not change from existing conditions since each of these measures rely on the roadway configuration (sidewalk width, posted speed, buffer type and width). Those conditions do not change in the interim. The average rating within this Study Area remains a BLTS 3 for bicycle facilities and PLOC 2.5 for pedestrian facilities. **Figure 21** shows a map of the locations assessed along with the PLOC segment ratings and **Figure 22** includes the segments assessed along with BLTS segment ratings for the 2045 No-Build Conditions. Improving the pedestrian sidewalk width, buffer width, and installing medians ten (10) feet or wider would increase level of comfort of pedestrians walking through the corridor. Creating buffered or separated bike lanes along primary corridors particularly on Ridge Street would raise awareness of bicyclists in the area and increase the level of comfort for biking through this corridor.

Figure 21: Interim No Build (2045) Pedestrian Level of Comfort Analysis Results

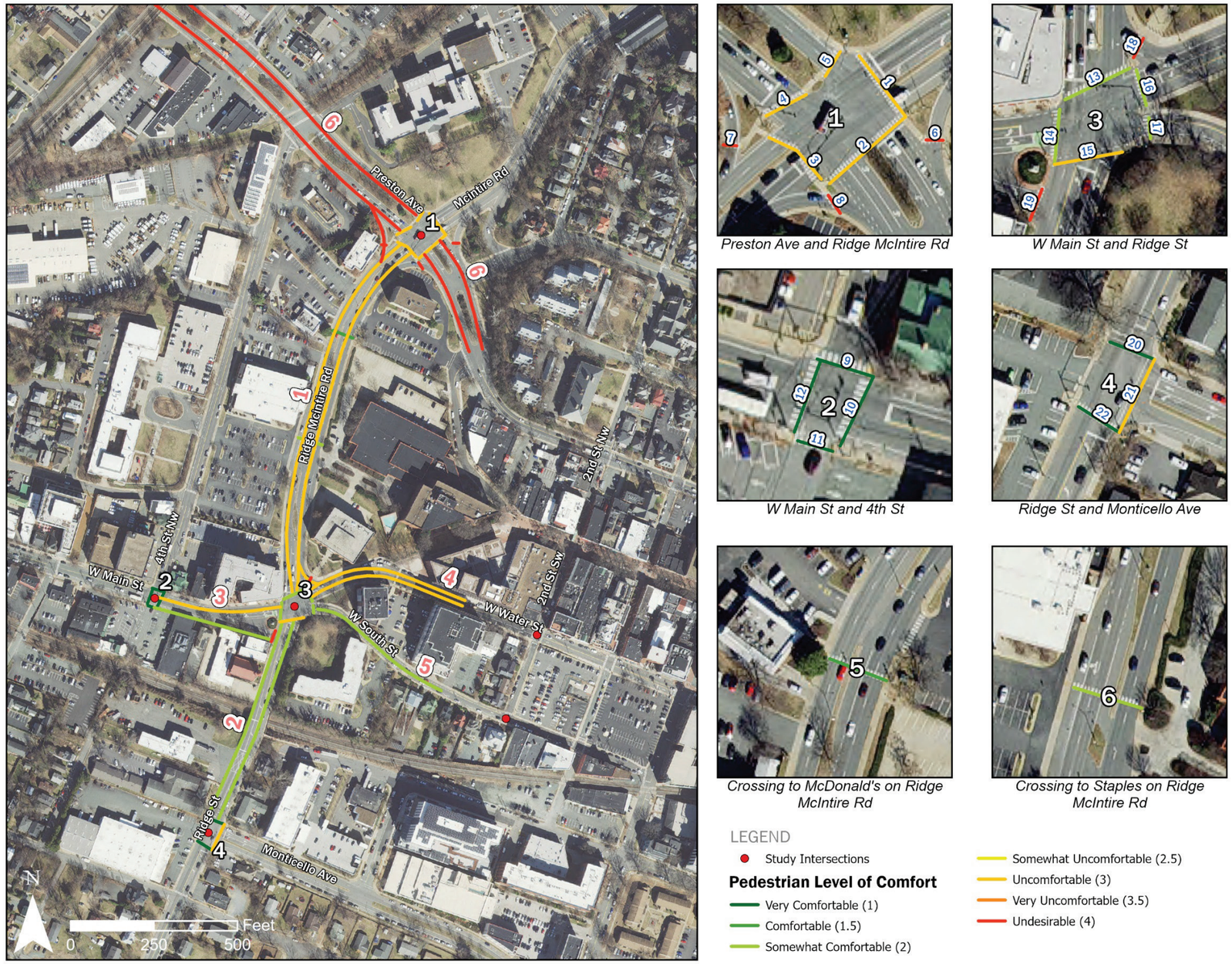


Figure 22: Interim No Build (2045) Bicycle Level of Traffic Stress Analysis Results

9.2 HCM Methodology Quantitative Analysis

9.2.1 Pedestrian Level of Service (LOS)

Table 12Table 13Table 12PLOS was assessed at all existing crossings at seven (7) intersections. There were twenty-nine (29) crossings that were analyzed. The following criteria were used for the pedestrian methodology:

- "Typical Pedestrian"
  - HCM Methodology reflects the average pedestrian and does not reflect the perception of those with disabilities.
- Target Travel Modes
  - HCM Methodology reflects travel by pedestrian walking across one or more legs of a signalized intersection and does not cover other modes (such as scooter).

Delay in sec/person were reported for all crossings at the signalized intersections. There were no crossings for the AM peak hour that had an overall PLOS Score that exceeded 3.50. **Table 28** and **Table 29** summarize the AM and PM peak hour PLOS and delay, respectively, for each crossing at the signalized intersections along the study corridor.

There were no crossings for the AM peak hour that had an overall PLOS Score that exceeded 3.50.

The results from **Table 28** suggest that the following AM peak hour crossings operate with an overall PLOS Score that exceeds 3.50 for the signalized intersections along this corridor. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

There were no crossings for the AM peak hour that had an overall PLOS Score that exceeded 3.50.

Table 28: Interim (2045) Pedestrian Level of Service AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.47	B	2.54	C	2.60	C	2.64	C	2.21	B
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.10	B	2.19	B	1.89	B	1.76	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.47	B	1.72	B	2.51	C	2.41	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.11	C	3.03	C	2.67	C	2.80	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	2.34	B	2.57	C	2.54	C	2.76	C		

The results from **Table 29** suggest that there are no crossings for the PM peak hour that had an overall PLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 29: Interim (2045) Pedestrian Level of Service PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.35	B	2.36	B	2.65	C	2.60	C	2.10	B
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.19	B	2.23	B	1.86	B	1.74	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.14	B	1.72	B	2.37	B	2.36	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.02	C	2.77	C	2.64	C	2.67	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	2.23	B	2.30	B	2.53	C	2.72	C		

9.2.1.1 Summary

In summary, all of the PLOS results were LOS C or better. Furthermore, the delay value for all of the signalized intersections is shown in **Appendix C-2**.

9.2.2 Bicycle Level of Service (BLOS)

- BLOS was assessed at all existing bicycle lanes for signalized intersections. There were twelve (12) bike lanes that were analyzed. The following criteria were used for the bicycle methodology:
- Shared or exclusive bicycle lanes
  - HCM Methodology evaluates the service or established bicycle lanes.
- Target Travel Modes
  - HCM Methodology reflects travel by bicycle through the signalized intersection and does not cover other modes (such as motorized bicycles).

Table 30 and **Table 31** summarizes the AM and PM peak hour BLOS and delay, respectively, for each crossing at the signalized intersections within the Study Area. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

The results from **Table 30** suggest that there are no crossings for the AM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 30: Interim (2045) Bicycle Level of Service for AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	1.24	A	N/A	N/A	N/A	N/A	N/A	N/A	2.10	B
2	1 - B1	W Main Street (BUS US - 250) at 4th Street NW	1.94	B	1.59	B	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	0.73	A	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.42	B	2.68	C	N/A	N/A	2.56	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.19	C	N/A	N/A	2.53	C	2.72	C		

The results from **Table 31** suggest that there are no crossings for the PM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

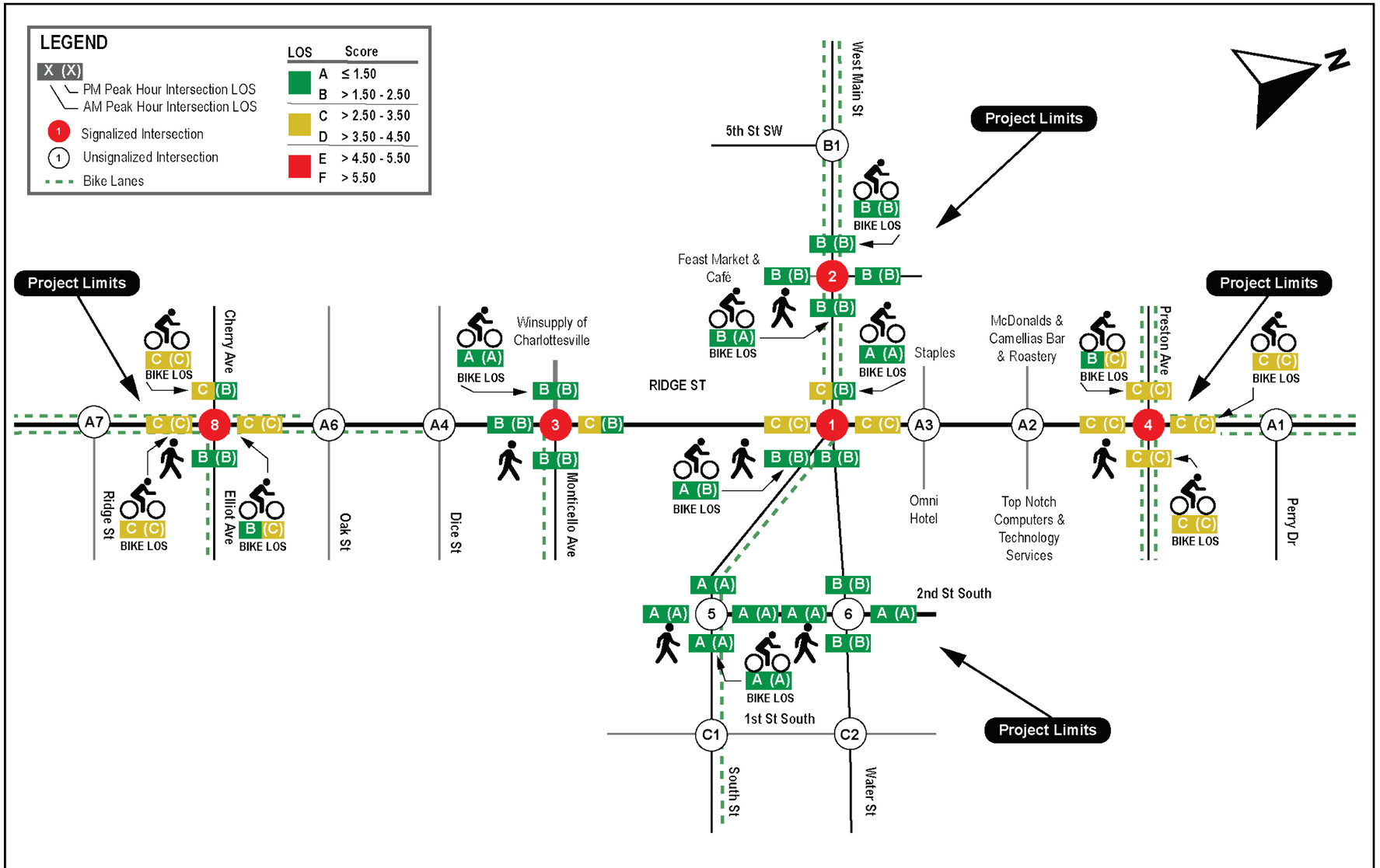
Table 31: Interim (2045) Bicycle Level of Service for PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	1.81	B	N/A	N/A	N/A	N/A	N/A	N/A	1.19	A
2	1 - B1	W Main Street (BUS US - 250) at 4th Street NW	2.46	B	1.28	A	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	0.73	A	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.78	C	2.76	C	N/A	N/A	2.52	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.47	C	N/A	N/A	2.83	C	2.85	C		

9.2.2.1 Summary

In Summary, all of the BLOS results were equal LOS C or better. Furthermore, the delay value for all the signalized intersections is a minimum of 18.9 sec/bicycle at eastbound West Main Street and 4th Street and the maximum delay of 38.7 sec/bicycle at westbound Ridge Street, Water Street, and South Street as seen in **Appendix C-2. Figure 23** also includes graphic with color coding the BLOS per crossing for both AM and PM peak hours.

Figure 23: Interim (2045) Pedestrian and Bicycle Level of Service (LOS) Analysis Results



STARS VDOT Virginia Department of Transportation

RIDGE STREET, From Cherry Ave to Preston Ave

Ridge Street Future (2045) Pedestrian /Bike AM And PM Level Of Service (LOS) Analysis Results

FIGURE 23

10 2056 No-Build Operational Analysis

Operational analysis was performed at each of the study intersections for the Future 2056 No-Build Conditions using the methodology described in Section 3 of this report.

10.1 Intersection Operations: 2056 No-Build Conditions

A traffic operational analysis was conducted using *SimTraffic* to evaluate overall performance of the study intersections and arterial segments within the corridor.

Microsimulation Delay in sec/veh under the 2056 No-Build scenario was reported from SimTraffic for each signalized intersection. **Table 32** provides a summary of the AM and PM peak hour delay for each movement for the study intersections along the study corridor. SimTraffic output sheets are provided in the **Appendix C-3**.

Note that intersection delay is reported for each node back to the upstream node in each direction. For closely-spaced intersections, delays may be limited due to the short distance between nodes/intersections. The results from **Table 32** suggest that the following intersections operate with an overall delay value that exceeds 35 sec/veh for signalized and 25 sec/veh for unsignalized, which equates to LOS D or greater.

Intersection 1 (SimTraffic Node 1) – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Microsimulation delay of 86.5 sec/veh during the AM peak hour and 103.6 sec/veh during the PM peak hour

Intersection 2 (SimTraffic Node 2) – Parking Lot/4th St NW & W Main St

- Microsimulation delay of 42.9 sec/veh during the AM peak hour and 98.5 sec/veh during the PM peak hour

Intersection 3 (SimTraffic Node 3) – Ridge St & Parking Lot/Monticello Ave

- Microsimulation delay of 82.9 sec/veh during the AM peak hour and 34.2 sec/veh during the PM peak hour

Intersection 4 (SimTraffic Node 4) – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Microsimulation delay of 38.5 sec/veh during the AM peak hour and 170.6 sec/veh during the PM peak hour

Queue length, or the distance to which stopped vehicles accumulate in a lane at an intersection, is another performance measure of intersection operations. Lengthy queues may be indicative of intersection capacity or operational issues, such as absence of or insufficient dedicated turn lanes, inefficient signal timings or phasing. A queuing analysis was completed for the study intersections during the AM and PM peak hours. SimTraffic Maximum Queue Lengths in feet were reported for each lane. These queue lengths are based on an average of 10 simulation runs. **Table 33** provides a summary of the maximum queue lengths during the AM and PM peak hours as compared to the available storage bay lengths. The highlighted queue lengths in **Table 33** are the movements where the reported maximum queue length values either meet or exceed the storage length available for that turning movement. The SimTraffic output sheets including the maximum queue lengths are included in **Appendix C-3**.

The results presented in **Table 33** indicate that several intersection movements are expected to experience heavy demand and queuing. Some of those intersections and the affected movements are summarized below:

Intersection 1 – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Eastbound left-turning movement (storage bay length of 180 ft) experienced substantial queuing, reaching 161 ft in the AM peak and maximum queue length of 180 ft. in the PM peak.
- Eastbound right-turning movement (storage bay length of 160 ft) showed a maximum queue length of 226 ft during the AM peak period and 313 ft. during the PM peak period.
- Westbound left-turning movement (storage bay length of 160 ft) showed a queue length of 160 ft during the AM peak period.
- Westbound right-turning movement (storage bay length of 350 ft) showed a queue length of 329 ft in the AM peak.
- Northbound left-turning movement (storage bay length of 180 ft) showed a queue length of 189 ft in the AM and PM peak.
- Southbound left-turning movement (storage bay length of 145 ft) showed a queue length of 148 ft in the AM and PM peak.

Intersection 2 – Parking Lot/4th St NW & W Main St

- Eastbound left-turning movement (storage bay length of 170 ft) showed a maximum queue length of 153 ft during both the AM and PM peak periods.

Intersection 3 – Ridge St & Parking Lot/Monticello

- Westbound left-turning movement (storage bay length of 190 ft) showed a queue length of 197 ft in the PM peak.
- Westbound through movement showed a queue length of 573 ft during the AM peak.
- Westbound right-turning movement (storage bay length of 415 ft) showed a queue length of 622 ft in the AM peak.

Intersection 4 – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Eastbound left-turning movement (storage bay length of 230 ft) experienced substantial queuing, reaching 218 ft in the PM peak.
- Eastbound right-turning movement (storage bay length of 240 ft) experienced substantial queuing, reaching 236 ft in the PM peak.
- Westbound left-turning movement (storage bay length of 90 ft) showed a queue length of 124 ft in the AM and PM peak.
- Westbound right-turning movement (storage bay length of 70 ft) showed a queue length of 65 ft and 67 ft in the AM and PM peak.
- Northbound left-turning movement (storage bay length of 120 ft) showed a queue length of 158 ft and 157 ft in the AM and PM peak.
- Southbound left-turning movement (storage bay length of 130 ft) showed a queue length of 129 ft and 130 ft in the AM and PM peak.

Table 32: No-Build (2056) SimTraffic AM and PM Peak Hour Delay (veh/sec)

Intersection	Lane Group	Eastbound		Westbound		Northbound		Southbound		Overall	
		AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay
1: Ridge Street at W Main Street/ W Water Street	Movement	W Main Street		W Water Street		Ridge Street		Ridge McIntire Road		Intersection	
	To South St W	46.2	33.1	350.3	56.6	27.5	37.1	103.1	236.3	86.5	103.6
	Left	43.6	30.4	350.2	49.0	61.1	45.5	104.0	239.3		
	Through	44.1	33.1	447.3	43.7	29.7	38.4	102.1	231.2		
	Right	56.1	66.5	86.2	2.4	23.9	35.4	117.3	228.9		
	Approach	47.9	47.0	303.8	23.6	36.0	39.4	105.2	231.7		
2: W Main Street at 4th St NW	Movement	W Main Street		W Main Street		Parking Lot		4th Street NW		Intersection	
	Left	41.7	157.0	67.5	54.0	19.8	---	16.8	33.8	42.9	98.5
	Through	37.4	158.9	59.0	33.8	18.9	20.6	15.3	30.4		
	Right	32.1	159.6	53.4	25.7	6.5	9.4	7.9	22.6		
	Approach	38.1	158.6	58.4	32.4	13.9	15.0	12.0	28.1		
3: Ridge Street at Monticello Avenue	Movement	Parking Lot		Monticello Avenue		Ridge Street		Ridge Street		Intersection	
	Left	46.5	34.7	75.6	53.8	---	---	66.8	57.7	82.9	34.2
	Through	---	22.2	84.2	---	122.0	45.5	16.1	11.8		
	Right	---	---	107.5	23.2	116.6	40.5	11.3	6.8		
	Approach	46.5	27.9	101.5	36.2	121.5	44.8	37.2	28.4		
4: Ridge McIntire Rd at Preston Avenue	Movement	Preston Avenue		Preston Avenue		Ridge McIntire Road		McIntire Road		Intersection	
	Left	30.5	128.2	54.0	56.1	68.7	42.4	23.7	392.1	38.5	170.6
	Through	38.7	157.4	38.0	36.6	44.2	35.8	28.9	382.6		
	Right	55.6	397.1	4.8	5.2	3.1	2.6	20.7	350.5		
	Approach	45.5	251.0	37.8	35.2	43.5	29.9	27.4	381.7		

Table 33: No-Build (2056) Conditions Summary of Maximum Queues (feet)

Intersection Number and Description	Lane Group	Eastbound			Westbound			Northbound			Southbound		
		Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)
1: Ridge St/Ridge McIntire Rd & South Street W	Movement	W Main Street			W Water Street			Ridge Street			Ridge McIntire Road		
	Left	180	161	180	160	160	146	180	189	189	145	148	148
	Through	---	226	313	---	470	215	---	367	318	---	733	880
	Right	160	226	313	350	329	64	---	338	282	---	754	883
2: Parking Lot/4th St NW & W Main St	Movement	W Main Street			W Main Street			Parking Lot			4th Street NW		
	Left	---	460	956	---	353	324	---	52	36	---	120	292
	Through												
	Right												
3: Ridge St & Parking Lot/Monticello Ave	Movement	Parking Lot			Monticello Avenue			Ridge Street			Ridge Street		
	Left	---	37	35	190	183	197	120	---	---	---	203	205
	Through				---	573	307	---	1055	420	---	200	198
	Right				415	622	272						
4: Ridge McIntire Rd/McIntire Rd & Preston Ave	Movement	Preston Avenue			Preston Avenue			Ridge McIntire Road			McIntire Road		
	Left	230	139	218	90	124	124	120	158	157	130	129	130
	Through	---	442	1481	---	277	332	---	342	340	---	335	1393
	Right	240	116	236	70	65	67	---	131	65	---	323	1380
	Maximum queue nearly meets available storage length												
	Maximum queue meets or exceeds available storage length indicating queue spillover												

11 2056 No-Build Pedestrian and Bicycle Analysis

11.1 Pedestrian Level of Comfort (PLOC) and Bicycle Level of Traffic Stress (BLTS)

Similar to the 2045 Interim No-Build, the Pedestrian Level of Comfort and the Bicycle Level of Traffic Stress do not change from existing conditions in the 2056 Future Year Condition. It is only with physical changes to the roadway that these measures change.

11.2 HCM Methodology Quantitative Analysis

11.2.1 Pedestrian Level of Service (LOS)

PLOS was assessed at all existing crossings at five (5) signalized intersections. There were twenty (20) crossings that were analyzed. The following criteria were used for the pedestrian methodology:

- "Typical Pedestrian"
  - HCM Methodology reflects the average pedestrian and does not reflect the perception of those with disabilities.
- Target Travel Modes
  - HCM Methodology reflects travel by pedestrian walking across one or more legs of a signalized intersection and does not cover other modes (such as scooters).

Delay in sec/person were reported for all crossings at the signalized intersections. **Table 34** and **Table 35** summarizes the AM and PM peak hour PLOS and delay, respectively, for each crossing at the signalized intersections within the Study Area.

The results from **Table 34** suggest that there are no crossings for the AM peak hour that had an overall PLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 34: Future (2056) Pedestrian Level of Service AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Sco re	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.5	B	2.5	C	2.6	C	2.7	C	2.3	B
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.1	B	2.2	B	1.9	B	1.8	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.5	B	1.7	B	2.5	C	2.4	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.1	C	3.0	C	2.7	C	2.8	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	2.4	B	2.6	C	2.6	C	2.8	C		

The results from **Table 35** suggest that there are no crossings for the PM peak hour that had an overall PLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 35: Future (2056) Pedestrian Level of Service PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.35	B	2.36	B	2.67	C	2.62	C	2.14	B
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.21	B	2.25	B	1.87	B	1.74	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.14	B	1.72	B	2.39	B	2.38	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.03	C	2.78	C	2.66	C	2.68	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	2.23	B	2.32	B	2.54	C	2.75	C		

11.2.1.1 Summary

In summary, all of the PLOS results were LOS C or better. Furthermore, the delay value for all of the signalized intersections is shown in **Appendix C-4**.

11.2.2 Bicycle Level of Service (BLOS)

BLOS was assessed at all existing bicycle lanes for signalized intersections. There were nine (9) crossings that were analyzed. The following criteria were used for the pedestrian methodology:

- Shared or exclusive bicycle lanes
  - HCM Methodology evaluates the service or established bicycle lanes.
- Target Travel Modes
  - HCM Methodology reflects travel by bicycle through the signalized intersection and does not cover other modes (such as motorized bicycles).

Table 14**Table 36** and

Table 15**Table 37** summarize the AM and PM peak hour BLOS and delay, respectively, for each crossing at the signalized intersections within the Study Area. This threshold was used because these scores have the potential to increase to unacceptable delays in the future-year conditions.

The results fromTable 14 **Table 36** suggest that there are no crossings for the AM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 36: Future (2056) Bicycle Level of Service for AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	1.28	A	N/A	N/A	N/A	N/A	N/A	N/A	0.66	A
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	1.97	B	1.64	B	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	0.73	A	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.45	B	2.71	C	N/A	N/A	2.58	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.23	C	N/A	N/A	3.33	C	2.45	B		

The results from **Table 37** suggest that there are no crossings for the PM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

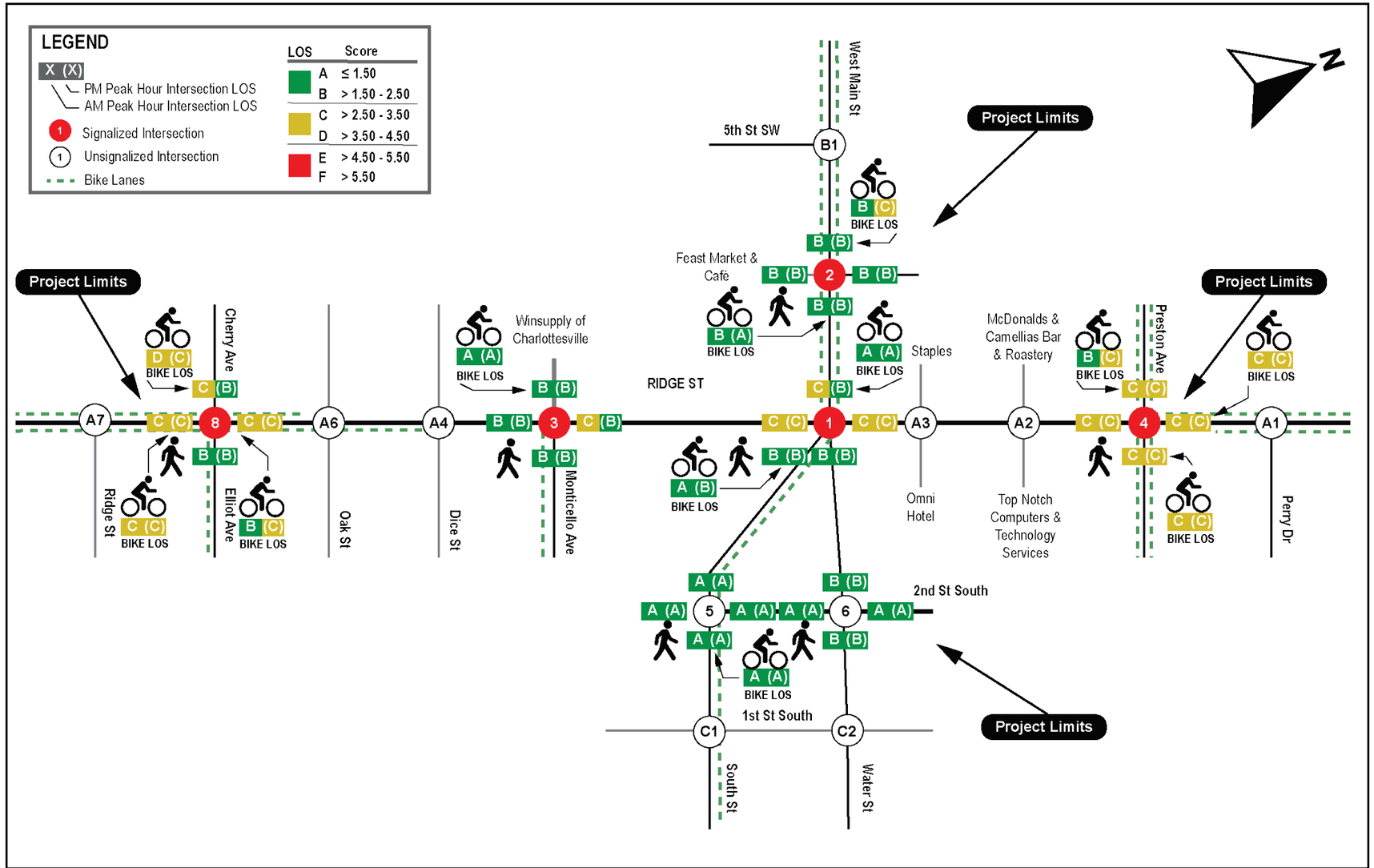
Table 37: Future (2056) Bicycle Level of Service for PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	1.87	B	N/A	N/A	N/A	N/A	N/A	N/A	1.26	A
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.53	C	1.30	A	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	0.73	A	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.84	C	2.79	C	N/A	N/A	2.55	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.52	D	N/A	N/A	2.91	C	2.90	C		

11.2.2.1 Summary

In summary, all of the BLOS results were equal LOS C or better. Furthermore, the delay value for all the signalized intersections is a minimum of 18.9 sec/bicycle at eastbound West Main Street and 4th Street and the maximum delay of 38.7 sec/bicycle at westbound Ridge Street, Water Street, and South Street as seen in **Appendix C-4**. **Figure 24** also includes graphical with color coding the BLOS per crossing for both AM and PM peak hours.

Figure 24: Future (2056) Pedestrian and Bicycle Level of Service (LOS) Analysis Results



STARS VDOT

RIDGE STREET, From Cherry Ave to Preston Ave

Ridge Street Future (2056) Pedestrian /Bike AM And PM Level Of Service (LOS) Analysis Results

FIGURE 26

12 Improvement Alternatives

The proposed improvements at the intersection of Ridge St and W Main St/ W Water Street are primarily driven by a need to address existing and future safety and operational concerns. The alternatives were developed based upon the results of the Existing Conditions, 2045 No-Build, and 2056 No-Build Conditions analyses, field observations, review of prior studies/recommendations, as well as coordination with the VDOT District Office, VDOT TMPD, and the City of Charlottesville.

12.1 Meetings and Coordination

An Alternatives Development Workshop was held with the SWG on May 19, 2025, to discuss the existing operational and safety issues and to discuss the Phase 1 Public Survey results and sentiment analysis and potential improvement alternatives within the study corridor. The discussion during the workshop primarily focused on potential preliminary alternatives. Prior to the meeting, these preliminary alternatives went through initial VJuST and Synchro screenings to determine their viability to address the intersection's operational issues. The following three (3) preliminary alternatives were selected to further develop:

- Alternative 1: One-way Pair for Water St and South St
- Alternative 2: One-way Pair for Water St and South St with Bikeway
- Alternative 3: Roundabout with One-way Pair for Water St and South St

A Citizen Information Meeting was held in an Open House forum on August 14, 2025, to discuss the advanced alternatives with the public and to receive feedback on which alternatives to further progress. Representatives from all stakeholders from the SWG were present at the Open House and openly discussed the three (3) alternatives. A second Public Survey went live on August 14, 2025, and lasted for two weeks closing on August 28, 2025, to gather public input about the three (3) alternatives. The results of this second public survey are provided in **Appendix D-1**.

An Alternatives Evaluation Workshop was held with the SWG on September 9,2025, to discuss the preliminary evaluation of the alternatives, including the operational and safety analysis as well as the planning level conceptual layouts for each of these alternatives. The goal of the Alternatives Evaluation Workshop was to select the Preferred Alternative to be fully evaluated in this study. The screened alternatives from the Alternatives Development Workshop were further tested for traffic operations improvements, safety improvements as well as potential cost. The analysis results along with the community outreach responses were shared with the SWG, and the pros and cons of each of the screened alternatives were discussed among the SWG. From the discussion, a preferred alternative was selected.

The preferred alternative was derived from the preliminary alternative 2 as well as additional modifications to better align the design with local priorities and operational goals.

A second Community Information Meeting was held in an Open House forum on January 22, 2026, to discuss the advanced alternative with the public and to receive feedback. Representatives from all stakeholders from the SWG were present at the Open House and openly discussed the preferred alternative. A formal comment period was provided January 22 – February 12, 2026, to allow the public additional time to review the Preferred Alternative and submit feedback. The result from the comment period and a summary of all the public engagement for this study are provided in **Appendix D-2**.

12.2 Preliminary Improvement Alternatives (iCAP Stage 1 Analysis)

Both traditional intersection improvements and innovative intersection concepts were considered in the development of potential improvement alternatives. Incorporating innovative intersections into the transportation network is one strategy that VDOT is using to improve safety and mobility for congested corridors. These alternatives were vetted through conceptual layouts as well as a preliminary traffic operations analysis using Synchro and VDOT's Junction Screening Tool (VJuST, Version 1.2). VJuST assists engineers and planners to screen number of innovative intersection and interchange ideas by evaluating the Critical Lane Volume (CLV) and identifies innovative intersection and interchange concepts that have potential to address congestion and safety issues. VJuST reports the maximum volume/capacity ratio considering the complete innovative intersection layout configuration (including any additional intersections as part of the innovative layout). Congestion results are based on user inputs such as turning movement volumes, number of lanes and lane configurations. Safety results are based on conflict points—any points where roadway users' paths can cross with other roadway users. The screened concepts can then be analyzed further for their suitability considering site specific data such as potential right-of-way and utility impacts, potential impacts to adjacent business access points, impacts to the pedestrian movements.

A VJuST screening was performed for the signalized intersections of Ridge Street and W Main Street/W Water Street to determine the effect of and potential applicability of innovative concepts. The VJuST summaries for both the Interim Year (2045) and Future Year (2056) are shown in **Figure 25** and **Figure 28**.

Figure 25: 2045 AM VJuST Results

VDOT Junction Screening Tool

Results Worksheet

VJuST
VDOT Junction Screening Tool

General Information	
Project Title:	STARS Ridge Street-W Main Street Intersection Study
EW Facility:	W Main Street (BUS US 250)/ W Water Street/ South Street W
NS Facility:	Ridge Street/ Ridge McIntire Road
Date:	AM 2045 Peak

Volumes (veh/hr)	U-Turn / Left	Through		Right
Eastbound	250	40	250	130
Westbound	45	150	250	125
Northbound	185	655	250	45
Southbound	195	555	250	170

General Instructions: All intersection and interchange configurations have a default assumption of one exclusive lane per movement. No results shall be interpreted until the user has verified the lane configurations on each worksheet.

Intersection Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Conventional	Weighted Total Conflict Points	Planning Level Cost Category	
Conventional	-	0.58		48	$	
Quadrant Roadway	S-W	0.48		40	$$$	
Roundabout	-	0.97		8	$$	

*The continuous green-T is the only three-legged innovative intersection in this tool. To compare the continuous green-T to other innovative intersections, conflicts corresponding with the fourth leg must be removed. This has been done for the conventional intersection. Conflict point diagrams for three-legged and four-legged conventional intersections have been provided on the conventional intersection worksheet for reference.

Interchange Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Traditional Diamond	Weighted Total Conflict Points	Planning Level Cost Category	

Information

Congestion	The maximum v/c ratio represents the worst v/c of all zones that make up an intersection.
Pedestrian	Compares the potential of each design to accommodate pedestrians based on safety, wayfinding, and delay. Potential is qualitatively defined as better (+), similar (blank cell), or worse (-) than a conventional intersection or traditional diamond interchange.
Safety	Weighted Total = (2 x Crossing Conflicts) + Merging Conflicts + Diverging Conflicts
Planning Level Costs	Cost category estimates for each intersection/interchange alternative. Some alternatives have choices that affect the resulting cost category (e.g. requirement of a new bridge) that can be configured on the individual input worksheets.

Figure 26: 2045 PM VJuST Results

VDOT Junction Screening Tool

Results Worksheet

VJuST
VDOT Junction Screening Tool

General Information	
Project Title:	STARS Ridge Street-W Main Street Intersection Study
EW Facility:	W Main Street (BUS US 250)/ W Water Street/ South Street W
NS Facility:	Ridge Street/ Ridge McIntire Road
Date:	PM 2045 Peak

Volumes (veh/hr)	U-Turn / Left	Through		Right
Eastbound	375	70	375	350
Westbound	70	130	375	210
Northbound	115	540	375	60
Southbound	150	855	375	75

General Instructions: All intersection and interchange configurations have a default assumption of one exclusive lane per movement. No results shall be interpreted until the user has verified the lane configurations on each worksheet.

Intersection Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Conventional	Weighted Total Conflict Points	Planning Level Cost Category	
Conventional	-	0.65		48	$	
Quadrant Roadway	S-W	0.60		40	$$$	
Roundabout	-	0.96		8	$$	

*The continuous green-T is the only three-legged innovative intersection in this tool. To compare the continuous green-T to other innovative intersections, conflicts corresponding with the fourth leg must be removed. This has been done for the conventional intersection. Conflict point diagrams for three-legged and four-legged conventional intersections have been provided on the conventional intersection worksheet for reference.

Interchange Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Traditional Diamond	Weighted Total Conflict Points	Planning Level Cost Category	

Information

Congestion	The maximum v/c ratio represents the worst v/c of all zones that make up an intersection.
Pedestrian	Compares the potential of each design to accommodate pedestrians based on safety, wayfinding, and delay. Potential is qualitatively defined as better (+), similar (blank cell), or worse (-) than a conventional intersection or traditional diamond interchange.
Safety	Weighted Total = (2 x Crossing Conflicts) + Merging Conflicts + Diverging Conflicts
Planning Level Costs	Cost category estimates for each intersection/interchange alternative. Some alternatives have choices that affect the resulting cost category (e.g. requirement of a new bridge) that can be configured on the individual input worksheets.

Figure 27: 2056 AM VJuST Results

VDOT Junction Screening Tool

Results Worksheet

VJuST
VDOT Junction Screening Tool

General Information	
Project Title:	STARS Ridge Street-W Main Street Intersection Study
EW Facility:	W Main Street (BUS US 250)/ W Water Street/ South Street W
NS Facility:	Ridge Street/ Ridge McIntire Road
Date:	AM 2056 Peak

Volumes (veh/hr)	U-Turn / Left	Through		Right
Eastbound	265	40	265	135
Westbound	45	160	265	130
Northbound	195	695	265	50
Southbound	200	585	265	180

General Instructions: All intersection and interchange configurations have a default assumption of one exclusive lane per movement. No results shall be interpreted until the user has verified the lane configurations on each worksheet.

Intersection Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Conventional	Weighted Total Conflict Points	Planning Level Cost Category	
Conventional	-	0.62		48	$	
Quadrant Roadway	S-W	0.50		40	$$$	
Roundabout	-	1.05		8	$$	

*The continuous green-T is the only three-legged innovative intersection in this tool. To compare the continuous green-T to other innovative intersections, conflicts corresponding with the fourth leg must be removed. This has been done for the conventional intersection. Conflict point diagrams for three-legged and four-legged conventional intersections have been provided on the conventional intersection worksheet for reference.

Interchange Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Traditional Diamond	Weighted Total Conflict Points	Planning Level Cost Category	

Information

Congestion	The maximum v/c ratio represents the worst v/c of all zones that make up an intersection.
Pedestrian	Compares the potential of each design to accommodate pedestrians based on safety, wayfinding, and delay. Potential is qualitatively defined as better (+), similar (blank cell), or worse (-) than a conventional intersection or traditional diamond interchange.
Safety	Weighted Total = (2 x Crossing Conflicts) + Merging Conflicts + Diverging Conflicts
Planning Level Costs	Cost category estimates for each intersection/interchange alternative. Some alternatives have choices that affect the resulting cost category (e.g. requirement of a new bridge) that can be configured on the individual input worksheets.

Figure 28: 2056 PM VJuST Results

VDOT Junction Screening Tool

Results Worksheet

VJuST
VDOT Junction Screening Tool

General Information	
Project Title:	STARS Ridge Street-W Main Street Intersection Study
EW Facility:	W Main Street (BUS US 250)/ W Water Street/ South Street W
NS Facility:	Ridge Street/ Ridge McIntire Road
Date:	PM 2056 Peak

Volumes (veh/hr)	U-Turn / Left	Through		Right
Eastbound	395	75	395	370
Westbound	75	135	395	220
Northbound	120	570	395	65
Southbound	160	905	395	80

General Instructions: All intersection and interchange configurations have a default assumption of one exclusive lane per movement. No results shall be interpreted until the user has verified the lane configurations on each worksheet.

Intersection Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Conventional	Weighted Total Conflict Points	Planning Level Cost Category	
Conventional	-	0.68		48	$	
Quadrant Roadway	S-W	0.63		40	$$$	
Roundabout	-	1.03		8	$$	

*The continuous green-T is the only three-legged innovative intersection in this tool. To compare the continuous green-T to other innovative intersections, conflicts corresponding with the fourth leg must be removed. This has been done for the conventional intersection. Conflict point diagrams for three-legged and four-legged conventional intersections have been provided on the conventional intersection worksheet for reference.

Interchange Results

Congestion | Pedestrian | Safety | Planning Level Costs | Notes

Type	Dir	Maximum V/C	Accommodation Compared to Traditional Diamond	Weighted Total Conflict Points	Planning Level Cost Category	

Information

Congestion	The maximum v/c ratio represents the worst v/c of all zones that make up an intersection.
Pedestrian	Compares the potential of each design to accommodate pedestrians based on safety, wayfinding, and delay. Potential is qualitatively defined as better (+), similar (blank cell), or worse (-) than a conventional intersection or traditional diamond interchange.
Safety	Weighted Total = (2 x Crossing Conflicts) + Merging Conflicts + Diverging Conflicts
Planning Level Costs	Cost category estimates for each intersection/interchange alternative. Some alternatives have choices that affect the resulting cost category (e.g. requirement of a new bridge) that can be configured on the individual input worksheets.

12.3 Preliminary Improvement Alternatives

Table 38 provides a matrix identifying the initial screened improvements alternatives at the study intersection. The alternatives consist of geometric improvements, access management, signal timing/phasing improvements, pavement marking and signage improvements, and pedestrian/bicycle accommodations. The improvement alternatives suggested are based upon the VJuST operational analysis, existing crash history and Crash Modification Factors (CMFs), relative cost, constructability, and SWG direction. A description of the preliminary alternatives for the study intersection discussed at the Alternatives Development Workshop and shown at the first citizen Input meeting are included below:

- Enhancing the existing signage at the intersection to improve visibility and clarity for all roadway users. This may involve replacing outdated signs, adding new signs to indicate lane directions, and ensuring all regulatory and warning signs meet current standards. The upgrade will help drivers, cyclists, and pedestrians better understand traffic patterns and rules, which would improve overall safety and reduce confusion.
- Implementing "No Turn on Red" restrictions will prevent vehicles from turning right during a red signal, which enhances pedestrian safety by reducing conflicts at crosswalks. Introducing protected left turns means that left-turning vehicles will only turn when given a dedicated signal, minimizing the risk of collisions with oncoming traffic and pedestrians.
- Adjusting signal timing to optimize traffic flow at the intersection will decrease delays and congestion. Analyzing current traffic volumes and patterns, to set signal phases and cycle lengths that accommodate peak and off-peak demands, improving efficiency for vehicles, cyclists, and pedestrians.
- Recalculating pedestrian signal timing to ensure adequate crossing time to make sure they provide enough time for people of all mobility levels to cross safely.
- Changing W Water Street to a one-way configuration between Ridge Street and 2nd Street SE aims to simplify traffic movements, reduce congestion, and enhance safety by minimizing conflicting turning movements in this segment. This conversion can also provide additional space for bike lanes, parking, or sidewalk improvements.
- Replacing the traditional signalized intersection with a roundabout can improve traffic flow and safety. Roundabouts reduce the number of conflict points, lower vehicle speeds, and decrease the likelihood and severity of collisions. This design is particularly effective for managing congestion and promoting continuous movement.
- Introducing a dedicated bike lane for westbound traffic on W Water Street will provide a safer, separated space for cyclists, encouraging cycling and reducing conflicts with motor vehicles. This improvement supports multimodal transportation and enhances connectivity for the local bike network.
- Adding an additional through lane increases capacity for vehicles traveling straight on W Water Street, helping to alleviate congestion and improve traffic flow during peak hours.
- Providing new parking spaces along W Water Street will increase accessibility for local businesses and residents. On-street parking can also serve as a traffic calming measure by narrowing roadway widths and encouraging slower vehicle speeds.
- Curb bump-outs extend the sidewalk into the parking lane, shortening crossing distances for pedestrians and improving visibility. Adding curb ramps ensures accessibility for wheelchair users and others with mobility challenges, complying with ADA requirements.
- Switching the bike lane direction from westbound contraflow to eastbound aligns with traffic patterns and improves safety by reducing the risk of head-on conflicts between cyclists and vehicles.
- Establishing a protected bikeway along W Main Street will provide a designated route for cyclists, connecting key destinations and integrating with existing bike infrastructure.
- Upgrading the pedestrian island on Water Street will improve safety and comfort for pedestrians waiting to cross. Reconstruction may involve expanding the size and ensuring ADA compliance.
- Reconstruct the channelized right turn on W Main Street will enhance safety for both vehicles and pedestrians. Adding a pedestrian plaza provides a welcoming space for people to gather, improves aesthetics, and encourages foot traffic in the area.
- Moving and re-purposing the statue pedestal allows for better use of public space, potentially improving sightlines and creating opportunities for new art installations or community features. This action can help revitalize the intersection and contribute to placemaking.
- Constructing new ramps that meet ADA standards ensures accessibility for all users. These improvements provide smooth transitions between sidewalk and street, facilitating safe and easy movement throughout the intersection.
- For the roundabout alternative, adding shared use paths to accommodate both pedestrians and cyclists, offering a wide, separated route that enhances safety and connectivity.
- Reconfiguring crosswalks to minimize crossing distances reduces exposure time for pedestrians and increases safety.
- Introducing a dedicated signal phase for bicycles and pedestrians means that these groups will have their own time period during the traffic signal cycle to cross the intersection, separate from vehicle movements. This reduces conflicts between turning vehicles and vulnerable roadway users, allowing cyclists and pedestrians to move safely and confidently.

Figure 29, **Figure 30**, and **Figure 31** show the preliminary alternative concepts developed from the Alternative Development Workshop and were presented at the first Citizens Input Meeting.

12.4 Preferred Improvement Alternatives

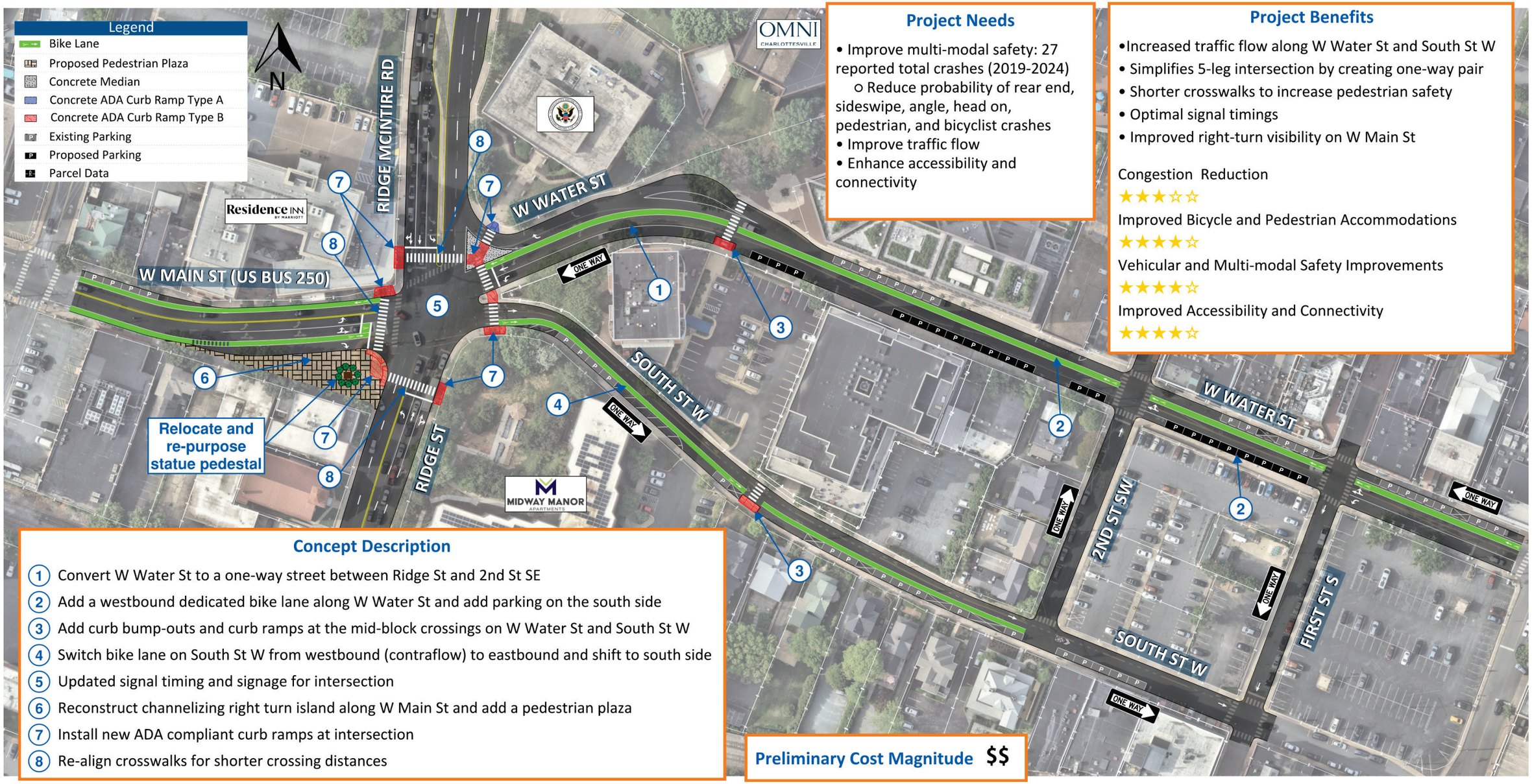
Table 38 not only provides a matrix identifying the initial screened improvement alternatives but also shows the final preferred alternative at each intersection selected by the SWG. The alternatives consist of geometric intersection improvements as well as safety improvements at each intersection based upon the operational analysis, safety analysis, relative cost, constructability, and SWG direction.

Figure 32 shows the preferred alternative concept developed from the Alternative Evaluation Workshop and was presented at the second Citizens Input Meeting.

Table 38: Preliminary Improvement Alternatives Matrix

Improvement	Improvements Matrix			
	Preliminary Alternative 1	Preliminary Alternative 2	Preliminary Alternative 3	Preferred Alternative 4
Update signage at intersection	X	X	X	X
No Turn on Red and protected left turns	X	X		X
Optimal signal timing	X	X	X	X
Recalculate pedestrian signal timing to ensure adequate crossing time	X	X		X
Convert W Water St to a one-way street between Ridge St and 2nd St SE	X	X	X	X
Convert signal to a roundabout			X	
Add westbound dedicated bike lane along W Water St	X	X	X	
Add a through lane on W Water St			X	
Add parking on W Water St	X	X		
Add curb bump-out and curb ramp on W Water St	X	X		
Add curb bump-out and curb ramp on South St W	X	X	X	X
Switch bike lane on South St W from westbound (contraflow) to eastbound	X	X	X	
Connect contraflow bike lane on South St W to Bikeway				X
Add projected bikeway on W Main St		X		X
Add projected bikeway on W Water St				X
Convert bike lanes on W Main St to Sharrows			X	
Reconstruct pedestrian island on Water St	X	X		X
Reconstruct channelized right turn island along W Main St and add pedestrian plaza	X	X		X
Relocate and re-purpose statue pedestal	X	X	X	X
Install new ADA complaint ramps and sidewalk	X	X	X	X
Install Shared Use Paths around intersection			X	
Re-align crosswalks for shorter crossing distances	X	X		X
Phasing Changes – protective/permissive left turns to protective left turns	X			X
Add dedicated signal phase for bicycles and pedestrians		X		
Signalize channelize right turn on W Water St				X
Update Lane configuration on W Main St			X	X
Add green bike lane through intersection				X

Figure 29: Preliminary Alternative 1- One-way Pair for Water St and South St



Project Needs

- Improve multi-modal safety: 27 reported total crashes (2019-2024)
  - Reduce probability of rear end, sideswipe, angle, head on, pedestrian, and bicyclist crashes
- Improve traffic flow
- Enhance accessibility and connectivity

Project Benefits

- Increased traffic flow along W Water St and South St W
- Simplifies 5-leg intersection by creating one-way pair
- Shorter crosswalks to increase pedestrian safety
- Optimal signal timings
- Improved right-turn visibility on W Main St

Congestion Reduction

★★★☆☆

Improved Bicycle and Pedestrian Accommodations

★★★★☆

Vehicular and Multi-modal Safety Improvements

★★★★☆

Improved Accessibility and Connectivity

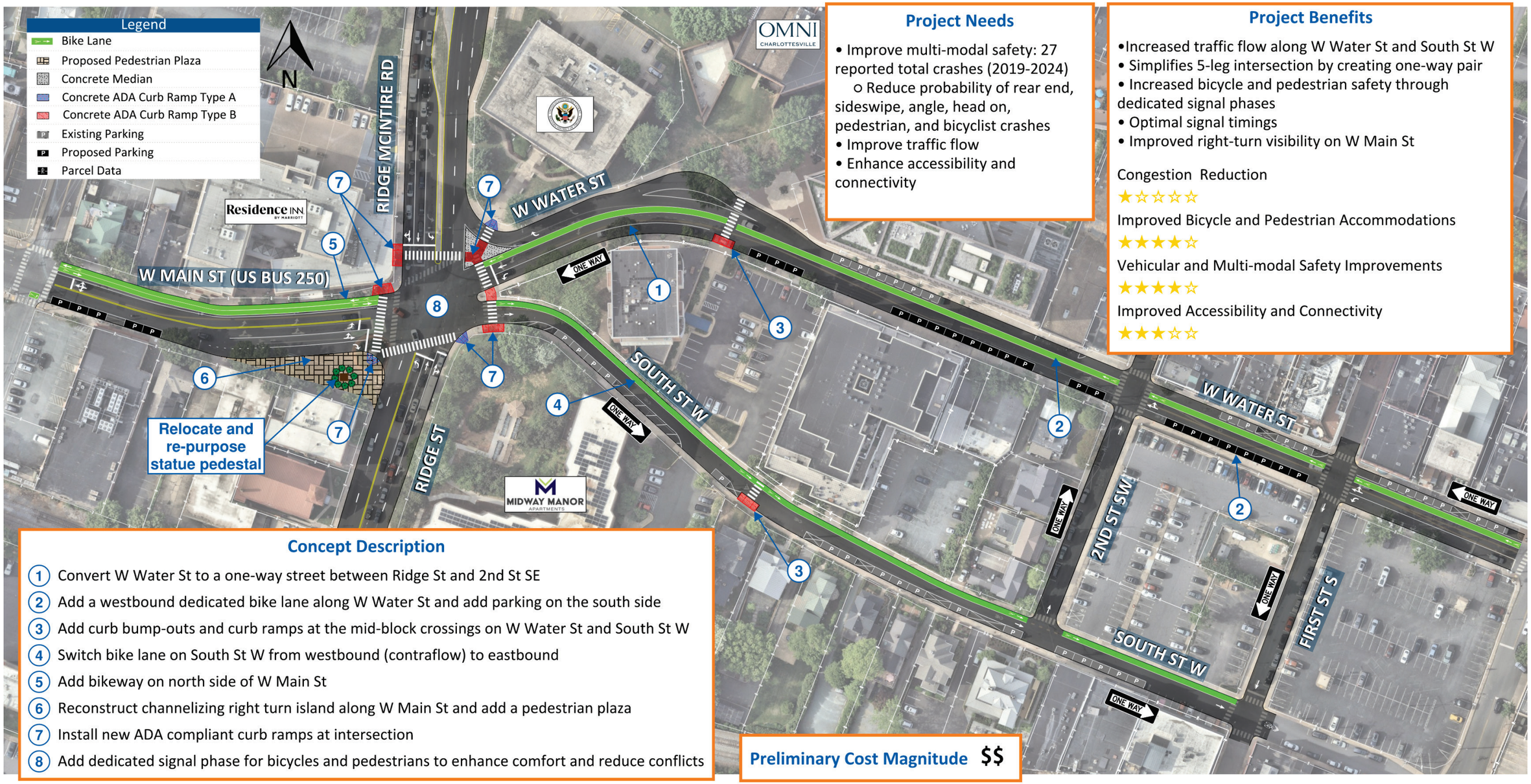
★★★★☆

Concept Description

1. Convert W Water St to a one-way street between Ridge St and 2nd St SE
2. Add a westbound dedicated bike lane along W Water St and add parking on the south side
3. Add curb bump-outs and curb ramps at the mid-block crossings on W Water St and South St W
4. Switch bike lane on South St W from westbound (contraflow) to eastbound and shift to south side
5. Updated signal timing and signage for intersection
6. Reconstruct channelizing right turn island along W Main St and add a pedestrian plaza
7. Install new ADA compliant curb ramps at intersection
8. Re-align crosswalks for shorter crossing distances

Preliminary Cost Magnitude $$

Figure 30: Preliminary Alternative 2 - One-way Pair for Water St and South St with Bikeway



Project Needs

- Improve multi-modal safety: 27 reported total crashes (2019-2024)
  - Reduce probability of rear end, sideswipe, angle, head on, pedestrian, and bicyclist crashes
- Improve traffic flow
- Enhance accessibility and connectivity

Project Benefits

- Increased traffic flow along W Water St and South St W
- Simplifies 5-leg intersection by creating one-way pair
- Increased bicycle and pedestrian safety through dedicated signal phases
- Optimal signal timings
- Improved right-turn visibility on W Main St

Congestion Reduction

★☆☆☆☆

Improved Bicycle and Pedestrian Accommodations

★★★★☆

Vehicular and Multi-modal Safety Improvements

★★★★☆

Improved Accessibility and Connectivity

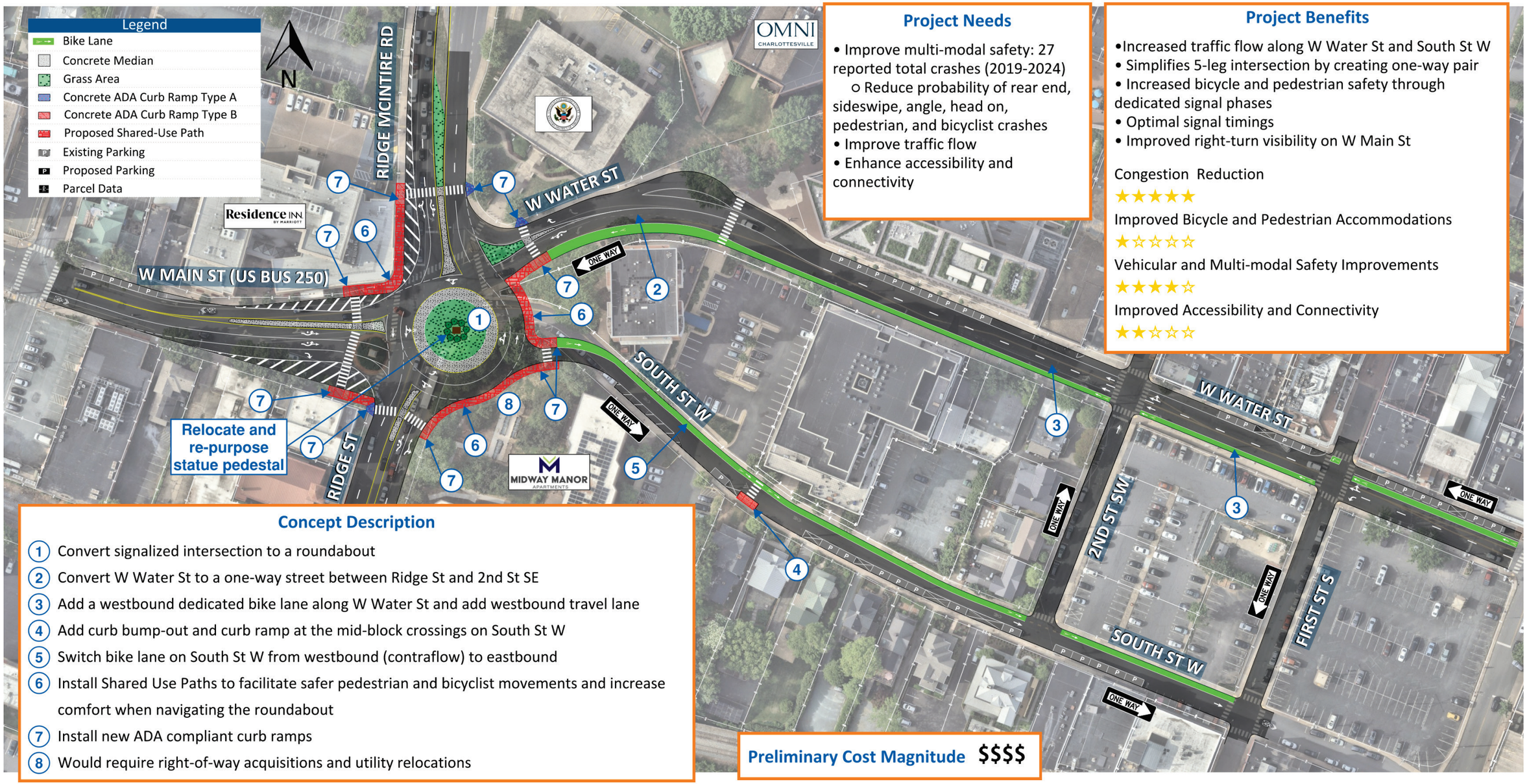
★★★☆☆

Concept Description

1. Convert W Water St to a one-way street between Ridge St and 2nd St SE
2. Add a westbound dedicated bike lane along W Water St and add parking on the south side
3. Add curb bump-outs and curb ramps at the mid-block crossings on W Water St and South St W
4. Switch bike lane on South St W from westbound (contraflow) to eastbound
5. Add bikeway on north side of W Main St
6. Reconstruct channelizing right turn island along W Main St and add a pedestrian plaza
7. Install new ADA compliant curb ramps at intersection
8. Add dedicated signal phase for bicycles and pedestrians to enhance comfort and reduce conflicts

Preliminary Cost Magnitude $$

Figure 31: Preliminary Alternative 3 - Roundabout with One-way Pair for Water St and South St



Project Needs

- Improve multi-modal safety: 27 reported total crashes (2019-2024)
  - Reduce probability of rear end, sideswipe, angle, head on, pedestrian, and bicyclist crashes
- Improve traffic flow
- Enhance accessibility and connectivity

Project Benefits

- Increased traffic flow along W Water St and South St W
- Simplifies 5-leg intersection by creating one-way pair
- Increased bicycle and pedestrian safety through dedicated signal phases
- Optimal signal timings
- Improved right-turn visibility on W Main St

Congestion Reduction

★★★★★

Improved Bicycle and Pedestrian Accommodations

★☆☆☆☆

Vehicular and Multi-modal Safety Improvements

★★★★☆

Improved Accessibility and Connectivity

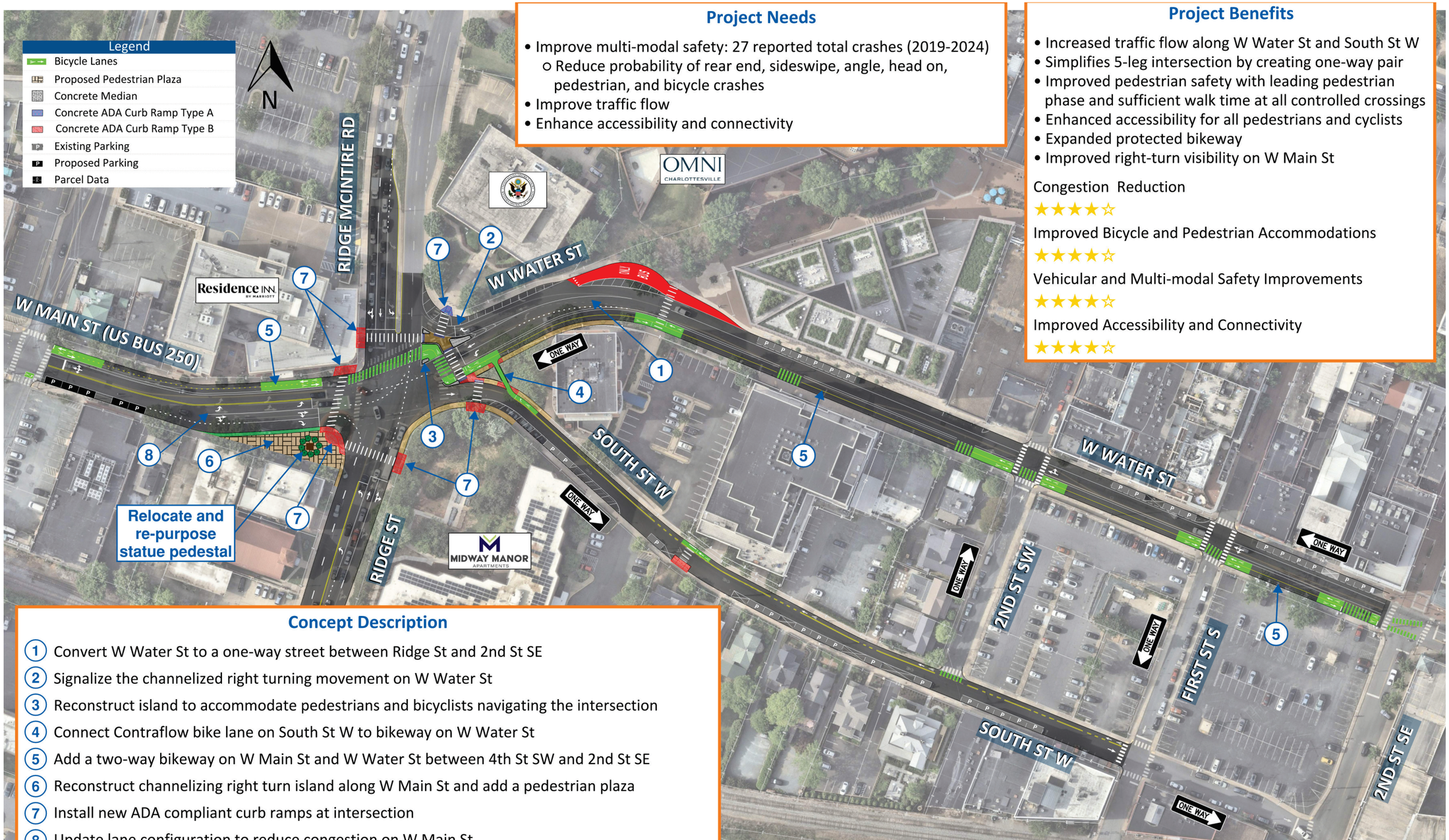
★★☆☆☆

Concept Description

1. Convert signalized intersection to a roundabout
2. Convert W Water St to a one-way street between Ridge St and 2nd St SE
3. Add a westbound dedicated bike lane along W Water St and add westbound travel lane
4. Add curb bump-out and curb ramp at the mid-block crossings on South St W
5. Switch bike lane on South St W from westbound (contraflow) to eastbound
6. Install Shared Use Paths to facilitate safer pedestrian and bicyclist movements and increase comfort when navigating the roundabout
7. Install new ADA compliant curb ramps
8. Would require right-of-way acquisitions and utility relocations

Preliminary Cost Magnitude $$$$

Figure 32: Preferred Alternative - One-way Pair for Water St and South St with Bikeway



Project Needs

- Improve multi-modal safety: 27 reported total crashes (2019-2024)
  - Reduce probability of rear end, sideswipe, angle, head on, pedestrian, and bicycle crashes
- Improve traffic flow
- Enhance accessibility and connectivity

Project Benefits

- Increased traffic flow along W Water St and South St W
- Simplifies 5-leg intersection by creating one-way pair
- Improved pedestrian safety with leading pedestrian phase and sufficient walk time at all controlled crossings
- Enhanced accessibility for all pedestrians and cyclists
- Expanded protected bikeway
- Improved right-turn visibility on W Main St

Congestion Reduction

★★★★☆

Improved Bicycle and Pedestrian Accommodations

★★★★☆

Vehicular and Multi-modal Safety Improvements

★★★★☆

Improved Accessibility and Connectivity

★★★★☆

Concept Description

1. Convert W Water St to a one-way street between Ridge St and 2nd St SE
2. Signalize the channelized right turning movement on W Water St
3. Reconstruct island to accommodate pedestrians and bicyclists navigating the intersection
4. Connect Contraflow bike lane on South St W to bikeway on W Water St
5. Add a two-way bikeway on W Main St and W Water St between 4th St SW and 2nd St SE
6. Reconstruct channelizing right turn island along W Main St and add a pedestrian plaza
7. Install new ADA compliant curb ramps at intersection
8. Update lane configuration to reduce congestion on W Main St

13 2045 Interim Build Operational Analysis

After comparing results of the initial modeling, public input, and screening of alternatives, the SWG selected the Preferred Alternative for the intersection. Operational analysis was performed at each of the study intersections for the Future 2045 Conditions using the methodology described in Section 3 of this report.

13.1 Intersection Operations: 2045 Build Conditions

A traffic operational analysis was conducted using *SimTraffic* to evaluate overall performance of the study intersections and arterial segments within the corridor.

Microsimulation Delay in sec/veh were reported from *SimTraffic* for all the signalized and unsignalized intersections. **Table 39** provides a summary of the AM and PM peak hour delay for each movement for the study intersections along the study corridor. SimTraffic output sheets are provided in the **Appendix D-3**.

Note that intersection delay is reported for each node back to the upstream node in each direction. For closely spaced intersections, delays may be limited due to the short distance between nodes/intersections. The results from **Table 26** suggest that the following intersections operate with an overall delay value that exceeds 35 sec/veh for signalized and 25 sec/veh for unsignalized, which equates to LOS D or greater.

Intersection 1 (SimTraffic Node 1) – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Microsimulation delay of 38.2 sec/veh during the AM peak hour and 42.7 sec/veh during the PM peak hour

Intersection 2 (SimTraffic Node 2) – Parking Lot/4th St NW & W Main St

- Microsimulation delay of 17.4 sec/veh during the AM peak hour and 77.4 sec/veh during the PM peak hour

Intersection 3 (SimTraffic Node 3) – Ridge St & Parking Lot/Monticello Ave

- Microsimulation delay of 42.4 sec/veh during the AM peak hour and 29.1 sec/veh during the PM peak hour

Intersection 4 (SimTraffic Node 4) – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Microsimulation delay of 28.3 sec/veh during the AM peak hour and 32.6 sec/veh during the PM peak hour

Queue length, or the distance to which stopped vehicles accumulate in a lane at an intersection, is another performance measure of intersection operations. Lengthy queues may be indicative of intersection capacity or operational issues, such as absence of or insufficient dedicated turn lanes, inefficient signal timings or phasing. A queuing analysis was completed for the study intersections during the AM and PM peak hours. SimTraffic Maximum Queue Lengths in feet were reported for each lane. These queue lengths are based on an average of 10 simulation runs. **Table 40** provides a summary of the maximum queue lengths during the AM and PM peak hours as compared to the available storage bay lengths. The highlighted queue lengths in **Table 40** are the movements where the reported maximum queue length values either meet or exceed the storage length available for that turning movement. The SimTraffic output sheets including the maximum queue lengths are included in **Appendix D-3**.

The results presented in **Table 40** indicate that several intersection movements are expected to experience heavy demand and queueing. Some of those intersections and the affected movements are summarized below:

Intersection 1 – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Eastbound left-turning movement (storage bay length of 180 ft) showed a maximum queue length of 150 ft during AM and PM peak periods.
- Eastbound right-turning movement (storage bay length of 160 ft) showed a maximum queue length of 282 ft in the AM peak and 328 ft in the PM peak.
- Northbound left-turning movement (storage bay length of 150 ft) showed a queue length of 165 ft in the AM peak and 164 ft in the PM peak.
- Southbound left-turning movement (storage bay length of 145 ft) showed a queue length of 160 ft in the AM and PM peak.

Intersection 2 – Parking Lot/4th St NW & W Main St

- Eastbound left-turning movement (storage bay length of 170 ft) showed a maximum queue length of 139 ft during AM peak and 140 ft during the PM peak period.

Intersection 3 – Ridge St & Parking Lot/Monticello

- Westbound left-turning movement (storage bay length of 190 ft) showed a queue length of 187 ft in the AM peak and 197 ft in the PM peak.
- Westbound right-turning movement (storage bay length of 415 ft) showed a queue length of 559 ft in the PM peak.

Intersection 4 – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Eastbound left-turning movement (storage bay length of 230 ft) experienced substantial queuing, reaching 218 ft in the PM peak.
- Eastbound right-turning movement (storage bay length of 240 ft) experienced substantial queuing, reaching 235 ft in the PM peak.
- Westbound left-turning movement (storage bay length of 124 ft) showed a queue length of 124 ft in the AM and PM peak.
- Westbound right-turning movement (storage bay length of 70 ft) showed a queue length of 61 ft and 68 ft in the AM and PM peak.
- Northbound left-turning movement (storage bay length of 120 ft) showed a queue length of 156 ft in the AM peak and 157 ft in the PM peak.
  Southbound left-turning movement (storage bay length of 130 ft) showed a queue length of 129 ft in the PM peak.

Table 39: Build (2045) SimTraffic AM and PM Peak Hour Delay (veh/sec)

Intersection Number and Description	Lane Group	Eastbound		Westbound		Northbound		Southbound		Overall	
		AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay
1: Ridge Street at W Main Street/ W Water Street	Movement	W Main Street		W Water Street		Ridge Street		Ridge McIntire Road		Intersection	
	To South St W	28.7	70.6	59.8	78.2	32.9	21.8	40.5	45.8	38.2	42.7
	Left	39.1	71.0	55.2	79.5	107.7	100.8	---	---		
	Through	1.6	14.8	48.5	55.5	42.2	28.4	23.8	36.2		
	Right	11.4	43.7	2.1	2.5	---	---	25.7	39.5		
	Approach	27.1	58.9	32.1	32.1	55.6	39.5	27.8	37.9		
2: W Main Street at 4th St NW	Movement	W Main Street		W Main Street		Parking Lot		4th Street NW		Intersection	
	Left	32.5	109.5	20.0	14.6	20.2	---	24.9	55.5	17.4	77.4
	Through	17.0	122.5	15.6	4.1	25.9	40.8	26.6	53.8		
	Right	14.5	116.8	11.7	2.9	6.8	36.7	12.5	39.2		
	Approach	20.0	120.5	15.1	4.0	16.2	38.7	18.4	47.3		
3: Ridge Street at Monticello Avenue	Movement	Parking Lot		Monticello Avenue		Ridge Street		Ridge Street		Intersection	
	Left	66.7	38.6	98.2	47.7	---	---	10.6	32.0	42.4	29.1
	Through	---	33.3	78.6	---	37.7	44.5	4.3	17.5		
	Right	---	---	91.1	19.8	33.1	37.2	2.3	17.9		
	Approach	80.0	36.3	92.2	31.5	37.3	43.4	6.8	22.7		
4: Ridge McIntire Rd at Preston Avenue	Movement	Preston Avenue		Preston Avenue		Ridge McIntire Road		McIntire Road		Intersection	
	Left	36.6	38.2	37.0	43.3	26.1	41.4	28.6	53.9	28.3	32.6
	Through	40.5	49.0	41.5	45.4	20.5	34.4	42.8	35.8		
	Right	4.5	7.7	4.6	6.5	2.8	2.7	31.5	22.3		
	Approach	23.1	30.3	36.1	36.7	18.3	29.0	39.6	37.6		

Table 40: Build (2045) SimTraffic AM and PM Peak Hour Delay (veh/sec)

Intersection Number and Description	Lane Group	Eastbound			Westbound			Northbound			Southbound		
		Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)
1: Ridge Street at W Main Street/ W Water Street	Movement	W Main Street			W Water Street			Ridge Street			Ridge McIntire Road		
	Left	180	150	150	120	100	100	150	165	164	145	160	160
	Through	---	282	328	---	249	282	---	440	328	---	344	524
	Right	160	282	328	350	16	130	---	415	280	---	329	524
2: W Main Street at 4th St NW	Movement	W Main Street			W Main Street			Parking Lot			4th Street NW		
	Left	170	139	140	---	338	124	---	57	50	---	150	295
	Through	---	287	958									
	Right												
3: Ridge St & Parking Lot/Monticello Ave 3: Ridge Street at Monticello Avenue	Movement	Parking Lot			Monticello Avenue			Ridge Street			Ridge Street		
	Left	---	43	43	190	187	197	120	---	---	---	198	285
	Through				---	486	269	---	449	452	---	189	294
	Right				415	559	280						
4: Ridge McIntire Rd/McIntire Rd & Preston Ave	Movement	Preston Avenue			Preston Avenue			Ridge McIntire Road			McIntire Road		
	Left	230	134	218	90	124	124	120	156	157	130	129	129
	Through	---	148	370	---	216	302	---	334	332	---	362	334
	Right	240	23	235	70	61	68	---	---	---	---	332	302
	Maximum queue nearly meets available storage length												
	Maximum queue meets or exceeds available storage length indicating queue spillover												

14 2056 Build Operational Analysis

Operational analysis was performed at each of the study intersections for the Future 2056 Conditions using the methodology described in Section 3 of this report.

14.1 Intersection Operations: 2056 Build Conditions

A traffic operational analysis was conducted using *SimTraffic* to evaluate overall performance of the study intersections and arterial segments within the corridor.

Microsimulation Delay in sec/veh were reported from *SimTraffic* for all the signalized and unsignalized intersections. **Table 41** provides a summary of the AM and PM peak hour delay for each movement for the study intersections along the study corridor. SimTraffic output sheets are provided in the **Appendix D-4**.

Note that intersection delay is reported for each node back to the upstream node in each direction. For closely spaced intersections, delays may be limited due to the short distance between nodes/intersections. The results from **Table 41** suggest that the following intersections operate with an overall delay value that exceeds 35 sec/veh for signalized and 25 sec/veh for unsignalized, which equates to LOS D or greater.

Intersection 1 (SimTraffic Node 1) – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Microsimulation delay of 41.2 sec/veh during the AM peak hour and 70.4 sec/veh during the PM peak hour

Intersection 2 (SimTraffic Node 2) – Parking Lot/4th St NW & W Main St

- Microsimulation delay of 16.7 sec/veh during the AM peak hour and 96.6 sec/veh during the PM peak hour

Intersection 3 (SimTraffic Node 3) – Ridge St & Parking Lot/Monticello Ave

- Microsimulation delay of 47.9 sec/veh during the AM peak hour and 37.5 sec/veh during the PM peak hour

Intersection 4 (SimTraffic Node 4) – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Microsimulation delay of 30.2 sec/veh during the AM peak hour and 60.5 sec/veh during the PM peak hour

Queue length, or the distance to which stopped vehicles accumulate in a lane at an intersection, is another performance measure of intersection operations. Lengthy queues may be indicative of intersection capacity or operational issues, such as absence of or insufficient dedicated turn lanes, inefficient signal timings or phasing. A queuing analysis was completed for the study intersections during the AM and PM peak hours. SimTraffic Maximum Queue Lengths in feet were reported for each lane. These queue lengths are based on an average of 10 simulation runs. **Table 42** provides a summary of the maximum queue lengths during the AM and PM peak hours as compared to the available storage bay lengths. The highlighted queue lengths in **Table 42** are the movements where the reported maximum queue length values either meet or exceed the storage length available for that turning movement. The SimTraffic output sheets including the maximum queue lengths are included in **Appendix D-4**.

The results presented in **Table 42** indicate that several intersection movements are expected to experience heavy demand and queueing. Some of those intersections and the affected movements are summarized below:

Intersection 1 – Ridge St/Ridge McIntire Rd & W Main Street/ W Water Street/South Street W

- Eastbound left-turning movement (storage bay length of 180 ft) showed a maximum queue length of 150 ft during the AM and PM peak periods.
- Eastbound right-turning movement (storage bay length of 160 ft) experienced substantial queuing, reaching 290 ft in the AM peak and 329 ft in the PM peak.
- Westbound left-turning movement (storage bay length of 120 ft) showed a queue length of 100 ft in the AM peak.
- Northbound left-turning movement (storage bay length of 150 ft) showed a queue length of 165 ft in the AM and PM peak.
- Southbound left-turning movement (storage bay length of 145 ft) showed a queue length of 160 ft in the AM and PM peak.

Intersection 2 – Parking Lot/4th St NW & W Main St

- Eastbound left-turning movement (storage bay length of 170 ft) showed a maximum queue length of 140 ft during the AM and PM peak period.

Intersection 3 – Ridge St & Parking Lot/Monticello

- Westbound left-turning movement (storage bay length of 190 ft) showed a queue length of 191 ft in the AM peak and 197 ft in the PM peak.
- Westbound right -turning movement (storage bay length of 415 ft) showed a queue length of 579 ft in the AM peak period.

Intersection 4 – Ridge McIntire Rd/McIntire Rd & Preston Ave

- Eastbound left-turning movement (storage bay length of 230 ft) experienced substantial queuing, reaching 217 ft in the PM peak.
- Eastbound right-turning movement (storage bay length of 240 ft) experienced substantial queuing, reaching 236 ft in the PM peak.
- Westbound left-turning movement (storage bay length of 90 ft) showed a queue length of 124 ft in the AM and PM peak.
- Westbound right-turning movement (storage bay length of 70 ft) showed a queue length of 64 ft and 66 ft in the AM and PM peak.
- Northbound left-turning movement (storage bay length of 120 ft) showed a queue length of 158 ft in the AM peak and 157 ft in the PM peak.
- Southbound left-turning movement (storage bay length of 130 ft) showed a queue length of 129 ft in the AM and in the PM peak.

Table 41: Build (2056) SimTraffic AM and PM Peak Hour Delay (veh/sec)

Intersection Number and Description	Lane Group	Eastbound		Westbound		Northbound		Southbound		Overall	
		AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay	AM Delay	PM Delay
1: Ridge Street at W Main Street/ W Water Street	Movement	W Main Street		W Water Street		Ridge Street		Ridge McIntire Road		Intersection	
	To South St W	28.6	74.9	57.6	92.4	31.1	22.3	48.6	108.2	41.2	70.4
	Left	40.4	74.4	59.1	94.3	119.0	108.8	---	---		
	Through	2.1	0.0	48.2	59.3	44.4	29.1	29.5	106.2		
	Right	11.0	49.2	2.2	3.1	---	---	31.2	109.5		
	Approach	27.3	63.8	31.6	36.3	58.8	41.1	33.9	106.7		
2: W Main Street at 4th St NW	Movement	W Main Street		W Main Street		Parking Lot		4th Street NW		Intersection	
	Left	31.5	151.5	18.3	13.7	20.0	---	23.8	55.4	16.7	96.6
	Through	17.2	163.2	13.7	4.1	21.5	41.5	24.8	54.1		
	Right	14.8	147.7	11.5	2.4	6.7	35.2	12.9	38.3		
	Approach	20.0	161.4	13.4	3.9	15.1	38.0	17.8	46.5		
3: Ridge Street at Monticello Avenue	Movement	Parking Lot		Monticello Avenue		Ridge Street		Ridge Street		Intersection	
	Left	64.1	33.1	123.8	51.5	---	---	12.4	40.4	47.9	37.5
	Through	---	33.1	122.2	---	41.2	59.4	4.4	25.7		
	Right	---	---	108.4	20.9	37.2	49.9	2.8	21.2		
	Approach	64.1	33.1	111.3	33.9	40.8	57.8	7.6	31.0		
4: Ridge McIntire Rd at Preston Avenue	Movement	Preston Avnuee		Preston Avenue		Ridge McIntire Road		McIntire Road		Intersection	
	Left	38.8	37.5	37.0	45.4	28.7	44.0	35.2	171.3	30.2	60.5
	Through	41.7	47.2	41.0	43.2	20.5	35.5	48.2	143.6		
	Right	4.8	46.8	4.9	6.4	2.7	2.7	37.6	112.0		
	Approach	23.2	45.7	35.6	35.9	19.5	30.4	45.2	145.4		

Table 42: Build (2056) SimTraffic AM and PM Peak Hour Delay (veh/sec)

Intersection Number and Description	Lane Group	Eastbound			Westbound			Northbound			Southbound		
		Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	PM Queue (ft)
1: Ridge Street at W Main Street/ W Water Street	Movement	W Main Stret			W Water Street			Ridge Street			Ridge McIntire Road		
	Left	180	149	150	120	100	100	150	165	165	145	160	160
	Through	---	290	329	---	249	311	---	438	339	---	413	724
	Right	160	290	329	350	33	196	---	406	301	---	410	738
2: Parking Lot/4th St NW & W Main St	Movement	W Main Street			W Main Street			Parking Lot			4th Street NW		
	Left	---	329	964	---	324	139	---	55	41	---	149	306
	Through												
	Right												
3: Ridge St & Parking Lot/Monticello Ave	Movement	Parking Lot			Monticello Avenue			Ridge Street			Ridge Street		
	Left	---	36	43	190	191	197	120	---	---	---	212	284
	Through				---	491	351	---	525	606	---	213	300
	Right				415	579	307						
4: Ridge McIntire Rd/McIntire Rd & Preston Ave	Movement	Preston Avenue			Preston Avenue			Ridge McIntire Road			McIntire Road		
	Left	230	118	217	90	124	124	120	158	157	130	129	129
	Through	---	168	652	---	249	330	---	336	332	---	406	751
	Right	240	85	236	70	64	66	---	30	---	---	375	736
	Maximum queue nearly meets available storage length												
	Maximum queue meets or exceeds available storage length indicating queue spillover												

15 2056 Build Pedestrian and Bicycle Analysis

15.1 Level of Traffic Stress Qualitative Analysis Metrics

During the process of updating the vehicular traffic analysis for the Build conditions, the Pedestrian Level of Comfort (PLOC) and Bicycle Level of Traffic Stress (BLTS) analysis were also updated. The same methodology used for existing conditions was also used for the build conditions, which reviews a high-level performance rating of pedestrian and bicycle facilities. The performance rating is based on the level of pressure or strain experienced by pedestrians, bicyclists, and other sidewalk users. This description of the methodology can be seen in **Chapter 4**.

15.1.1 Pedestrian Level of Comfort (PLOC)

15.1.1.1 Segment Analysis

PLOC was assessed for the segments and intersections shown in the Build Condition**. Table 43** provides the PLOC rating for each of the segments analyzed. **Figure 33** shows a map of the locations assessed along with the PLOC segment ratings.

The PLOC improves for the sidewalk on the north side of W. Main given the additional buffer provided by the two-way separated bike lane. The PLOC also improves on W. Water Street with the addition of on-street parking on the north side and the two-way separated bike lane on the south. The PLOC for South Street does not change.

Table 43: Segment BUILD PLOC Rating

Segment	Location	Segment Final PLOC Rating			
		North Sidewalk	South Sidewalk	East Sidewalk	West Sidewalk
3	W Main Street (4th to Ridge)	PLOC 1	PLOC 3	-	-
4	W Water Street	PLOC 2	PLOC 1	-	-
5	South Street W	PLOC 2	PLOC 2	-	-

15.1.1.2 Crossing Analysis

Table 44 provides the Crossing PLOC rating for each of the crosswalks analyzed. At the Ridge Street/W. Main Intersection, the southern crossing and eastern crossings of Water and South show improvement over existing due to the addition of the high visibility crosswalk on the south side of the intersection, improved ADA curb ramps, leading pedestrian intervals, and fewer travel lanes. The pedestrian crossing at the channelized westbound right turn lane near the Federal Court House also improves due to added signalization at that location.

Table 44: Crossing BUILD PLOC Rating

Int #	Crosswalk #	Location	Crossing Final PLOC Rating			
			North Leg	South Leg	East Leg	West Leg
2	9-12	W Main Street (BUS US -250E) at 4th Street NW	PLOC 1	PLOC 1	PLOC 1	PLOC 1
3	13-19	Ridge Street and W Main Street/W Water Street	PLOC 2	PLOC 2	PLOC 1	PLOC 2

15.1.2 Bicycle Level of Traffic Stress (BLTS)

Table 45 includes the segments assessed along with the BLTS segment ratings. Additional BLTS evaluation results for both segments are presented in **Figure 33**. The W. Main Street and W. Water Street segments improve BLTS with the addition of the two-way separated bike lane.

Table 45: BLTS Rating

Int #	Segment #	Location	Segment Final BLTS Rating			
			North	South	East	West
2 to 3	3-5	W Main Street (4th to Ridge)	BLTS 1	N/A	-	-
3	6-7	W Water Street	N/A	BLTS 1	-	-
3	8	South Street West	BLTS 2	BLTS 2*	-	-

*This rating is for the southbound shared bike lane

15.1.3 Analysis Summary

The average rating within this Study Area improved as a result of the proposed improvements largely due to the two-way protected bike lane which separates bicyclists from vehicle traffic and also provides an additional buffer for the pedestrians using the sidewalk on the corresponding side of the street. Additionally, the curb ramp improvements and leading pedestrian intervals make the crossings safer for people walking.

Figure 33: Build (2056) Pedestrian Level of Comfort Analysis Results

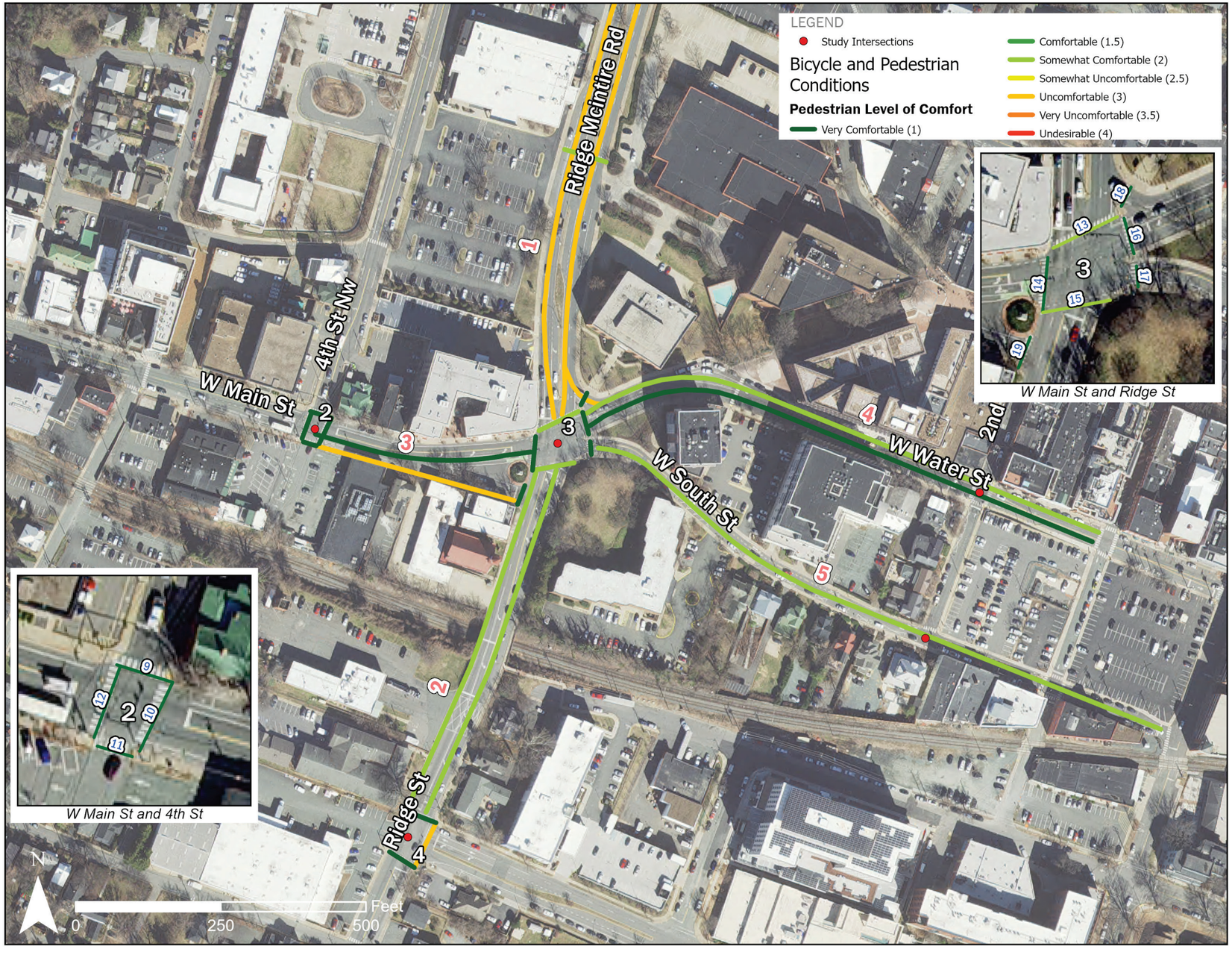


Figure 34: Build (2056) Bicycle Level of Traffic Stress Analysis Results

15.2 HCM Methodology Quantitative Analysis

15.2.1 Pedestrian Level of Service (LOS)

PLOS was assessed at all existing crossings at five (5) signalized intersections. There were twenty (20) crossings that were analyzed. The following criteria were used for the pedestrian methodology:

- "Typical Pedestrian"
  - HCM Methodology reflects the average pedestrian and does not reflect the perception of those with disabilities.
- Target Travel Modes
  - HCM Methodology reflects travel by pedestrian walking across one or more legs of a signalized intersection and does not cover other modes (such as scooters).

Delay in sec/person were reported for all crossings at the signalized intersections. **Table 46** and **Table 47** summarizes the AM and PM peak hour PLOS and delay, respectively, for each crossing at the signalized intersections within the Study Area.

The results from **Table 46** suggest that there are no crossings for the AM peak hour that had an overall PLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 46: Future Build (2056) Pedestrian Level of Service AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.38	B	2.36	B	2.62	C	2.66	C	2.25	B
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.10	B	2.19	B	1.89	B	1.76	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.47	B	1.72	B	2.51	C	2.41	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.11	C	3.03	C	2.67	C	2.80	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	2.34	B	2.57	C	2.54	C	2.76	C		

The results from **Table 47** suggest that there are no crossings for the PM peak hour that had an overall PLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 47: Future Build (2056) Pedestrian Level of Service PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			East Crossing		West Crossing		North Crossing		South Crossing		Northwest Crossing	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	2.27	B	2.18	B	2.67	C	2.62	C	2.14	B
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.18	B	2.23	B	1.86	B	1.73	B		
3	1 - A4	Ridge Street at Monticello Avenue	2.14	B	1.72	B	2.37	B	2.36	B		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	3.02	C	2.77	C	2.64	C	2.67	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	2.23	B	2.30	B	2.53	C	2.72	C		

15.2.1.1 Summary

In summary, all of the PLOS results were LOS C or better. Furthermore, the delay value for all of the signalized intersections is shown in **Appendix D-5**.

15.2.2 Bicycle Level of Service (BLOS)

BLOS was assessed at all existing bicycle lanes for signalized intersections. There were nine (9) crossings that were analyzed. The following criteria were used for the pedestrian methodology:

- Shared or exclusive bicycle lanes
  - HCM Methodology evaluates the service or established bicycle lanes.
- Target Travel Modes
  - HCM Methodology reflects travel by bicycle through the signalized intersection and does not cover other modes (such as motorized bicycles).

Table 48 and **Table 49** summarizes the AM and PM peak hour BLOS and delay, respectively, for each crossing at the signalized intersections within the Study Area. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

The results from **Table 48** suggest that there are no crossings for the AM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

Table 48: Future Build (2056) Bicycle Level of Service for AM Peak Hour

Int #	Existing Crossing #	Location	AM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	0.94	A	2.16	B	N/A	N/A	N/A	N/A	0.56	A
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	1.94	B	1.59	B	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	0.73	A	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.42	B	2.68	C	N/A	N/A	2.56	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.19	C	N/A	N/A	3.24	C	2.44	B		

The results from **Table 49** suggest that there are no crossings for the PM peak hour that had an overall BLOS Score below a C or that exceeded 3.50. This threshold was used because these scores have the potential to increase to unacceptable delays in the future year conditions.

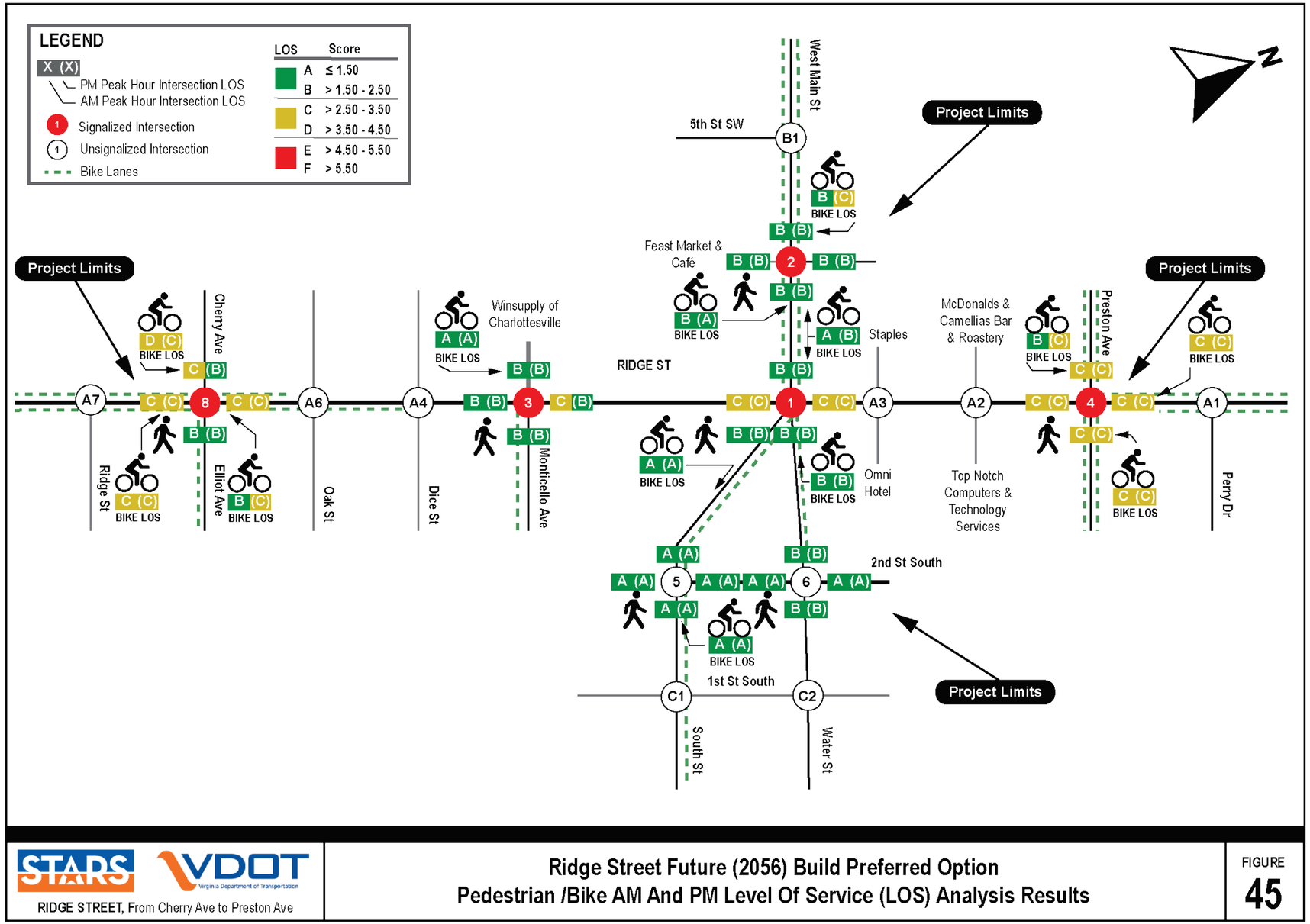
Table 49: Future Build (2056) Bicycle Level of Service for PM Peak Hour

Int #	Existing Crossing #	Location	PM Peak Hour									
			Eastbound Bike Lane		Westbound Bike Lane		Northbound Bike Lane		Southbound Bike Lane		Northwestbound Bike Lane	
			Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
1	3 - A3 & 2-5/6	Ridge Street - W Main Street (BUS US -250) - Water Street	1.54	B	2.31	B	N/A	N/A	N/A	N/A	1.15	A
2	1 - B1	W Main Street (BUS US -250) at 4th Street NW	2.46	B	1.28	A	N/A	N/A	N/A	N/A		
3	1 - A4	Ridge Street at Monticello Avenue	0.73	A	N/A	N/A	N/A	N/A	N/A	N/A		
4	A1 - A2	Ridge McIntire Street (BUS US-250) at Preston Avenue	2.78	C	2.76	C	N/A	N/A	2.52	C		
8	A6 - A7	5th Street SW/Ridge St & Cherry Avenue/Elliot Avenue	3.47	C	N/A	N/A	2.83	C	2.85	C		

15.2.2.1 Summary

In summary, all of the BLOS results were equal LOS C or better. Furthermore, the delay value for all the signalized intersections is a minimum of 18.9 sec/bicycle at eastbound West Main Street and 4th Street and the maximum delay of 38.7 sec/bicycle at westbound Ridge Street, Water Street, and South Street as seen in **Appendix D-5. Figure 35** also includes graphical with color coding the BLOS per crossing for both AM and PM peak hours.

Figure 35: Future Build (2056) Pedestrian and Bicycle Level of Service (LOS) Analysis Results



STARS VDOT Virginia Department of Transportation

RIDGE STREET, From Cherry Ave to Preston Ave

Ridge Street Future (2056) Build Preferred Option
Pedestrian /Bike AM And PM Level Of Service (LOS) Analysis Results

FIGURE 45

16 Planning Level Cost Estimates

16.1 Planning Level Cost Estimates

A Planning level cost estimate was developed for the preferred improvement alternative using the *Culpeper District's Detailed Project Cost Estimate Summary, Version 2.1* and the *VDOT Project Estimate Summary Tool Version 3.0.* The cost estimates included Preliminary Engineering (PE), Right-of -Way (ROW) and Utilities relocation, and Construction (CN) costs.

Table 50 provides a summary of the cost estimates using both tools for the preferred alternative proposed and are expressed in year 2032 dollars. The detailed cost estimates are included in **Appendix D-6**.

The planning level cost estimates were developed to get a preliminary idea of the funding requirements for the proposed improvements.

Table 50: Planning Level Cost Estimate (Year 2032 USD)

Estimating Tool	Location	Cost Estimate			
		Preliminary Engineering (PE)	Right-of-Way/ Utilities (ROW)	Construction (CN)	Total with CEI
VDOT Project Estimate Summary Workbook	Ridge Street/ Ridge McIntire Rd at W Main Street/Water Street	**$1,538,676**	**$293,082**	**$7,814,626**	**$9,646,385**
VDOT Pre-Quantity Tool (PQT)	Ridge Street/ Ridge McIntire Rd at W Main Street/Water Street	**$2,106,000**	**$445,500**	**$11,025,200**	**$13,576,700**

17 Crash Reduction Analysis

A crash reduction analysis was conducted for the intersection of Route 104 (Ridge Street/Ridge McIntire Road) and Route 250 (West Main Street). As part of the crash reduction methodology, the SMART SCALE Round 6 CMF list, the VA State Preferred CMF List, *Crash Modification Factor Clearinghouse*[7], and the *FHWA Desktop Reference for Crash Reduction Factors*[8] were utilized to calculate the crash reduction associated with the proposed improvements. The Crash Modification Factors (CMFs) were applied to crashes from the study period, November 1st, 2019, to October 31st, 2024, from the *VDOT Crashtools Database*[9] to determine the expected number of crashes and the percent reduction in crashes for the alternative.

The expected crash reduction was also monetized using *VDOT's Virginia Traffic Crash Costs*[10] to compare the benefits of crash savings with the construction costs.

17.1 Analysis Methodology

The following sections describe the methodology that was used to determine the crash expectancy and cost savings associated with the proposed modifications.

17.1.1 Proposed Roadway Modifications and CMFs

CMFs were selected based on proposed improvements in the preferred alternative. CMFs were selected based on factors such as applicability and quality. Though CMFs for improvements may exist, studies used to generate CMFs are site-specific and must match all factors to the study area. Factors that influence the applicability of CMFs include, but are not limited to, roadway volumes, number of lanes, and surrounding area type. CMFs collected from the *Crash Modification Factor Clearinghouse* also provide a level of star quality that influences selection. Roadway modifications without designated CMFs did not reduce crashes in the analysis; these improvements are not expected to affect crash rates.

Crash Reduction Factors (CRFs) are percentages that illustrate the benefits of proposed improvements. CRFs are calculated by subtracting 1 from the CMF. This number is then multiplied by 100 to find the reduction percentage. CRFs are used in reporting to provide a clearer explanation of the impact of a proposed improvement on related crashes. **Equation 1** below shows the formula for calculating CRFs.

Equation 1. Crash Reduction Factor Calculation

$$CRF = (1 - CMF) * 100$$

The **Appendix D-6** includes the following: 1) the countermeasures proposed, 2) categories of countermeasures obtained from the *CMF* sources, 3) applicable crash type and severity, 4) percent of applicable crashes, and 5) notes for selected CRFs.

17.1.2 Applicable Crashes

To determine the impact of the Build improvements on expected crashes, an evaluation of historical crash data (11/01/2019 – 10/31/2024) was conducted. Generally, improvements are unlikely to reduce the frequency of all crashes at a location. As an example, pedestrian-related improvements, such as adding ADA Curb Ramps, would not be expected to reduce vehicle-related crashes. The CMF only applies to pedestrian or bicycle crashes in the specific area of the improvement. Historical crash data was analyzed during the existing conditions phase of the project, including the creation of crash maps and diagrams to help determine the cause of each crash and the applicability of the CMFs.

Crashes over the five years were divided by five to determine the average annual number of crashes at the intersection. This was used as a benchmark (*No Build*) to compare the effects of the improvements on the *Build* conditions. Applicable crashes were multiplied by the CMF to determine the new expected crashes. To calculate the average annual crashes for the Build condition, crash reductions and unaffected crashes were summed.

17.1.3 General Assumptions

Clearinghouse

- CRFs having studies with 3 stars or better were used for application.
- Only applicable and relevant CRF factors were utilized for respective countermeasures. If no applicable category was found, the FHWA Desktop Reference was used. If an applicable CRF was not provided in either source, no CMF was utilized and is shown by N/A in reporting.

FHWA Desktop Reference for Crash Reduction Factors

- Only applicable and relevant CRF factors were utilized for respective countermeasures. If no applicable category was found, no CMF was used and is shown by N/A in reporting.
- Based on the overall setting and city, it was assumed this area was urban.

Crash Reduction Analysis

- Expected crash reductions were compared to existing crash data to determine if the alternatives improved safety.
- Cost savings were determined based on the difference between existing crash costs and expected crash costs.

17.2 Analysis Results

The total crash reduction values for the preferred alternative are provided in **Table 51**. Calculations of specific improvements and their reductions in crashes are presented in the **Appendix D-7**.

[7] Federal Highway Administration (2017). Crash Modification Factors Clearinghouse. Washington, DC. Retrieved from http://www.cmfclearinghouse.org/.

[8] Federal Highway Administration. (2014). *Desktop Reference for Crash Reduction Factors*. Washington, DC. Retrieved from https://safety.fhwa.dot.gov/tools/crf/resources/fhwasa08011/.

[9] Virginia Department of Transportation. (2017). *Crash Analysis Tool*. Retrieved from https://public.tableau.com/profile/tien.simmons#!/vizhome/Crashtools8_2/Main.

[10] Virginia Department of Transportation. (2025). Virginia Traffic Crash Costs. Retrieved from https://www.vdot.virginia.gov/media/vdotvirginiagov/about/strategic-highway-safety-plan/VDOT-Crash-Costs-Memo-2024_10252024_508c_acc08182025_RM.pdf.

Table 51: Total Crash Reduction

Alternative	Improvements	Total Crashes/Year	Injury Crashes/Year
No Build	N/A	5.4	2.8
One-Way Conversion with Cycle Track	Straighten right-turn lane	4.56	2.13
	Convert to High-Visibility Crosswalk		
	Leading Pedestrian Interval		
	One-Way Conversion		
	Protected Left-turns		
	No Rights On Red		
	Addition of Cycle Track		
	Optimize Signals		

17.2.1 Benefit-Cost Ratio

The benefit of a project is calculated by using *Virginia Specific Crash Costs*. These costs are updated frequently to remain as accurate as possible. The updated costs released in August of 2025 were used in this analysis. Costs are assigned to crash severities, and costs increase as the severity of the crash increases. Comprehensive crash costs are presented in **Table 52**. The difference in crash costs between the *No Build* scenario and the *Build* scenarios is the annual project benefit. Roadway modifications have a service life before replacement or extreme maintenance is needed. The yearly project benefit is multiplied by the service life to determine the total benefit of the improvement.

Table 52: VDOT's Virginia Specific Crash Costs (2025)

Crash Severity	Comprehensive Crash Costs
K	$16,842,856
A	$985,207
B	$325,011
C	$188,599
PDO	$17,130

The total benefit of the Build scenario is then compared to the preliminary cost estimate. This helps determine the return on investment. A ratio of one (1) or above indicates that the crash savings have covered the construction costs. The benefit below is the sum of the benefits of the combined set of improvements for the alternative. **Table 53** displays the Benefit-Cost Ratio.

Preliminary costs were estimated using the Culpeper District's Detailed Project Cost Estimate Summary and VDOT's Project Estimate Summary tool. This provided a range of $9 million - $14 million for construction costs. Benefit-cost ratios for both estimates are provided in the table below**.** The more conservative estimate has a benefit-cost ratio of 0.69, while the higher cost estimate has a ratio of just under 0.5. While the entire project cost is not covered by the benefit score, approximately half of the construction costs could be covered by crash savings.

Table 53: Benefit Cost Ratio for the Preferred Alternative

Scenario	Benefit	Cost	Benefit-Cost Ratio
Preferred Alternative	$6,674,441.89	$9,646,385	0.69
		$13,576,700	0.49

18 Conclusions And Recommendations

The STARS Ridge Street and W Main Street/ W Water Street Intersection Study identifies operational, safety, access management and congestion issues along the corridor. This study also evaluates potential mitigation measures and improvement alternatives to address those issues. This study should be used as a planning level document to establish the next steps of planning, programming, designing and constructing the identified safety, operational and access management improvements within the corridor. Following are the specific steps that may be followed:

18.1.1.1.1 Gain Consensus and Prioritize Improvements

It is recommended to conduct outreach meetings with stakeholders who were not part of the SWG of this study to gain their consensus on the proposed candidate improvement alternatives. Prioritization of the improvements is suggested by considering the following factors:

- Benefit-Cost
- Local/District Preference
- Safety Benefits
- Operational Benefits
- Geometric Improvements
- ROW Impacts

18.1.1.1.2 Prepare Projects for Advancement

Upon identifying and prioritizing the improvements at the regional level, the projects with the highest priority should be advanced to be included in the following plans:

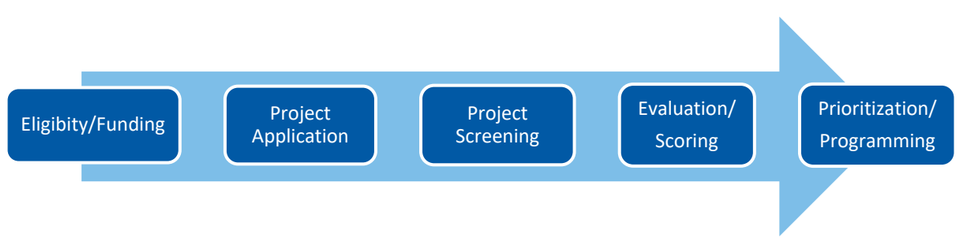
- Constrained Long Range Transportation Plan (CLRP)
- Transportation Improvement Plan (TIP)
- Statewide Transportation Improvement Plan (STIP)
- VDOT Six-Year Improvement Program (SYIP)

18.1.1.1.3 Secure Funding

There are several funding sources or revenue sharing programs that can be tapped into to fund the improvements identified in this study:

18.1.1.1.4 SMART SCALE

Virginia's SMART SCALE process facilitates selecting the right transportation projects for funding and ensuring the best use of limited tax dollars. It includes five overreaching steps as depicted below:



Per the SMART SCALE Technical Guide, the scoring process evaluates, scores and ranks projects based on congestion mitigation, economic development, accessibility, safety, environmental quality and land use factors. The location of the project determines the weight of each of these scoring factors. For the projects in the Culpeper District (Category B), the scoring factors with the highest weight are:

- Congestion Mitigation (25%)
  - Congestion mitigation is weighted highest among the factors in the prioritization process
- Accessibility (25%)
- Safety (20%)
- Environmental Quality (10%)
- Economic Development (20%)

All the improvement alternatives identified in this study are candidate projects for SMART SCALE funding. Several of these projects can also be packaged together into one SMART SCALE application to achieve better project score and to recognize cost savings associated with completing the projects concurrently.

The SMART SCALE funding may be accompanied by other sources of funding as listed below:

- Construction District Grants Program (DGP)
- High Priority Projects Program (HPPP)
- Congestion Mitigation and Air Quality Funding (CMAQ)
- Regional Surface Transportation Block Grant Program (RSTBG)
- Revenue Sharing
- Transportation Alternatives (TA) Set-Aside Funds
- Highway Safety Improvement Program (HSIP) and Other Safety Program Funds
- Tele-fees and Unpaved Road Related Funds
- State of Good Repair

SMART SCALE projects can be submitted by regional entities including counties, cities and towns that maintain their own infrastructure. Once the project has been screened, scored and selected for funding by the Commonwealth Transportation Board (CTB), it remains in the SYIP as a funding priority.

18.1.1.1.5 Project Completion

Once the funding is secured and improvements are ready for construction, the projects should be advanced and implemented with close coordination among the affected stakeholders in the region.