US 52

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BCDCOG US 52 Corridor Study

Traffic Analysis Summary Report & Short-Term Recommendations

Berkeley and Charleston Counties, South Carolina

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Prepared for
BCDCOG

Prepared by

1 Introduction

The US 52 corridor is an important connection between North Charleston, Goose Creek and Moncks Corner and is poised for consequential growth and development. Its proximity to Charleston and North Charleston makes it attractive for both residential and employment development. The population within the corridor is anticipated to increase by approximately 70 percent between 2020 (21,000 residents) and 2040 (36,000), increasing the demand for upgraded infrastructure and additional residences[1].

The US 52 corridor's character changes dramatically along the approximate 18 miles between US 17 Alt. in Moncks Corner and US 78 in North Charleston. The corridor's character has evolved over the many decades of community growth, with roadway improvements completed between 1958-1973. Subsequent intersection improvements at Stephanie Drive, Hollywood Drive, Old Fort Road, and US 176 followed in the 1980s and 1990s.

The US 52 corridor is identified as part of a High-Capacity Transit (HCT) network for the region and is recommended for future Bus Rapid Transit (BRT). This future transit investment will enhance resident's quality of life and support economic growth for the region.

The *US 52 Corridor Study* area, shown in Figure 1-1, is located in Berkeley and Charleston counties and extends approximately 18 miles between the intersection of US 78 (University Boulevard) in North Charleston and US Highway 17 Alt. and Rembert C. Dennis Boulevard in Moncks Corner. The study area also encompasses the approximately 12-mile parallel roadway along Old US 52 and Rembert C. Dennis Boulevard/US 52 Bypass in Moncks Corner.

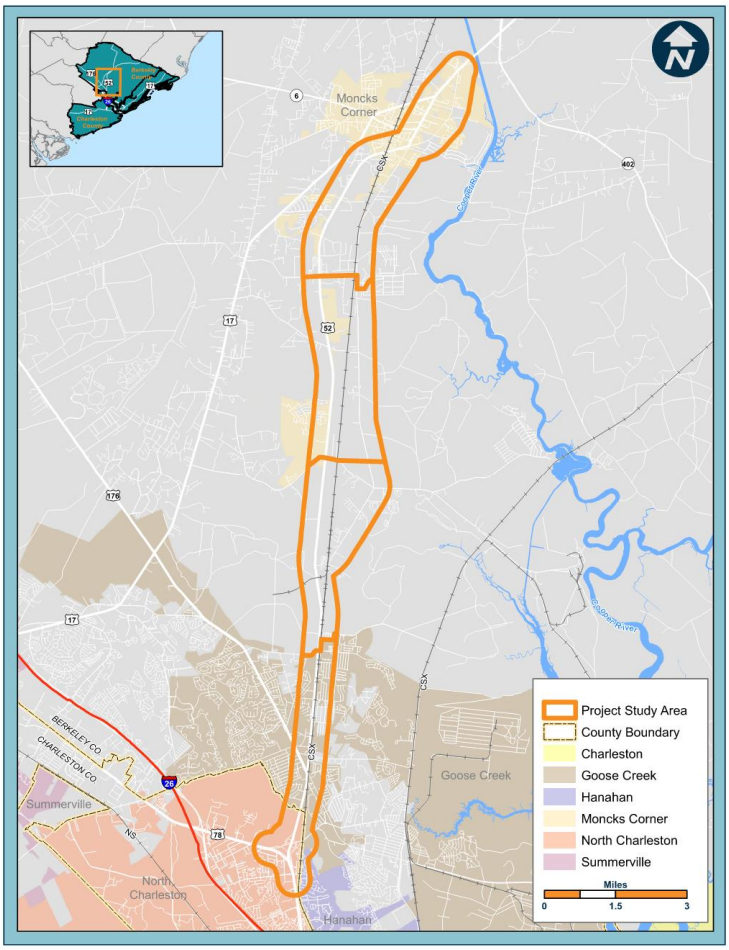

Figure 1-1: Project Study Area

[1] CHATS Travel Demand Model

2 Traffic and Safety Analysis

This Section summarizes the traffic data collection and analyses performed for the assessment of existing conditions within the project study area.

Data Collection

The following data collection activities were performed within the study area.

Network Inventory

The existing roadway and intersection geometrics, speed limits and traffic control were inventoried throughout the US 52 corridor.

US 52 has multiple names throughout the project corridor. In Moncks Corner, it is known as 'N US Hwy 52'. Between its intersection with Old US 52/Rembert C Dennis Boulevard and Goose Creek, the road is known as 'US 52'. In Goose Creek, it is named 'N Goose Creek Boulevard' to the north of Red Bank Road and 'S Goose Creek Boulevard' from Red Bank Road to the Charleston County line. In Charleston County, US 52 is named 'Rivers Avenue'.

US 52 enters the Town of Moncks Corner at the north end of the study area as a four-lane section with a paved center median and a posted 45 miles per hour (mph) speed limit. Approximately 1,100 feet north of the signalized intersection with Reid Hill Road/Rembert C Dennis Boulevard, the speed limit changes to 40 mph. Beginning at its intersection with Dock Road, the paved median is re-striped as either dedicated left turn lanes or as a two-way left turn lane to separate turning traffic from through traffic at various intersections and driveways. US 52 is also designated as US Route 17 Alt north of its intersection with N Live Oak Drive (US 17Alt).

At the intersection of Rembert C. Dennis Blvd and Old US 52, US 52 curves to the southwest as a four-lane roadway with a grass median. The speed limit increases to 45 mph approximately 200 feet east of the railroad bridge and approximately 1,700 feet northeast prior to exiting the Moncks Corner town limits near Merrimack Boulevard (S-8-978).

After exiting Moncks Corner, the road curves to the south. The speed limit increases to 60 mph approximately 225 feet south of its intersection with Wigfall Street/Hopkins Drive. Continuing to the south, it continues as a four-lane roadway divided with a grass median. Periodically, a third lane will develop that functions as a storage lane for left turn/u-turn median crossovers.

An at-grade railroad crossing is present approximately 1,350 south of the Old Fort Road (Old US 52) intersection. This crossing is for a railroad spur line to the Century Aluminum Company. The speed limit drops to 55 mph approximately 4,550 feet south of the railroad crossing. This location is where a single-track railroad line begins to run parallel to US 52. The railroad will continue to run parallel in close proximity to US 52 for approximately three miles, crossing streets which intersect the roadway from the east between Pine Grove Road and Red Bank Road.

US 52 enters the City of Goose Creek near Old Mount Holly Road. The speed limit drops to 50 mph approximately 500 feet south of the Windsor Mill Road/Stephanie Drive intersection and to 45 mph approximately 1000 feet north of the Central Avenue intersection.

The roadway changes from a four-lane grass median divided roadway to a six-lane roadway approximately 400 feet north of the Button Hall Avenue intersection and continues as a six-lane roadway with a center two-way left turn lane south of this intersection.

US 52 enters Charleston County and the City of North Charleston as a six-lane road with a 50-mph posted speed limit. A short segment of curbed grass and concrete median is present approaching the bridge over Goose Creek and continues southbound through the US 78 interchange. The speed limit drops to 45 mph south of the interchange and becomes an eight-lane section with a curbed median to the Otranto Road intersection.

Old US 52 runs generally parallel to US 52 for approximately 9.7 miles between its intersection termini. At the north end of Old US 52, the roadway transitions in 800 feet from a four-lane section to a two-lane undivided section with a 40-mph posted speed limit. The speed limit increases to 55 mph approximately 2,350 feet south of its northern terminus. The two-lane, 55 mph section continues until it widens to provide a paved, striped median approximately 950 feet north of its signalized intersection with Cypress Gardens Road. South of Cypress Gardens Road, the roadway continues to the south with a two-lane section with a striped median. The speed limit is reduced to 45 mph approximately 600 feet south of Cypress Gardens Road (just north of Man O War Lane). It transitions back to an undivided two-lane section approximately 750 feet south of its intersection with Old Cypress Plantation Road/Colony Post Loop and continues in this way to its southern terminus.

Rembert C Dennis Boulevard (US 52 Bypass) runs generally parallel to US 52 for approximately two miles. Starting at its northern terminus at its intersection with US 52 opposite Reid Hill Road in Moncks Corner, Rembert C Dennis Boulevard runs for approximately 1,200 feet as a two-lane roadway with a striped paved median with a posted 45 mph speed limit before continuing south as a two-lane undivided roadway to its southern terminus with US 52/Old US 52.

Non-Traditional Intersection Control

The intersection of US 52 with Oakley Road (S-8-50) is an unsignalized 'R-Cut' intersection as shown in Figure 2-1. R-Cut intersections are an alternative to traditional intersections that allow left turn and through movements from side streets. At an R-Cut intersection, traffic that would normally turn left from the side streets, or that would travel straight across are instead required to turn right to make use of a u-turn downstream As shown below, the R-Cut u-turns on US 52 are located approximately 800 feet to the north and south of the Oakley Road intersection.

Figure 2-1: R-Cut Intersection

Crash Data

Crash Data was obtained from the South Carolina Department of Transportation (SCDOT) Safety Office for the period between January 1, 2015 and June 30, 2020 for the US 52 corridor and for the intersecting routes.

Traffic Volume Data

A wide range of traffic volume data was obtained throughout the corridor. Traffic volume data included current and historic turning movement counts, historic and current SCDOT Average Annual Daily Traffic, SCDOT Automatic Traffic Recording (ATR) stations, vehicle classification/speed, and travel time/delay.

Existing Turning Movement Counts

Turning movement count data were collected in 15-minute intervals during the morning peak period (6:00 to 9:00 AM) and afternoon peak period (4:00 to 7:00 PM) on Tuesday, October 27, 2020 or Wednesday, October 28, 2020 at the following signalized intersections:

- US 52 at Reid Hill Road (S-8-1173)/Rembert C Dennis Boulevard (US 52 Bypass)
- US 52 at N Live Oak Drive (US 17 Alt)
- US 52 at E Main Street (SC 6)/Main Street Extension (S-8-1072)
- US 52 at Altman Street (S-8-43)
- US 52 at Old US 52/Rembert C Dennis Boulevard
- US 52 at Gaillard Road (S-8-357)
- US 52 at Cypress Gardens Road (S-8-9)
- US 52 at Google Driveway
- US 52 at Old US 52
- US 52 at (S-8-45) Old Mt Holly Road /Montague Plantation Road
- US 52 at Windsor Mill Road/Stephanie Drive (S-8-400)
- US 52 at Hollywood Drive (S-8-281)
- US 52 at Central Avenue (S-8-1109)
- US 52 at Button Hall Avenue (S-8-644)
- US 52 at (S-8-529) Thomason Boulevard /Liberty Hall Road
- US 52 at St James Avenue (US 176)/Red Bank Road (S-8-37)
- US 52 at Otranto Road (S-10-542E)
- Rembert C Dennis Boulevard at Stoney Landing Road (S-8-316)/(S-8-1243)
- Rembert C Dennis Boulevard at Main Street Extension (S-8-1072)/Sterling Oaks Road
- Old US 52 at Cypress Gardens Road (S-8-9)

Turning movement count data was also collected between 6:00 AM and 7:00 PM for the following unsignalized intersections:

- US 52 at Tom Hill Road (entrance to Mt Holly Commerce Park)
- Old US 52 at Gaillard Road (S-8-357)
- University Boulevard (US 78) at Old University Boulevard (S-10-821)
- Goose Creek Road (US 78) at N.A.D. Road (S-10-2533)

Based on the cumulative turning movement traffic count data, the study area morning peak hour was between 7:00 and 8:00 AM and the afternoon peak hour was between 4:45 and 5:45 PM. The turning movement traffic count data are contained in the Traffic Technical Report, submitted separately.

Historic Turning Movement Counts

Adjustments to existing traffic volumes were anticipated to be necessary to account for reduced traffic under the current pandemic. Available historic turning movement counts were obtained from SCDOT District 6 to assist in evaluating potential adjustments to reflect pre-pandemic conditions.

Vehicle Classification and Speed Counts

Vehicle classification and speed counts were collected on Tuesday, October 27, 2020 on US 52 south of Mt Holly Plantation Lane.

The daily, morning and afternoon peak hour total heavy vehicle percentages, the percentage of Single Unit vehicles (FHWA classifications 4-7) and percentage of Semi/Tractor-Trailer (FHWA classifications 8-13) are shown for the two-way, northbound and southbound directions in **Table 2-1**.

Table 2-1: Heavy Vehicle Percentages- US 52 South of Mt. Holly Plantation Lane

	Daily			AM Peak			PM Peak		
	Total	Single Unit	Semis	Total	Single Unit	Semis	Total	Single Unit	Semis
Two-way	20.5%	18.4%	2.1%	20.4%	18.2%	2.2%	17.0%	16.3%	0.7%
Northbound	26.5%	24.1%	2.4%	30.1%	26.6%	3.5%	21.7%	20.9%	0.8%
Southbound	14.3%	12.4%	1.9%	13.5%	12.0%	1.5%	11.0%	10.4%	0.6%

The daily, morning and afternoon 10-mph speed ranges in which the 85th-percentile speed falls and the percentage of total traffic traveling at less than 70 mph at the count location are shown in **Table 2-2**.

Table 2-2: 85th Percentile Speed Ranges- US 52 South of Mt. Holly Plantation Lane

85th Percentile Speed Range (mph)			
	Daily	AM Peak	PM Peak
Two-way (85th %)	70-80	70-80	70-80
% < 70 mph	72%	65%	77%
Northbound (85th %)	60-70	70-80	60-70
% < 70 mph	85%	81%	89%
Southbound (85th %)	70-80	70-80	70-80
% < 70 mph	58%	54%	62%

Vehicle count, classification and speed counts were also performed on the eight ramps at the US 52/US 78 interchange location in the southern end of the corridor in Charleston County.

Vehicle count, classification, and speed counts were performed at the following locations on other major arterials within the study area:

- Rembert C Dennis Boulevard west of Edwards Drive
- US 52 west of Old US 52/Rembert C Dennis Boulevard
- Old US 52 south of Dairy Farm Road
- Old US 52 east of Concrete Lane

- US 52 between the US 78 interchange and Camelot Drive

Table 2-3 summarizes the combined and direction heavy vehicle percentages at these locations.

The 85th percentile speeds for mainline traffic at the various locations are as follows:

- Rembert C Dennis Boulevard west of Edwards Drive (between 46 and 50 mph)
- US 52 west of Old US 52/Rembert C Dennis Boulevard (between 51 and 55 mph)
- Old US 52 south of Dairy Farm Road (between 56 and 60 mph)
- Old US 52 east of Concrete Lane (between 56 and 60 mph)
- US 52 between the US 78 interchange and Camelot Drive (between 56 and 60 mph)

Rembert C Dennis West of Edward Drive									
	Daily			AM Peak			PM Peak		
	Total	Single Unit	Semis	Total	Single Unit	Semis	Total	Single Unit	Semis
Two-way	9.3%	7.2%	2.1%	11.7%	8.9%	2.8%	5.8%	5.5%	0.3%
Eastbound	9.9%	7.6%	2.3%	13.6%	9.8%	3.8%	6.8%	6.5%	0.3%
Westbound	8.3%	6.6%	1.7%	9.6%	7.7%	1.9%	4.2%	4.2%	0.0%
US 52 West of Old US 52									
	Daily			AM Peak			PM Peak		
	Total	Single Unit	Semis	Total	Single Unit	Semis	Total	Single Unit	Semis
Two-way	8.4%	6.1%	2.3%	11.3%	8.1%	3.2%	4.9%	3.6%	1.3%
Eastbound	6.8%	4.7%	2.1%	8.5%	5.8%	2.7%	3.0%	1.5%	1.5%
Westbound	10.1%	7.5%	2.6%	13.7%	10.1%	3.6%	4.9%	3.8%	1.1%
Old US 52 South of Dairy Farm Road									
	Daily			AM Peak			PM Peak		
	Total	Single Unit	Semis	Total	Single Unit	Semis	Total	Single Unit	Semis
Two-way	11.2%	9.2%	2.0%	15.1%	11.8%	3.3%	9.9%	7.9%	2.0%
Northbound	12.0%	9.8%	2.2%	16.2%	13.7%	2.5%	9.2%	7.7%	1.5%
Southbound	10.8%	8.7%	2.1%	12.1%	10.2%	1.9%	10.4%	7.3%	3.1%
Old US 52 East of Concrete Lane									
	Daily			AM Peak			PM Peak		
	Total	Single Unit	Semis	Total	Single Unit	Semis	Total	Single Unit	Semis
Two-way	10.9%	9.8%	1.1%	14.6%	12.4%	2.2%	9.4%	8.7%	0.7%
Eastbound	8.3%	7.3%	1.0%	13.6%	11.2%	2.4%	6.8%	6.1%	0.7%
Westbound	13.7%	12.5%	1.2%	14.5%	12.7%	1.8%	13.8%	12.9%	0.9%
US 52 South of Camelot Drive									
	Daily			AM Peak			PM Peak		
	Total	Single Unit	Semis	Total	Single Unit	Semis	Total	Single Unit	Semis
Two-way	12.3%	6.8%	5.5%	13.9%	7.7%	6.2%	11.8%	5.9%	5.9%
Northbound	11.9%	6.4%	5.5%	12.9%	6.5%	6.4%	11.8%	6.3%	5.5%
Southbound	12.5%	7.2%	5.3%	14.8%	9.8%	5.0%	12.3%	6.0%	6.3%

Table 2-3: Heavy Vehicle Summary- Multiple Locations

Travel Time/Delay

Travel time and delay information throughout the corridor were obtained during the morning and afternoon peak periods on the following days:

- Tuesday October 27, 2020
- Wednesday, October 28, 2020
- Wednesday, November 11, 2020

- Thursday, November 12, 2020
- Tuesday, November 17, 2020

Fourteen separate travel time runs were performed in each direction along the entire 18.5-mile long corridor. Eighteen checkpoints were set up in each direction along US 52, dividing the corridor into 17 segments. The length of these segments ranged from 0.10 miles to 3.85 miles.

Northbound US 52

Five travel time runs were performed along northbound US 52 during the morning peak period and nine runs were performed during the afternoon peak period.

During the morning peak period, the average speed to travel the entire corridor in the northbound direction was 40.8 mph. There were several segments where the vehicles stopping and/or dealing with traffic congestion resulted in noticeable reductions in average travel speed. The average speeds in these select locations were approximately 20 to 50% slower than the average:

- Otranto Road to Red Bank Road (19.6 mph)
- Red Bank Road to Liberty Hall Road (32.0 mph)
- Heatley Street to Main Street (30.7 mph)
- Live Oak Drive to Reid Hill Road (21.8 mph)

During the afternoon peak period, the northbound average speed throughout the corridor was 37.8 mph. The average speeds in these select locations were approximately 25 to 60% slower than the average:

- Approaching Otranto Road (14.9 mph)
- Otranto Road to Red Bank Road (28.6 mph)
- Red Bank Road to Liberty Hall Road (16.6 mph)
- Windsor Mill Road to Old Mt Holly Road (25.3 mph)
- Old Mt Holly Road to Old Fort Road (26.8 mph)
- Heatley Street to Main Street (20.1 mph)
- Main Street to Live Oak Drive (24.4 mph)
- Live Oak Drive to Reid Hill Road (27.1 mph)

Locations along US 52 where northbound traffic encountered long delays were:

- Red Bank Road (AM and PM)
- Liberty Hall Road (PM)
- Old Mt Holly Road (PM)
- Old US 52 (PM)
- Reid Hill Road (AM and PM)

Southbound US 52

Ten travel time runs were performed along southbound US 52 during the morning peak period and five runs were performed during the afternoon peak period.

During the morning peak period, the average speed to travel the entire corridor in the southbound direction to traverse the entire corridor was 43.9 mph. There were several segments where the vehicles stopping and/or dealing with traffic congestion resulted in noticeable reductions in average travel speed. The average speeds in these select locations were approximately 12 to 65% slower than the average:

- Approaching Reid Hill Road (23.2 mph)
- Live Oak Drive to Main Street (29.7 mph)
- Main Street to Heatley Street (26.7 mph)
- Heatley Street to Old US 52 (31.6 mph)
- Old Fort Road to Old Mt Holly Road (38.8 mph)
- Button Hall Road to Liberty Hall Road (14.8 mph)
- Liberty Hall Road to Red Bank Road (24.0 mph)

During the afternoon peak period, the southbound average speed throughout the corridor was 40.7 mph. The average speeds in these select locations were approximately 15 to 75% slower than the average:

- Approaching Reid Hill Road (19.4 mph)
- Reid Hill Road to Live Oak Drive (31.5 mph)
- Live Oak Drive to Main Street (27.6 mph)
- Main Street to Heatley Street (18.8 mph)
- Heatley Street to Old US 52 (29.7 mph)
- Hollywood Drive to Central Avenue (34.7 mph)
- Central Avenue to Button Hall Road (23.7 mph)
- Button Hall Road to Liberty Hall Road (10.5 mph)
- Liberty Hall Road to Red Bank Road (11.6 mph)

Locations along US 52 where southbound traffic encountered long delays were:

- Main Street (PM)
- Heatley Street PM)
- Old Mt Holly Road (AM)
- Liberty Hall Road (PM)
- Red Bank Road (PM)

At-Grade Railroad Crossings

Where at-grade rail crossings are in close proximity to a signalized intersection, railroad preemption is often included in the signal operation. Railroad preemption is a special traffic operation that, when track equipment detects a train approaching the crossing, interrupts the normal signal operation to transition to a special signal phase to clear traffic from the intersection approach with the rail crossing. Once that phase is completed, the signal under preemption will run modified phasing that serves the other intersection approaches, though some phases, (such as protected left turn phases) that would bring vehicular traffic into conflict with the at-grade crossing will be skipped. Special 'blank-out' signs displaying 'no left turn' or 'no right turn' symbols are often used at intersections incorporating railroad preemption. The intersections along US 52 have exclusive left turn phases to control left turns onto the side street and either "no right turn" blank-out signs or railroad gates across the right turn ramps. The intersection of US 52 at Button Hall Avenue has permissive left turn phasing and a "no left turn" blank-out sign in the southbound direction.

The following signal-controlled intersections along US 52 include an eastern approach and incorporate railroad preemption:

- Old Mt Holly Road/Montague Plantation Road
- Windsor Mill Road/Stephanie Drive
- Hollywood Drive

- Button Hall Avenue
- Thomason Boulevard/Liberty Hall Road
- St James Avenue (US 176)/Red Bank Road

The signal at US 52 and Google Driveway is maintained by a contractor for Google for the last six years. This signal is intended to be a temporary signal that will be removed at an appropriate time in the future.

Previous Studies within the Corridor

The *US 52 at US 176 Interchange Concept Report*, prepared for Berkeley County evaluated existing intersection operational and geometric deficiencies and traffic operations for conceptual design alternatives, including a partial cloverleaf interchange, single point urban interchange, and tight urban diamond interchange. No preferred alternative was identified in the Concept Report.

Existing Conditions Analysis

Crash Analysis

SCDOT provided crash data from January 1, 2015 to June 30, 2020 (5.5 years) along the US 52 corridor, including the intersecting arterial roadways, interchanges, and frontage roads within Berkeley and Charleston Counties. During this time period, a total of 4,420 crashes occurred within the study limits. The study corridor was broken down into five segments, each approximately 3 to 4 miles in length to cover the full 18-mile corridor:

- Segment 1: From South of Otranto Road to North of Stephanie Drive
- Segment 2: From North of Stephanie Drive to North of Tom Hill Drive
- Segment 3: From North of Tom Hill Drive to South of Gaillard Road
- Segment 4: From South of Gaillard Road to South of Rembert C. Dennis Blvd
- Segment 5: From South of Rembert C. Dennis Blvd to North of Reid Hill Road

Table 2-4 provides a summary of the available crash data for each segment by year, severity, manner of collision, lighting, and roadway surface.

Crash Data Categories	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Total
Crashes by Year						
2015	473	87	29	18	8	**615**
2016	439	111	27	10	5	**592**
2017	449	123	32	21	15	**640**
2018	556	152	93	68	156	**1025**
2019	628	153	102	79	152	**1114**
2020 (Jan-Jun)	239	60	33	35	67	**434**
Total	**2784**	**686**	**316**	**231**	**403**	**4420**
Crashes by Severity						
Inj. 0 - No Injury	2125	508	214	147	289	**3283**
Inj. 1 - Possible Injury	457	137	67	63	99	**823**
Inj. 2 - Non-incapacitating Injury	169	36	21	14	10	**250**
Inj. 3 - Incapacitating Injury	27	5	10	5	4	**51**
Inj. 4 - Fatality	5	0	4	2	1	**12**
Unknown	1	0	0	0	0	**1**
Total	**2784**	**686**	**316**	**231**	**403**	**4420**
Crashes by Manner of Collision						
Rear End	1514	429	92	92	144	**2271**
Angle	623	97	83	53	180	**1036**
Side Swipe	434	70	29	20	45	**598**
Not a Collision w/ Motor Vehicle	134	78	100	58	18	**388**
Head On	28	4	8	6	9	**55**
Backed Into	34	7	3	2	7	**53**
Pedestrian/Bicycle	13	0	0	0	0	**13**
Unknown	4	1	1	0	0	**6**
Total	**2784**	**686**	**316**	**231**	**403**	**4420**
Crashes by Lighting						
Dawn	74	34	11	10	6	**135**
Daytime	2079	483	190	154	317	**3223**
Dusk	68	10	4	11	9	**102**
Dark	563	159	111	56	71	**960**
Total	**2784**	**686**	**316**	**231**	**403**	**4420**
Crashes by Roadway Surface						
Dry	2343	552	271	192	352	**3710**
Wet	437	132	41	38	50	**698**
Ice	1	2	4	1	1	**9**
Snow	2	0	0	0	0	**2**
Contaminate	1	0	0	0	0	**1**
Total	**2784**	**686**	**316**	**231**	**403**	**4420**

Table 2-4: Crash Data Analysis (January 2015-June 2020)

As shown above, the most southern segment of the study corridor (Segment 1) accounts for 63 percent of the crashes within the study area. Additionally, there was a significant spike in crashes between 2017 and 2018, which may be attributed to an increase in traffic, particularly in Segments 3, 4 & 5.

There were 12 reported fatalities and 51 confirmed incapacitating injury crashes over the study period. Out of the 63 reported fatalities and incapacitating injury crashes, 31 occurred at or in the immediate vicinity of a signalized intersection. Out of the 12 fatal crashes, 6 were designated as single vehicle crashes (not a collision with another motor vehicle), 3 were angle crashes, and 3 were sideswipes. Additionally, 11 occurred under dry pavement conditions and 1 occurred with wet pavement conditions. The probable causes listed for the 12 fatal crashes include speeding or aggressive driving (6), failure to yield right of way (3), driving under the influence (2), and lying or illegally in roadway (1).

Figure 2-2 depicts the crash data by time of day, with the highest number of crashes occurring during the 7:00-8:00 AM hour and the 5:00-6:00 PM hour, which is in line with the AM and PM rush hours as determined by the turning movement count data.

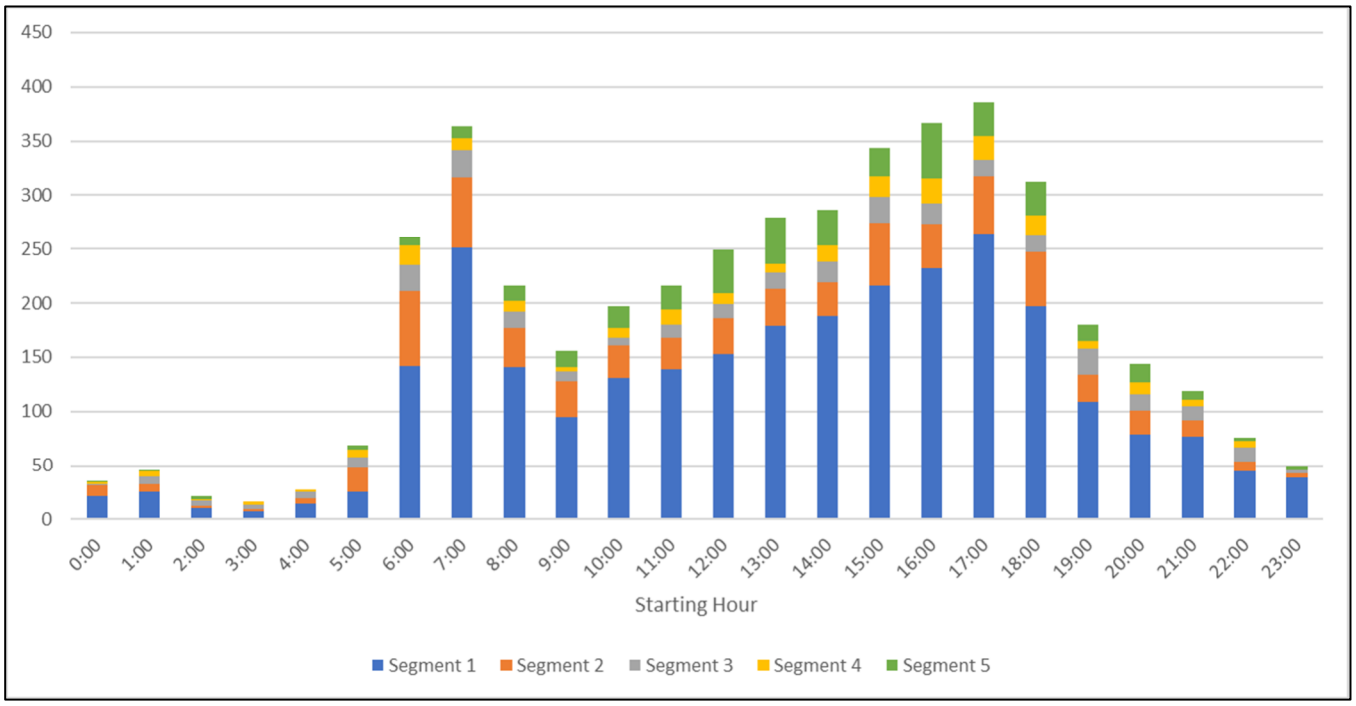

Figure 2-2: Crashes by Time of Day

There are 20 full or half traffic signals along the study corridor. **Table 2-5** shows the crashes at or in the immediate vicinity of each signalized intersection by type. A crash was considered an intersection crash based on crash cluster (based on GPS coordinates) and whether the specific crash type could be attributed to congestion caused by the signalized intersection. Crash rates per intersection are based on the following equation, where the average of the AM and PM peak hour Total Entering Vehicles from the collected turning movement count data was assumed to account for 10% of daily traffic:

$$ACR = \frac{NC \times 1{,}000{,}000}{5.5 \times 365 \times TEV}$$

Where:

ACR = Actual Crash Rate per 1 Million Entering Vehicles

NC = Number of Crashes

TEV = Total Entering Vehicles and 5.5 is the number of years

Table 2-5: Crashes at Signalized Study Intersections by Manner of Collision

Intersection	Rear End	Angle	Side Swipe	Single Veh	Head On	Backed Into	Ped/Bike	Total	Crash Rate
Segment 1									
US 52 at Otranto Rd	185	56	64	13	8	5	1	**332**	**2.62**
US 52 at US 176	393	126	110	26	5	9	3	**672**	**5.81**
US 52 at Thomason Blvd	189	77	47	9	2	9	1	**334**	**4.19**
US 52 at Button Hall Ave	99	65	19	5	2	1	1	**192**	**2.88**
US 52 at Central Ave	98	20	20	5	0	1	1	**145**	**2.06**
US 52 at Hollywood Dr	45	12	5	8	0	2	0	**72**	**1.07**
US 52 at Stephanie Dr	111	35	14	11	0	6	1	**178**	**2.66**
Segment 2									
US 52 at Old Mount Holly Rd	205	31	30	12	2	4	0	**284**	**3.81**
US 52 at Old US 52	84	17	15	15	0	1	0	**132**	**2.20**
US 52 at Google Driveway	13	2	4	1	0	0	0	**20**	**0.40**
Segment 3									
US 52 at Cypress Gardens Rd	33	29	9	9	3	1	0	**84**	**1.42**
Old US 52 at Cypress Gardens Rd	9	13	1	10	2	0	0	**35**	**1.34**
Segment 4									
US 52 at Gaillard Rd	41	12	3	3	1	0	0	**60**	**1.30**
Segment 5									
US 52 at RC Dennis Blvd	18	25	5	6	1	0	0	**55**	**1.19**
US 52 at Heatley St	5	29	2	0	0	0	0	**36**	**1.14**
US 52 at Main St	18	10	2	0	0	2	0	**32**	**0.86**
RC Dennis Blvd at Main St Ext	5	2	0	0	1	0	0	**8**	**0.35**
RC Dennis Blvd at Stoney Landing Dr	2	1	0	0	1	0	0	**4**	**0.19**
US 52 at N Live Oak Dr	20	16	6	0	1	0	0	**43**	**0.80**
US 52 at Reid Hill Rd	34	26	11	3	1	1	0	**76**	**1.36**

The following intersections have a crash rate that exceeds 1.5 crashes per million entering vehicles over the 5.5-year study period and improvements to these locations should be prioritized (in order from highest crash rate to lowest):

1. US 52 at US 176
2. US 52 at Thomason Blvd / Liberty Hall Rd
3. US 52 at Old Mount Holly Rd
4. US 52 at Button Hall Ave
5. US 52 at Stephanie Dr
6. US 52 at Otranto Rd
7. US 52 at Old US 52
8. US 52 at Central Ave

According to FHWA, sites with a collision rate of 1.5 crashes per 1 million entering vehicles should be considered for further safety evaluation. It should be noted that all of the above locations are within Segments 1 and 2 of the study corridor. **Table 2-6** shows the crashes by type at the above 8 priority locations as a percentage of the total at each intersection.

Table 2-6: Crashes at Signalized Study Intersections as a Percent of Total Intersection Crashes

Intersection	Rear End	Angle	Side Swipe	Single Veh	Head On	Backed Into	Ped/Bike
Segment 1							
US 52 at Otranto Rd	56%	17%	19%	4%	2%	2%	0%
US 52 at US 176	58%	19%	16%	4%	1%	1%	0%
US 52 at Thomason Blvd	57%	23%	14%	3%	1%	3%	0%
US 52 at Button Hall Ave	52%	34%	10%	3%	1%	1%	1%
US 52 at Central Ave	68%	14%	14%	3%	0%	1%	1%
US 52 at Stephanie Dr	62%	20%	8%	6%	0%	3%	1%
Segment 2							
US 52 at Old Mount Holly Rd	72%	11%	11%	4%	1%	1%	0%
US 52 at Old US 52	64%	13%	11%	11%	0%	1%	0%

As shown, all locations have majority rear end crashes, which may be attributed to any of the following:

- Significant congestion in this segment of US 52
- The changing functional classification of the roadway from rural principal arterial to urban principal arterial as you head southbound into Charleston County
- The reduction in speed limit in the southbound direction from 60 mph to 45 mph
- Closely spaced driveways
- Inadequate change and clearance intervals at the intersection
- At-grade railroad crossings along the east legs of the intersections

Some possible remedies for the above causes of rear end crashes are:

- Improved signal coordination or added capacity where needed to reduce congestion
- Driveway consolidation or a frontage road
- Speed enforcement along the corridor
- Confirm change and clearance intervals against minimum required values

The second most predominant crash type at the signalized study intersections is angle crashes, which may be attributed to any of the following:

- Exclusive/Permissive or Permissive left turn phasing on the mainline or sidestreet
  - US 52 at Otranto Rd operates with Exclusive/Permissive phasing on the sidestreet approaches
  - US 52 at Thomason Blvd operates with Exclusive/Permissive phasing on the sidestreet approaches
  - US 52 at Button Hall Ave operates with Exclusive/Permissive phasing in the northbound direction and permissive phasing in all other directions
- Red light running
- Intersection geometry
  - This item is particularly relevant to the US 52 at US 176 intersection which is very wide and has sweeping turning paths.

To reduce angle type crashes, it is recommended that available traffic data be used to perform a left turn warrant analysis to assess if left turn phasing should be altered to provide protected phasing at applicable intersections and if it's feasible to improve/tighten the geometry of the US 176 intersection.

Side swipe crashes are the next most prevalent crash type, particularly at the Otranto Rd, US 176, and Thomason Blvd intersections. Shoulders are not provided along US 52 which may be a contributing factor, as almost all of the side swipe crashes are in the same direction with the majority attributed to improper lane use change. Widening US 52 to provide for a shoulder may decrease side swipe type crashes along mainline US 52, and improved guide signage and reduced congestion would reduce the number of lane changes approaching the signalized intersections.

Crash History of At-Grade Rail Crossings

Out of the 4,420 reported crashes within the study area during the 5½ year time period, only 1 crash is listed as occurring between a motor vehicle and a railway vehicle. This crash occurred at the US 176 / Red Bank Road intersection in April 2020. The crash occurred at night and resulted in an incapacitating injury. The probable cause of the crash is listed as the motorist disregarding signs and signals. While not included in the crash data provided by SCDOT, there was also a collision between an AMTRAK train and a vehicle on January 9, 2021 at the Red Bank Road crossing. Median reports that the motorist disregarded and drove around the railroad gates.

Development of TransModeler Network

The TransModeler network was created using links taken from the South Carolina state-wide model (SCSWM) in TransCAD. Those links were incorporated into a TransModeler network and were modified with appropriate attributes to create the base microsimulation model network. The existing signal phasing and timings were confirmed based on SCDOT data.

Caliper's TransModeler was chosen as the software for performing microsimulation modeling of the corridor and its intersections. TransModeler is a microscopic behavior-based multi-purpose traffic simulation program that takes into consideration vehicle interactions and driver behavior, as well as the effects of operational impacts arising from downstream and upstream traffic conditions. TransModeler also has the capability to model multiple modes, including freight rail, which is running parallel to US 52 in Goose Creek. It also provides for dynamic traffic assignment to assess and analyze traffic based on future conditions, including land use scenarios that could change the origins and destinations of trips throughout the network.

Quality Counts provided turning movement counts and vehicles classification data for the corridor. The morning and afternoon peak hour volumes were manually entered into the network. The morning peak hour volumes were increased by 9 percent to account for COVID-19 impacts.

Evaluation of Existing Conditions

The existing conditions TransModeler analysis was performed for the signalized and unsignalized intersections within the study area. The existing truck percentages for the model were developed utilizing the tube counts with the truck percentages on US 52 at the north and south end of the corridor, along with two locations on Old US 52 and one location on Rembert C Dennis Blvd. Outside of that, the truck percentages from the turning movement counts were utilized.

Intersection Analysis

Capacity analyses for the signalized and unsignalized intersections within the study area were performed for existing conditions. For unsignalized intersections, the intersection operation is represented by the worst approach delay and LOS of all the stop sign controlled approaches to the intersection. For signalized intersections, the intersection operation is represented by the intersection delay and LOS.

The results of the unsignalized and signalized intersection capacity analyses for existing conditions are shown in **Table 2-7**.

Table 2-7: Existing Intersection Capacity Analysis Results

Intersection Name	2020 Existing			
	AM		PM	
	LOS	Delay	LOS	Delay
US 52 & Reid Hill Rd/Rembert Dennis Blvd	B	14.1	C	20.6
US 52 & N Live Oak Dr	B	11.0	B	12.0
E Main St/Main St Ext & US 52	B	15.4	B	19.0
US 52 & Heatley/Altman St and AutoZone Driveway	A	7.9	B	19.6
US 52/Rembert Dennis Blvd & US 52/Old US 52	B	15.6	B	19.4
Rembert Dennis Blvd & Stoney Landing Rd	B	13.3	A	6.4
Rembert Dennis Blvd & Main St Ext/Sterling Oaks Dr	A	7.3	A	6.3
US 52 & Gaillard Rd	B	16.8	C	21.7
Old US 52 & Gaillard Rd	B	10.4	B	13.8
US 52 & Cypress Gardens Rd	D	50.4	E	60.2
Old US 52 & Cypress Gardens Rd	B	16.4	E	66.8
US 52 & Mt Holly Commerce Park	C	15.1	C	16.3
US 52 & Google	A	2.1	A	1.9
US 52 & Old US 52	A	4.4	A	5.0
Goose Creek Blvd & Old Mount Holly Rd/Montague Plantation Rd	C	30.3	D	41.1
Goose Creek Blvd & Stephanie Dr/Windsor Mill Rd	B	11.8	A	8.4
Goose Creek Blvd & Hollywood Dr	B	18.6	C	29.3
Goose Creek Blvd & Central Ave	A	9.1	C	27.5
Goose Creek Blvd & Button Hall Ave	A	3.4	A	9.2
Goose Creek Blvd & Liberty Hall Rd/Thomason Blvd	C	33.7	E	75.1
Goose Creek Blvd & Saint James Ave/Red Bank Rd	E	61.8	F	87.2
University Blvd & Old University Blvd	F	627.8	F	1,061.1
N.A.D. Rd & Goose Creek Rd	F	80.6	F	573.4
US 52 & Otranto Rd	C	33.9	D	41.2

Signalized intersections
Unsignalized intersections

LOS D or better are generally considered to be an acceptable LOS for intersections within urbanized or developed areas. LOS C or better are generally considered to be acceptable LOS for intersections in rural areas. At unsignalized intersections, the stop sign controlled approaches to high volume streets may experience high delay and may require additional evaluation to determine if geometric improvements can be made to reduce delay and/or if the installation of a traffic signal may be warranted. In some cases, the analysis may overestimate delay, such as at University Boulevard or at N.A.D. Road for example, where left turning traffic may use the striped median to complete a two-stage left turn rather than requiring waiting until sufficient gaps are available to complete a single-stage left turn.

Existing Conditions

AM Peak Hour

In addition to the overall Level of Service and Delays shown in Table 2-7, TransModeler simulations for the morning peak hour were observed and minor queue spillovers were observed at the following locations:

- Eastbound approach of Cypress Gardens Road at US 52
- Northbound left turn lane on N.A.D. Road at Goose Creek Road
- Northbound left turn lane on US 78 at Old University Boulevard
- Westbound left turn lane on Liberty Hall Road at Goose Creek Blvd
- Westbound left turn lane on Old Mount Holly Road at Goose Creek Blvd

PM Peak Hour

In addition to the overall Level of Service and Delays shown in **Table 2-7**, TransModeler simulations for the afternoon peak hour were observed and minor queue spillovers were observed at the following locations:

- Westbound left turn lane of US 78 at Old University Boulevard
- Northbound left turn lane on Old University Boulevard at US 78
- Northbound left turn lane on N.A.D. Road at Goose Creek Road
- Westbound left turn lane of Otranto Road
- Westbound approach on Liberty Hall Road at Goose Creek Blvd
- Eastbound left turn lane on Liberty Hall Road at Goose Creek Blvd
- Eastbound left turn lane on Central Avenue at Goose Creek Blvd
- Westbound left turn lane on Old Mount Holly Road at Goose Creek Blvd

Traffic Signal Warrant Analysis

Following the project scope of services, traffic signal warrant analyses were performed following the methodology outlined in the Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition, using existing turning movement counts collected between 6 AM and 7 PM at the following four T-intersections:

- US 52 at S-8-1067 (Tom Hill Road) – entrance to Mt Holly Commerce Park
- Old US 52 at S-8-357 (Gaillard Road)
- US 78 (University Boulevard) at S-10-2532 (Old University Boulevard)
- Goose Creek Road at S-10-2533 (N.A.D. Road)

The MUTCD states that an engineering study shall be conducted to justify the installation of a traffic control signal. The study shall investigate the need for a traffic control signal based on an analysis of applicable traffic signal warrants as listed below:

- Warrant 1 – Eight-Hour Vehicular Volume
- Warrant 2 – Four-Hour Vehicular Volume
- Warrant 3 – Peak Hour
- Warrant 4 – Pedestrian Volume
- Warrant 5 – School Crossing
- Warrant 6 – Coordinated Signal System
- Warrant 7 – Crash Experience

- Warrant 8 – Roadway Network
- Warrant 9 – Intersection near a Grade Crossing

When an intersection is located in a community of less than 10,000 population or the speed on the major street exceeds 40 mph, the minimum volume thresholds required to meet the signal warrants are reduced. Since the major-street speed exceeds 40 mph for all four intersections, these volume reductions have been applied.

The MUTCD indicates a traffic control signal should improve the overall operation or safety of the intersection. The MUTCD also indicates engineering judgment is required to determine how right turn movements on the minor street approaches effect the intersection operation and determine if any volume reductions are appropriate when assessing the intersection.

In assessing the traffic signal warrants at the four T-intersections, only the Old US 52 intersection with Gaillard Road did not include a separate right turn lane on the minor street approach. At the US 52 intersection with Tom Hill Road, the eastbound minor street right turn lane is channelized and turn onto an approximately 500 feet long acceleration lane on southbound US 52. In this case, the minor street right turn movements would have minimal conflict with US 52 traffic. For this reason, the right turn volumes from the minor street approach at this intersection were removed from consideration in the warrant analysis. At the other two T-intersections, a single lane widens to provide separate left and right turn lanes on the northbound minor street approaches. The right turn movements are not channelized and do not have an acceleration lane to facilitate turning onto the major street with minimal conflict. These minor street approaches were analyzed as single lane approaches and no reductions were made to the right turn volumes.

Warrant 1 – Eight-Hour Vehicular Volume

Warrant 1 is composed of three conditions; Condition A – Minimum Vehicular Volume, Condition B – Interruption of Continuous Traffic and the combination of Conditions A and B. The combination of Conditions A and B is intended for application at locations where Condition A is not satisfied, and Condition B is not satisfied. The MUTCD states that the need for a traffic control signal shall be considered if one of the two conditions of the warrant exists for 8 hours of an average day or a combination of conditions 1A and 1B exists.

Warrant 2 – Four-Hour Vehicular Volume

According to the MUTCD, the conditions of Warrant 2 are to be applied where the volume of intersecting traffic is the principal reason for traffic control signal installation. To satisfy Warrant 2, the hourly vehicular volume of each of four hours in an average day must fall above the applicable curve, as depicted in the charts contained within the MUTCD.

Warrant 3 – Peak Hour

According to the MUTCD, to satisfy Warrant 3 the hourly vehicular volume for one hour of an average day must fall above the applicable curve as depicted in the charts contained within the MUTCD. The MUTCD advised that this warrant *"…shall be applied only in unusual cases, such as office complexes, manufacturing plans, industrial complexes, or high-occupancy vehicle facilities that attract of discharge large numbers of vehicles over a short time."*

Warrant 4 – Pedestrian Volume

Warrant 4 is considered when high volumes of major street traffic result in excessive delay to pedestrians waiting to cross. Pedestrian traffic at the four intersections were negligible and delay to pedestrians crossing the major street was not observed. Therefore, Warrant 4 is not applicable.

Warrant 5 – School Crossing

Warrant 5 is considered when a signal is needed to assist elementary school through high school students to cross the major street. No school crossings are located at the four intersections. Therefore, Warrant 5 is not applicable.

Warrant 6 – Coordinated Signal System

Warrant 6 is considered when it is necessary to install traffic signals at unsignalized intersections to maintain vehicle platooning along the major street. Maintaining progressive movement of vehicle platoons in a coordinated signal system is not a factor in considering the installation of a traffic control signal at this intersection. Therefore, Warrant 6 is not applicable.

Warrant 7 – Crash Experience

The MUTCD states that the need for a traffic control signal shall be considered if all three of the following criteria are met for an intersection:

A. Adequate trial of alternatives with satisfactory observance and enforcement
B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred in a 12-month period
C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Warrant 1, Condition A, or the vph in both of the 80 percent columns of Warrant 1, Condition B exists on the major-street and the higher-volume minor-street approach

Under Condition A, there are none of the typical alternatives to reduce crash experience, such as advance warning signs or flashing warning beacons, in place at the four intersections. Thus, **condition A of Warrant 7 is not satisfied.**

Under Condition B, crash reports for the four intersections have been collected from SCDOT for 5.5 years from January 1, 2015 through June 30, 2020. The crashes that occurred at the US 52 at S-8-1067 (Tom Hill Road), Old US 52 at S-8-357 (Gaillard Road), and Goose Creek Road at S-10-2533 (N.A.D. Road) intersections during that time period consisted of angle, rear-end crashes, single vehicle, and side swipe type crashes. Of these, right angle crashes are the crash type that may be susceptible to correction by a traffic signal. To satisfy Warrant 7, at least five angle crashes have to occur within a year. For every year, that the crash data is provided, the number of right-angle crashes is *four* or less. Thus, condition B of Warrant 7 is not satisfied at these three locations. For the US 78 (University Boulevard) at S-10-2532 (Old University Boulevard) intersection, there were 13 angle crashes that occurred in 2019 and would be susceptible to correction by a traffic signal. Thus, **condition B of Warrant 7 is satisfied** at the US 78 (University Boulevard) at S-10-2532 (Old University Boulevard) intersection.

As for condition C, the required volumes of the 80 percent column of Warrant 1 Condition A are met for nine hours at the intersection of US 78 at Old University Boulevard, and are met for eight hours at the intersection of Goose Creek Road and N.A.D. Road. Since eight hours must be satisfied for either Condition A or Condition B, **condition C of Warrant 7 is satisfied.**

Since all three conditions are not met, **Warrant 7 is not satisfied.**

Warrant 8 – Roadway Network

Warrant 8 is considered where organizing and concentrating traffic flow might be justified. Since encouraging concentration and organization of traffic flow by installing a traffic control signal at this intersection is not being considered, Warrant 8 is not applicable.

Warrant 9 – Intersection near a Grade Crossing

Warrant 9 is considered when none of the previous eight warrants are met but the intersection has an at-grade crossing on an approach controlled by a stop sign or yield sign. None of the four intersections are located where an at-grade crossing is present on one of the approaches. Therefore, Warrant 9 is not applicable.

The results of the warrant analyses at the four intersections are shown in **Table 2-8**. Summaries of the individual intersection warrant analyses reports are contained in the Traffic Technical Report, submitted separately.

Table 2-8: Warrant Analysis Summary

Intersection	Major Lanes	Minor Lanes	Major Street Speed	Warrant 1A	Warrant 1B	Warrant 1A & 1B	Warrant 2	Warrant 3	
US 52 at Tom Hill Road	2	2[A]	60	No	No	No	No	No	
Old US 52 at Gaillard Road	1	1	55	No	No	No	No	No	
US 78 at Old University Boulevard	3	1	45	No	Yes	Yes[B]	Yes	Yes	
Goose Creek Road at N.A.D. Road	2	1	45	No	Yes	Yes[B]	Yes	Yes	
Intersection	**Major Lanes**	**Minor Lanes**	**Major Street Speed**	**Warrant 4**	**Warrant 5**	**Warrant 6**	**Warrant 7**	**Warrant 8**	**Warrant 9**
US 52 at Tom Hill Road	2	2[A]	60	n/a	n/a	n/a	No	n/a	n/a
Old US 52 at Gaillard Road	1	1	55	n/a	n/a	n/a	No	n/a	n/a
US 78 at Old University Boulevard	3	1	45	n/a	n/a	n/a	No	n/a	n/a
Goose Creek Road at N.A.D. Road	2	1	45	n/a	n/a	n/a	No	n/a	n/a

[A] - Separate right turn lane with acceleration lane; minor street right turn volumes not considered

[B] - Does not meet warrant volume thresholds for eight or more hours when analyzed as two minor lanes

Guidance in the MUTCD suggests that an approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles. On the University Boulevard approach to US 78, the existing volumes are heavier on the left turn movement than the right turn movement, and the left turn storage lane is approximately 250 feet long. During five of the 13 hours counted, the left turn traffic is double the right turn volume; for 11 of the 13 hours, the left turn volume was at least 38 percent higher than the right turn volume. On the N.A.D. Road approach to Goose Creek Road, the existing volumes are substantially heavier on the right turn movement than on the left turn movement, and the left turn storage lane is approximately 170 feet long. During ten of the 13 hours counted, the right turn volume is more than double the left turn volume. An additional warrant analyses was performed considering the minor street approach as two lanes instead of one lane at these intersections. The results of the additional warrant analyses were the same as the analyses with considering

one lane minor approaches, except the combination Warrant 1A and 1B no longer met warrants for a minimum of eight hours.

The results of the traffic signal warrant analyses indicate the intersections of US 78 at Old University Boulevard and Goose Creek Road at N.A.D. Road meet Warrant 1B, Combination Warrant 1A & 1B, Warrant 2, and Warrant 3 for more than the minimum required number of hours. These intersections are in close proximity to the US 52/US 78 interchange ramps where installing a signal could disrupt traffic flow to and from the ramps. At the intersection of US 78 and Old University Boulevard, consideration and coordination with the Lowcountry Rapid Transit Project needs to occur before any improvements are recommended here.

Additionally, the Goose Creek Road/N.A.D. Road intersection is located within 300 feet of an at-grade railroad crossing on the east leg of Goose Creek Road. Since Goose Creek Road traffic currently has no traffic control through this intersection, the introduction of a signal at this location would create the potential of stopping westbound traffic which could back up onto the railroad crossing. A signal installation at this location would likely require the incorporation of railroad preemption circuitry, as is present at many of the other signalized intersection that are in close proximity to at-grade crossings along US 52.

Foxbank Plantation Access

Stakeholder discussions have raised concerns about traffic movements into and out of the Foxbank Plantation subdivision, generally located in the northwest quadrant of the intersection of US 52 with Cypress Gardens Road. Access is currently provided on US 52 at Foxbank Plantation Boulevard, located approximately 1,750 feet north of Cypress Gardens Road, and Red Leaf Boulevard, located approximately 3,100 feet north of Foxbank Plantation Boulevard. Future access is to be provided via Yorkshire Drive, which is located on Cypress Gardens Road approximately 1,350 feet west of US 52. Neither of the existing access locations are currently controlled by traffic signals.

Foxbank Elementary School is located approximately 1,600 feet west of US 52 on Foxbank Plantation Boulevard. Driveways to the school are located opposite Alderly Drive and Yorkshire Drive, which both connect to the future neighborhood access point at the Cypress Gardens Road intersection with Yorkshire Drive. In additional to providing access to traffic generated by the residential and commercial areas of the neighborhood, school traffic from outside the neighborhood also enter and exit Foxbank Plantation via Foxbank Plantation Boulevard. As development continues within Foxbank Plantation and school enrollment increases within Foxbank Plantation and at other outside neighborhoods, traffic entering and exiting Foxbank Plantation will continue to increase.

Information has been provided about the difficulty experienced by traffic turning left when exiting Foxbank Plantation. Comments received indicate that drivers avoid the delay encountered waiting to turn left by instead turning right, traveling south on US 52 and making a U-turn at adjacent intersections or median crossovers. The actual left turn demand, therefore, is not included in the turning movement count. As a result, traffic signal warrant studies have concluded that a traffic signal is currently not warranted.

US 52 at Reid Hill Road

Stakeholder discussions have also raised concerns about northbound left turn movements from US 52 to Reid Hill Road. Without a left turn traffic signal phase, comments indicated that traffic is turning left at either of the two driveways south of the intersection toward the Walmart parking lot to access Reid Hill Road. Similar to Foxbank Plantation Blvd. above, since left turning traffic at the signalized intersection is reduced due to the diversion, a left turn signal phase is not warranted.

3 Short Term Recommendations

As indicated above, there are capacity constraints along US 52 through Goose Creek, at the Cypress Gardens intersections with US 52 and Old US 52 and at the two unsignalized intersections along US 78 in North Charleston. The following are recommended as short-term improvements:

- Old US 52 at Cypress Gardens Road - Adjust the traffic signal timing to improve the PM Level of Service from E to B and reduce the average delay from 66.8 seconds to 16.6 seconds.
- US 52 at Cypress Gardens Road - Add turn lanes on both approaches of Cypress Gardens Road as illustrated in Appendix A, Exhibits 5 & 6. Note that the westbound left turn lane and three lane section extending east to the railroad crossing are anticipated to be permitted and constructed to support proposed development. This improves the existing PM Level of Service from E to B and reduces the average delay from 60.2 seconds to 15.2 seconds.
- US 52 at Liberty Hall Road - Install a northbound and westbound right turn overlap signal phase as illustrated in Appendix A, Exhibit 2. While the Level of Service remains an E, but the average delay is reduced from 75.1 seconds to 69.2 seconds.
    - US 52 at US 176/Red Bank Road: Install a 3rd northbound left turn lane
    - Prohibit westbound left turns
    - Convert the westbound left turn lane to a 2nd through lane
    - Install a westbound right turn overlap signal phase

  This improves the PM Level of Service from F to E and reduces the average delay from 87.2 seconds to 74.6 seconds. These changes are illustrated in Appendix A, Exhibit 1

- Consider whether the two unsignalized intersections along US 78 should be signalized in light of the following:
    - Proximity to the US 52 interchange ramps
    - Proximity of NAD Road to the at-grade rail crossing
    - Anticipated changes to the Old University Blvd. intersection due to the Lowcountry Rapid Transit project
- Conduct warrant analyses to assess if left turn phasing should be altered to reduce the incidence of left turn crashes.
- Accelerate the Foxbank Plantation connection to Cypress Gardens Road to provide east-to-north left turns the opportunity to turn at a signalized intersection with US 52. Other options may include an origin-destination study to document the actual left turn demand or a median acceleration lane, although that may require the street opposite Foxbank Plantation Blvd. be restricted to right-in/right-out only.
- Conduct an origin-destination study to document the actual northbound left turn demand at US 52 and Reid Hill Road to verify if a left turn traffic signal phase might be warranted. An updated capacity analysis would also be necessary to determine the impact on traffic operations and queuing if a left turn signal phase were installed to accommodate the actual left turn demand.
- Extend the median acceleration lane from Central Avenue to Northbound US 52 to satisfy SCDOT Design criteria and to mitigate the number of crashes occurring here. This is illustrated in Appendix A, Exhibit 3.
- Extend the median acceleration lane from Old US 52 to Southbound US 52 to mitigate the number of crashes occurring here. The extension doesn't quite meet SCDOT's Design Criteria in order to end the taper prior to the at-grade rail crossing and median crossover immediately to the south. This extension is illustrated in Appendix A, Exhibit 4.

Appendix A

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	RTE. NO.	SHEET NO.
3	S.C.	BERKELEY	4020858	US 52	1

MATCHLINE SEE EXHIBIT 2

EXHIBIT 1

STV 100 Years
STV Incorporated
4969 CENTRE POINT DR
SUITE 102
CHARLESTON, SOUTH CAROLINA 29418

50 0 50 100
scale feet

RECOMMENEDED ALTERNATIVE

BCDCOG
BERKELEY-CHARLESTON-DORCHESTER COUNCIL OF GOVERNMENTS

US 52 CORRIDOR STUDY
RED BANK RD TO CENTRAL AVE

MarpeKJ
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4/5/2021

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	RTE. NO.	SHEET NO.
3	S.C.	BERKELEY	4020858	US 52	2

MATCHLINE SEE EXHIBIT 1

EXHIBIT 2

STV 100 Years
STV Incorporated
4969 CENTRE POINT DR
SUITE 102
CHARLESTON, SOUTH CAROLINA 29418

50 0 50 100
scale feet

RECOMMENEDED ALTERNATIVE

BCDCOG
BERKELEY-CHARLESTON-DORCHESTER COUNCIL OF GOVERNMENTS

US 52 CORRIDOR STUDY
RED BANK RD TO CENTRAL AVE

MarpeKJ
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4/5/2021

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	RTE. NO.	SHEET NO.
3	S.C.	BERKELEY	4020858	US 52	4

EXHIBIT 3

STV 100 Years
STV Incorporated
4969 CENTRE POINT DR
SUITE 102
CHARLESTON, SOUTH CAROLINA 29418

50 0 50 100
scale feet

RECOMMENEDED ALTERNATIVE

BCDCOG
BERKELEY-CHARLESTON-DORCHESTER COUNCIL OF GOVERNMENTS

US 52
CORRIDOR STUDY
RED BANK RD TO CENTRAL AVE

MarpeKJ
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4/5/2021

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	RTE. NO.	SHEET NO.
3	S.C.	BERKELEY	4020858	US 52	6

EXHIBIT 4

STV 100 Years
STV Incorporated
4969 CENTRE POINT DR
SUITE 102
CHARLESTON, SOUTH CAROLINA 29418

50 0 50 100
scale feet

RECOMMENEDED ALTERNATIVE

BCDCOG
BERKELEY-CHARLESTON-DORCHESTER COUNCIL OF GOVERNMENTS

US 52 CORRIDOR STUDY
US 52 AND AND OLD US 52

MarpeKJ
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4/5/2021

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	RTE. NO.	SHEET NO.
3	S.C.	BERKELEY	4020858	US 52	7

MATCHLINE SEE SHEET 6

EXHIBIT 5

STV Incorporated
4969 CENTRE POINT DR
SUITE 102
CHARLESTON, SOUTH CAROLINA 29418

50 0 50 100
scale feet

RECOMMENEDED ALTERNATIVE

BCDCOG
BERKELEY-CHARLESTON-DORCHESTER COUNCIL OF GOVERNMENTS

US 52
CORRIDOR STUDY
US 52 AT
CYPRESS GARDENS RD

MarpeKJ
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4/5/2021

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	RTE. NO.	SHEET NO.
3	S.C.	BERKELEY	4020858	US 52	8

EXHIBIT 6

STV 100 Years
STV Incorporated
4969 CENTRE POINT DR
SUITE 102
CHARLESTON, SOUTH CAROLINA 29418

50 0 50 100
scale feet

RECOMMENEDED ALTERNATIVE

BCDCOG
BERKELEY-CHARLESTON-DORCHESTER COUNCIL OF GOVERNMENTS

US 52 CORRIDOR STUDY
US 52 AT CYPRESS GARDENS RD

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