Appendix B:
Purpose and Need

526 EAST LOWCOUNTRY CORRIDOR

TECHNICAL MEMORANDUM:

PURPOSE AND NEED

Prepared for:

SCDOT

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ACRONYMS AND ABBREVIATIONS

ADT	Average Daily Traffic
BI	Buffer Index
CFR	Code of Federal Regulations
FHWA	Federal Highway Administration
LCC	Lowcountry Corridor
NEPA	National Environmental Policy Act
OD	Origin-destination
PEL	Planning and Environmental Linkages
PIM	Public Information Meeting
PTI	Planning Time Index
SCDOT	South Carolina Department of Transportation
TTI	Travel Time Index
VPD	Vehicles Per Day

1.0 INTRODUCTION

The South Carolina Department of Transportation (SCDOT) is conducting a Planning and Environmental Linkages (PEL) study for the Interstate 526 Lowcountry Corridor (I-526 LCC) EAST Project. The study corridor includes a 10-mile section of I-526 from Virginia Avenue in North Charleston to U.S. 17 in Mount Pleasant. This corridor serves as a major commuter corridor as well as a major economic connector in the lowcountry, linking the goods to and from South Carolina Port Authority's Wando Welch Terminal with Interstate 26 (I-26) and other integral components of the state's freight network.

This PEL document identifies the transportation issues, priorities, and environmental concerns for the I-526 LCC EAST Project. It provides a clear path forward for its implementation by conducting early project scoping and providing project development options.

1.1 PURPOSE OF THE PEL STUDY PROCESS

A PEL study is a collaborative approach to decision-making used to identify transportation issues and environmental concerns. This integrated approach considers environmental, community, and economic goals early in the planning process and uses this information to streamline the transportation project development and environmental review process. The resulting information of a PEL study will be carried forward into the next phase of the project development process, the NEPA process. Combining planning, preliminary engineering, and NEPA is an integral part of the PEL study process that can minimize the duplication of effort, promote environmental stewardship, encourage meaningful and productive public engagement, and reduce delays in project implementation.

1.2 STUDY AREA

The I-526 LCC EAST study area is approximately 10 miles long and includes the Don Holt Bridge over the Cooper River and the James B. Edwards Bridge over the Wando River, which are significant river crossings for the region. **Figure 1-1** illustrates the study corridor and vicinity.

Figure 1-1: Study Corridor and Vicinity Map

2.0 Purpose and Need

2.1 Purpose of the Project

The purpose of transportation improvements along this corridor is to reduce congestion and improve travel time reliability along I-526 from Virginia Avenue in North Charleston to U.S. 17 in Mount Pleasant.

Travelers on the I-526 EAST corridor currently experience heavy congestion, delay, and un-reliable travel times. Forecast growth in population and development in the region will result in a continued increase in traffic volumes, congestion, and more delays.

Improvements considered for implementation should provide an acceptable volume to capacity ratio, reduced vehicle hours of delay, increased average speeds, and more reliable travel times. These performance metrics will be utilized to evaluate proposed concepts and will be further defined in the Alternatives Analysis Technical Memorandum.

2.2 Need for Improvements

Transportation improvements are needed to address the congestion and travel time issues in the corridor. Mobility and roadway deficiencies that contribute to the congestion and unreliable travel times are discussed below:

- **Mobility:** The high volume of people, goods, and services moving through the corridor has increased congestion, impeded travel time and reliability, and increased incidents along the corridor. The key issues are:
  - Traffic related congestion
  - Over capacity facilities
  - Unreliable travel times
  - Congestion related crashes on I-526
- **Roadway deficiency:** The existing roadway, bridges, and interchange ramps along the corridor have geometric deficiencies that do not accommodate existing and future traffic volumes and contribute to inadequate mobility and travel times. The key roadway deficiencies are:
  - Inadequate shoulder widths
  - Insufficient acceleration/deceleration ramp lengths
  - Tightly curved ramps

2.2.1 Mobility

I-526 serves many users including daily commuters, circulation for local traffic, long-haul trucks, trucking delivery routes, visitors to the region, and those pursuing recreational opportunities.

2.2.1.1 Traffic Related Congestion

The corridor regularly experiences extreme and prolonged congestion. The existing traffic volumes approach capacity along some portions of the corridor, resulting in heavy congestion and delays. **Table**

2-1 shows the 2017 and projected future 2050 No-Build average daily traffic (ADT) volumes along segments of the study area. The highest ADT of the study area in 2017 occurs in North Charleston near Virginia Avenue at approximately 86,500 vehicles per day (vpd). The lowest ADT in the same year is approximately 29,600 vpd in Mount Pleasant where I-526 terminates at Chuck Dawley Boulevard. Using an average annual growth rate of 1.6 percent[1], the future daily traffic demand is projected to increase approximately 69 percent by the year 2050.

Table 2-1: Average Total, Two-Way Daily Interstate Traffic (2017-2050)

Segment Termini on I-526	2017	2050 No-Build	Change
Virginia Avenue and Clements Ferry Road	86,489[1]	146,033	59,544 (69%)
Clements Ferry Road and Daniel Island	61,400[2]	103,671	42,271 (69%)
Daniel Island and Long Point Road	77,941[1]	131,600	53,659 (69%)
Long Point Road and bridge over Mathis Ferry Road	64,492[1]	108,892	44,400 (69%)
Bridge over Mathis Ferry Road and split between U.S. 17 North and U.S. 17 South	29,600[2]	49,978	20,378 (69%)

Source: Traffic counts provided by SCDOT and CDM Smith
Notes: [1]CDM Smith counts were collected via video and radar recording methods over a two-day period during the week, and the volumes listed represent the average daily volume. [2]SCDOT volumes listed represent estimated AADT volumes from data collected at the respective locations. A recommended compound annual growth rate of 1.6% was applied to the 2017 traffic volumes to derive the projected future traffic volumes.

Existing I-526 consists of two lanes in each direction from Virginia Avenue to U.S. 17. Throughout the corridor there are auxiliary lanes in each direction that serve as either acceleration or deceleration lanes for interchange ramps. Climbing lanes are also provided for trucks climbing to the crests of the Don Holt Bridge over the Cooper River and the Wando River Bridge. The purpose is to provide a dedicated lane for trucks to use as the grade increases along the bridge structures. Although road signage states that trucks should use the truck climbing lane, trucks are not consistently utilizing the lanes and passenger cars often use the truck climbing lane to pass slower moving traffic. Truck volume percentages from 2017 are shown in **Figure 2-1**. The heaviest truck activity of the study area occurs along Long Point Road at the Wando Welch Terminal. The average daily percentages are around 10 percent from Virginia Avenue to the Long Point Road Interchange. Based on 2017 hourly classification counts, the AM peak hour experiences the highest percentage of trucks.

Consideration of trucks is a critical part of traffic flow within the study area due to the Wando Welch Port Terminal on Long Point Road and the speeds at which the trucks can traverse the bridges. The truck percentages shown in **Figure 2-1** specifically consider tractor trailer trucks and do not include medium sized vehicles such as buses, dump trucks, or delivery trucks. Medium sized vehicles percentage plus heavy vehicles percentage, results in up to 24 percent of daily bi-directional traffic on the Wando River Bridge west of Long Point Road.

[1] The average annual growth rate of 1.6 percent is document in the I-526 Lowcountry Corridor EAST Growth Factor Justification Technical Memo, July 2018.

Figure 2-1: Percent Daily Trucks by Segment (2017)

Source: CDM Smith

As growth and development continues, the increase in traffic volumes and traffic density will result in increased congestion and more delays. Density is the number of vehicles occupying a road segment and relates to the flow of traffic. **Table 2-2** shows the 2017 and projected future 2050 No-Build densities along the corridor segments. The I-526 LCC EAST study considered the I-526 LCC WEST project connector-distributor road from North Rhett Avenue in the No-Build analysis conditions which will impact the density results of segments near the North Charleston area.

Considering 2017 traffic volumes, some segments of the corridor operate at a higher level of congestion. The unacceptable densities are detailed in **Table 2-2**. Primarily, the segments that operate under poor conditions are both directions between the North Rhett Avenue and Clements Ferry Road interchanges

during both AM and PM peak hours. Additionally, the eastbound travel direction (from North Charleston to Mount Pleasant) operates at poor conditions from the Daniel Island interchange to the Long Point Road interchange during the 2017 PM peak hour. During both peak hours, the segment from Long Point Road to U.S. 17 experiences the lowest density in the entire I-526 EAST corridor, as would be expected with lower traffic volumes.

Under 2050 No-Build conditions, the majority of the corridor operates at poor conditions during the PM peak hour. The anticipated increase of demand on the corridor will result in drivers experiencing longer delays, slower travel speeds, and longer travel times throughout the study area.

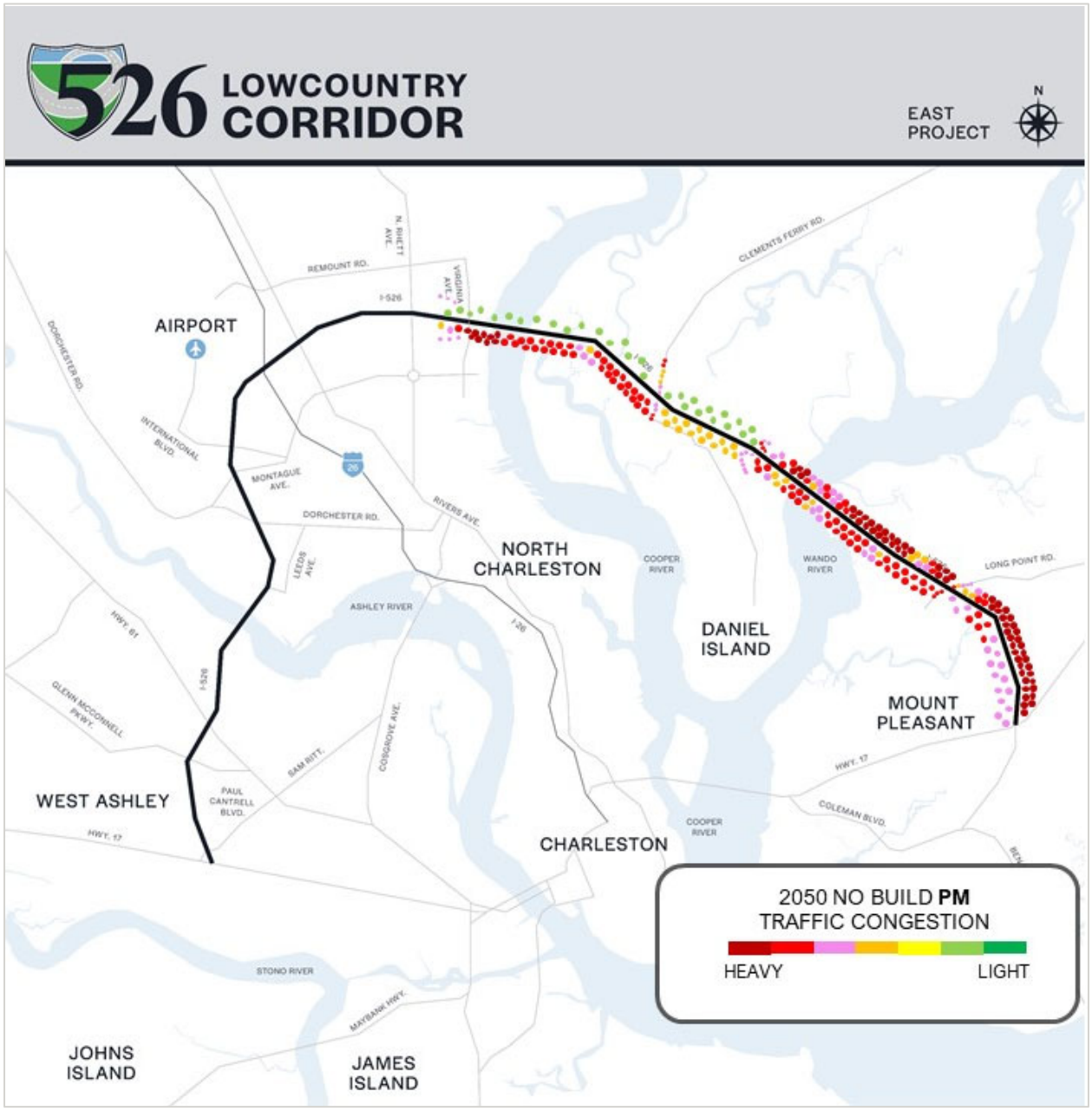
Table 2-2: 2017 and 2050 No-Build Density of I-526 Segments

Segment Between	2017 Density (pc/mi/ln)				2050 No-Build Density (pc/mi/ln)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	EB	WB	EB	WB	EB	WB	EB	WB
North Rhett Avenue Interchange and the Cooper River	64.5	37.0	37.7	71.3	91.6	28.5*	106.4	13*
The Cooper River and Clements Ferry Road Interchange	40.1	35.1	35.7	75.3	49.4	26.9*	77.7	14*
Clements Ferry Road Interchange and Daniel Island Interchange	23.2	25.2	27.4	29.9	26.7	31.6	26.7	12.2
Daniel Island Interchange and the Wando River	22.7	28.2	39.3	23.9	25.8	36.7	55.6	114.8
The Wando River and Long Point Road Interchange	21.9	29.4	37.4	24.5	24.0	40.9	59.2	89.1
Long Point Road Interchange and US 17 Interchange	17.6	16.9	29.8	19.6	19.7	22.8	44.1	112.4

**Density impacted by Interchange Breakdowns. Note: Red text indicates unacceptable density. Based on the Transportation Research Board's Highway Capacity Manual, 6th Edition, densities along freeway segments greater than 35 passenger cars per mile per lane (pc/mi/ln) are considered to be unacceptable and experience unstable flow.*
Source: SCDOT and CDM Smith

The 2050 No-Build condition analysis reveals additional segments will operate at unacceptable flows. Some of the densities in the AM and PM peak hours reflect the expected unacceptable flows while other segments show preliminary acceptable densities. These lower densities are caused by interchange breakdowns which do not allow traffic to flow properly on I-526. **Figure 2-2** illustrates the PM peak hour flow that occurs due to the breakdown of the interchanges. Although the density results show the flow of traffic will be acceptable, the interchange failures do not allow free movement; therefore, mimicking the operation of a lower density. The segments of I-526 LCC EAST will not operate at acceptable densities based on the traffic demands.

Figure 2-2: 2050 No-Build PM Peak Hour Traffic Flow



Source: CDM Smith

2.2.1.2 Over Capacity Facilities

As discussed above, portions of the corridor operate under poor conditions. The projected future traffic conditions of almost the entire corridor under the 2050 No-Build condition are expected to continue to operate under highly congested conditions during peak hours.

2.2.1.3 Travel Time Reliability Analysis

Travel time reliability is a key performance indicator of the level of variability in travel times. Our analysis included one metric for congestion and two metrics for reliability:

- Congestion – Travel Time Index (TTI): Experienced travel time compared to free flow[2] travel time
- Reliability – Buffer Index (BI): How much additional time a traveler would have to plan to ensure on-time arrival compared to an average day
- Reliability – Planning Time Index (PTI): How much total time a traveler would have to plan to ensure on-time arrival compared to free flow conditions

To determine travel time reliability, common origin-destination (OD) paths were defined. The common OD paths that the analysis focused on were:

- I-526 west of North Rhett Avenue and North Rhett Avenue;
- I-526 west of North Rhett Avenue and Clements Ferry Road;
- I-526 west of North Rhett Avenue and Long Point Road;
- I-526 west of North Rhett Avenue and U.S. 17 East of I-526; and
- I-526 west of North Rhett Avenue and Bowman Road South of I-526.

Table 2-3 shows the TTI for all traffic for 2017 and projected future 2050 No-Build conditions. Based on the Transportation Research Board's *Highway Capacity Manual, 6th Edition*, TTI defines reliable travel times as having a value less than **1.33**. This threshold approximates the points beyond which travel times become much more variable or unreliable. The common path of I-526 west of North Rhett Avenue to Clements Ferry Road headed eastbound has a 2.0 TTI in 2017. The 2.0 TTI suggests that it takes two times as long to travel the same distance compared to free-flow conditions. **All segments in the study area are currently unreliable and will become more variable with time.**

[2] Free flow speed is the term used to describe the average speed that a motorist would travel if there were no congestion or other adverse conditions such as bad weather.

Table 2-3: 2017 and 2050 No-Build All Vehicles Travel Time Index

All Traffic TTI				
Direction	Common Paths		2017	2050 No-Build
	Origin	Destination		
Eastbound	I-526 west of N. Rhett Ave.	N. Rhett Ave.	3.0	15.1
	I-526 west of N. Rhett Ave.	Clements Ferry Rd.	2.0	6.6
	I-526 west of N. Rhett Ave.	Long Point Rd.	1.5	3.7
	I-526 west of N. Rhett Ave.	U.S. 17 East of I-526	1.4	3.3
	I-526 west of N. Rhett Ave.	Bowman Rd. S. of I-526	1.4	3.2
Westbound	N. Rhett Ave.	I-526 west of N. Rhett Ave.	2.6	1.0*
	Clements Ferry Rd.	I-526 west of N. Rhett Ave.	3.3	1.1*
	Long Point Rd.	I-526 west of N. Rhett Ave.	2.6	2.9
	U.S. 17 East of I-526	I-526 west of N. Rhett Ave.	2.4	3.6
	Bowman Rd. S. of I-526	I-526 west of N. Rhett Ave.	2.3	4.1

**Impacted by bottlenecks from the Wando bridge and Long Point Road Interchange*

Table 2-4 shows the TTI of trucks for 2017 and projected future 2050 No-Build conditions. All segments in the study area are currently unreliable for trucks and will continue to be unreliable with time.

Table 2-4: 2017 and 2050 No-Build Trucks Only Travel Time Index

Trucks Only TTI				
Direction	Common Paths		2017 Existing	2050 No-Build
	Origin	Destination		
Eastbound	I-526 west of N. Rhett Ave.	N. Rhett Ave.	3.0	9.7
	I-526 west of N. Rhett Ave.	Clements Ferry Rd.	2.0	5.5
	I-526 west of N. Rhett Ave.	Long Point Rd.	1.5	3.2
	I-526 west of N. Rhett Ave.	U.S. 17 East of I-526	1.4	2.9
	I-526 west of N. Rhett Ave.	Bowman Rd. S. of I-526	1.4	2.7
Westbound	N. Rhett Ave.	I-526 west of N. Rhett Ave.	2.6	1.1*
	Clements Ferry Rd.	I-526 west of N. Rhett Ave.	3.3	1.2*
	Long Point Rd.	I-526 west of N. Rhett Ave.	2.6	2.9
	U.S. 17 East of I-526	I-526 west of N. Rhett Ave.	2.4	3.5
	Bowman Rd. S. of I-526	I-526 west of N. Rhett Ave.	2.3	4.0

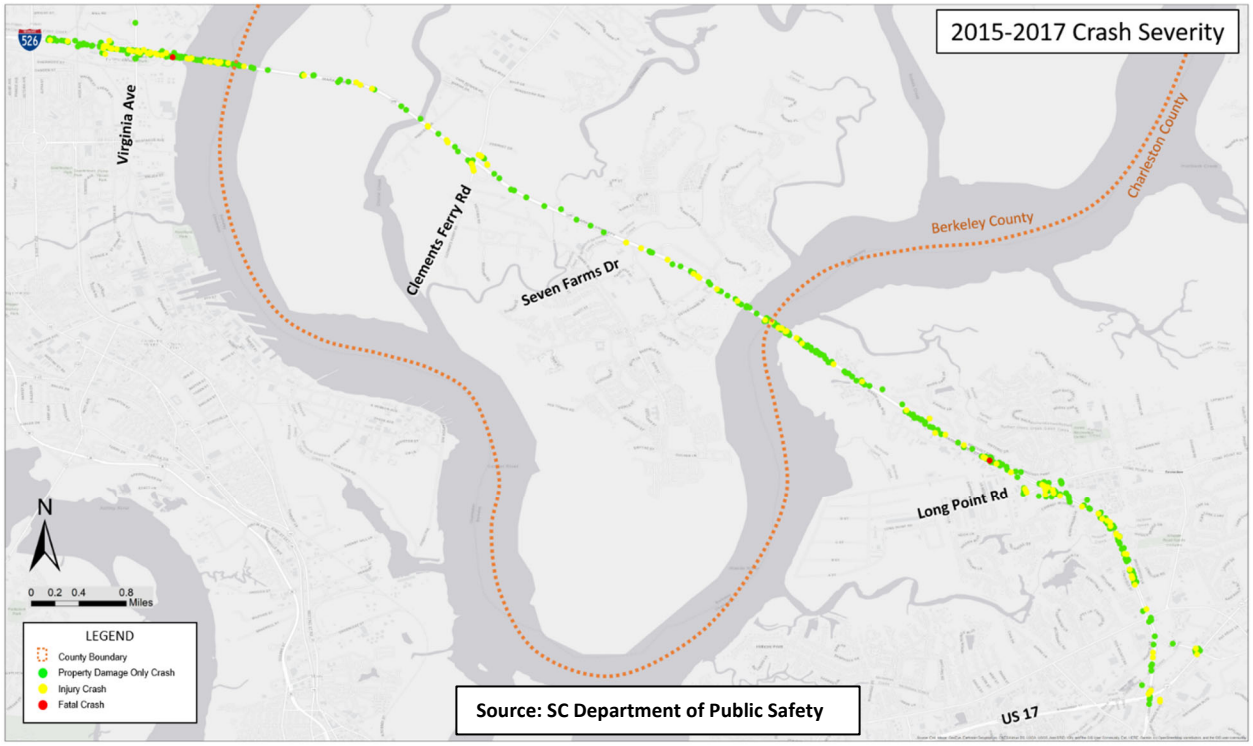
**Impacted by bottlenecks from the Wando bridge and Long Point Road Interchange*

Comparing the existing reliability to the 2050 No-Build conditions reflect how the degradation of traffic conditions along the I-526 LCC EAST corridor will impact drivers on a day to day basis in terms of time spent driving and possible time loss due to excessive traffic. Looking at all traffic and truck only TTI reveals that congestion and reliability patterns in the corridor for trucks and the overall traffic stream are similar under the 2050 No-Build condition with trucks typically experiencing slightly slower travel times in general. The 2050 No-Build condition shows the TTI at extremely high levels of congestion with nearly twice the acceptable TTI values, with the exception of the two most eastern segments of the corridor that show improvement due to bottlenecks that occur to the west at the Wando bridge and Long Point Road interchange that stifle the flow of traffic.

2.2.1.4 Incidents Summary

Congestion has a direct effect on collision incidents. An analysis of crashes from year 2015 to 2017 was conducted for the I-526 LCC EAST corridor. During the three-year reporting period between January 1, 2015 to December 31, 2017 there were 754 crashes reported on I-526 between Virginia Avenue and Bowman Road. **Figure 2-3** illustrates the severity of crashes. Fatal crashes comprised less than 0.3 percent of total crashes and injury crashes comprised 20.3 percent of the reported total. Crash types are listed in **Table 2-5**. Of the crashes reported, more than half (61%) were rear end, followed by single vehicle crashes at 18 percent. Heavy congestion often contributes to an increase in crashes. This is due to vehicles being in closer proximity to each other during congested conditions increasing the likelihood of rear end collisions or sideswipes while merging.

Figure 2-3: Vehicle Crashes by Severity (2015-2017)



Source: SC Department of Public Safety

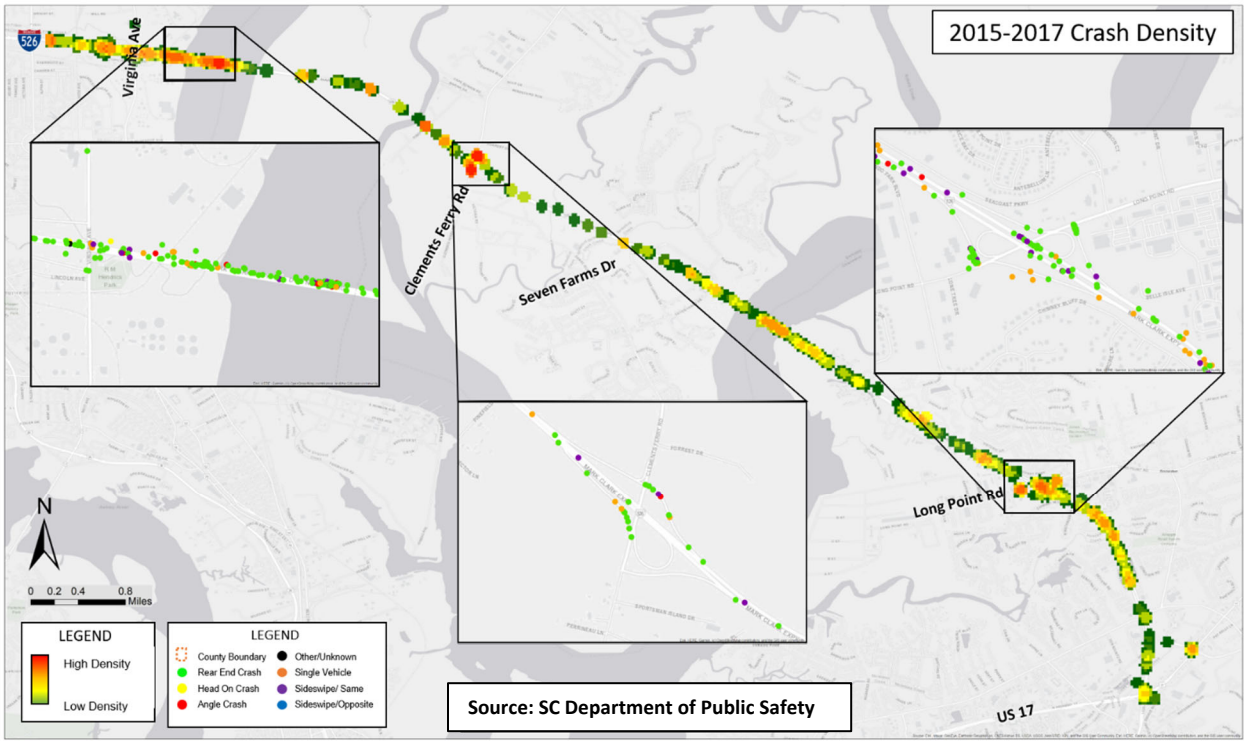
Table 2-5: 2015 to 2017 Vehicle Crashes by Type

Manner of Collision	Number of Crashes	Percentage of Crashes
Angle	32	4.2%
Head On	9	1.2%
Rear End	461	61.1%
Single Vehicle	136	18.0%
Sideswipe, Opposite Direction	2	0.3%
Sideswipe, Same Direction	103	13.7%
Other/Unknown	11	1.5%
Total Crashes	**754**	**100.0%**

Source: SC Department of Public Safety

Figure 2-4 illustrates crash density spots for the same three-year period. While crashes were reported throughout the I-526 LCC EAST corridor, a higher density of crashes were reported on both the Don Holt Bridge and the Wando Bridge as well as at the Virginia Avenue, Clements Ferry Road, and Long Point Road interchanges.

Figure 2-4: Crash Density Analysis (2015-2017)



Source: SC Department of Public Safety

2.2.2 Roadway Deficiencies

There are a number of current deficiencies along the corridor that contribute to congestion and reduced travel times along the corridor. A brief summary of the deficiencies is provided below.

2.2.2.1 Inadequate Shoulder Widths

Shoulder widths vary throughout the corridor. In sections along the bridges where there are two travel lanes, the inside and outside shoulders are typically 10 feet. In the sections with the additional truck climbing lane, the outside shoulder is reduced to 6 feet in most areas and the inside shoulder is 4 feet. East of the Wando River Bridge, the outside shoulder increases to 10 feet and the inside paved shoulder is between 4 and 5 feet. The shoulder width deficiencies in the three-lane sections do not provide enough space for disabled vehicles or crash investigations. When an incident occurs in these areas, the resulting condition may effectively be a lane closure.

2.2.2.2 Insufficient Acceleration/Deceleration Ramp Lengths

Some of the interchange ramps along the I-526 corridor have insufficient acceleration and deceleration lanes. An acceleration lane provides the opportunity for vehicles entering a freeway to achieve the speed of traffic on the freeway prior to entering the traffic flow. A deceleration lane provides an opportunity for vehicles exiting the freeway to slow down enough to stop or enter a lower speed roadway at the end of a ramp. The length of acceleration or deceleration lanes needed is based on the relative speeds of both roadways. When insufficient length is provided, it is difficult for a vehicle to achieve the appropriate speed outside the mainline lanes of the facility.

2.2.2.3 Tightly Curved Ramps

The existing interchange ramp curves within the corridor are designed for 25 miles per hour. Ramp speeds are determined to ensure that the speed differential a vehicle on a ramp must gain/reduce to enter or exit a highway is not too great. For loop ramps, the desirable minimum speed for the ramp is approximately 50 percent of the speed on the mainline highway, which ranges from 55 to 60 miles per hour along I-526. A vehicle can navigate a larger curve at higher speeds, requiring shorter acceleration/deceleration lengths to and from the mainline facility. There is a balance in design speed for the ramp and acceleration/deceleration length.

2.3 STUDY GOALS

The following goals were developed in conjunction with the SCDOT project management team, resource agencies, and input from the public. While the goals are not study needs or the study's purpose, they provide guidance for alternatives development and evaluation throughout the PEL process. Alternatives should:

- Be consistent with local plans and projects
- Improve roadway infrastructure to accommodate increased traffic volumes
- Reduce congestion related incidents through the corridor
- Enhance mobility for people and goods through the corridor
- Improve seismic resiliency
- Accommodate future transportation technologies
- Improve connections with area ports and transit

3.0 PUBLIC AND AGENCY INVOLVEMENT

The public, stakeholder, and agency involvement is critical to understanding the perspectives, needs, and issues of the public and stakeholders during the PEL process. The public involvement, stakeholder, and agency coordination efforts used in this study were conducted in a manner to satisfy the Council of Environmental Quality (CEQ) NEPA guidance 23 USC 168(d)(5)(a). Federal, state, and local agencies and community members were engaged throughout the study and feedback was solicited at key milestones to guide the development of the purpose and need.

3.1 SCDOT AND FHWA COORDINATION

Project coordination meetings were held monthly with SCDOT and FHWA during the development of the PEL study. In addition, formal coordination with FHWA occurred during four coordination points that served as check-in points to confirm progress to date, review any issues or concerns, and lay out next steps to achieve the next coordination point.

- Coordination Point 1 – PEL Initiation (March 23, 2020)
- Coordination Point 2 – Purpose and Need Statement (February 18, 2021)
- Coordination Point 3 – Alternatives Screening (September 13, 2021)
- Coordination Point 4 – PEL Document

3.2 RESOURCE AGENCY COORDINATION

The PEL study was coordinated with local, state, and federal resource agencies, including:

- Berkeley Charleston Dorchester Councils of Government
- S.C. Department of Archives and History State Historic Preservation Office
- S.C. Department of Health and Environmental Control (SCDHEC)
- SCDHEC Ocean and Coastal Resource Management
- S.C. Department of Natural Resources
- S.C. Department of Transportation
- Federal Highway Administration
- National Oceanic and Atmospheric Administration, National Marine Fisheries Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

Agencies were asked to provide comments on the draft purpose and need and information that may be helpful in evaluating potential environmental impacts of the project. A summary of the resource agency input is shown in **Table 3-1**.

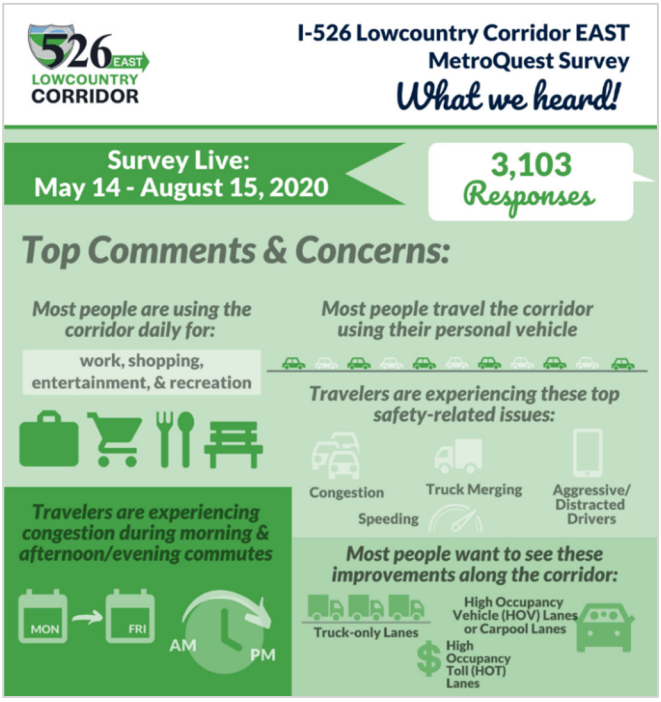
Table 3-1: Resource Agency Responses

Resource Agency	Input
USFWS	Partner consultation under Section 7 of the ESA will be required. Once a preferred alternative is selected, a survey of the selected corridor for the presence of species protected under the ESA would be required. Salt marsh wetlands are predominant along the I-526 EAST corridor and may be significantly impacted by any selected alternative. The PEL study must also consider potential impacts to migratory birds. Flight patterns, foraging, and nesting of migratory birds may be adversely affected by the corridor improvements, particularly during construction phases of the project.
NOAA Fisheries	We want to participate in the I-526 LCC EAST PEL study.
SCDNR	SCDNR accepts the invitation to participate in the environmental review of this project.

3.3 Public Engagement

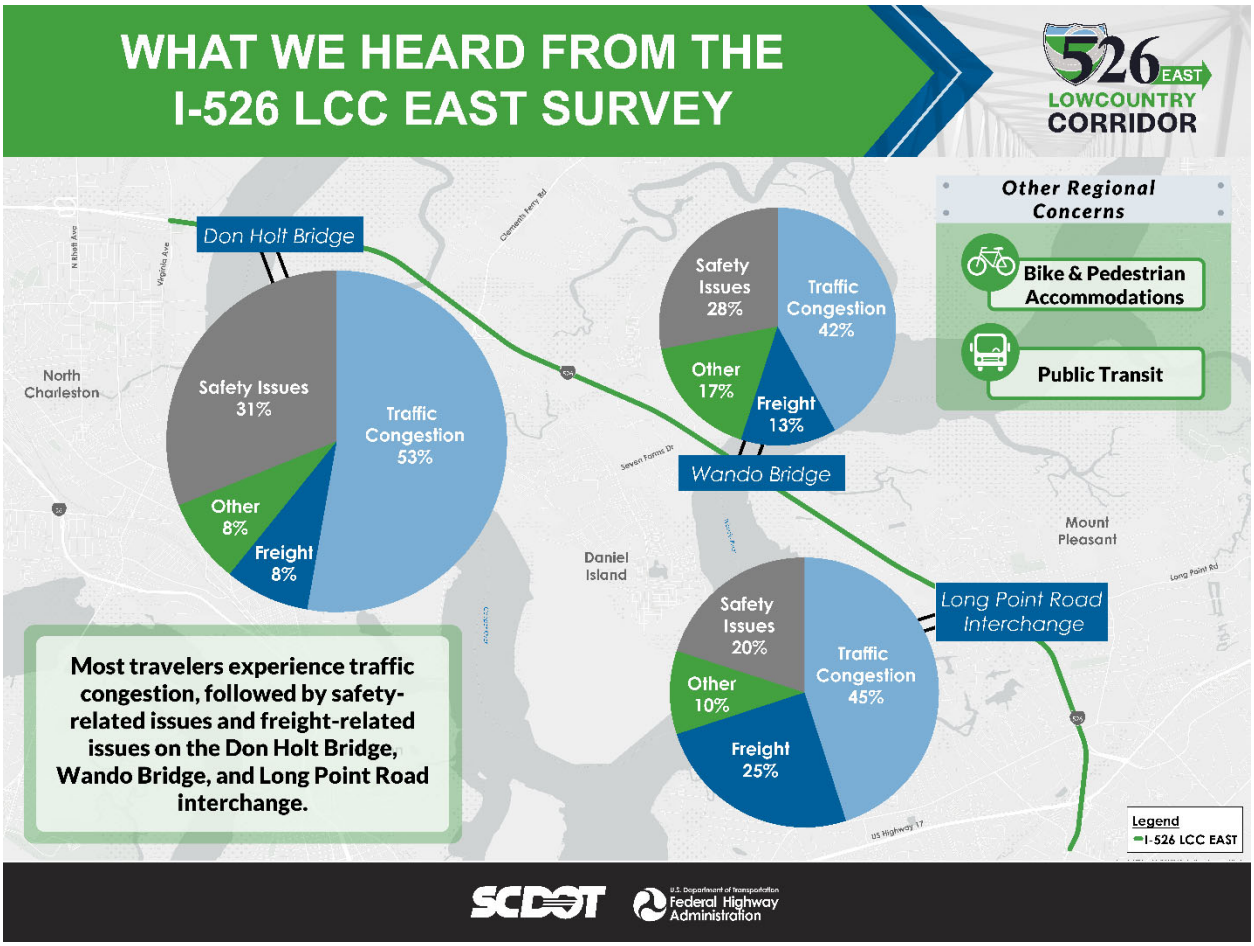
The public had an opportunity to review the draft purpose and need during an on-demand, Public Information Meeting (PIM) hosted online at www.526lowcountrycorridor.com/vpim-east/ from July 15 to August 15, 2020. The meeting was originally scheduled as an in-person meeting, however due to the public health crisis, it was rescheduled as an online PIM. In accordance with 23 USC 168(d)(5)(a), the public was asked to provide input on the draft Purpose and Need during the July 15-August 15, 2020 virtual PIM and again during the October 26 and 27, 2021 in-person PIMs. In addition to the PIM, an interactive online survey (MetroQuest) was released on May 14 and remained open until August 15, 2020. Public comments received during the PIM covered a wide range of topics. The top comments and concerns were associated with noise, neighborhood impacts, and trucks. The MetroQuest survey was designed to solicit input on the draft purpose and need; provide feedback on what travelers experience while using the EAST corridor; and provide feedback on types of improvements that the public would like to see. Two of the top safety-related issues that were reported in the survey are congestion and truck merging, aligning with the safety and traffic analyses described in **Section 2.0**. **Figure 3-1** illustrate the summary of comments received for the PIM and MetroQuest survey.

Figure 3-1: Summary of PIM and MetroQuest Survey



The MetroQuest survey also included an interactive online map to input locations of where travelers experience concerns using the EAST corridor and what type of concern. A majority of the responses show that travelers are experiencing travel concerns on the Don Holt Bridge, Wando Bridge, and the Long Point Road Interchange as summarized on **Figure 3-2**.

Figure 3-2: Summary of Mapped MetroQuest Comments



The input and feedback from the public and stakeholders helped confirm the draft purpose and need and will be utilized in the development of the alternative concepts.