SCDOT
South Carolina
Department of Transportation

MEMORANDUM

TO: Christy A. Hall, Secretary of Transportation

FROM: Brent S. Dillon, P.E., PTOE, Director of Traffic Engineering BSD

DATE: November 14, 2023

RE: 2023 Vulnerable Road User Safety Assessment

As you are aware, in accordance with 23 U.S.C. 148(l) as described by the Infrastructure Investment and Jobs Act (IIJA) (Pub. L. 117-58, also known as the "Bipartisan Infrastructure Law" (BIL)) all States are required to develop a Vulnerable Road User Safety Assessment as part of their Highway Safety Improvement Program (HSIP). States are required to complete an initial Vulnerable Road User (VRU) Safety Assessment by November 15, 2023 and include it as part of their State Strategic Highway Safety Plan (SHSP). South Carolina's current SHSP has been approved for the dates 2020-2024 which is after the November 15, 2023 date. As such, this initial VRU Safety Assessment attached is being included as a separate document (e.g., an addendum) from the existing SHSP as allowed per the VRU Safety Assessment guidance from FHWA dated October 21, 2022. This VRU will be integrated into the 2025-2029 SHSP per the BIL as noted above to remain in compliance.

REP:
Attachments:
File: TE/

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955 Park Street
Columbia, SC 29202-0191

2023 Vulnerable Road User Safety Assessment

Background

In accordance with 23 U.S.C. 148(l) as described by the Infrastructure Investment and Jobs Act (IIJA) (Pub. L. 117-58, also known as the "bipartisan Infrastructure Law" (BIL)) all States are required to develop a Vulnerable Road User Safety Assessment as part of their Highway Safety Improvement Program (HSIP). States are required to complete an initial Vulnerable Road User (VRU) Safety Assessment by November 15, 2023 and include it as part of their State Strategic Highway Safety Plan (SHSP). South Carolina's current SHSP has been approved for the dates 2020-2024 which is after the November 15, 2023 date. As such, this Initial VRU Safety Assessment is being included as a separate document (e.g., an addendum) from the existing SHSP per the VRU Safety Assessment guidance dated October 21, 2022. The SC SHSP, PBSAP, and this VRU safety assessment can be found at SCDOT's website here https://www.scdot.org/performance/performance-reports.aspx.

This initial VRU Safety Assessment will primarily include the South Carolina Pedestrian and Bicycle Safety Action Plan (PBSAP) dated May 13, 2022. Note that the Guidance was released five months after the PBSAP was finalized. This report serves as a bridging document between the VRU Safety Assessment Guidance and the 2022 PBSAP. The next update of the SC SHSP (2025-2029) will include the VRU Safety Assessment and PBSAP as an appendix.

In addition to this VRU Safety Assessment, the PBSAP, and upcoming SC SHSP, SCDOT will look to incorporate the principles of The Safe System Approach where possible in the projects and processes currently utilized within SCDOT. SCDOT will also look for opportunities to improve and expand into areas of the Safe System approach not currently used at the agency. Using this holistic approach, SCDOT will look to effect change in supporting a safety culture for all roadway users.

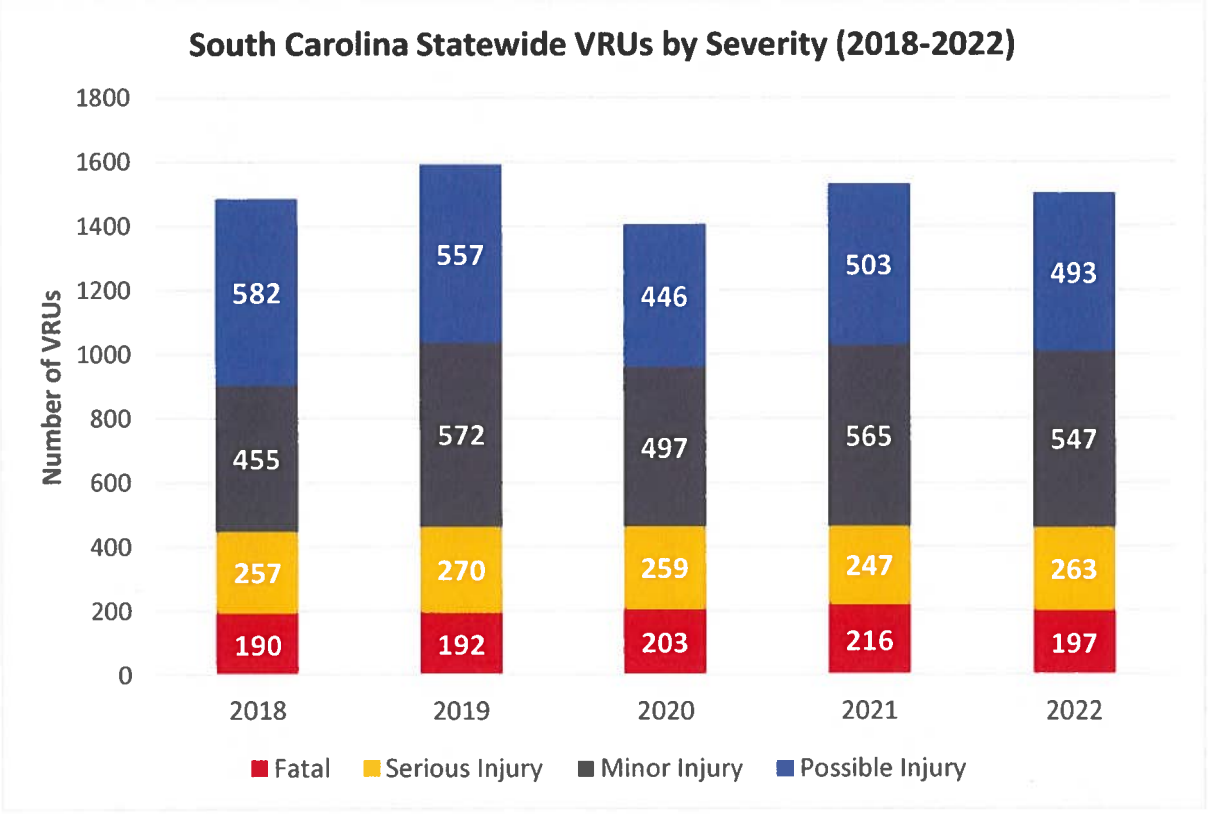
Overview of Vulnerable Road User Safety Performance

As of the 2022 SC PBSAP, South Carolina ranked fifth in the nation for pedestrian fatalities based on population. From 2009 to 2019, pedestrian fatalities increased 80% and bicycle fatalities more than doubled across the state. The data used in the PBSAP was the five-year period from 2015-2019. The "Summary of Quantitative Analysis" section of this document provides data from a more recent 5-year period; however, the overall trends for pedestrian, bicycle, and other vulnerable road users unfortunately shows a continued increase in fatalities and serious injuries statewide.

The regulatory definition of a vulnerable road user is

> *a non-motorist with a fatality analysis reporting system (FARS) person attribute code for pedestrian, bicyclist, other cyclist, and person on personal conveyance or an injured person that is, or is equivalent to, a pedestrian or pedalcyclist as defined in the ANSI D16.1-2007. (See 23 U.S.C. 148 (a) (15) and 23 CFR 490.205). A vulnerable road user may include people walking, biking, or rolling. Please note that a vulnerable road user:*
>
> • *Includes a highway worker on foot in a work zone, given they are considered a pedestrian.*
>
> • *Does not include a motorcyclist.*

The South Carolina Department of Public Safety disaggregates road users using the unit type field. Examples of these are: different types of motor vehicles, pedestrians, and pedalcycles. The SC PBSAP uses only pedestrians and pedalcyclists (bicyclists) for its analysis. Because of the Department of Public Safety's definition of pedestrian and pedalcycles, all vulnerable roadway users were and continue to be captured in future analysis.



The SC PBSAP indicates that pedestrian and bicycle fatalities comprised more than 20% of all highway deaths in SC in 2019 despite contributing to less than 1% of all crashes. Between the data used in the 2022 PBSAP and this document, VRU fatalities are down to 18% of South Carolina's 2022 fatalities. Data analysis shows that between 50%-60% of all pedestrian and bicycle crashes occur in Urban and Suburban areas (defined by the US Census Bureau and the National Center for Education Statistics) while roadways in Urban and Suburban South Carolina only account for 17% of all roadways in the state.

In an effort to mitigate VRU fatalities and serious injuries, SCDOT has an Engineering Directive (ED-75) titled "Vulnerable Road User Safety Project Prioritization Process" dated November 16, 2021. The purpose of this document is to use objective and quantifiable criteria to analyze up to five years of statewide crash data along all non-interstate highways in order to achieve a significant reduction in traffic fatalities and serious injuries on our roadways through the implementation of infrastructure-related improvements. This document can be found in Appendix A. SCDOT also has an Engineering Directive (ED-74) titled "Road Safety Assessment Project Prioritization Process" that details the process in choosing Road Safety Assessment (RSA) locations. This document can be found in Appendix B. SCDOT

performs both vehicular and vulnerable road user RSAs in addition to their data-derived HSIP annual list. In Federal Fiscal Year 2023, SCDOT devoted $5M to VRU RSAs and an additional $17M to separate VRU projects. This was an increase over prior years' funding levels due, in part, to the results of the PBSAP. SCDOT also makes the PBSAP, its list of projects, and its cut-sheets freely available to all local planning and transportation agencies and frequently presents the results of the PBSAP to the local agencies throughout the State of South Carolina. This encourages more agencies to fund VRU projects because they have already been through the data analysis and prioritization process. SCDOT and the South Carolina Department of Public Safety Office of Highway Safety and Justice Programs work diligently each year to set meaningful safety performance targets. Based on the data at the time of this assessment, South Carolina anticipates meeting the non-motorized fatality and serious injury safety performance target for 2018-2022. Currently South Carolina is reporting an average of 458.8 non-motorized fatalities and serious injuries which is less than the specified target of 500.

Summary of Quantitative Analysis

SCDOT's PBSAP was a data-driven effort. It was based on a comprehensive evaluation of pedestrian and bicycle crashes occurring across South Carolina between 2015 and 2019. While SCDOT does own the majority of the roads in the State, any crash analysis the agency performs includes all crashes on all roads in the state, not just SCDOT-owned roads. Several crash data analyses were conducted, including: summary-level crash statistics, systemic crash typing analyses for all fatal pedestrian and bicycle crashes, nominal crash analyses to identify high-crash locations, and substantive crash analyses to determine high-risk locations.

The data analysis in the 2022 PBSAP includes disaggregation between crash severity with a focus on fatal and serious injury crashes. Since a vast majority of all VRU crashes are inherently more severe, SCDOT analyzed all pedestrian and bicycle crashes as part of the high-crash area list. Along with a list of high-crash areas, SCDOT assessed crash risk using the following risk factors, shown with their factor weights, in order to develop a list of the top 1,000 high-risk roadways. The high-risk list is in Appendix B of the PBSAP.

Table 8 – Risk Assessment Factor Weights

Factor	Weighting	Weighting %
Posted Speed Limit	Low	4
Number of Travel Lanes	High	12
Functional Class	Medium	8
TWLTL Present?	High	12
Paved Shoulder Width	Medium	8
AADT	High	12
Area Type	High	12
Population Density	Low	4
% Households in Poverty	Medium	8
Existing Crash History	Low	4
Proximity to Schools	Medium	8
Proximity to Alcohol Sales	Medium	8
TOTAL		**100%**

Along with the weighted factors listed above for high-risk areas, the high-crash area data analysis used age, gender, and race as additional demographics. The PBSAP used the US Census bureau's data related to poverty thresholds as an additional demographics input. However, in the time that the PBSAP has been completed, several additional tools are now available and will be utilized in the upcoming SHSP update inclusive of the PBSAP and VRU assessment. The breakdown of the data and demographics previously used can be found in the PBSAP.

Analyzing more recent data shows a total of 887 pedestrian fatalities occurred from 2018 to 2022. The majority of crashes occurring in urban areas involved a pedestrian struck by a vehicle while crossing the roadway at a midblock location. Alternatively, the majority of crashes occurring in rural areas involved a pedestrian struck from the front or behind while walking along the roadway. A total of 111 bicycle fatal crashes occurred during the five-year study period from 2018 to 2022. The majority of these crashes, regardless of area type, involved a bicyclist struck while being overtaken (i.e., passed) by a motor vehicle. When examining these crash data in relation to roadway types, the results indicated 35% of all pedestrian statewide fatal and serious injury crashes occurred on Principal Arterial roadways. However, Principal Arterial roadways make up just 4% of the public roadway system, indicating an overrepresentation in the crash data by 31%.

Summary of Consultation

SCDOT created a vast network of stakeholders when doing the Pedestrian Bicycle Safety Action Plan. These stakeholders were from various Divisions at SCDOT, Department of Public Safety, Department of Motor Vehicles, Department of Health and Environmental Control, local cities, MPOs, Councils of Government, universities, and statewide advocacy groups. The plan started with a State of the Practice Review that included interviews with 35 groups throughout the state to gather information regarding

pedestrian and bicycle safety. These interviews were documented by the study group and included in the countermeasures information.

As mentioned previously, SCDOT has been extremely proactive about sharing the high-risk list with local agencies and the planning organizations statewide. The PBSAP also includes cut-sheets for some of the top locations on the list in various geographical regions throughout the state. One of the goals of the PBSAP is to provide other transportation agencies with the locations and countermeasures that have the highest risks.

There are locations on the high-risk list that SCDOT has already planned and/or programmed. Most of these locations are Road Safety Assessments. As part of the RSA process, all stakeholders are invited to attend the RSA for desk and field reviews. One additional step SCDOT has added to its RSA process, is to include a public involvement step the program. This will be completed through a public meeting to allow the general public and the road users specific to each RSA location to have a voice for the community in helping to enhance safety. This is the way that SCDOT provides consultation for projects in stakeholder areas. Through the PBSAP and the RSA many local planning agencies have started to increase coordination with SCDOT in doing safety projects as well as developing local safety programs.

Program of Projects or Strategies

The PBSAP includes a table of countermeasures for pedestrian and bicycle safety, a list of high-crash locations, a list of high-crash locations, and cut-sheets for several high-crash locations that combines the locations with recommended countermeasures that are site specific. This list is available to the public and SCDOT has encouraged local agencies to choose these locations and implement the included countermeasures.

Future Plans and Updates

The current SC SHSP will be updated during calendar year 2024 and will be dated 2025-2029. As part of the SHSP update process, the PBSAP will also be updated and enhanced to include and expound upon the requirements of the VRU Safety Assessment regulations.

For the SC SHSP 2025 update, SCDOT will utilize its new customized Safety Management Solutions (SMS) software, which is in the process of being finalized and ready for use at the end of October 2023. Its main purpose is to support SCDOT in making strategic decisions for improving roadway safety. This web-based application integrates crash data from SCDPS with the road network and roadway characteristics managed by SCDOT. It includes several modules to create a comprehensive safety management solution. This first phase of the SMS application includes functionality for importing crashes, querying for crashes, viewing crashes in a map, editing crashes, reporting, and creating investigations. When querying crashes, users can perform basic roadway or intersection searches, spatial searches and specified advanced queries. The second phase of the SMS application, which is nearing production, provides statewide ranking functionality and an interface to track projects from the ranked candidate lists. The analysis tools include fixed length, sliding scale, homogenous segments with SPFs and intersections with SPFs. This new tool will not only aid in making project level decisions, but agency and state wide safety program and process decisions.

SCDOT will use SMS as another tool in its continued data driven approach as the primary source for its strategic planning of safety programs, but acknowledges the need to review safety from a multifaceted

perspective. The Safe System Approach along with other national efforts and safety initiatives will be reviewed and examined for potential inclusion as program drivers or guidance to SCDOT's drive to reduce fatal and injury crashes, with the ultimate goal of zero fatalities.

Please contact State Highway Safety Engineer Mr. Duncan Smith, P.E. at (803) 737-1418 should there be any questions regarding the SHSP, PBSAP, or the VRU assessment.

Sincerely,

Christy A. Hall, P.E.
Secretary of Transportation
South Carolina Department of Transportation

Robert G. Woods IV
Director
South Carolina Department of Public Safety
Governor's Representative for Highway Safety

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Appendix A

South Carolina Department of Transportation

Engineering Directive

Directive Number:	**ED-75**	**Effective: November 16, 2021**
Subject:	**Vulnerable Road User Safety Project Prioritization Process**	
References:	**Section 57-1-370 of South Carolina Code of Laws, 1976, as amended; S.C. Code of Regulations 63-10, as amended**	
Primary Department:	**Traffic Engineering**	

In 2007, the South Carolina General Assembly enacted Act 114. One of the landmark items in Act 114 was the requirement that the South Carolina Department of Transportation (SCDOT) establish a project prioritization process. In 2016, the General Assembly enacted Act 275. Act 275 eliminated some of Act 114's requirements but it retained the requirement for project prioritization. This requirement is codified in Section 57-1-370 of the South Carolina Code of Laws, 1976, as amended. Additional detail on the process is found in S.C. Code of Regulations 63-10, as amended.

This engineering directive details the process for prioritizing and selecting projects for **the Vulnerable Road User Safety Program** using objective and quantifiable criteria. The process includes an analysis of up to five years of statewide crash data along all non-interstate highways. Crash data for all non-interstate highways is sorted by route and county to produce the vulnerable road user safety corridor candidate list.

SCDOT currently maintains approximately 41,500 miles of roadways. The purpose of this program is to achieve a significant reduction in traffic fatalities and serious injuries on our roadways through the implementation of infrastructure-related improvements.

Crash data is received from South Carolina Department of Public Safety (SCDPS) on a quarterly basis. SCDPS is the official custodian of the state's master crash data file.

Locations of crashes are recorded by the investigating officer on the collision report and SCDPS records the crash details. The crash data from SCDPS is imported into SCDOT's Safety Management Software (SMS) which provides the total number of fatalities and serious injury crashes along with associated crash factors within the above defined corridors.

The following **relevant** criteria will be used when identifying the vulnerable road user safety candidate list.

- **Public Safety** – The sole purpose and need of this program is to improve public safety by reducing the number and severity of highway related crashes.

- **Financial Viability** – Financial viability is based on the consideration of project cost in comparison to the six-year Statewide Transportation Improvement Program (STIP) budget. This information is used to determine the number of projects considered in the candidate pool.

- **Total Pedestrian and Bicycle Crashes** – Crashes that involve a pedestrian and/or a bicycle.

- **Crash Density** – The total number of bicycle/pedestrian crashes divided by the corridor length.

The vulnerable road user safety candidate list will be comprised of locations within the SMS database. Additional candidates may also be considered and evaluated based on submittals from either internal or external entities, but will be subject to the same safety project selection detailed below.

Criteria

A vulnerable road user safety candidate list was developed through analysis within SCDOT's Pedestrian and Bicycle Safety Action Plan (PBSAP). A geographical information systems (GIS) analysis was conducted using the latest five years of statewide total pedestrian and bicycle crash data. The GIS analysis consisted of a cluster analysis to determine the density of crashes along roadway segments ranging in length for 0.25 to 1.0 miles with at least five (5) reported crashes. Project lengths were further adjusted based on existing crash patterns and logical termini.

Financial viability will be used to determine the extent of the candidate list. These candidates will be further analyzed by safety engineers for consideration. Candidates will be selected for projects based upon the availability of engineering solutions to reasonably reduce crashes occurring within the corridor. Candidates may be eliminated from selection for various reasons such as overlap with an active project from another funding source, previously reviewed and eliminated as a candidate within the past year, or no reasonable engineering solution available.

The final list will be prioritized utilizing weighted crash severity to identify locations, and then ranked based upon total pedestrian and bicycle crashes and crash density.

The following Act 114 criteria were considered but deemed **not relevant** as they relate to this program category priority list, as they do not support the **purpose and need** of the Vulnerable Road User Safety Program.

- **Volume-to-Capacity Ratio** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.

- **Truck Traffic** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.

- **Pavement Condition** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.

- **Environmental Impact** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.

- **Potential for Economic Development** – Not relevant to the prioritization process since this program category consists of the rehabilitation and reconstruction of existing roads.
- **Alternative Transportation Solutions** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.
- **Consistency with Local Land Use Plans** – Not relevant to the prioritization process since this program category consists of the rehabilitation and reconstruction of existing roads.

Upon completion of the analysis, the prioritized list of vulnerable road user safety projects will be presented to the SCDOT Commission for approval.

All data used for project prioritization will be kept on file as required by Departmental Directive 51 and SCDOT's record retention schedules.

Submitted by: Rob Perry, P.E.
Director of Traffic Engineering

Recommended by: Andrew T. Leaphart, P.E.
Chief Engineer for Operations

Approved by: Leland Colvin, P.E.
Deputy Secretary for Engineering

History: Issued on July 25, 2018
First Revision on November 16, 2021

Appendix B

South Carolina Department of Transportation

Engineering Directive

Directive Number:	**ED-74**	**Effective: July 25, 2018**
Subject:	**Safety – Road Safety Assessment Project Prioritization Process**	
References:	**Section 57-1-370 of South Carolina Code of Laws, 1976, as amended; S.C. Code of Regulations 63-10, as amended**	
Primary Department:	**Traffic Engineering**	

In 2007, the South Carolina General Assembly enacted Act 114. One of the landmark items in Act 114 was the requirement that the South Carolina Department of Transportation (SCDOT) establish a project prioritization process. In 2016, the General Assembly enacted Act 275. Act 275 eliminated some of Act 114's requirements but it retained the requirement for project prioritization. This requirement is codified in Section 57-1-370 of the South Carolina Code of Laws, 1976, as amended. Additional detail on the process is found in S.C. Code of Regulations 63-10, as amended.

This engineering directive details the process for prioritizing and selecting projects for **the Road Safety Assessment (RSA) Program** using objective and quantifiable criteria. A description of the RSA program process is referenced in enclosure 1.

The RSA candidate selection process includes an analysis of up to five years of statewide crash data along all non-interstate highways. The crash data is divided into one mile segments over the entire non-interstate highway network.

SCDOT currently maintains approximately 41,500 miles of roadways. The purpose of this program is to achieve a significant reduction in traffic fatalities and serious injuries on our roadways through the implementation of infrastructure-related improvements.

Crash data is received from South Carolina Department of Public Safety (SCDPS) on a quarterly basis. SCDPS is the official custodian of the state's master crash data file.

Locations of crashes are recorded by the investigating officer on the collision report and SCDPS records the crash details. The crash data from SCDPS is imported into SCDOT's Safety Management Software (SMS), which provides the total number of fatalities and serious injury crashes along with associated crash factors within the above defined segments.

The following **relevant** criteria will be used when identifying the RSA safety candidate list.

- **Public Safety** – The sole purpose and need of this program is to improve public safety by reducing the number and severity of highway related crashes.
- **Financial Viability** – The financial viability is based on the consideration of project cost in comparison to the six-year Statewide Transportation Improvement Program (STIP)

budget. This information is used to determine the number of projects considered in the candidate pool.

- **Total Crashes** – The total number of crashes resulting in a fatality or serious injury within a selected corridor.

The RSA candidate list will be comprised of locations within the SMS database. Other candidates may also be considered and evaluated based on submittals from either internal or external entities, but will be subject to the same safety project selection detailed below.

Criteria

A RSA candidate list will be developed by sorting the list of the one-mile segment lengths by highest crash total involving a fatal and / or serious injury. Financial viability will be used to determine the extent of the candidate list.

The final list will be prioritized based on the highest crash total of fatal and / or serious injury crashes. Final project list termini may be adjusted to include other segments from the ranked list that appear adjacent to the initial location.

The following Act 114 criteria were considered but deemed **not relevant** as they relate to this program category priority list, as they do not support the **purpose and need** of the safety intersection program.

- **Volume-to-Capacity Ratio** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.
- **Truck Traffic** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.
- **Pavement Condition** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.
- **Environmental Impact** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.
- **Potential for Economic Development** – Not relevant to the prioritization process since this program category consists of the rehabilitation and reconstruction of existing roads.
- **Alternative Transportation Solutions** – Not relevant as part of the prioritization process since this criteria does not meet the program category "safety" purpose and need.
- **Consistency with Local Land Use Plans** – Not relevant to the prioritization process since this program category consists of the rehabilitation and reconstruction of existing roads.

Upon completion of the analysis, the prioritized list of road safety assessment safety projects will be presented to the SCDOT Commission for approval.

All data used for project prioritization will be kept on file as required by Departmental Directive 51 and SCDOT's record retention schedules.

Submitted by: Rob Perry, P.E.
Director of Traffic Engineering

Recommended by: Andrew T. Leaphart, P.E.
Chief Engineer for Operations

Approved by: Leland Colvin, P.E.
Deputy Secretary for Engineering

History: Issued on July 25, 2018

Enclosure 1

SCDOT Road Safety Assessment Program Process

INTRODUCTION

Road Safety Assessments (RSAs) are identified as an effective strategy to identify potential safety improvements for many of the state's SHSP emphasis areas, such as intersection and roadway departure crashes. SCDOT's Highway Safety Improvement Program (HSIP) provides a funding mechanism and data driven process to identify the best engineering countermeasures for the prevailing crashes at a location. The identification of safety problems within candidate segments and the development of countermeasures to address observed safety issues are critical components to the overall success of the HSIP program. HSIP funds have been allocated to improve the candidate RSA segments with the most injuries and deaths from crashes. This document describes the RSA process.

RSA DESCRIPTION AND BACKGROUND

A road safety assessment is defined as a formal examination of an existing or a future highway or traffic project in which a team of independent and multidisciplinary examiners report on the segment's safety performance. The overall objective of the RSA is to identify potential roadway safety issues for roadway users and to consider measures to eliminate or mitigate the safety deficiencies. The process can be best applied to roadway segments of 1 to 3 miles in length and is used on rural as well as urban roads.

SCDOT's focus will be conducting RSAs on existing roadways, typically 1 to 3 miles in length with locations selected as described in EDM ??. The reviews will consider the roadway and traffic control elements in the context of the multiple human, vehicle and roadway causes for the crashes that have occurred and the events leading up to, during and after the collision.

RSA PROCESS

The RSA process occurs after potential segments have been screened to determine the priority locations by the SCDOT Highway Safety Office. The safety office staff will be expected to play a major role in the assessment of safety and operations of the corridor. Highway Safety staff will also be responsible for conducting the crash data analysis and reviewing the RSA to allocate funding to the proposed safety improvement projects that are eligible.

Figure 1 identifies the nine major steps of the process used by SCDOT to conduct the RSA.

Enclosure 1

Figure 1.