

2023 Kansas Vulnerable Road User Safety Assessment

Addendum to the 2020–2024 Kansas Strategic Highway Safety Plan



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Acknowledgments

FINAL

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The Kansas Department of Transportation (KDOT) appreciates the concerted effort of local, regional, and Tribal agencies that provided input in the Vulnerable Road User Safety Assessment. Additionally, the Strategic Highway Safety Plan partners, consisting of the Drive to Zero Coalition and the Emphasis Area Teams, are valuable partners in a shared mission of saving lives on public roads in Kansas. KDOT looks forward to continued partnership on this important subject.

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Executive Summary

The Kansas Department of Transportation (KDOT) produced this Vulnerable Road User Safety Assessment (VRUSA) in accordance with the federal Bipartisan Infrastructure Law (BIL, also known as the Infrastructure Investment and Jobs Act). Vulnerable road users (VRUs), including pedestrians, cyclists, and others using non-motorized modes of transportation, are killed or seriously injured on Kansas roads every year at a rate faster than other road users. The VRUSA aims to improve understanding of the conditions and behaviors present in fatal and serious injury crashes involving VRUs. The VRUSA includes recommendations for the Strategic Highway Safety Plan (SHSP) Update as well as guidance for implementing VRU safety programs and projects in Kansas. KDOT intends to implement the recommendations of the VRUSA to continue its concerted effort to eliminate death and serious injuries from traffic crashes.

The Safe System Approach

KDOT developed this VRUSA in alignment with the Safe System Approach (SSA) as defined by the U.S. Department of Transportation (USDOT) in the National Roadway Safety Strategy. To support decision-making, the data analysis involved an assessment of common and reoccurring themes involving road user behaviors, roadway design, speed, and post-crash care. KDOT also used the SSA objectives (i.e., Safer People, Safer Roads, Safer Speeds, Safer Vehicles, and Post-Crash Care) as a framework for stakeholder engagement and the final VRUSA recommendations.

Overview of Vulnerable Road User Safety Performance

Between 2014 and 2021, there were an estimated 3,172,000,000 VRU trips in Kansas. At that same time, there were 1,034 fatal or suspected serious injury crashes, resulting in 269 VRU deaths and 790 VRU serious injuries. Comprehensive crash costs associated with VRU fatal and suspected serious injury crashes (KA crashes) totaled \$4,246,000,000. While VRU KA crashes constitute less than 10% of overall KA crashes in Kansas, VRU KA crashes have increased in recent years at a faster rate than overall KA crashes.

While overall VRU KA crashes are increasing statewide, there are areas in Kansas that are lower risk and have achieved near zero VRU KA crashes in recent years despite having consistent VRU usage. The cities that include lower-risk areas garnered long-term buy-in from the public and elected officials for improving VRU safety and mobility, engaged in VRU planning efforts, and implemented VRU projects. These cities provide a model for implementing VRU safety countermeasures in Kansas.

Data Analysis

KDOT completed a comprehensive data analysis of VRU safety by studying VRU KA crashes from 2014 to 2021, including analyzing crash trends and contributing circumstances, mapping a High-Injury Network (HIN), conducting a systemic safety risk analysis, and creating a High-Risk Network (HRN).



KDOT identified higher-risk areas and roadways in the state. The analysis involved a systemic safety risk analysis, including the creation of the HRN. KDOT normalized VRU KA crashes in geographic areas against VRU trips, population, miles of roads, and land area to identify areas that were either overrepresented or underrepresented in VRU KA crashes. These areas are referred to as either lower-risk or higher-risk areas.

KDOT also analyzed VRU safety within different area types—including rural, suburban, and urban—and separately analyzed safety within and outside Disadvantaged Census (DAC) tracts and by demographic factors such as race/ethnicity, sex, and age. Crash risk is unequally distributed among all these factors, with higher risks in urban areas and DACs. Black and Native American, male, and young users (under 24 years old) are overrepresented in VRU KA crashes compared to the proportion of Kansas’s population. Pedestrians constitute over 70% of VRUs killed or seriously injured in Kansas.

Stakeholder Engagement

KDOT hosted two rounds of stakeholder engagement to facilitate dialogue among local and regional government agencies to understand their VRU safety needs. The first round of statewide workshops was a listening tour across the state, where nearly 100 agencies participated in the meetings, representing 45 counties, 38 cities, and 15 other government agencies. The second round of workshops involved six cities in lower-risk areas and five cities in higher-risk areas. Key takeaways from the meetings identified a need to:

- Gain local political and public buy-in for addressing VRU safety, focusing on the increasing number of VRU KA crashes and countermeasures that can be used to improve safety.
- Focus on constructing infrastructure for VRU safety, including sidewalks, bicycle facilities, trails, shoulders, and high-quality street crossings.
- Reduce vehicle speeds through a robust speed management program that includes education and enforcement as well as investing in infrastructure treatments that create self-enforcing designs, such as road diets, traffic calming, and roundabouts.
- Support local agencies with funding and technical assistance, including providing analysis findings and supporting the identification of a preferred countermeasure(s).

Programmatic Integration

The VRUSA also includes recommendations and guidance for developing an improved means to deliver VRU safety investments through existing funding sources. The guidance aims to proactively identify and fund a program of projects and strategies to reduce the safety risks for VRUs in high-risk areas, with a concerted focus on local, urban roads.



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Abbreviations

AADT	Average Annual Daily Traffic	KATE	Kansas Active Transportation Program
ADA	Americans with Disabilities Act	KDOT	Kansas Department of Transportation
ADAS	Advanced Driver Assistance Systems	LPA	Local Public Agency
ATP	Active Transportation Plan	LPI	Leading Pedestrian Interval
BIL	Bipartisan Infrastructure Law	LTAP	Local Technical Assistance Program
CCL	City Connecting Link	mph	miles per hour
CMAQ	Congestion Mitigation and Air Quality Improvement Program	MPO	Metropolitan Planning Organization
CSP	Cost-Share Program	MUTCD	Manual on Uniform Traffic Control Devices
DAC	Disadvantaged Communities (as defined by USDOT)	NHTSA	National Highway Transportation Safety Administration
DTZ	Drive To Zero	PHB	Pedestrian Hybrid Beacon
EAT	Emphasis Area Team	RRFB	Rectangular Rapid Flashing Beacon
EMS	Emergency Medical Services	SHSP	Strategic Highway Safety Plan
ETC	Equitable Transportation Community	SRTS	Safe Routes to Schools
FHWA	Federal Highway Administration	SSA	Safe System Approach
FY	Fiscal Year	SS4A	Safe Streets and Roads for All
HIN	High-Injury Network	STBG	Surface Transportation Block Grant
HRN	High-Risk Network	TEAP	Traffic Engineering Assistance Program
HRRR	High-Risk Rural Road Program	TRB	Transportation Research Board
HRUR	High-Risk Urban Road Program	USDOT	U.S. Department of Transportation
HSIP	Highway Safety Improvement Program	VRU	Vulnerable Road User
Hub	Kansas Infrastructure Hub	VRUSA	Vulnerable Road User Safety Assessment
KA	“K” and “A” severity crashes from the Highway Safety Manual scale of crash severity rating. K = fatal; A = suspected serious injury		



1. Introduction



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The Kansas Department of Transportation (KDOT) produced the Vulnerable Road User Safety Assessment (VRUSA) in accordance with guidance from the Federal Highway Administration (FHWA).¹ The VRUSA will be included as an addendum in the 2020–2024 Strategic Highway Safety Plan (SHSP).² The document is accompanied by a Technical Report that contains additional information related to the analysis, findings, and recommendations.

FHWA defined Vulnerable Road Users (VRUs) as anyone walking, biking, or rolling by non-motorized forms of transportation on public roads or on foot in work zones. Prior to preparing the VRUSA, KDOT conducted an analysis to work toward improving VRU safety. In 2018, KDOT began convening VRU stakeholders for the 2020–2024 SHSP. The SHSP included the first Pedestrian and Cyclist Emphasis Area Team (EAT) in response to the rise in VRU fatal and suspected serious injury crashes (KA crashes). KDOT updated the Kansas Active Transportation Plan (ATP) in February 2023.³

1.1 Vulnerable Road User Safety Assessment Development

To develop the VRUSA, KDOT conducted an extensive analysis of VRU crashes resulting in a fatality or suspected serious injury and developed a High-Injury Network (HIN) map to identify areas of historical crash concentrations. KDOT also assessed both the contributing circumstances and demographic factors noted in crash reports, as reported by law enforcement, and then conducted a systemic safety risk analysis comparing the locations of the crashes to the features of the roadway, such as the number of lanes, speed limits, and location context. KDOT used this systemic safety risk analysis to create a High-Risk Network (HRN) to identify locations where another VRU KA crash could occur given context and VRU usage.

The analysis shows that from 2014 to 2021, there were an estimated 3,172,000,000 VRU trips in Kansas. At that same time, there were 1,034 KA crashes, resulting in 269 VRU deaths and 790 VRU serious injuries. Comprehensive crash costs associated with these VRU fatal and suspected serious injury crashes (VRU KA crashes) totaled \$4,246,000,000.⁴ Additionally, VRU fatal and serious injury crashes have increased in recent years and are increasing at a faster rate than overall KA crashes.

¹ U.S. Department of Transportation: Federal Highway Administration. (2022). *Vulnerable Road User Safety Assessment Guidance*. https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL_508.pdf

² Kansas Department of Transportation. (2020). *Kansas Strategic Highway Safety Plan*. <https://www.ksdot.gov/bureaus/burTrafficSaf/reports/kshs.asp>

³ Kansas Department of Transportation. (2023). *Kansas Active Transportation Plan*. <https://www.ksdot.gov/KansasATP.asp>

⁴ Based on the cost of crashes in the KDOT Fiscal Year (FY) 2024 Crash Costs memorandum.



To improve understanding of the qualitative factors leading to VRU crashes, KDOT engaged local and regional agencies across the state in a series of safety workshops. In spring 2023, KDOT consulted with more than 100 Local Public Agencies (LPAs) to gain insight into the issues in their communities and to gather feedback on countermeasures and strategies that would work best in the state. In the summer of 2023, KDOT engaged LPAs representing high- and low-risk cities to understand their perspectives on the support that local agencies need to address VRU safety. A summary of the stakeholder engagement efforts is included in Section 3 of this document.

Findings from the data analysis and the stakeholder engagement were used to develop recommendations for the SHSP Update and to provide program-level guidance to address VRU safety with existing safety funding sources available at KDOT. The recommendations are included in Sections 4 and 5 of this document. By evaluating findings from the VRUSA and creating and implementing strategies, KDOT’s goal is to decrease deaths and serious injuries of VRUs.

1.2 Safe System Approach

The Safe System Approach (SSA) aims to eliminate serious injuries and deaths in the transportation system.⁵ The SSA outlines an effective way to address and mitigate risks inherent in the transportation system and builds and reinforces the multiple layers of the system to both prevent crashes from happening and minimize harm when crashes occur. The SSA includes six principles and five objectives, as displayed in Figure 1.

KDOT developed the VRUSA in alignment with the SSA. To support decision-making, the data analysis aimed to improve understanding of road user behaviors, roadway design, speed, and post-crash care. Future analysis may include the safer vehicle objective; however, vehicle data were not readily available for this VRUSA. KDOT also used the SSA objectives as a framework for stakeholder engagement and the final VRUSA recommendations.



Figure 1: Safe System Approach Principles and Objectives (Source: USDOT)

⁵ U.S. Department of Transportation. (2022). *What is a Safe System Approach?* <https://www.transportation.gov/NRSS/SafeSystem>



2. Data Analysis



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Data-driven safety analysis is key to implementing the SSA. Crash and roadway attribute data are an important tool to uncover patterns, trends, and underlying factors that contribute to traffic crashes. KDOT prepared the first iteration of data analysis prior to conducting the statewide workshops to provide attendees with information about the issues and trends related to VRU safety. Staff gathered stakeholder feedback during the workshops and used it to refine the data analysis and explore additional topics raised by attendees in both rounds of workshops. The VRUSA integrates the following data analysis techniques:

1. **Crash Trends:** evaluating common and reoccurring trends in VRU KA crashes.
 - o **Contributing Circumstances:** exploring demographic, behavioral, and contributing factors indicated in crash reports completed by law enforcement officers.
2. **High-Injury Network (HIN):** identifying roads with elevated VRU KA crash concentrations based on past crashes, normalized by various factors such as population, land area, and VRU trips.
3. **High-Risk Network (HRN):** identifying roads with elevated risks to VRUs based on roadway configuration and contextual features identified by the systemic safety risk analysis.
 - o **Systemic Safety Risk Analysis:** conflating VRU KA crash locations with roadway data and land use context to assess relative overrepresentation or underrepresentation of crashes to identify a proxy for VRU risk.

KDOT focused on two separate land area contextual definitions:

1. **Development Density:** analysis of crashes by rural, suburban, and urban land areas.
2. **Equity:** analysis of crashes within and outside Disadvantaged Communities (DACs).⁶

The size of the transportation system in Kansas, which comprises nearly 140,000 linear miles, and the nature of VRU crashes on a local level make mapping these crash locations challenging to display. To alleviate these challenges, KDOT created a VRU Mapping Tool to supplement the data analysis. To implement the VRUSA's recommendations, KDOT's goal is to provide the VRU Mapping Tool online for use by LPAs or interested stakeholders. Details on data analysis and the mapping methodology are included in the Technical Report.

⁶ KDOT used the U.S. Department of Transportation's (USDOT) definition of DACs, as shown in the Equitable Transportation Community (ETC) Explorer. More information on the DACs in Kansas is included in the Technical Report. U.S. Department of Transportation. (2023). *ETC Explorer*. <https://www.transportation.gov/priorities/equity/justice40/etc-explorer>



2.1 Crash Trends

Between 2014 and 2021, there were 1,034 KA crashes involving VRUs. Recognizing common or reoccurring crash trends helps identify the patterns and understand the impacted groups. General crash trends involving VRUs killed or seriously injured were identified and queried by location, user type, behaviors, and other reoccurring factors. Kansas crash data analysis identified several takeaways:

- VRU KA crashes increased at a faster rate than overall KA crashes (Figure 2).
- More than 70% of VRU KA crashes involved pedestrians.
- VRU KA crashes were concentrated by area and on roads of similar characteristics.
 - More than 85% of VRU KA crashes happened on local roads (Figure 3).
 - Over 80% of all VRU KA crashes happened in urbanized areas.
 - More than 70% of VRU KA crashes occurred on less than 1% of public roads in Kansas.
 - Local, urban, four-lane roads, major and minor arterial roads, roads with bus routes, roads with 30 and 35 mile per hour (mph) speed limits, and roads with annual average daily traffic (AADT) between 10,000 and 25,000 pose the highest risk for VRUs. These roads have VRU crash concentrations 20 to 70 times higher than average.
 - Nearly 70% of KA pedestrian crashes occurred at mid-block locations (not at intersections), whereas nearly 60% of cyclist KA crashes occurred at intersections.
- VRU crashes are overrepresented in DACs and among certain racial groups:
 - Over 40% of KA crashes occurred in DACs, whereas only 16% of Kansas roads are in DACs.
 - Black and Native American road users are approximately twice as likely to be killed in a VRU crash than other races when normalized by population by race in Kansas.
- Individuals between 25 and 34 years old were the largest age group killed or seriously injured in VRU crashes.
- More than 60% of VRUs killed or seriously injured in a crash were male.
- Almost 60% of pedestrian KA crashes were either at night, dawn, or dusk hours. Approximately 65% of cyclist KA crashes were during daylight hours.
- Alcohol or drug intoxication of VRUs accounted for less than 5% of VRU KA crashes. Law enforcement officers noted pedestrian contributing circumstances such as “darting,” “inattention,” “cell phone use,” and “wearing dark clothing” in fewer than 20% of VRU KA crash reports.

These VRU KA crash trends are further documented in the Technical Report.



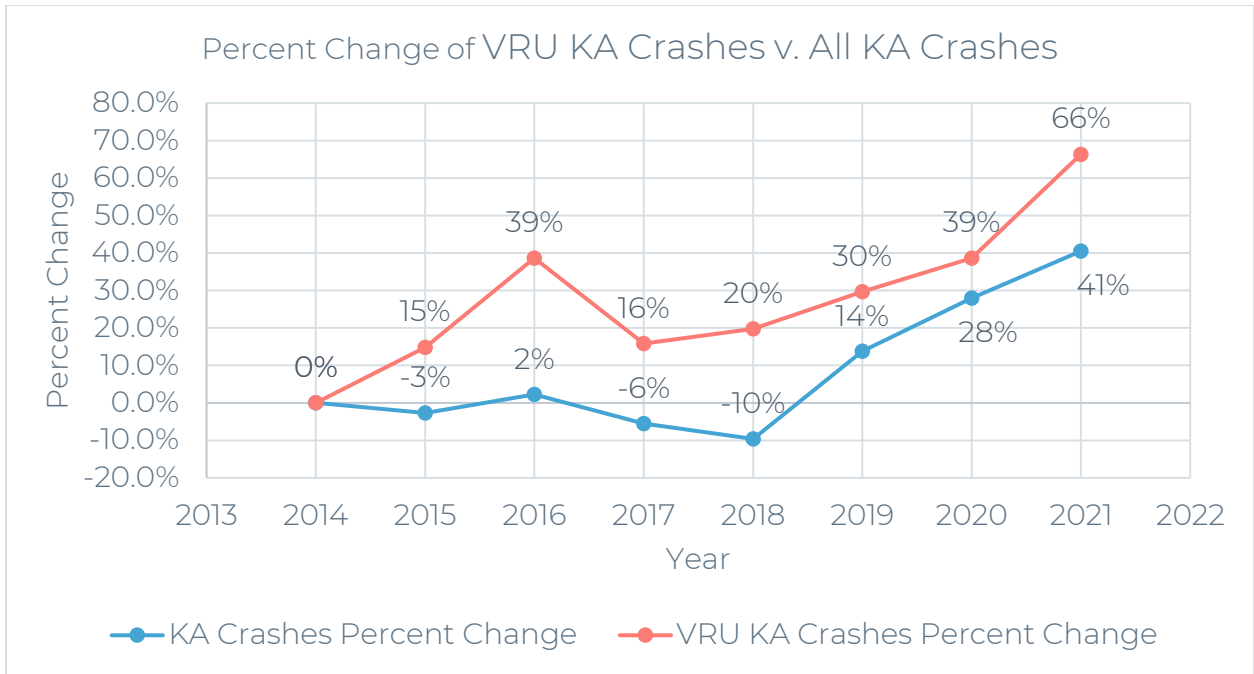


Figure 2: VRU KA Crashes Compared to All KA Crashes Percent Change (2014–2021)

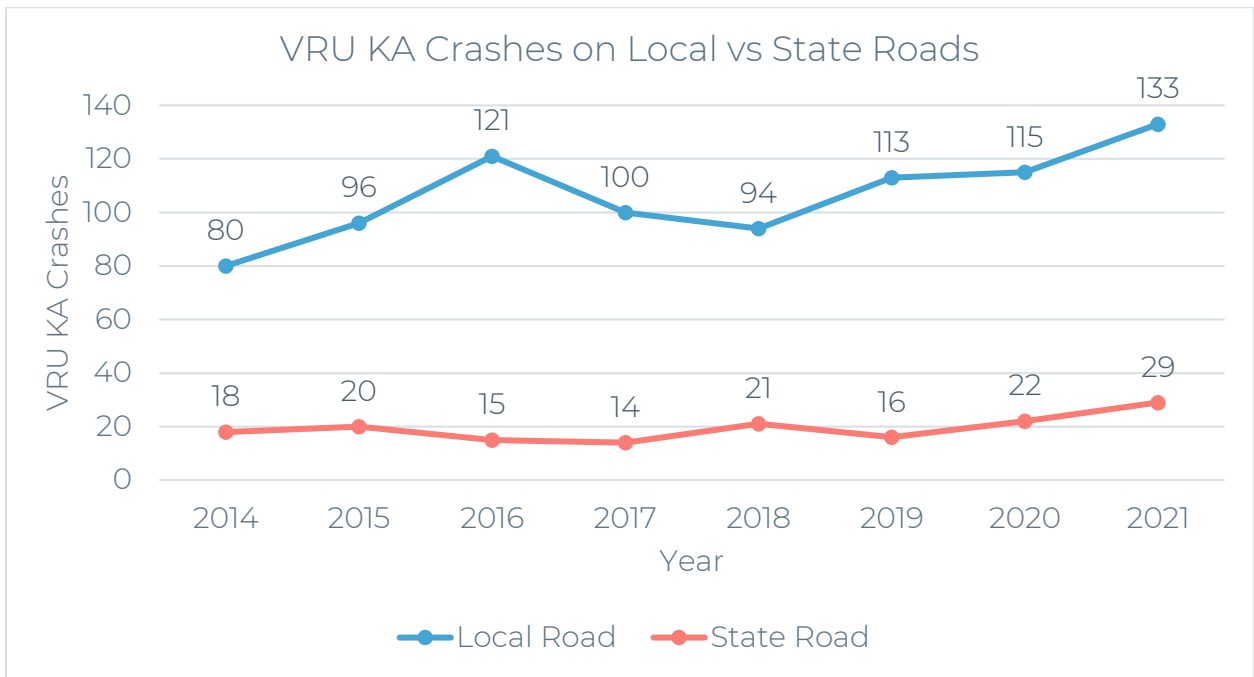


Figure 3: VRU KA Crashes on Local vs. State Roads (2014–2021)



2.2 High-Injury Network

KDOT developed the HIN by mapping VRU KA crashes to public road segments in Kansas and finding segments with the highest concentration of VRU KA crashes. These segments constitute the HIN. Table 1 illustrates that 72% of VRU crashes occurred on 0.28% of public roads in Kansas. Additionally, the HIN segments are not equally distributed inside and outside of DACs. Table 2 shows that even though 16% of Kansas roads are in DACs, 46% of the HIN is in a DAC.

Table 1: High-Injury Network Statistics

HIN Designation	KA Crashes		Centerline Miles	
	KA Crashes	% of KA Crashes	Total	%
HIN	743	72%	394	0.28%
Statewide	1,034	100%	141,005	100%

Table 2: High-Injury Network Statistics for Disadvantaged Communities

HIN Designation	Miles not in DAC	Miles in DAC	Percent in DAC
HIN	212	182	46%
Statewide	118,094	22,910	16%

2.3 High-Risk Network

To identify an HRN, KDOT conducted a systemic safety risk analysis for VRU KA crashes to identify common and reoccurring roadway characteristics or land use context. Provided below is an abbreviated list of the systemic safety risk analysis results. Additional details of the analysis can be found in the Technical Report.

- **For both state and local roads:**
 - Urban areas have a higher risk than suburban or rural areas. Rural areas have the lowest risk.
 - Regardless of whether the road is in an urban, suburban, or rural context, roads in DACs have a higher risk for VRUs than roads outside DACs.
 - As VRU usage (i.e., exposure) increases, the risk to VRUs increases.
 - Roads closer to schools have a higher risk than roads farther from schools.
 - The farther a crash occurs from a trauma center in a rural area, the more likely the crash is to result in a death than a serious injury.



- For local roads (including local City Connecting Link [CCL] Program⁷ roads):
 - Four-lane roads have the highest risk among all lane configurations, with more than 60 times higher crash concentration than average.
 - Major and minor arterial roads have the highest risk among all functional classifications at a crash concentration rate 20 times higher than average.
 - Roads with bus routes have a higher risk than streets without bus routes, independent of all other factors. Major arterial roads with bus routes have 75 times higher crash concentration than average.
 - Roads with posted speeds between 30 and 35 mph have the highest risk among all posted speed classes, with more than 20 times higher crash concentrations than average.
 - Roads with 10,000 to 25,000 AADT have the highest risk among all AADT classes, with nearly 50 times higher crash concentrations than average.
- For state roads (excluding local CCL roads):
 - As traffic volume increases on a state highway, the risk to VRUs increases.
 - As the number of lanes on a state highway increases, the risk to VRUs increases, regardless of functional classification.

The systemic safety risk analysis identified characteristics that correlate with VRU KA crashes. To highlight roads with these features, the HRN was created. The HRN map is predictive and proactive because it identifies locations that may not have a history of VRU KA crashes but share characteristics with HIN roads, such as area context and road configuration. KDOT developed risk-scoring systems for four roadway categories based on the systemic safety risk analysis. Each category has its risk-scoring system, and each risk feature in the scoring system was assigned a point according to its relative risk suggested by the systemic assessment. The greater the awarded points, the higher the risk on the roadway. The four categories include:

- State system rural roads
- State system urban roads (including CCL that KDOT maintains)
- Local rural roads
- Local urban roads (including CCL that the LPA maintains)

⁷ A City Connecting Link (CCL) is a road inside a city limit that includes a state highway designation, as further defined in Kansas Statute: State Highways, #68-406 (2019). https://www.kslegislature.org/li_2020/b2019_20/statute/068_000_0000_chapter/068_004_0000_article/068_004_0006_section/068_004_0006_k/#:~:text=%22City%20connecting%20link%22%20means%20a%20routing%20inside%20the.the%20national%20system%20of%20interstate%20and%20defense%20highways.



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3. Stakeholder Engagement



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KDOT hosted two rounds of stakeholder engagement. Round 1 entailed a series of statewide workshops. Round 2 entailed targeted meetings with cities with lower-risk areas as well as those with the largest number of higher-risk areas. A summary of the stakeholder workshop process and feedback is provided below. Complete feedback from these workshops is included in the Technical Report.

3.1 Statewide Workshops

The first round of stakeholder workshops with LPAs was conducted as part of a statewide listening tour. To reach as many key audiences as possible, KDOT organized nine in-person meetings over two weeks, using KDOT District facilities when available. A virtual meeting option was then offered for those unable to attend the in-person meetings. To encourage attendance, KDOT emailed two invitational memos and included methods to reply. The League of Kansas Municipalities and the Kansas Association of Counties sent out memos and reminder emails to their contact lists. KDOT staff called agencies that did not respond to the initial invitation to increase attendance at several meetings. Nearly 100 agencies participated in the statewide workshops, representing 45 counties, 38 cities, and 15 other agencies. FHWA Kansas Division staff also attended some of the stakeholder meetings.

During the workshops, KDOT staff shared preliminary VRU safety data analysis with local agencies and gathered feedback on VRU safety concerns relevant to local communities in Kansas. Each workshop included three primary engagement activities. The first two group activities involved breakout groups and focused on the safety experiences of the attendees and countermeasures. The third activity included all participants and focused on the needs of LPAs.

Attendees focused on common aspects related to improving VRU safety, such as:

- Constructing VRU infrastructure, including sidewalks, trails, and high-quality crossings for pedestrians and bicycle lanes, shoulders, and trails for cyclists.
- Improving sidewalk surface quality in compliance with accessibility standards, including connecting infrastructure where gaps exist.
- Addressing the need for additional funding and technical capacity within LPAs that hinders the ability to implement more VRU safety infrastructure.
- Educating the public and elected officials on the increasing number of VRU KA crashes and countermeasures to improve VRU safety.
- Improving VRU infrastructure around schools, in DACs, and where rural highways transition to cities and experience a shift from a rural to an urban or suburban environment.
- Incorporating VRU safety into private development review and approval processes.
- Identifying minimum criteria for U.S. bicycle routes in Kansas.



3.2 Lower- and Higher-Risk Area Workshops

The second round of workshops involved meetings for LPAs representing lower-risk and higher-risk areas. One workshop was held for the six cities that were underrepresented in VRU KA crashes despite VRU usage (Augusta, Gardner, Hays, Manhattan City, Ottawa, and Pittsburg). One workshop was held for each of the five cities that were overrepresented in VRU KA crashes (Hutchinson, Kansas City, Topeka, Salina, and Wichita). KDOT used workshop findings to develop VRUSA recommendations.

3.2.1 Lower-Risk: Key Takeaways

The workshop with the cities with an underrepresentation of VRU KA crashes (i.e., lower risk) focused on their best practices to understand VRU safety achievements. Representatives from Hays, Newton, and Pittsburg attended this workshop, and representatives from Ottawa provided comments after the workshop. Representatives from Manhattan and Augusta were not able to attend and did not provide comments. The goal of the lower-risk areas workshop was to gather lessons learned from these cities and determine if their experiences with VRU safety can be replicated across the state. Cities with the larger amount of lower-risk areas actively focus on planning and constructing infrastructure projects and engage in educational initiatives to improve VRU safety. Key takeaways include:

- Long-term commitment to VRU safety is crucial, including:
 - Buy-in from elected officials, the public, and city staff.
 - Information sharing with the public and elected officials to provide proof of success with countermeasures to gain buy-in.
 - Sharing information about co-benefits of safety infrastructure, such as improving quality of life and economic development.
- Transportation planning has led to prioritizing projects and providing a platform for educating the public and elected officials on the challenges and solutions. Participants indicated the following plans as beneficial to VRU safety:
 - Pedestrian and Bicycle Master Plans
 - Safe Routes to School (SRTS) Plans
 - Americans with Disability Act (ADA) Transition Plans
 - Asset Management Inventory
- Plan implementation was critical, particularly in the implementation of infrastructure countermeasures. Successful implementation of VRU safety countermeasures included:
 - Road diets/road rightsizing (e.g., reconfiguring four-lane undivided roads to two-lane divided roads)
 - Roundabouts
 - Street lighting



- Sidewalks and trails
- Enhanced crosswalks (e.g., with enhanced street lighting and actuated warning beacons like Rectangular Rapid Flashing Beacon [RRFBs] and Pedestrian Hybrid Beacon [PHBs])

3.2.2 Higher-Risk: Key Takeaways

KDOT held five individual workshops with cities that have an overrepresentation of VRU KA crashes. The workshops included city-specific data analysis findings and gathering feedback on local agency needs and experiences. Representatives from all five cities participated in their respective workshops. KDOT presented maps displaying relevant HIN and HRN segments and reviewed city planning documents to understand when plans and studies led to VRU infrastructure implementation.

The primary takeaway from the higher-risk areas workshops is that these cities are working toward improving VRU safety and are actively engaged in planning for related countermeasures. These cities have recently begun implementing countermeasures to improve VRU safety, and it may take time for the data to reflect the improvements. Participants identified the following challenges:

- Many cities are car-centric, and leaders are challenged with societal bias favoring traffic efficiency over VRU safety infrastructure. Speeding is also an issue within these cities.
- Community education on road safety is crucial to gain public support and to shift societal biases.
- Cities need comprehensive safety action plans based on the SSA, including infrastructure improvements, user education, speed management, and planning for timely emergency response.
- These agencies often lack the staff capacity to identify and prioritize safety countermeasures, apply for grant funding, and deliver projects.

However, these cities also identified the following opportunities:

- All cities are focusing on improving pedestrian and cyclist safety and actively seeking solutions despite challenges.
- Measures like road diets and rightsizing, improved signal design, enhanced street lighting, and enhanced pedestrian crossings are considered in projects.
- The recent expansion of state and federal funding could provide a resource to achieve the VRU infrastructure development, but these agencies would benefit from additional capacity support from KDOT.



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4. Recommendations for the Strategic Highway Safety Plan Update



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This section reviews and assesses the 2020–2024 Kansas SHSP strategies and implementation action plans related to VRU safety. KDOT reviewed its plans to assess alignment with the SHSP and VRUSA findings. The BIL requires the VRUSA recommendations to be incorporated in the SHSP or included as an addendum to an existing SHSP. KDOT intends to include this VRUSA as an addendum to the existing 2020–2024 SHSP, and this section outlines a list of recommended actions that will be evaluated and incorporated in the SHSP Update.

1. **Safe System Alignment:** Rather than isolate VRU safety under only the Pedestrians and Cyclists EAT, VRU safety should be discussed within the SSA objectives. Accordingly, the recommendations within this VRUSA fall within one of the SSA objectives. KDOT is responsible for providing safe mobility for all road users; therefore, improving each EAT’s understanding of where, why, and how often non-motorized trips occur will improve their understanding of how VRU safety relates to each emphasis area.
2. **Strategy Development:** VRU safety strategies in the 2020–2024 SHSP are primarily focused on engineering-related countermeasures and are mostly silent in their consideration of education, enforcement, or emergency response actions that could be taken. While there is one existing strategy for education, the focus is on improving LPA’s understanding of the need for infrastructure via a Road Safety Audit Training Program. While there is one existing strategy for data collection, the focus is on quantifying exposure to determine where to prioritize infrastructure investments. While these strategies improve the potential delivery of infrastructure-related countermeasures, the VRU discussion should also include behavioral safety-related countermeasures to advance the road safety culture in Kansas. In the SHSP Update, the strategies for VRU safety should consider a multidisciplinary approach to raise awareness of human body vulnerabilities and improve the road safety culture to foster a shared responsibility for VRU safety among all road users. Additionally, VRU safety correlates to other existing emphasis areas within the SHSP, including intersections and local roads. Therefore, there should be crosscutting strategies for these emphasis areas.
3. **Conduct Strategy Evaluations:** KDOT should establish a regular process to evaluate the effectiveness of VRU safety strategies and initiatives. Following evaluation findings, KDOT may choose to update or alter the approach to each strategic initiative.

In addition to the three main themes above, KDOT will consider the following strategies in the SHSP Update. These strategies are organized under each of the five SSA objectives (i.e., Safer People, Safer Roads, Safer Speeds, Safer Vehicles, Post-Crash Care). Some of the recommended strategies could be implemented through KDOT’s existing authority and may not benefit from being incorporated in the SHSP Update. Refer to the Technical Report for more details on the following SHSP Update recommendations.



4.1 Safer Speeds

Vehicle speed is a primary determinant of the severity of a VRU crash. Speeds generally considered safer for vehicle occupants could result in the death or serious injury of VRUs. The systemic safety analysis section shows that roadways with the highest risk to VRUs are local roadways with 30–35 mph posted speed limits. Considering self-enforcing design options may benefit future strategies in addition to lowering speed limits and providing speed enforcement. Strategies aimed at lowering operating speeds on urban roads should be considered with the SHSP Update:

- 1. Traffic Calming Measures:** Support the implementation of appropriate traffic calming measures in areas identified on the HIN or HRN. Examples of traffic calming devices include raised crosswalks, raised intersections, mini roundabouts, medians, pedestrian refuge islands, and speed humps. These devices can help reduce vehicle operating speeds, alter crash angles, or improve pedestrian visibility at high-conflict locations. Traffic calming devices do not work in every roadway context; therefore, KDOT may need to share additional guidance related to the appropriate context for each traffic calming device.
- 2. Implement Speed Management Programs:** Develop and implement comprehensive speed management programs that include setting speed limits based on the roadway context and number of access points (i.e., target speed approach). Consider adopting a target-driven speed limit tool such as the Posted Speed Limit Setting Procedure and Tool (NCHRP966).⁸ Additionally, a forthcoming Manual on Uniform Traffic Control Devices (MUTCD) update may provide additional guidance on target speed approaches. Prior to the VRUSA, KDOT developed a Speed Management Action Plan that will be revisited following the forthcoming updates to the MUTCD.
- 3. Speed Feedback Signs:** Support the installation of dynamic speed feedback signs in areas with high pedestrian and cyclist activity. These signs display the driver's current speed and provide real-time feedback to encourage them to slow down and adhere to the posted speed limit. Some of these signs can also notify law enforcement; however, these VRUSA recommendations do not encourage use as an enforcement device without legislative due diligence.
- 4. Automated Speed Enforcement:** Explore avenues to implement automated speed enforcement technologies, such as speed cameras, in high-risk areas or areas with a history of VRU crashes, which can deter speeding and help enforce

⁸ National Cooperative Highway Research Program. (2022). *Posted Speed Limit Setting Procedure and Tool*. <https://www.trb.org/Main/Blurbs/182038.aspx>



speed limits. Automated enforcement may require state laws to define these technologies' use to manage unlawful driver behaviors such as speed.

4.2 Safer Roads

Roadway characteristics are a likely determinant of VRU crash risk. The systemic safety analysis indicated roadway factors, in particular, the number of lanes, the presence or absence of a median, speed limits, and traffic volumes contribute to varying levels of crash risk. For example, four-lane local, urban roads in Kansas have a VRU KA crash concentration over 40 times higher than the average road in the state. The following strategies should be considered with the SHSP Update:

1. **Complete Streets Policy:** Continue the implementation of SHSP Pedestrians and Cyclists EAT strategy 2.3.1 to “Develop a ‘Complete Streets’ policy, program, and guidance that covers transportation projects across the state.”⁹ FHWA states that a Complete Street is and feels safe for all users by prioritizing safety, comfort, and connectivity to destinations for all people who use the roadway network, including pedestrians, bicyclists, public transportation users, children, older individuals, individuals with disabilities, motorists, and freight vehicles.¹⁰ Adopt a KDOT Complete Streets Policy that directs KDOT staff to consider the needs of all road users in a context-appropriate way. Establish a goal to prioritize the creation of safe and accessible VRU infrastructure in relevant transportation projects. Once adopted, share the KDOT Complete Streets Policy with metropolitan planning organizations (MPOs) and local agencies as an example and encourage local agencies to adopt a similar policy for the design, operations, and maintenance of local system roads.
2. **Road Rightsizing Implementation:** Implement road rightsizing countermeasures (i.e., road diets) in appropriate locations where there is excess capacity and a need to reduce pedestrian, cyclist, or vehicle crashes. Road rightsizing may involve converting four-lane undivided roads to three-lane roads with a center turn lane or median (with or without pedestrian refuge islands). The additional pavement space gained by reducing travel lanes can be used for an on-street bicycle lane or on-street parking, depending on the goals and priorities of the specific project. Road rightsizing enhances safety for all road users by reducing rear-end, left-turn, and right-angle crashes; reducing pedestrian crossing distances; and reducing operating speeds. KDOT may create a process for reviewing candidate locations for road rightsizing on the state system. Establish processes to encourage local agencies to implement

⁹ Kansas Department of Transportation. *Kansas Strategic Highway Safety Plan 2020–2024*. <https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTrafficSaf/reports/reportspdf/SHSP2020.pdf>

¹⁰ U.S. Department of Transportation Federal Highway Administration. (2022). *Complete Streets in FHWA*. <https://highways.dot.gov/complete-streets/complete-streets-fhwa>



the road rightsizing countermeasure at HIN or HRN locations through safety funding programs.

3. **Intersection Improvements:** Identify intersection locations on the HIN or HRN and prioritize implementation of countermeasures with a beneficial Crash Modification Factor to reduce pedestrian and cyclist-involved crashes at intersections. Examples include roundabouts, traffic calming, leading pedestrian intervals (LPIs) with restricted right on red, pedestrian countdown signals, and bicycle lanes.
4. **Access Management:** Identify strategies to expand the implementation of access management and update the KDOT Access Management Policy. FHWA identified corridor access management as one of the proven safety countermeasures to decrease KA crashes, particularly factoring for driveway density, size, and activity level, as well as the installation of medians to restrict left-in and left-out turning movements.¹¹ The next update to the Transportation Research Board (TRB) Access Management Manual will provide an opportunity for KDOT to revisit its Access Management Policy.
5. **Safe Pedestrian Crossings:** Prioritize the installation of high-quality pedestrian crossings, including marked crosswalks, pedestrian refuge islands, bulb-outs, and pedestrian-activated signals like RRFBs and PHBs on HIN or HRN segments. Use the KDOT Crosswalk Guide to work with local partners for consistency and encourage high-visibility crosswalks, particularly in locations with high pedestrian activity and at existing pedestrian crossings. Explore the creation of guidelines to provide pavement markings, signage, and lighting at crosswalks to improve pedestrian visibility.
6. **Bicycle Infrastructure:** Where bicycle usage is known and where segments are identified on the HIN or HRN, identify countermeasures to provide spatial separation, improve visibility of cyclists, and improve driver expectation of bicycle activity. Support the advancement of a connected bicycle network by providing safety funding for HIN or HRN locations where bicycle accommodation is desired. Revisit the minimum requirements of the U.S. Bicycle Route designation on the state system and determine if additional infrastructure investment is needed.
7. **Roadway Safety Audit Program:** Continue implementation of SHSP strategy PC 3.2.1 regarding providing a training curriculum for community-led Road Safety Audits. Community-led Road Safety Audits can help local agencies gain the necessary support for infrastructure investments.

¹¹ U.S. Department of Transportation Federal Highway Administration. (2021). *Corridor Access Management* (Publication No. FHWA-SA-21-040). <https://highways.dot.gov/safety/proven-safety-countermeasures/corridor-access-management>



8. **Safety Plans, Assessments, or Studies:** Identify areas that are both on the HIN and HRN that may require a comprehensive study process to examine alternatives and reach an agreement on the preferred solution. Include consideration of roadway and contextual attributes that elevate risk. When community buy-in is necessary to advance the infrastructure improvement, engage the public or stakeholders to evaluate alternatives before finalizing the preferred infrastructure solution.
9. **Community Engagement:** Encourage local agencies to engage with their community to discuss alternative design solutions and reach an agreement on the preferred design. Explore existing funding programs for LPAs to determine how best to support community engagement on infrastructure projects.

Other resources for identifying appropriate countermeasures include *Safe Transportation for Every Pedestrian*,¹² *Proven Safety Countermeasures*,¹³ *Pedestrian Safety Guide and Countermeasure Selection System*,¹⁴ and the *Bicycle Safety Guide and Countermeasure Selection System*.¹⁵

4.3 Safer People

Road users, whether VRUs or vehicle drivers operate within the system planned, designed, and built by government agencies. Improving roadways can create a system with more safety features. However, reconstructing the transportation network to improve safety is a long-term proposition, and improving driver and VRU behavior today is critical. Even on roads with many safety countermeasures, safe behavior by road users is critical to providing the redundancy described by the SSA. Achieving safety goals depends on eliminating the risky behaviors of drivers, cyclists, and pedestrians. These strategies should be discussed and considered with the SHSP Update:

1. **Driver Education:** Determine if improvements are needed to driver education, license obtainment, or renewal processes to improve road user understanding of VRU safety. Any improvements should focus on the importance of yielding to pedestrians at crosswalks and intersections, maintaining safe passing distances from cyclists, and being vigilant in areas with high VRU activity.

¹² U.S. Department of Transportation Federal Highway Administration. (2021). *Every Day Counts STEP initiative*. <https://highways.dot.gov/safety/pedestrian-bicyclist/step>

¹³ <https://highways.dot.gov/safety/proven-safety-countermeasures>

¹⁴ U.S. Department of Transportation Federal Highway Administration. (2013). *Pedestrian Safety Guide and Countermeasure Selection System*. <http://www.pedbikesafe.org/pedsafe/>

¹⁵ U.S. Department of Transportation Federal Highway Administration. (2014). *Bicycle Safety Guide and Countermeasure Selection System*.

<http://www.pedbikesafe.org/BIKESAFE/index.cfm>



2. **Pedestrian and Driver Safety Campaign:** Develop and distribute a unified safety message for understanding human interactions within the multimodal transportation system. Three separate campaigns should focus on the following:
 - **Traditional VRUs** (i.e., non-motorized users, people walking on foot, traveling in a wheelchair, or cycling). Develop an educational campaign to raise awareness among pedestrians and motorists about the importance of sharing the road, particularly in areas of elevated risk.
 - **Decision-makers.** Provide education for government transportation staff, decision-makers, and elected officials to improve understanding of the issues, proven safety countermeasures, and community benefits.
 - **Non-traditional VRUs** (i.e., leaving an abandoned vehicle, work zones, and restricted pedestrian locations such as Interstate highways). Develop an educational campaign increasing awareness of the risks of stopping and exiting a vehicle on a limited access freeway (i.e., Safe Stopping on Freeways). Promote awareness of motorist assistance programs and encourage using these services rather than walking to adjacent service facilities. The campaign could be incorporated as part of a Move Over, Slow Down campaign initiative.
 - Communication and messaging for these campaigns should include the following:
 - Educational materials about the unnecessary yet inherent risks facing pedestrians and cyclists and a shared responsibility to address the issues.
 - Messaging about the importance of obeying speed limits to save lives.
 - Information on where pedestrians and cyclists face the most risk as ranked under the systemic safety risk analysis (e.g., pedestrians face a higher risk of being killed or seriously injured on major arterial roads versus residential streets).
 - Non-traditional pedestrian messaging about the dangers of walking along highways, construction workers staying within the work zone buffer, and safety tips for assistance due to vehicle breakdowns.

Additional resources exist for identifying appropriate Safer People countermeasures, such as the National Highway Transportation Safety Administration’s (NHTSA) Countermeasures That Work.¹⁶

¹⁶ U.S. Department of Transportation National Highway Traffic Safety Administration. (2020). *Countermeasures That Work*. <https://www.nhtsa.gov/book/countermeasures/countermeasures-work>



4.4 Safer Vehicles

Vehicle design influences VRU safety. A vehicle’s size and weight and the design of the grill, hood, rear end, and windshield influence a driver’s ability to see and stop for VRUs and the kinetic energy impact on human bodies. Advanced vehicle technologies provide safety capabilities to notify drivers of unsafe behaviors and VRUs. KDOT has limited ability to influence vehicle design, but some strategies exist at state and local levels. These strategies should be considered with the SHSP Update:

1. **Fleet Vehicle Safety Initiatives:** Explore the ability to influence the procurement of state vehicle fleets to increase the number of vehicles with advanced safety features on Kansas roads. Encourage companies and organizations to prioritize purchasing and using vehicles with top safety ratings and safety technologies.
2. **Active Safety Features:** Promote the adoption of vehicles equipped with advanced driver assistance systems (ADAS) that enhance safety for pedestrians and cyclists, including but not limited to blind spot detection, automated braking systems, and backup cameras.

4.5 Post-Crash Care

In the event of a crash, the timeliness in which a road user receives lifesaving care is critical to preventing a fatality. The systemic risk analysis shows that as the distance increases from a trauma center, the percentage of VRU crashes resulting in death increases. Like Safer Vehicles, KDOT has less influence over the Post-Crash Care objective. These strategies should be considered with the SHSP Update:

1. **Multidisciplinary Collaboration:** Establish a Post-Crash Care Team in the SHSP Update to improve collaboration among emergency medical service (EMS) providers, trauma centers, public health agencies, law enforcement, and transportation departments to strengthen a comprehensive approach to post-crash care. This is critically important in high-risk rural areas.
2. **Integration of Hospital Trauma Data:** Continue the implementation of SHSP strategy Data Support 2 involving the integration of EMS and trauma data with crash data. This integration can improve understanding of crash patterns, injury severity, and long-term outcomes, leading to more targeted safety improvements and medical care. Cross-reference the crash report data with hospital trauma data to identify if and where VRU crashes are unreported in the crash data.



3. **Improve Emergency Response Times:** Consider campaigns and potential funding of devices or software to assist with faster emergency notification. This goal could be accomplished through collaborative efforts with EMS providers, law enforcement, and local authorities to reduce emergency response times. Consider the challenge of rural hospital closures.
4. **Revisit Traffic Incident Management Training:** Emphasize the need for specialized trauma care training to determine whether injuries commonly experienced by VRUs are incorporated into the training. Encourage tabletop exercises among first responders to plan for timely post-crash care in high-risk areas.
5. **Public Awareness of Post-Crash Care:** Explore an educational initiative to improve the public's understanding of post-crash care and their role as first responders. Provide information on safely assisting injured individuals at crash scenes while waiting for professional help.



5. Implementation Guidance



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This section includes guidance on how to incorporate recommendations of the VRUSA in existing programs and funding sources. The section is written with the understanding that the purpose of the VRUSA is to inform the Highway Safety Improvement Program (HSIP) program; therefore, the programming guidance focuses on the HSIP as the primary funding source for infrastructure-related VRU safety countermeasures. The section includes other funding sources available in Kansas that could be used to accomplish recommendations in Section 4. This section concludes with an abbreviated list of near-term and mid-term actions (see 5.2) to be undertaken by KDOT's Bureau of Transportation Safety following approval of the VRUSA.

5.1 Program Guidance

This section outlines recommendations for a programming structure to better support VRU safety needs by focusing on increasing the applications from and projects awarded to LPAs. Additionally, this program guidance can be used to identify and implement projects on the state system. While KDOT will track VRU safety projects within its own program management system, the solicitation for LPA projects may be included as part of a larger local safety program solicitation. The programming guidance aims to prioritize investments in overrepresented areas on the HIN or HRN.

5.1.1 Prioritization Framework

A new project prioritization framework modeled on the VRUSA's findings increases the likelihood that program funding will address identified risks and crash history. A comprehensive VRU Mapping Tool was created by combining the HIN and HRN analysis methods. KDOT staff will use this tool to identify potential project locations and prioritize projects through a scoring process. An abbreviated summary of the HIN and HRN is provided below.

- **HIN** = A geographic display of the road segments where a crash resulted in a fatality or suspected serious injury of a VRU.
- **HRN** = A systemic safety risk analysis was conducted on the HIN to determine the common and reoccurring roadway and contextual attributes. The HRN is where those roadway and contextual attributes reoccur on public roads in Kansas.

While the HRN identifies locations with an increased probability of a severe VRU crash in the future, it cannot identify all risks because of the complex nature of VRU crashes. Therefore, some roads on the HIN may not be included in the HRN. Where a location is shown on both the HIN and HRN, both crash history and systemic safety risks exist.

The prioritization framework includes four levels, as described below and illustrated in Table 3. As VRU safety needs are reviewed and assessed on an annual basis, KDOT staff intends to fund projects in Priority 1 before projects in Priority 2, and so on.



- **Priority 1** = Segment is on both the HIN (any level) *and* the HRN (moderate–highest)
- **Priority 2** = Segment is on the HIN (highest) *or* the HRN (highest)
- **Priority 3** = Segment is on the HRN (moderate–higher) but not on the HIN
- **Priority 4** = Segment is on the HIN (moderate–higher) but not on the HRN

Table 3: Priority Corridor Definitions

HIN Designation	HRN Designation			
	Highest	Higher	Moderate	Not on HRN
Highest	Priority 1			Priority 2
Higher				Priority 4
Moderate				
Not on HIN	Priority 2	Priority 3		Not Prioritized

5.1.2 Project Identification

Through stakeholder engagement processes, LPAs reported a gap in staff capacity to identify and execute projects in their cities and counties. These communities expressed interest in additional support from KDOT to identify project locations proactively. Using the VRU Mapping Tool, KDOT intends to establish a process to identify projects for local and state networks with a concerted focus on the priority levels described above. Consultations with LPAs could lead to the identification of other areas to implement VRU safety countermeasures.

The LPA can choose one of two options for support in project identification and recommendations: (1) request KDOT staff recommendations, or (2) request consultant support for concept development. Each option is further described below.

Option 1: Request KDOT Staff Recommendation.

Once locations are identified, KDOT can recommend potential countermeasures for the chosen location. These countermeasures may include recommendations described in Sections 4.1 and 4.2. The recommended countermeasures may include low, moderate, and high costs to provide options to the local partners. KDOT will determine if additional information and location details are needed to justify the project. For example, some projects may need to be assessed to determine the benefit-cost ratio. LPA staff would present the identified projects and countermeasures to receive approval from LPA decision-makers. Once the LPA



agrees on the chosen countermeasures, LPA staff would apply for implementation funding.

Option 2: Request Consultant Support for Study or Concept Development.

In some communities, receiving approval on infrastructure investment choices can be challenging, particularly in jurisdictions where it may be the first time implementing a VRU safety project. To these LPAs, it may be difficult to reach an agreement on the engineering solution. KDOT will explore the ability to support LPAs through either a Traffic Engineering Assistance Program (TEAP) study or a concept design project:

- **TEAP Study:** The LPA can request a TEAP study to assess the local safety needs and identify a recommended solution. The TEAP study is conducted by a pre-screened list of consultants with technical traffic engineering experience. More information on the TEAP program can be found in the Local Program Opportunity Guide.¹⁷
- **Concept Design:** KDOT will explore establishing an eligible project type where LPAs could request funding for a concept development project. The new eligible activity would include KDOT providing a pre-screened list of qualified consultants to conduct the work for the LPAs. The consultant would conduct pre-scoping work, including factoring for the site conditions, preparing alternative design solutions, conducting public engagement, preparing a 15% concept design of the preferred alternative, and presenting to LPA decision-makers for final approval. Once the LPA has a 15% concept design, it may choose to pursue funding provided through KDOT or to compete for federal discretionary dollars. KDOT will need to establish an upper-cost limit for this new eligible activity and establish funding targets that may restrict the number of concept design projects funded in any given year. Additionally, KDOT will need time to develop this new activity type, including, at a minimum, preparing the list of consultants, establishing contracting mechanisms, raising awareness among LPAs, as well as other official processes required by KDOT or FHWA.

5.1.3 Eligible Applicants

While VRU safety funds will be used for roads on and off the state system, the targeted recipients of these funds are all LPAs with transportation infrastructure authority (city, county, and Tribal lands), particularly those LPAs that target higher-risk areas.

¹⁷ Kansas Department of Transportation. (2023). *Local Programs Opportunity Guide*. <https://ikewebstorage.blob.core.windows.net/files/KDOT-Local-Opportunity-Guide-2023.pdf>



5.1.4 Project Eligibility

Prioritized locations and project scoping should follow the SSA. FHWA Proven Safety Countermeasures will receive priority. Additionally, low-cost and systemic countermeasures are encouraged. Higher-cost countermeasures that may require right-of-way, extensive utility relocations, and environmental impacts may require a benefit of cost greater than 1.0 (preferably above 2.0). KDOT may require higher-cost projects to be justified through an engineering analysis to determine project feasibility before funds are obligated. All completed projects are expected to be evaluated annually for no less than three years after completion of construction.

5.1.5 Funding Projects

Although HSIP funds will be a primary focus of the VRUSA implementation, the HSIP is not the only funding source available. Depending solely on HSIP funds will not address the increasing rate of VRU KA crashes throughout the state. Therefore, KDOT will work to incorporate VRU safety as often as possible, where appropriate, particularly on Priority 1 and 2 Corridors. A sampling of relevant programs that could offer funding for VRU safety improvements is provided below.

- **Highway Safety Improvement Program (HSIP):** Federal funding to study, plan, and/or implement projects that will reduce fatal and serious injury crashes; several targeted sub-programs accomplish this. In FY24, FHWA required Kansas to develop an HSIP Implementation Plan because the state had failed to meet or make significant progress on safety performance targets. The HSIP Implementation Plan describes how KDOT plans to achieve safety performance targets and long-term safety outcomes in the future. It includes a summary of Kansas's available HSIP funding, program-level allocations, and anticipated projects for the next fiscal year. In future years, the HSIP Implementation Plan will include programs, projects, and strategies from the VRUSA that will be implemented through the HSIP. Recommendations for the HSIP include:
 - Per the new provision allowed in BIL, provide annual funding toward the non-federal share on Transportation Alternatives Program Set-Aside projects if the project meets HSIP eligibility criteria, with priority given to locations on the HIN or HRN.
 - Work to include VRU safety improvements on HSIP projects that are located on the HIN or HRN.
 - Expand the High-Risk Rural Road (HRRR) program to support the implementation of VRU systemic safety countermeasures on high-risk rural roads as defined in the SHSP.
 - Revisit documentation of eligible study types within the TEAP study sub-program to allow for VRU safety-related studies.
- **Congestion Mitigation and Air Quality Improvement Program (CMAQ):** Federal funding for projects that contribute to maintaining air quality standards. Some of



these funds have been used for pedestrian and cyclist projects, systems management, and operations projects.

- **Kansas Active Transportation Enhancement Program (KATE):** State funding that provides an increased investment to improve safety, equity, mobility, community health and vibrancy, culture shift and education, and system longevity for active modes of transportation, such as walking and biking.
- **Kansas Carbon Reduction Program:** Federal funds to promote the reduction of carbon in the atmosphere by reducing transportation-related emissions or through carbon reduction strategies, including promoting public transportation, promoting alternative transportation (e.g., creating pedestrian and bicyclist pathways), and creating traffic monitoring and control facilities, among others.
- **Kansas Cost-Share Program (CSP):** State funds intended for LPAs to increase job growth and retention in the state. Projects may address an important transportation need like safety, access improvement, congestion relief, or improvement of a current roadway condition, including multimodal needs.
- **Federal Discretionary Grants and the Kansas Infrastructure Hub (Hub):** Established in 2022, the Hub serves as a resource center for Kansas communities to pursue federal discretionary programs with the BIL. The Hub provides technical assistance, collaboration, grant tracking, and financial match support via the Build Kansas Fund.
- **Kansas Safe Streets and Roads for All (SS4A) Match Pilot Program:** State funds contributed to the local match requirement of the USDOT discretionary grant, SS4A. On an annual basis, KDOT reviews funding availability to determine whether local match support can be provided.
- **National Highway Traffic Safety Administration (NHTSA):** Federal funding intended to improve road user behaviors through education and enforcement activities. KDOT receives NHTSA certain 402 and 405 grants that have specific provisions and limitations unique to each grant. NHTSA 402 or 405(h) program dollars may be used to implement recommendations of the VRUSA.
- **Safety Program Services for LPAs:** Federal funds available to cities and counties for safety-related activities such as traffic studies and safety training. TEAP studies are available upon request for LPAs to use an on-call engineer to study a safety-related concern on the local road system.
- **Safe Routes to School (SRTS):** Federal funding for infrastructure and non-infrastructure projects that benefit non-motorized traffic to and from elementary, middle, and high schools.
- **Surface Transportation Block Grant (STBG):** Federal funding for projects to preserve and improve the conditions and performance of any federal-aid eligible roadway, including pedestrian and cyclist infrastructure.
- **Transportation Alternatives Program:** Federal-funded program to provide a variety of alternative transportation projects, such as pedestrian/bicycle/non-motorized transportation facilities.



5.1.6 Agency Coordination

KDOT has several divisions and bureaus with projects such as road and bridge design, access management permits and policies, District/Area engineering construction, maintenance, and traffic engineering projects, to name a few. Additionally, the agency has several program managers who strive to fund projects on state and local roads, which may include segments of the HIN or HRN.

Implementing a successful VRU program requires collaboration and coordination with both internal KDOT staff and external LPAs. The VRUSA identifies opportunities to make improvements in the following areas:

- Promote an early pre-scoping safety assessment with design projects so analysis findings and/or safety needs can be planned for early in the project.
- Determine systemic countermeasures that can be implemented within programmed projects and establish a formal check process.
- Consider engineering interventions when granting access to a property changes the road conditions and affects VRU safety or other crash types.
- Continue to collaborate with KDOT staff who oversee the programs or projects related to off-system locations, including Cost-Share, Active Transportation, Safety, and Local Projects.
- Continue to collaborate with planners, project managers, program managers, operations, and maintenance to advance VRU safety on the state system. Work with these partners to reach an agreement on VRU safety improvements.

5.1.7 Communication and Outreach

KDOT is working to improve the availability of information to LPAs and stakeholders. With this goal in mind, the agency is restructuring the HSIP to allow for a greater variety of safety-beneficial projects both on and off the state system. Keeping stakeholders informed of funding opportunities and priorities is critical to building a transparent VRU program process. A call for projects will strive to align with other agency-scheduled calls for projects. This call for projects can be accomplished in many ways and is expected to include an online process that allows LPAs to apply for several safety programs through one online application. Accomplishing this goal will require coordination within KDOT. Transparency of the data analysis results is also necessary to assist LPAs as they strive to request funding for their highest priority locations. Additional recommendations related to transparency are listed below:

- Publish the KDOT VRU Mapping Tool with Priority Corridors on a web page. Include specific language of how the mapping tool should be interpreted and its intended use.
- Provide a webinar and/or a survey to support LPAs in navigating which program best fits their needs and how to apply under that program.



- Provide LPAs with priority locations and mechanisms to request additional support for project development.

5.1.8 Performance Monitoring

This section outlines the methods that KDOT will use to monitor the performance of VRU safety goals.

Performance Measures and Targets

KDOT develops and implements agency-wide performance measures that are aligned with the agency’s vision, mission, and goals. The ongoing review and reporting of these measures support the agency’s decision-making. KDOT has four safety performance measures related to VRUs. Two of the measures are reported to NHTSA, and one is reported to FHWA. Two of the measures are KDOT Key Performance Measures used in the annual performance-based budgeting process.

- Number of non-motorized fatalities and suspected serious injuries: A KDOT key and an FHWA-required performance measure
- Non-motorized fatality and suspected serious injury rate (as a proportion of the population): A KDOT key performance measure
- Pedestrian fatalities (five-year moving average): A NHTSA-required performance measure
- Bicycle fatalities (five-year moving average): A NHTSA-required performance measure

While crash-based performance measures are common in the transportation industry, the challenge with using these measures for program monitoring is that they are lagging indicators of performance. Particularly in the areas of infrastructure delivery, it can take several years to build a new program and implement enough projects to see a notable change in crash outcomes statewide.

Additional metrics could be monitored within the Active Transportation program at KDOT, including but not limited to, changes in VRU activity, accessibility investments, transit on-time performance, and community perception or feedback metrics.

Countermeasure, Project, or Program-Level Evaluations

As HSIP-funded VRU safety projects are implemented, KDOT may conduct a before-after evaluation to determine whether crash outcomes changed and may choose to use other evaluation metrics (i.e., operating speed reduction, risk mitigation, etc.) to determine countermeasure-, project-, or program-level effectiveness. KDOT may determine it is best to wait for a bundle of VRU safety projects of similar types to conduct a project-type or program-level evaluation. The findings of the evaluations may improve KDOT’s understanding of countermeasure or program effectiveness.



Program Output Measures

The success of the VRUSA relies on KDOT’s ability to implement the recommendations contained herein. Therefore, KDOT may establish leading indicators to monitor the effectiveness of the VRU safety program, which could include the number of projects delivered, the number of Priority 1 miles implemented, or the number of local agencies engaged. These output measures will allow KDOT to determine whether measurable progress is being made toward non-motorized safety performance targets through the implementation of the VRUSA recommendations.

5.2 Next Steps

Following approval of the VRUSA, KDOT will need to complete several next steps to implement the recommendations in this document successfully. Provided below are KDOT’s near- and mid-term actions following VRUSA approval.

5.2.1 Near-term Actions

Near-term actions are the steps KDOT will take to advance recommendations of the VRUSA in the year following VRUSA approval.

1. Post the VRUSA online as an Addendum to the 2020–2024 SHSP and update SHSP stakeholders, including the Drive to Zero (DTZ) Coalition and EAT members.
2. Finalize the VRU Mapping Tool to use in identifying and scoring projects.
3. Develop a detailed plan of action to implement the two behavioral safety campaign recommendations in the VRUSA (see Section 4.3).
4. Increase LPA investments in VRU safety:
 - 4.1. Identify potential project managers and address any capacity constraints within KDOT to deliver VRU safety funding to the LPAs.
 - 4.2. Create a High-Risk Urban Road (HRUR) application process that allows LPAs to apply for systemic improvements in higher-risk areas. The new application process will incorporate recommendations of the VRUSA and other systemic programs in development under the 2020–2024 SHSP (i.e., signalized intersections and stop-controlled intersections). Develop an HRUR application.
 - 4.3. Revisit local match criteria and determine whether changes can be made to encourage VRU safety investments in higher-risk areas, particularly DACs.
 - 4.4. Produce or update necessary program documentation for the State Transportation Improvement Program and FHWA.
 - 4.5. Establish a web presence for local agencies to pursue safety set-aside funds at KDOT. Provide clarity on where/how rural LPAs apply (HRRR) and where/how urban LPAs apply (HRUR).



- 4.6. Develop a communication plan to announce new funding opportunity for LPAs.
5. Coordinate with other program managers that oversee funding for LPAs:
 - 5.1. Determine the best way to share information on the other non-HSIP funds that LPAs can use to accomplish their VRU safety goals. Communicate within KDOT any program applications received that are related to VRU safety improvements. If FHWA determines that the VRU Special Rule applies to Kansas in the future, it will be vital to capture VRU safety investments under the HSIP to ensure the agency meets the obligation requirements set by FHWA.¹⁸
 - 5.2. Use the VRU Mapping Tool to identify locations that are rural and part of the LPA system. Share these findings with the HRRR program manager and discuss how VRU safety needs could be encouraged in the existing HRRR program.
 - 5.3. Work with the Active Transportation program managers (i.e., Transportation Alternatives Program, SRTS, and KATE) and the CSP manager to determine how the VRUSA findings and recommendations can be shared with LPAs through these programs.

5.2.2 Mid-term Actions

Mid-term actions are value-added changes that may not require immediate action but are nonetheless important next steps. The mid-term actions focus either on improving technical support available to LPAs or on the next steps to implement VRU safety needs on the state system.

1. Conduct an annual webinar to share knowledge of safety resources (i.e., analysis results, funding sources, and technical support) available to LPAs.
2. Provide information on high-priority corridors to LPAs.
3. Have KDOT staff available as a resource to LPAs to recommend countermeasures to address VRU safety.
4. Clarify the ability to use TEAP studies to assess a location of concern and identify recommendations.
5. Explore the creation of a new eligible activity that allows LPAs to apply for funding to prepare a 15% conceptual design. Reference Section 5.1.2, Option 2.
6. Determine how to fund local safety action plans in Kansas (i.e., state safety set-aside funding vs. state match contribution to federal discretionary grants). Plan for when the USDOT SS4A program ends.

¹⁸ The VRU Special Rule at 23 U.S.C. 148 (g)(3) states that if the number of traffic fatalities for VRUs is equal to or greater than 15% of the total State fatalities in a single year period, then the VRU Special Rule Applies, including obligating at least 15% of HSIP funds to VRU projects. U.S. Department of Transportation Federal Highway Administration. (2022). *23 U.S.C. 148(g) Highway Safety Improvement Program Special Rules Guidance*. https://safety.fhwa.dot.gov/hsip/rulemaking/docs/Section148_SpecialRule_Guidance.pdf



7. Promote the soon-to-be-established Road Safety Audit Training Program to be offered by the Kansas Local Technical Assistance Program (LTAP) Center and KDOT.
8. Determine the appropriate phase at which to programmatically integrate VRU safety needs in the project life cycle at KDOT. The goal is to capture the VRU safety need in the pre-scoping or scoping phase to increase the likelihood of the VRU safety recommendations being accomplished in the relevant projects delivered on the state system.
9. Conduct an internal staff training or workshop at KDOT to raise awareness of the assessment findings and recommendations. This may be best conducted at the District-level and would include analysis findings from other network screening analyses for all crash types. The workshop or training would allow for two-way dialogue and feedback from District staff and the Bureau of Transportation Safety.
10. Assess VRU safety needs and identify recommendations for priority corridors identified on the state system (including, but not limited to, U.S. Bicycle Routes, City Connecting Links, and locations with Corridor Plans). Recommendations for City Connecting Links will likely require agreement between the LPA as well as staff within the Districts/Areas, the Bureau of Traffic Engineering, and the Bureau of Local Projects, at a minimum.
11. Identify state system locations where a more comprehensive safety assessment may be needed. Such locations may require safety improvements for all road user types and/or may require engagement with the local community to determine the preferred design.

5.2.3 Executive-Level Support or Guidance

While KDOT aims to begin implementing recommendations of the VRUSA promptly, some recommendations may require strategic action or partnership within the DTZ Coalition via the SHSP Update. Any recommendations that are currently beyond the funding available, extend beyond KDOT’s administrative authority, or would benefit from interagency collaboration may be best if executed via the SHSP process, including the involvement of the DTZ Coalition.

While the VRUSA is incorporated as an addendum to the 2020–2024 SHSP, the recommendations provide valuable groundwork for ways to incorporate VRU safety in a SSA during the SHSP Update process.



Conclusion

In Kansas, pedestrians and cyclists are killed and seriously injured on public roads every year, and the rate of VRU KA crashes is increasing faster than all KA crashes in the state. This VRUSA provides insight into the locations and causes of these crashes. It also describes a stakeholder outreach effort that involved over 100 agencies across the state. This engagement showed the desire to improve VRU safety and described the current actions in the state; it also showed the challenges to improving VRU safety, chiefly the lack of funding or staff capacity.

To address these challenges and improve VRU safety, this report outlines guidance for KDOT in administering HSIP funds as well as recommendations to consider in the SHSP Update.

Following the completion of the VRUSA, KDOT intends to integrate the recommendations in the SHSP Update process and may elect to engage SHSP stakeholders to determine the highest priority strategies to implement first.

KDOT aims to continue the momentum to eliminate fatal and serious injury crashes on public roads in Kansas, and the VRUSA provides critical guidance to improve safety for the state's most VRUs.

