

INDIANA

VULNERABLE ROAD USER
SAFETY ASSESSMENT



COUNTDOWN TO

ZER

THE
**SAFE
SYSTEM
APPROACH**



NextLevel
INDIANA



INDIANA DEPARTMENT OF TRANSPORTATION

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Eric Holcomb, Governor
Michael Smith, Commissioner

November 15, 2023

TO: Jermaine Hannon, Indiana Division
Federal Highway Administration

FROM: Michael Smith, Commissioner,
Indiana Department of Transportation

SUBJECT: Indiana Vulnerable Road Users Assessment

Dear Mr. Hannon,

Per the requirements as described in 23 U.S.C. 148(l), as amended 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). Attached is Indiana's first statewide Vulnerable Road User (VRU) Assessment. The Indiana VRU Assessment follows a data driven process to provide a coordinated set of strategies around which safety stakeholders may unite to reduce fatalities and serious injuries among the most vulnerable of road users. The Indiana VRU Assessment adheres to the Safe Systems Approach as defined in the Indiana Strategic Highway Safety Plan. The intent is to provide an examination of the safety challenges experienced by bicyclists, pedestrians and micromobility users, and other users of non-motorized vehicles.

The Indiana VRU Assessment was created in conjunction with partner state and local agencies and safety advocates as a data-driven means to assess VRU safety data and provide a coordinated set of strategies to enhance safety for vulnerable road users. The Indiana VRU Assessment provides a framework for scoring potential safety projects and setting priorities by considering both conditions that can lead to motorvehicle crashes with vulnerable individuals and equity concerns for identified populations historically at elevated risk of serious injuries and fatalities.

The Indiana VRU Assessment is an amendment to the Indiana SHSP and as such adheres to the vision, goals, strategies, and objectives to save lives, reduce suffering, and limit economic losses that result from motor vehicle crashes in support of Indiana's ongoing commitment to ensure all road users have access to a safe transportation experience.

Please review this VRU Assessment and attached project list. If you have any questions, please feel free to contact our Traffic Safety Office.

Best Wishes,

A handwritten signature in black ink that reads "Michael J. Smith".

Michael J. Smith, Commissioner
Indiana Department of transportation

Enclosure

CC: FHWA Indiana Division, Tynli Frierson FHWA, Rick Drumm FHWA, INDOT: Jim Sturdevant, Dan McCoy, Mike Holowaty, Roy Nunnally, Brandon Burgoa

report

Vulnerable Road User Safety Assessment

prepared for

Indiana Department of Transportation

prepared by

Cambridge Systematics, Inc.
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date

November 15, 2023

Table of Contents

Executive Summary	ES-1
1.0 Introduction	1-1
1.1 VRU Definition	1-1
1.2 Safe System Approach	1-2
1.3 VRU Safety Assessment Purpose and Organization	1-2
1.4 An Evolving Process	1-3
2.0 Vulnerable Road User Safety Performance	2-1
2.1 Statewide VRU Safety Trend	2-1
2.2 Statewide VRU Safety Performance.....	2-4
3.0 Vulnerable Road User Safety Analysis	3-1
3.1 Data Sources	3-1
3.2 VRU Safety Assessment Process	3-1
3.3 High-Risk Vulnerable Road User Areas	3-5
4.0 Local Consultation	4-1
4.1 Local Consultation Process	4-1
4.2 Summary of Consultation	4-1
5.0 Program of VRU Strategies	5-1
5.1 VRU Common Themes and Key Takeaways	5-1
5.2 VRU Strategies and Actions	5-2
6.0 Conclusion	6-1
Appendix A. Acronyms and Glossary	A-1
Appendix B. List of Tier-1 High-Risk VRU Corridors and Intersections	B-1

List of Tables

Table 2-1	Indiana VRU Safety Performance Overview	2-5
Table 3-1	Prioritization Process Summary of Weights	3-5
Table 3-2	Urban and Rural High-Risk Area Breakpoints by VRU Score	3-6
Table 3-3	Indiana Tier-1 High-Risk VRU Segments and Intersections	3-6

List of Figures

Figure 2-1	Statewide VRU Fatalities and Serious Injuries Trend (2018-2022).....	2-1
Figure 2-2	Statewide Pedestrian and Bicycle Fatalities and Serious Injuries Trend (2018-2022)	2-2
Figure 2-3	VRU Fatalities and Serious Injuries by Urban and Rural Area.....	2-2
Figure 2-4	Statewide VRU Fatalities and Serious Injuries by Functional Classification (2018-2022)	2-3
Figure 2-5	VRU Fatalities and Serious Injuries by Functional Classification in Urban and Rural Roadways (2018-2022)	2-4
Figure 3-1	Indiana Bicycle and Pedestrian Crashes (2018–2022)	3-2
Figure 3-2	Steps of VRU Safety Assessment Analysis	3-3
Figure 3-3	Sliding Window	3-4
Figure 3-4	Tier-1 High-Risk VRU Segments and Intersections in Urban Roadways.....	3-7
Figure 3-5	Tier-1 High-Risk VRU Segments and Intersections in Rural Roadways.....	3-8
Figure 3-6	Screenshot of Indiana VRU Analysis Interactive Web Map Application.....	3-9

Executive Summary

Indiana's Vulnerable Road User (VRU) assessment examines the safety challenges faced by road users categorized as vulnerable, such as bicyclists, pedestrians, micromobility users, and other users of non-motorized vehicles (i.e., horse drawn conveyance). This assessment incorporates the Safe System Approach to enhance safety for these vulnerable road users by addressing infrastructure, behavior, and policy factors. The goal is to identify strategies to improve safety, reduce crashes, and facilitate a more equitable and sustainable transportation system that accommodates all modes of surface travel.

The Indiana VRU safety assessment was developed utilizing input and oversight from the VRU Steering Committee, which is comprised of representatives from Indiana Department of Transportation (INDOT), Federal Highway Administration (FHWA) Indiana Division, Indianapolis Metropolitan Planning Organization (MPO), Michiana Area Council of Governments, the Bloomington-Monroe County MPO, the Northeastern Indiana Regional Coordinating Council, and Indiana Local Technical Assistance Program (INLTAP) at Purdue University.

1.0 Introduction

Indiana has subscribed to the American Association of State Transportation Officials' (AASHTO) "Towards Zero Deaths" initiative to reduce the number of fatalities on the state's roadways to zero and reflects this vision in its Strategic Highway Safety Plan (SHSP). As mandated by the Infrastructure Investment and Jobs Act (IIJA), all states must complete a VRU Safety Assessment as an amendment to their SHSP by November 15, 2023. This VRU Safety Assessment has been conducted by INDOT, consistent with requirements set forth under this act. In alignment with Federal priorities, the VRU Safety Assessment supports Indiana's ongoing commitment to ensure all road users have access to a safe transportation experience and is a comprehensive analysis that prioritizes the safety of bicyclists, pedestrians, and other users of non-motorized vehicles. By adopting the Safe System Approach, this assessment recognizes that the responsibility for safety lies not only with the road users but also with the infrastructure design, vehicle technology, and policy framework.



This report identifies strategies to improve infrastructure design and maintenance, enhance road user education and awareness, promote safe vehicle technology, and develop effective policies that prioritize the safety of vulnerable road users. By integrating these strategies into the State's transportation planning and operations, a more inclusive and sustainable system can be established, allowing all road users to travel safely.

1.1 VRU Definition

A **vulnerable road user** refers to an individual who is at higher risk of injury or harm while using the road due to lack of protection or visibility, as compared to motor vehicle occupants. The United States Department of Transportation's (USDOT) FHWA defines a VRU as a non-motorist with a fatality analysis reporting system attribute code for:

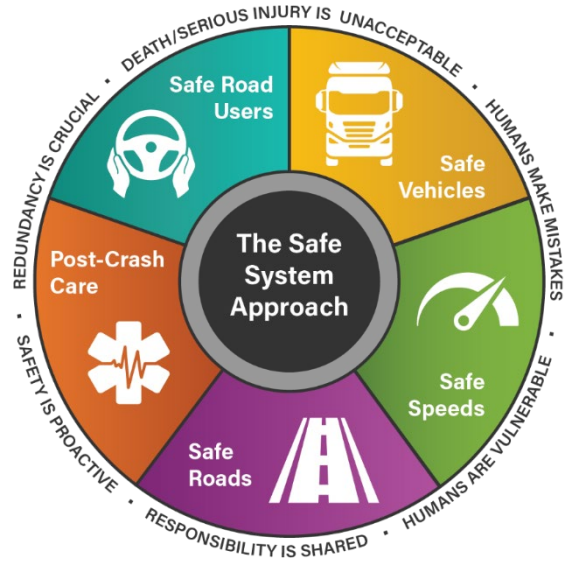
- A pedestrian (including a highway worker on foot in a work zone);
- A bicyclist or other cyclist; or
- A person on a personal conveyance or an injured person that is, or is equivalent to, a pedestrian or pedal cyclist as defined in the ANSI (American National Standards Institute) D16.1-2007 (see 23 U.S.C. 148(a)(15) and 23 CFR (Code of Federal Regulations) 490.205).

Examples of vulnerable road users in Indiana are pedestrians, pedal cyclists such as bicyclists, scooter riders, wheelchair users, and other individuals who rely on non-motorized transportation modes. Although not mentioned in the federal VRU definition, Indiana has included horse drawn conveyance users as VRU in the assessment process, as a significant number of communities are dependent on this mode of travel.

1.2 Safe System Approach

This VRU incorporates the methodology of the Safe System Approach, which has been newly highlighted in Indiana's SHSP. As illustrated below, the Safe System Approach is guided by six principles (shown in the outer rings of the pie chart) and five elements (shown as slices of the pie chart), which work together to reduce fatalities and serious injuries. At its core, the Safe System Approach is an acknowledgment that collaboration across all safety stakeholders is needed to target transportation system design and operations to anticipate human mistakes and lessen impact forces to reduce crash severity and save lives.

The Safe System Approach considers interactions between road users, the built environment, and vehicles. By addressing each of these elements comprehensively, this assessment aims to create an integrated approach to safety that will benefit all road users by reducing the severity of crashes or preventing crashes altogether.



1.3 VRU Safety Assessment Purpose and Organization

For road safety to be improved for all users, it is important to identify underlying factors that contribute to crashes involving vulnerable road users. This assessment aims to evaluate Indiana's existing infrastructure, road user behavior patterns, equity, and policies to understand the risks faced by these VRUs. By gaining a comprehensive understanding of these challenges, this assessment identifies targeted strategies to enhance safety and reduce the occurrence of crashes of VRUs.

In alignment with Federal guidance, the VRU Safety Assessment was conducted using a data-driven and collaborative process which consisted of the following components:

- **Network screening analysis of all fatalities and serious injuries on state and local roadways –** This was conducted to identify high-risk vulnerable road user areas. The analysis identified a set of high-risk roadway segment corridors and intersections, and provided insight related to VRU-involved crash characteristics, demographics, and contributing factors. Disaggregated data for characteristics such as race, ethnicity, gender, age, and income were evaluated to facilitate the identification of disparities and ensure that equity considerations were built into the analyses.
- **Consultation –** INDOT consulted with the VRU Steering Committee and local agency representatives to gather local knowledge and perspectives of vulnerable road user safety needs, challenges, and successes within different community contexts.
- **Strategy Development –** Insight gathered from the network screening analysis and local consultation process were used to develop a program of VRU-focused safety strategies.

The development of the VRU Safety Assessment is described in the following chapters:

Chapter 2: Vulnerable Road User Safety Performance – presents historical vulnerable road user safety trends and describes progress towards meeting non-motorized safety performance targets.

Chapter 3: Identification of High-Risk VRU Areas – describes the methodology and data used to conduct network screening crash analysis and identifies VRU high-risk areas.

Chapter 4: Local Consultation – describes the process to consult with the VRU Steering Committee and local agencies and community representatives on the identified VRU high-risk areas and provides a summary of feedback gathered in each local consultation meeting.

Chapter 5: Program of VRU Strategies – describes a set of common themes and key-takeaways from the data analysis and location consultation process and identifies a program of VRU strategies to improve VRU safety.

1.4 An Evolving Process

The Indiana VRU Safety Assessment Report is developed following the [FHWA VRU Safety Assessment Guidance](#). Due to the short timeframe for completing this VRU Safety Assessment this will be considered an initial VRU Safety Assessment for the state of Indiana, to be included as an addendum to the existing [Indiana SHSP \(2022-2026\)](#). As outlined in Chapter 3, a crash analysis was conducted to identify high-risk VRU areas throughout the state of Indiana, Chapter 4 outlines the stakeholder engagement, and Chapter 5 details the strategies that have been developed to enhance VRU safety in Indiana. The VRU Safety Assessment is strongly aligned with the SHSP and the outcomes from this initial analysis will be incorporated into relevant SHSP emphasis areas and implemented through state and local planning procedures. INDOT and the Steering Committee for the VRU consider this an evolving process and anticipates that additional data analysis, stakeholder engagement, strategies, and actions will be developed in the future and revisions of this VRU Safety Assessment will take place.

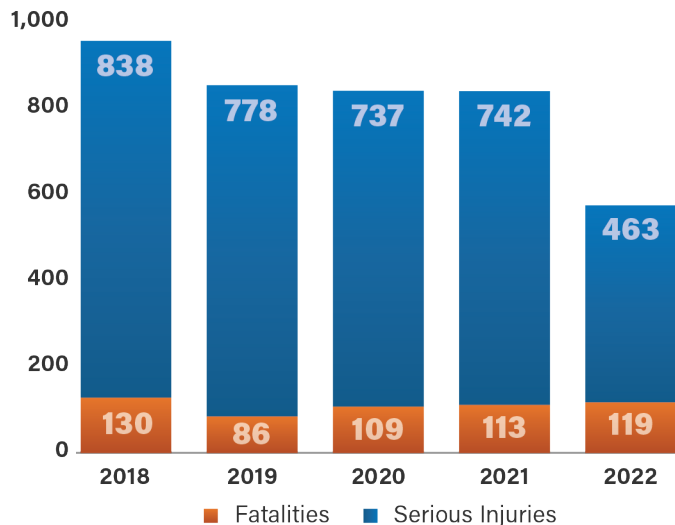
2.0 Vulnerable Road User Safety Performance

2.1 Statewide VRU Safety Trend

In Indiana, a total of **4,479 people died and 17,367 were seriously injured from 2018 to 2022**, of which **VRUs represented approximately 12 percent of the State's total fatalities and 20 percent of the serious injuries**. While the magnitude of these fatalities and injuries may not be as high as the largest serious crash types addressed by Emphasis Areas within the Indiana SHSP, the State understands that utilizing a Safe System Approach to eliminate fatalities and serious injuries requires a transportation system that is safe and accessible for all users.

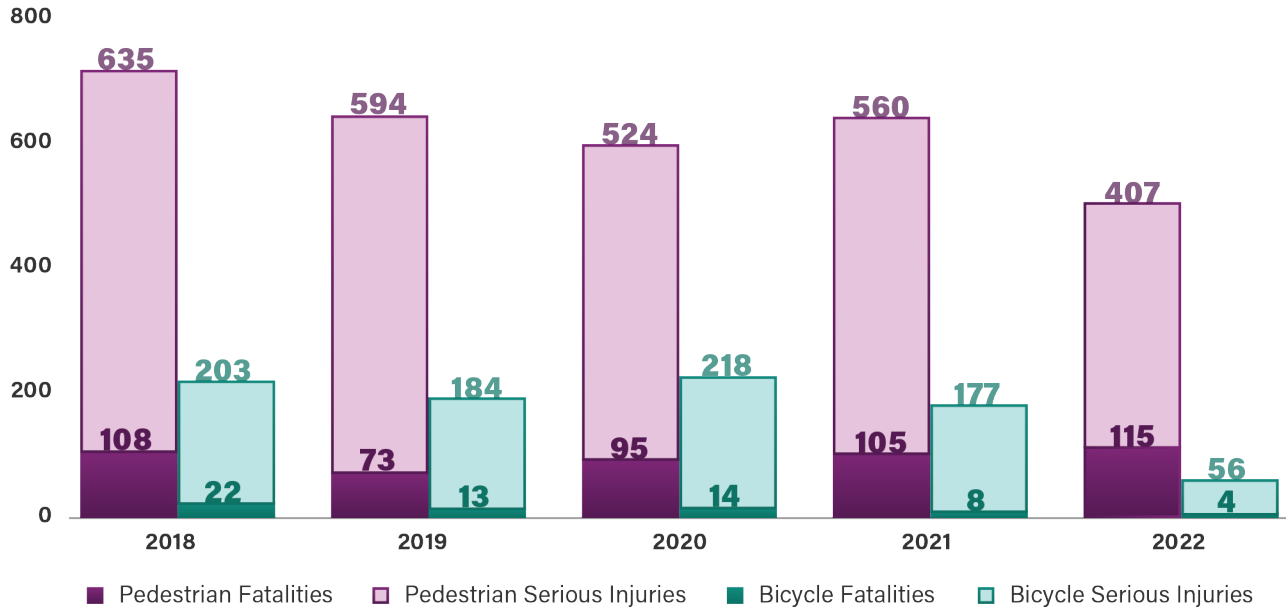
In the past five years (2018-2022), out of a total of 4,115 VRU fatalities and serious injuries, 22 percent involved a bicyclist, while 78 percent included a pedestrian. VRU fatalities and serious injuries both followed a downward trend from 2018 to 2022, where VRU fatalities dropped by 8 percent and VRU serious injuries dropped by 45 percent (see Figure 2-1). A breakdown of the analysis by user type in Figure 2-2 reveals a noteworthy trend, indicating bicycle-related fatalities and serious injuries dropped from 225 to 60 between 2018 and 2022, thereby representing a 73 percent reduction in the past five years. Whereas pedestrian-related fatalities and serious injuries decreased by 30 percent in the same time period (Figure 2-2). Although total VRU serious injuries appear to have been falling since 2018, total VRU fatalities have been climbing each and every year since 2019 (Figure 2-1), which is mainly attributed from the growing pedestrian fatalities since 2019. According to Figure 2-2, the growing pedestrian fatalities constitutes an increasing share of the pedestrian fatalities and serious injuries from 2019 to 2022.

Figure 2-1 Statewide VRU Fatalities and Serious Injuries Trend (2018-2022)



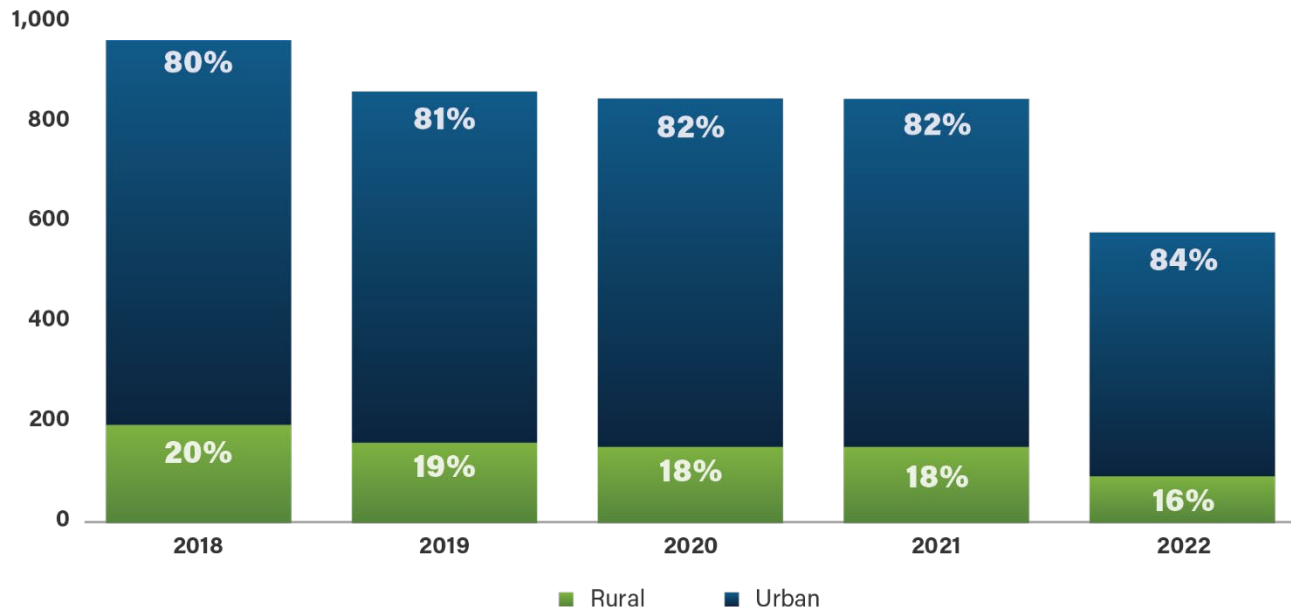
VRU fatalities dropped by 8%, while VRU serious injuries dropped by 45% from 2018 to 2022.

Figure 2-2 Statewide Pedestrian and Bicycle Fatalities and Serious Injuries Trend (2018-2022)



In Indiana, VRU crashes are significantly overrepresented in urban roadway systems compared to rural roadways. On average, 82 percent of the VRU fatalities and serious injuries occurred on urban roadways and 18 percent occurred on rural roadways, between 2018 and 2022 (Figure 2-3).

Figure 2-3 VRU Fatalities and Serious Injuries by Urban and Rural Area



Looking at the statewide VRU crashes by functional classification, Figure 2-4 reveals that the majority of the VRU crashes occurred on local roadways (28 percent), followed by minor arterial (27 percent), and principal arterial (24 percent) in the last five years. Further breakdown of this analysis for urban and rural roadways

(Figure 2-5) reveals a different finding, indicating that the majority of the VRU fatal and serious injury crashes in urban roadways occurred on local (28 percent), minor arterial (28 percent), and principal arterial other (25 percent), whereas in rural roadways, local (34 percent), major collector (28 percent), and minor arterial (12 percent) comprised the majority of the VRU crashes.

Figure 2-4 Statewide VRU Fatalities and Serious Injuries by Functional Classification (2018-2022)

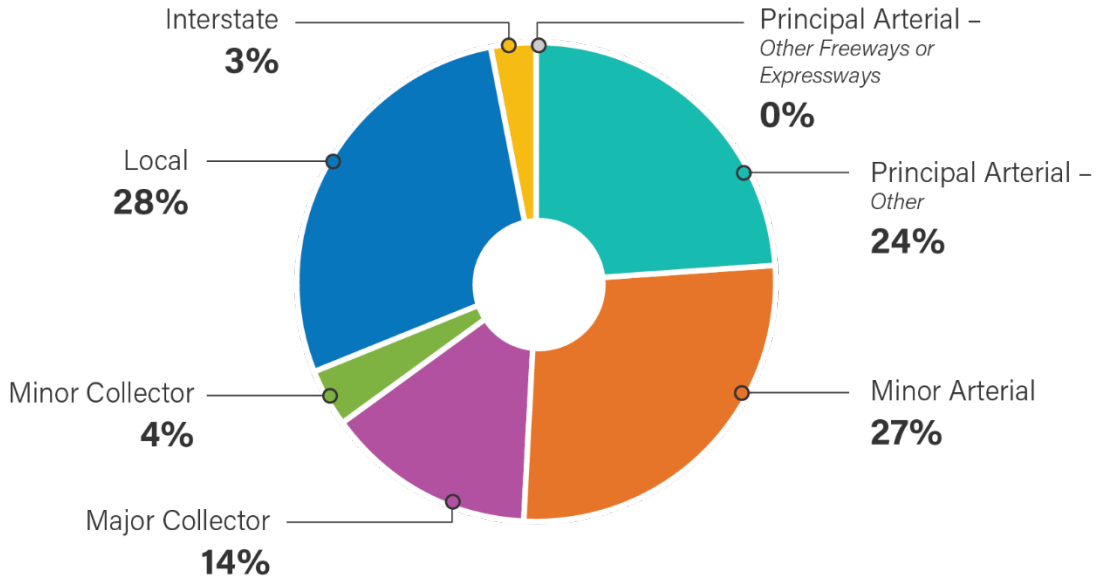
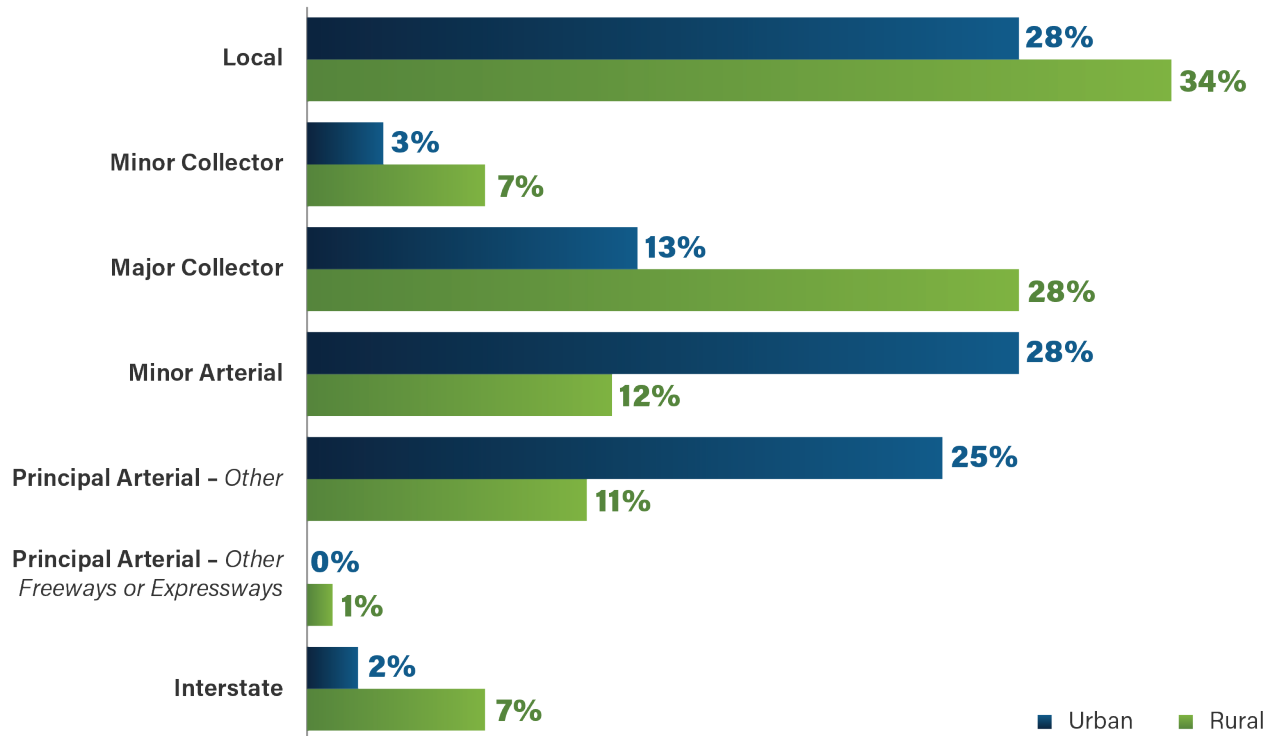


Figure 2-5 VRU Fatalities and Serious Injuries by Functional Classification in Urban and Rural Roadways (2018-2022)



2.2 Statewide VRU Safety Performance

Indiana’s SHSP has set a measurable goal of reducing statewide fatalities and serious injuries by two percent annually, different from the annual safety targets the State submits to the FHWA and National Highway Traffic Safety Administration (NHTSA). INDOT uses crash data to analyze trend by user type, severity, location; and forecasts crashes to identify safety performance measures and monitor progress.

Table 2-1 below summarizes data and trends in VRU safety performance between 2018 and 2022. During 2018-2022, the overall VRU fatalities and serious injuries decreased by 8 percent and 45 percent respectively. Serious injuries for both pedestrians and bicyclists dropped, while the fatalities have declined for bicyclists, pedestrian fatalities have increased. However, looking at the 2022 five-year rolling average against the SHSP target 2026 five-year rolling average indicates that the State is making great progress in reaching the fatalities target for both pedestrians and bicyclists, while there is more work to be done in reducing pedestrian and bicyclist serious injuries to stay on the SHSP target. INDOT continues to evaluate existing action steps from the SHSP Pedestrian and Bicyclist Action Plan (under vulnerable road user emphasis area) and identify additional strategies and measures to make meaningful progress towards achieving the target.

Table 2-1 Indiana VRU Safety Performance Overview

	Fatalities				Serious Injuries			
	5-year Total	5-year percent Change	5-year Rolling Avg. (2022)	SHSP Target 5-year Rolling Avg. (2026)	5-year Total	5-year percent change	5-year Rolling Avg. (2022)	SHSP Target 5-year Rolling Avg. (2026)
Total VRUs	557	-8%	111	N/A	3,558	-45%	712	N/A
Pedestrian	496	6%	99	98	2,720	-36%	544	186
Bicyclist	61	-82%	12	14	838	-72%	168	44

3.0 Vulnerable Road User Safety Analysis

3.1 Data Sources

The VRU Safety assessment process considered information related to crash location, roadway functional classification, travel frequency, land use, and demographics of the location of pedestrian and bicyclist fatalities and serious injuries. INDOT used the below data sources for this analysis:

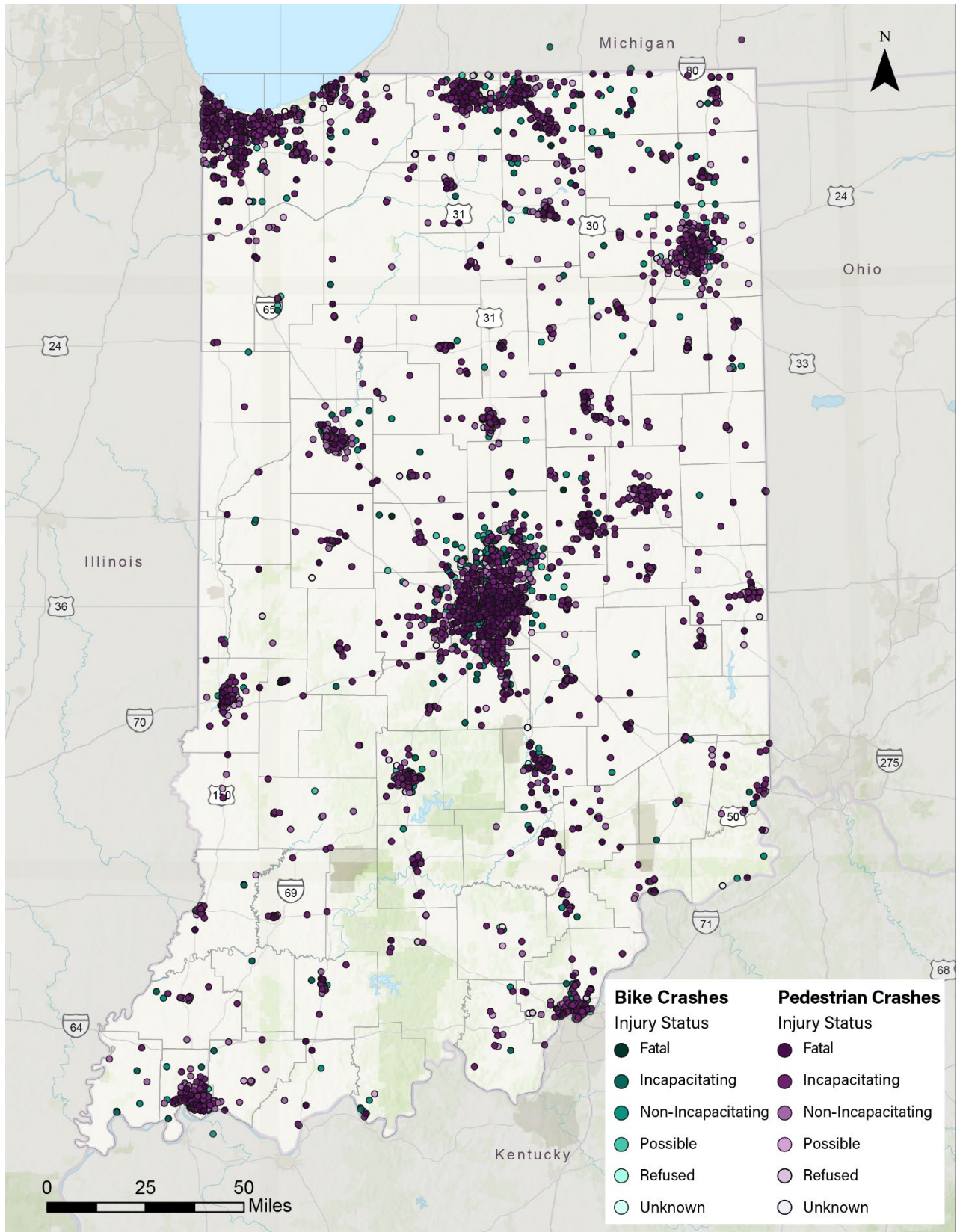
- **INDOT GIS Shapefiles and Crash Data:** The VRU crash data was sourced from updated extracts of INDOT's ARIES 6, which underwent recent geolocation cleaning. This data set provided details on each of the pedestrian and bicycle crashes, including severity of crash, crash location, and roadway functional classification and ownership. Area type shapefiles were also provided by INDOT to consider high-risk VRU segments and intersections within urban and rural areas separately.
- **U.S. Census Bureau Data:** The Census Bureau is a government agency responsible for collecting and disseminating demographic and economic data about the United States. The data covers a wide range of purposes, including demographic analysis, policy planning, economic research, and social studies. The data obtained from the U.S. Census Bureau for Indiana include households with no vehicle ownership.
- **Climate and Economic Justice Screening Tool:** This dataset (referred to as Justice40) is from the White House's Council on Environmental Quality and their Justice40 initiative, which is an initiative to provide 40 percent of overall benefits of certain Federal investments to disadvantaged communities. This tool was used to identify underserved census tracts (i.e., income and racial minority) in Indiana.
- **LOCUS:** LOCUS (Location-based Services Data and Big Data Analytics) is a transportation data analytics platform that captures the movement of travelers/vehicles and the performance of the transportation system across a region on an ongoing basis. This is a proprietary data analytics platform, which is not publicly available. The platform derives its source data from Location Based Service data collected from mobile phones and other global positioning system (GPS) technologies. LOCUS data was utilized to get an average trip frequency more specific for the corridor or region for rural areas than the state average. This data consists of both daily walking and biking trips that are above the average frequency within rural areas.

3.2 VRU Safety Assessment Process

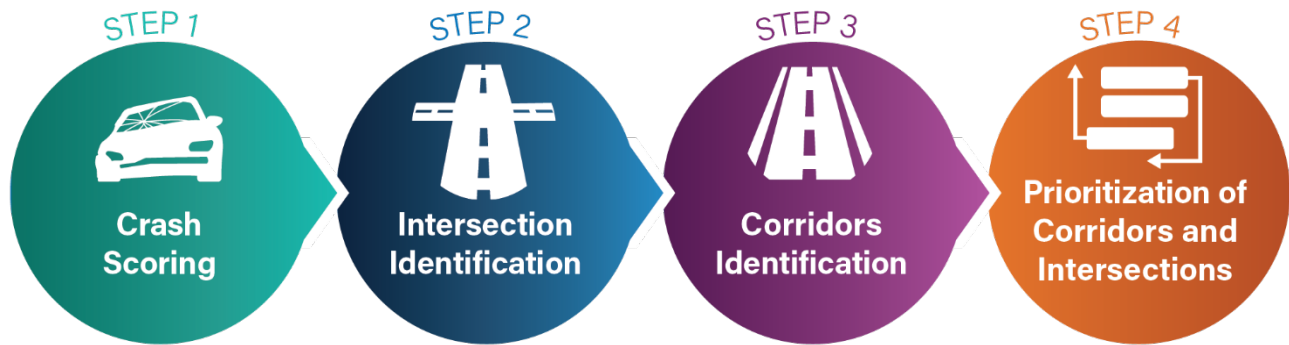
In order to identify the high-risk VRU areas, a network screening process was utilized to evaluate potential transportation corridors and intersections for safety risks within the state of Indiana. The quantitative data analysis incorporated all 7,803 VRU crashes that occurred between 2018 and 2022, provided by INDOT. Figure 3-1 shows a depiction of pedestrian and bicycle crashes throughout the State.

The procedure and criteria included in the assessment were reviewed and agreed upon by the Steering Committee. The following section provides a high-level methodology of the process.

Figure 3-1 Indiana Bicycle and Pedestrian Crashes (2018–2022)



Source: Indiana Crash Data 2018–2022.

Figure 3-2 Steps of VRU Safety Assessment Analysis

STEP 1: Crash Scoring

As the first step, each VRU-involved crash was assigned a weight based on crash severity. Three points were assigned to fatal and incapacitating injury crashes, two points to minor injury crashes, and one point was to all other crashes. This scoring provided the total count of crashes and their crash scores for each intersection and segment in the road network. By utilizing this approach, locations with higher crash scores were identified as top priorities to target safety interventions to mitigate the VRU risks and enhance overall road safety.

STEP 2: Intersection Identification

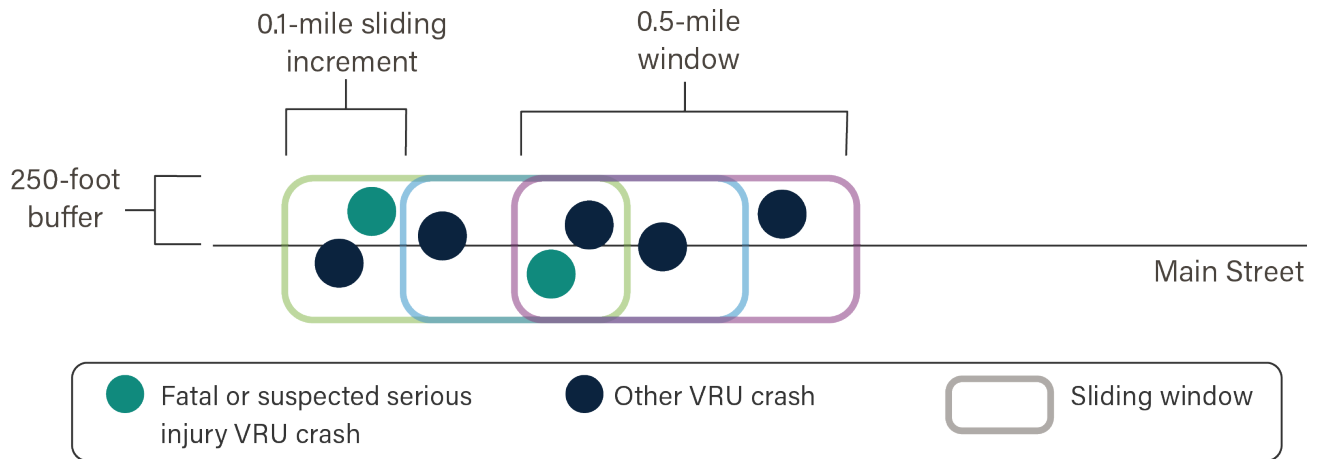
To identify the intersections, an automated, geographic information system (GIS)-based approach was utilized, which allowed for the identification of all points where roads intersected within the transportation network. Subsequently, VRU crashes (2018-2022) occurring within a 100-foot radius of each intersection were attributed to the intersection for analysis. To begin prioritizing these locations and identifying higher crash frequencies, the severity-weighted network screening and scoring process was used. The results of the crash scoring underwent manual review to ensure accuracy and produce a final list of High Injury Intersection locations, which represented intersections with significant concerns in terms of crash severity to VRUs.

STEP 3: Corridor Identification

A thorough analysis was conducted to identify High Injury Corridors, which are roadway segments exhibiting high frequencies of crashes involving VRUs. The screening technique utilized a Sliding Windows approach, which is a recognized method supported by the [FHWA in the Guidebook on Identification of High Pedestrian Crash Locations](#), in Chapter 7 Supplemental Materials. This approach involves creating windows that cover the transportation road network, with each window offset by a short distance from the previous one. The analysis is repeated until the entire road network is segmented into overlapping finite windows with which crash data can be overlaid (Figure 3-3).

Within the context of this assessment, the 0.5-mile windows were built along all roads with consistent name, functional class, and proximity to each other. The windows were offset along the network in 0.1-mile increments. All U.S., state, and local roads throughout the State were included. Crashes within 100 feet were counted, and a severity weighted score was attributed to each window segment.

Figure 3-3 Sliding Window



STEP 4: Prioritization of Corridor and Intersections

Finally, an additional scoring process is employed to provide a priority ranking of each corridor and intersection that resulted from the Network Screening process. Following the [FHWA VRU Safety Assessment Guidance](#), the Indiana VRU Safety Assessment effort considered safety, equity, demographic, and land use factors in the prioritization process. The safety factor is measured by number of pedestrian and bicycle crashes per mile, weighted by severity. Equity and demographic factors are measured by four indicators—vehicle ownership, average trip frequency, households below poverty level, and percent of population non-white or Hispanic. The land use factors added distinction to segments and intersection that fall within urban or rural areas. Weighting was provided to each of the criteria so that total scores were calculated to be out of 100 total possible points.

Consideration of Demographics

In addition to the safety factors and severity of crashes, the high-risk crash locations were prioritized within identified equity areas and specific land use types. In the State of Indiana, 15.28 percent of people are non-white or Hispanic and 39.17 percent of communities are disadvantaged income communities.¹ The assessment process applied Justice40 principles, which addresses environmental and climate inequalities and ensures that the benefits of environmental and climate action are equitably distributed. The primary focus is on promoting advantages for disadvantaged and underserved communities facing environmental challenges. Therefore, the process incorporated data on income equity and racial minority representation, specifically concentrating on areas with over 50 percent of households below the poverty level (low-income communities) and those where the non-white population comprises 50 percent or more (non-white communities).² Vehicle ownership was also considered as a demographic factor of the location of pedestrian and bicycle fatalities and serious injuries to prioritize the corridors and intersections.

¹ The Climate and Economic Justice Screening Tool

² U.S. Census Bureau

The final score contribution by weight for each corridor and intersection is summarized in Table 3-1. Compared to the urban areas, the rural areas have less VRU crashes and those are more spread out, therefore the factor weights were considered differently in the urban and rural area VRU crash prioritization process.

Table 3-1 Prioritization Process Summary of Weights

Factor	Metric	Metric Weight in Points (Contribution to factor weight)	Factor Weight
URBAN			
Total Crash severity scores	Over 20	75	75%
	20 to 16	60	
	15 to 11	45	
	10 to 6	30	
	5 to 1	15	
Demographic and Equity Scores	Non-white communities	8.33	25%
	Vehicle ownership below state average	8.33	
	Low-income communities	8.33	
RURAL			
Total Crash Severity Scores	Over 5	60	60%
	4	48	
	3	36	
	2	24	
	1	12	
Demographic and Equity and Exposure Scores	Non-white communities	13.33	40%
	VRU activity above average (for rural areas)	13.33	
	Low-income communities	13.33	

3.3 High-Risk Vulnerable Road User Areas

After the prioritization process, the high-risk VRU segments and intersections were identified for urban and rural roadways separately based on the total VRU score. Table 3-2 shows the breakpoints of the tiers. The segments and intersections with the highest VRU score range (Tier 1) for urban and rural roadways were identified as high-risk VRU areas.

Table 3-2 Urban and Rural High-Risk Area Breakpoints by VRU Score

URBAN		RURAL	
High Scoring Segment Tiers (Total VRU Score)	High Scoring Intersection Tiers (Total VRU Score)	High Scoring Segment Tiers (Total VRU Score)	High Scoring Intersection Tiers (Total VRU Score)
Tier 1: 71–92	Tier 1: 46–61	Tier 1: 51–75	Tier 1: 41–75
Tier 2: 61–70	Tier 2: 36–45	Tier 2: 41–50	Tier 1: 41–50
Tier 3: 53–60	Tier 3: 30–35	Tier 3: 36–40	Tier 1: 36–40

A Summary of identified tier-1 high-risk areas is provided below.

Table 3-3 Indiana Tier-1 High-Risk VRU Segments and Intersections

	Tier-1 High-Risk VRU Segments	Tier-1 High-Risk VRU Intersections
URBAN	<p>Overall, 21,905 segments with a crash</p> <ul style="list-style-type: none"> 29% in over 50% low-income communities 12% in 50% non-white community 28% in communities with vehicle ownership below state average <p>Urban Tier-1 VRU Segments: 8 segments (around 4 corridors) with VRU Score greater than 70.</p> <ul style="list-style-type: none"> 2 segments in over 50% low-income communities 2 segments in 50% non-white community 0 in communities with vehicle ownership below state average 	<p>Overall, 819 unique intersections</p> <p>Urban Tier-1 VRU Intersection:</p> <ul style="list-style-type: none"> 6 unique intersections with VRU score greater than 45. 6 in over 50% low-income communities 5 in 50% non-white communities 2 in communities with vehicle ownership below state average
RURAL	<p>Overall, 2,037 segments with a crash</p> <ul style="list-style-type: none"> 16% in over 50% impoverished communities Less than 1% in 50% non-white communities 18% where VRU trips above average for rural block groups <p>Rural Tier-1 VRU Segments: 46 segments (around 16 corridors) with VRU score greater than 50.</p> <ul style="list-style-type: none"> 12 corridors in over 50% low-income communities 2 corridors in 50% non-white communities 6 where VRU trips above average for rural block groups 	<p>Overall, 82 unique intersections</p> <p>Rural Tier-1 VRU Intersection: 8 unique intersections with VRU score greater than 50.</p> <ul style="list-style-type: none"> 6 in over 50% low-income communities 2 in 50% non-white communities 3 where VRU trips above average for rural block groups

Figures 3-4 and 3-5 illustrate spatial distribution of the tier-1 high-risk VRU segments and intersections in urban and rural roadways. The list of tier-1 high-risk VRU corridors and intersections in urban and Rural roadways is available in Appendix A.

Figure 3-4 Tier-1 High-Risk VRU Segments and Intersections in Urban Roadways

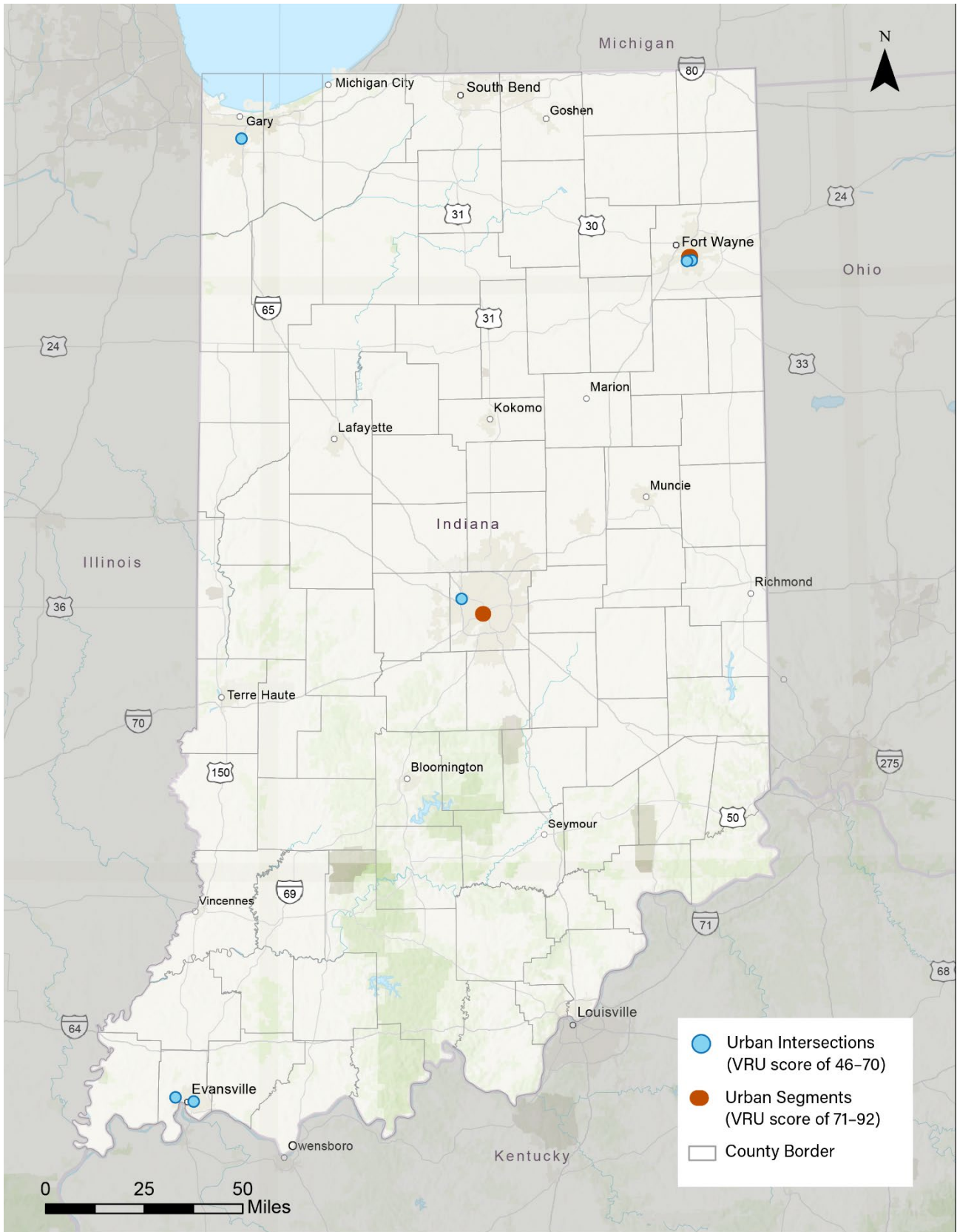
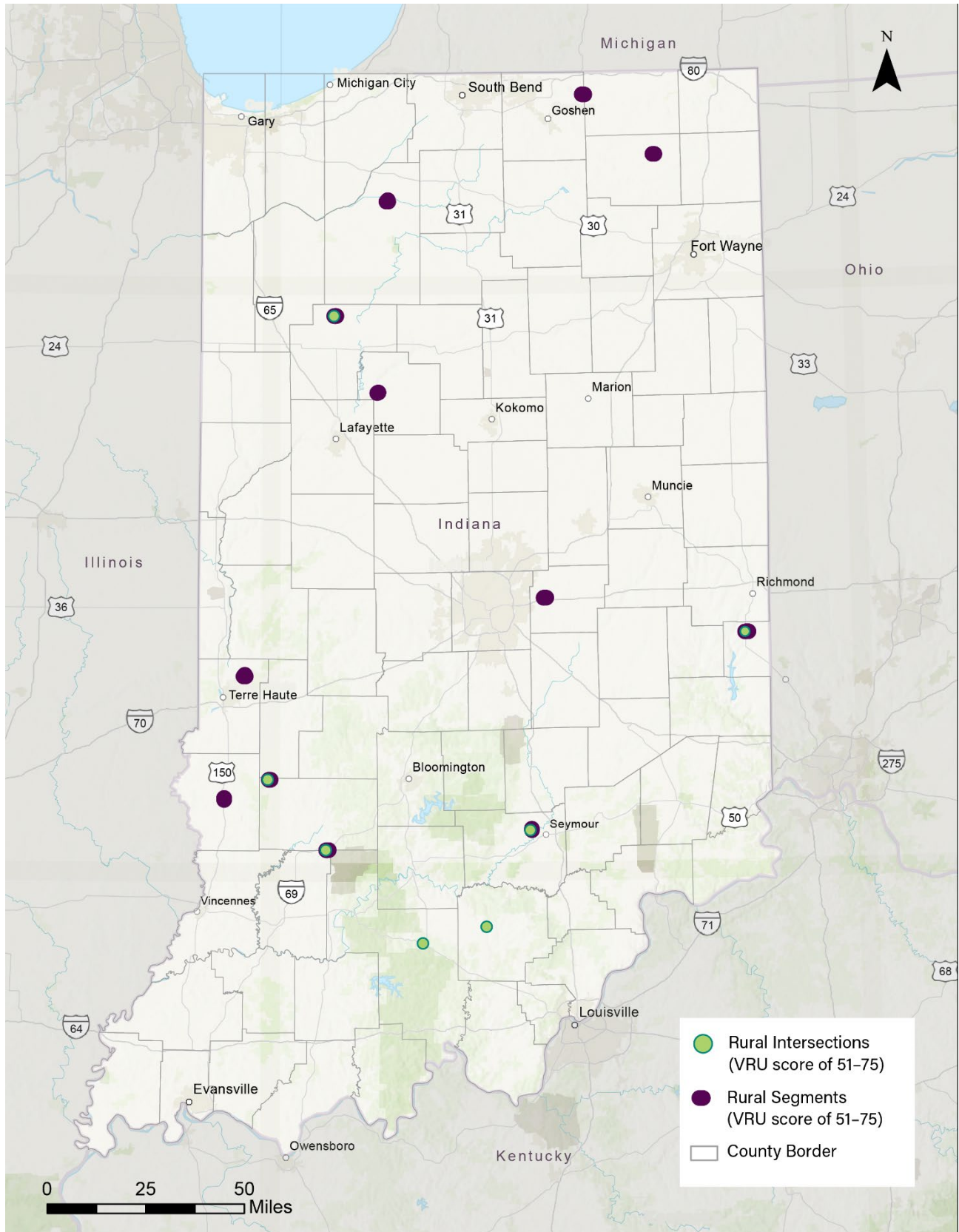


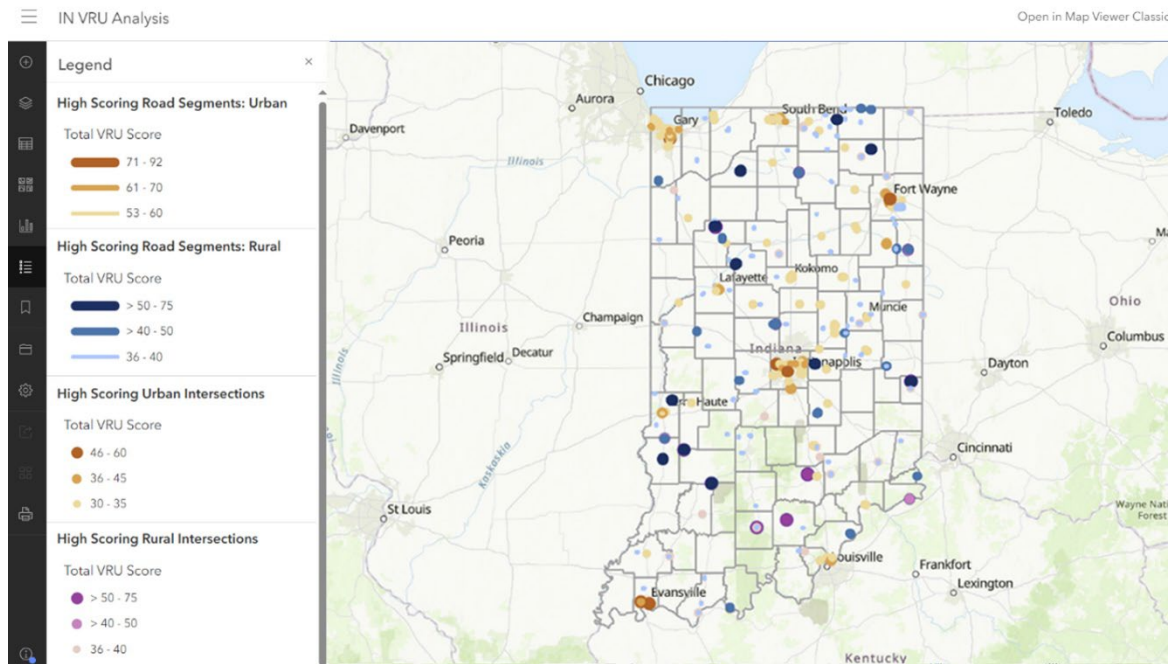
Figure 3-5 Tier-1 High-Risk VRU Segments and Intersections in Rural Roadways



Interactive Map

INDOT developed an [interactive web map application](#) which allowed stakeholders to geospatially visualize the high-risk VRU segments and intersections areas. The layers of the interactive platform also included information on the factors (crash severity, demographic, racial and income equity scores) considered during the safety assessment process associated with each high-risk segment and intersection. The interactive map was shared with the MPOs during the local consultation sessions, which permitted scrutinized analysis of the identified high-risk VRU corridors and intersections and supported the discussion regarding safety concerns, ongoing projects and potential strategies to reduce VRU risk. A screenshot of the interactive web map application is provided in Figure 3-6.

Figure 3-6 Screenshot of Indiana VRU Analysis Interactive Web Map Application



4.0 Local Consultation

4.1 Local Consultation Process

Consultation with state and local safety stakeholders and partners is vital to understand the communities in the identified high-risk areas, their safety concerns, and vision for the area. The Indiana VRU safety assessment was developed based on constant input from the VRU Steering Committee including representatives from INDOT, FHWA Indiana Division, Indianapolis MPO, Michiana Area Council of Governments, Bloomington-Monroe County MPO, Northeastern Indiana Regional Coordinating Council, INLTAP at Purdue University. The assessment process also involved consultation with Indiana Department of Public Works, Indiana Department of Health, Indiana State Police, Indiana Criminal Justice Institute, local governments, county authorities, MPOs, non-profit and advocacy organization, and community members (including representatives from Amish communities), to gain in-depth understanding of unique VRU safety needs and identify potential projects or strategies to improve non-motorized user safety within individual communities.

During the month of October 2023, INDOT conducted one outreach at the statewide MPO Conference and a total of three virtual consultation meetings with rural areas of the State, Indianapolis MPO and State Agencies, and with all other MPOs, reaching more than 120 attendees.

Additionally, according to the U.S. Census there are approximately 62,000 Amish in Indiana. Most Amish families in Indiana own one or two horse drawn conveyances (i.e., buggies) and utilize them for transportation as well as walking or bicycling. Although horse drawn conveyances are not traditionally defined as a VRU by the USDOT, INDOT believes accounting for the Amish community's safety in the VRU Safety Assessment is appropriate. As such, INDOT reached out and spoke with several Amish contacts by phone and in-person regarding their safety challenges which are detailed further in the following subsections.

The consultation process focused on presenting the identified high-risk VRU segments and intersections to the stakeholder groups, identifying additional risk patterns on the pin-pointed locations, factors contributing to the VRU risks, ongoing safety actions or plans on high-risk areas. Feedback was also gathered on potential solutions and strategies/initiatives to improve safety of VRUs in disadvantaged communities.

4.2 Summary of Consultation

Consultation with state and local safety partners, stakeholders and communities provided insights on the greatest safety concerns related to priority segments and assisted in identifying the most vulnerable group(s) in terms of safety and associated potential impacts of improving safety in the communities. A summary of the consultation is provided below.

The Greatest VRU Related Safety Challenges:

- For Indianapolis MPO, the greatest VRU related safety challenges centered around the road and intersection design, with issues including high travel speeds having been prioritized over safety in the design, obsolete intersection design and technology, long intersection crossing distances without any refuge island, lack of midblock crossing, and lack of traffic calming features. Part of the Washington Street/Cultural trail is an identified VRU high-risk area, which includes a high volume of all road users (vehicles, pedestrians, and bicyclists). Dangerous driving behavior, lack of drivers' awareness about how

to drive with VRUs on the road, insufficient signage for pedestrians and bicyclists who are new to the area, lack of education on road signage, and insufficient law enforcement presence, particularly in discouraging running red lights and no turn on red—are some of the safety challenges relevant to the corridor. Vehicles parked outside of the designated parking areas or double parking in the Cultural trail also impact the visibility of pedestrians and bicyclists. Funding formulas lacking consideration of the Safe System Approach were also listed as safety challenges by the Indianapolis MPO stakeholders.

- All other MPOs mentioned similar safety challenges for VRU including wide intersections and insufficient crossing times, lack of adequate warning devices, pedestrians/bicyclists as well as vehicular drivers not following roadway rules, etc. The stakeholders also reported maintenance of physical and vision-impaired detection, and inaccurate geospatial data locating VRU crash as safety challenges in their areas. INDOT cleaned the crash data that was used for the VRU Safety Assessment process. However, some of the latitude-longitudes do not align with the exact spatial location. It was clarified to the stakeholders that the purpose of the assessment was more targeted towards identifying trends of where the VRU crash risk is higher and developing strategies rather than pinning down crashes to an exact location. INDOT will take the inaccurate crash location issue into account and try to minimize the inaccuracy by the next VRU Safety Assessment iteration.
- In rural areas, stakeholders mostly focused on the lack of bike-ped facilities and vehicles travelling at high speeds as the greatest VRU safety challenges in their areas. They reported lack of pedestrian infrastructure near interchanges or underpasses, inadequate bike-ped facilities and transit accommodations, sidewalks with inadequate buffer zones, lack of midblock crossings, inadequate street lighting, parking obstructions and dangerous driving behavior (distracted and impaired driving) that poses particularly serious threat to school zone safety in rural areas.
- The difficulty in safe access to commercial areas, transit hubs, assisted living facilities, schools, universities, community centers, parks, and essential services for the homeless population was also reported as a challenge during the local consultation session.
- The Amish community noted that motorists exceeding speed limits and following too closely were their primary concerns. Additionally, windy roads reduce sight lines for vehicles coming up on slower moving horse drawn conveyances. It was also noted that horse drawn conveyances are sensitive to rumble strips, potholes, ruts and pooling water on the roadway more so than automobiles.



Types of Areas Most Associated with VRU Safety Challenges:

- Major Arterials came up as the most prevalent roadway type for VRU safety challenges in urban and rural areas, with long crossing distances for VRUs, above average traffic and high speeds. During the consultation process, stakeholders reported some of the major arterial streets lack guard rail, sidewalk, or trail connectivity, have high travel speeds, and there is often inadequate lighting, which makes the non-motorized safety challenges even worse.

- Interstate crossings also lack proper VRU facilities, such as adequate sidewalks, clearly marked crosswalks, overpasses/underpasses, adequate pedestrian crossing times, etc. All of these issues result in people taking unsafe actions to cross the interstate or interstate ramps.
- High-speed and high-volume roads with a large number of intersections and driveway access points and lack of separated bike lanes were also reported as areas of concern for VRU safety.
- During the consultation process, inadequate transit stops were noted as a VRU safety issue in low-income areas and near schools, and universities were additional areas of concern, particularly for the rural stakeholders.
- Narrow lanes in various counties where Amish are present are a concern for horse drawn conveyances.

The Most Vulnerable Group in Terms of Safety:

- The stakeholders were asked to rank who they believe to be the most vulnerable group in terms of safety in their communities. Indianapolis MPO and rural area stakeholders indicated children as the most vulnerable in terms of safety, while all other MPOs indicated people with disabilities as the critical vulnerable group. The stakeholders stressed school zone safety and the need for Americans with Disabilities Act (ADA) compliant bike-ped facilities in the areas which are greatly impacted by unsafe driving behavior such as distracted driving, impaired driving, and speeding.
- Apart from children and persons with disabilities, the low-income population, zero vehicle households, older adults, and non-English speakers were ranked in order as other vulnerable groups in terms of safety. These groups mostly rely on active transportation for moving around places, which emphasizes the importance of bike-ped safety for these vulnerable groups. The stakeholders acknowledged that the Indiana VRU Safety Assessment process considered income equity, demographics, and vehicle ownership as factors in identifying the high-risk VRU areas, and they indicated the importance of driver education, awareness, early education on road safety at school, and improvement of driver and pedestrian behavior as strategies to eliminate VRU risk for these groups of people.



Treatments to Greatly Impact Safety Improvement:

- Regarding treatments to remove severe conflict points, all of the stakeholder groups supported the idea that improved sidewalks and walkways and the addition of medians and pedestrian refuge islands will have the greatest impact on improving safety. According to stakeholders from both urban and rural areas alike, enhancing sidewalks and pavement markings, improving sidewalk connectivity, and implementing medians or pedestrian refuges would decrease conflict points and significantly improve safety within the communities. Protected bike lanes, bike boxes, and shared use paths were identified as other potential roadway safety treatments for reducing conflict points between non-motorized users and motorized vehicles.

- High speed vehicles are a common challenge to VRU safety throughout the State of Indiana, which is also the greatest concern of INDOT. Stakeholders from the Indianapolis MPO and rural areas reported self-enforcing/explaining roadways would work best for their communities in reducing vehicle speeds, while all other MPOs chose road diet / right sizing as the best treatment to address high vehicle speeds. There is a common local roadway condition in both mixed-use and residential areas of Indiana wherein roads feature extra wide lanes, without lane lines or edge of pavement markings. Edge delineation treatment of these locations could be helpful for drivers to judge their position on the road and prevent endangering pedestrians or bicyclists by passing too closely.

- In the Indianapolis MPO, some of the identified high-risk corridors have significant pedestrian activity at intersections which lack pedestrian crossing signals, have poor sight distance, and have high incidents of right-turn conflicts between vehicles and pedestrians. The implementation of leading pedestrian intervals (LPIs), pedestrian hybrid beacons, and right-turn restrictions were identified as ways to mitigate these conflicts. However, the importance of increased traffic enforcement and imposing penalties to encourage compliance with the rules of the road were also emphasized.



- For all the MPOs (including Indianapolis) curb extensions/sight distance improvements and crosswalk visibility enhancement were ranked as the top treatments to increase driver attentiveness and awareness. Inadequate lighting was brought up as a major issue prevailing in rural areas, particularly for bicyclists or pedestrians travelling during night-time conditions. Therefore, the rural area stakeholders emphasized the need for improved lighting in their communities. Well-placed lighting increases the night-time visibility of non-motorized road users as well as driver awareness of VRUs in and adjacent to the roadway. Landscaping is another potential low-cost treatment that provides traffic calming benefits which enhance safety, in addition to being aesthetically pleasing.
- In northern Indiana there is a Tri-County Safety Committee that hosts workshops twice a year to educate the Amish about road safety. The Amish interviewed strongly encourage the use of safety devices and believe it is their duty to make themselves as visible as possible. For example, horse drawn conveyances are often outfitted with lights, turn signals and other reflectors which far exceeds the Indiana standard of the slow-moving vehicle sign, and they encourage other users of horse drawn conveyances to do the same.

On-going/Upcoming Safety Projects

Stakeholders discussed on-going and upcoming projects for the identified high-risk corridors and intersections and surrounding areas that are focused on VRU safety.

- Improvement projects/plans have recently been implemented or are underway in some of the identified high-risk VRU areas. Upgrades include accessible pedestrian signals, the addition of ADA-compliant ramps, installation of new crosswalks, and the addition of rectangular rapid-flashing beacons (RRFBs) along the north and south sides of High School Road, Indianapolis. These improvements used the

Federal Highway Safety Improvement Program (HSIP) funds for locations of high conflict between vehicles and pedestrians.

- Other safety improvement projects, including enhancements for pedestrian safety, are currently in progress. One example is the joint plan by the city of Indianapolis and INDOT to implement raised medians along US 36/ Pendleton Pike. Additionally, there are plans in Indianapolis to introduce the Bus Rapid Transit along 38th Street.
- The Bloomington-Monroe County MPO Planning department is preparing a Safe Streets and Roads for All (SS4A) grant application, with extensive input from bicyclists and pedestrian groups. The Madison County Council of Governments (MCCOG)-Anderson also submitted an SS4A grant application.
- MCCOG-Anderson adopted a safety Action Plan for the Anderson region in March 2023, which is called Protect 2030. The plan identifies systemic and location-specific safety issues and provides recommendations to address them. A focus was placed on vulnerable users as a priority area, recognizing their contribution to and overrepresentation in severe crashes. Stakeholders reported that numerous studies were conducted in corridors having a high pedestrian crash volume, which were also identified as the VRU high-risk corridors, to identify potential treatments.

5.0 Program of VRU Strategies

5.1 VRU Common Themes and Key Takeaways

The program of VRU strategies is intended to address VRU safety challenges and barriers identified both in the data-driven network screening analysis and local consultation meetings. The following section includes a list of common themes and key-takeaways presented within the VRU Safety Assessment, which informed the VRU strategies presented in the next section.

VRU Trends: In the last five years, Indiana has experienced a decrease in non-motorized fatalities and serious injuries. More than 80 percent of crashes involving vulnerable road users occurred in densely populated urban areas, with over 70 percent taking place on arterial roadways and collectors with high vehicle traffic volumes and elevated travel speeds.

VRU Demographics: Indiana acknowledges that vulnerable road users extend beyond just statistics in crash reports; they encompass a diverse range of individuals, including children, persons with disabilities, older adults, persons experiencing homelessness, students, non-English speakers, and members of low-income or zero-vehicle households. Each of these groups deserve equitable access to safe and dependable transportation. It is crucial not only to recognize who these potentially disadvantaged transportation communities and active transportation-dependent individuals are but also to understand where they reside and how they interact with the transportation network. This knowledge is vital in comprehensively understanding existing safety concerns.

Barriers to Reaching Services and Points of Interest: In Indiana, urban roadway corridors and intersections play a vital role in the transportation network, granting residents access to essential destinations and services for their daily needs. However, they also present significant challenges in terms of VRU safety. Local consultations have revealed the ongoing difficulty in ensuring safe access to various destinations, including commercial areas, transit hubs, assisted living facilities, schools, universities, community centers, parks, and essential services for the homeless population. Within Indiana's VRU high-risk regions, land use issues cited in consultation as a prevalent issue for many community members in residential areas often forced to navigate wide and high-speed roadways lacking pedestrian and bicyclist infrastructure. In many instances, VRUs must access popular destinations without adequate sidewalks or safe crossing opportunities, leaving them susceptible to conflicts with motor vehicles. This divide in land use disproportionately affects households without cars and individuals with limited mobility.

Crash Contributing Factors: Crash contributing factors include high number of intersection conflict points, vehicles travelling at high speeds, lack of pedestrian or bicycle infrastructure, and limited visibility and awareness of traveling vulnerable road users.

Safety Needs: Indiana's VRU Safety Assessment underscored a range of safety requirements tailored to VRUs spanning engineering, education, and enforcement strategies. Indiana's communities have recognized the ongoing necessity of bolstering pedestrian and bicyclist infrastructure to foster VRU-friendly environments. These necessities encompass the provision of safe sidewalks and walkways in adherence to ADA standards, the enhancement of VRU visibility across state and local roads, and the deployment of traffic calming measures to mitigate high vehicular speeds. Furthermore, local representatives have emphasized the importance of educating community members about new safety measures, enlightening local officials about the proven benefits and advantages of implementing VRU transportation improvement projects, executing high-visibility

traffic enforcement efforts to curtail high vehicle speeds, and engaging with local community groups and leaders in active transportation.

Safety Successes: Indiana, as a state, remains dedicated to advancing roadway improvement initiatives that prioritize the safety of non-motorized road users. These efforts encompass a range of noteworthy treatments, such as road diets and other road reconfigurations, enhanced signage and pavement markings, intensified pedestrian lighting, and enhanced crosswalk visibility. Indiana is committed to creating safer roads for all.

5.2 VRU Strategies and Actions

The VRU strategies listed below have been developed through stakeholder feedback to tackle identified barriers and challenges faced by VRUs, consistent with the strategies in the SHSP. They also incorporate successful safety initiatives proven to enhance VRU safety and align with the principles and elements of the Safe System Approach. It is important to note that these strategies and actions are not meant to provide location-specific recommendations or replace engineering expertise. Instead, they should serve as a planning framework for addressing VRU risks and concerns.

INDOT will work to implement appropriate elements of the strategies listed below, including the VRU focused action items contained in the Indiana SHSP. Indiana encourages local governments and MPOs to adopt the VRU strategies that best suit their unique community context and needs, all in pursuit of the statewide Vision Zero goal. These VRU strategies and associated actions are categorized into infrastructure-based solutions and education and enforcement solutions, for easy reference and implementation. The VRU Safety Assessment does not guarantee funding, so the funding sources for the strategies and action would be premature and is an element of individual project assessment and selection.

Infrastructure-Based Solutions

Strategy #1: Reduce vehicle speeds.

Implement countermeasures such as road diets (right sizing), lane narrowing, roundabouts, speed bumps and reduced turning radius intersections, as well as promote self-explaining/self-enforcing roadway design and gateway treatments to communicate context changes to drivers.

Strategy #2: Remove VRU conflict points intersections.

Implement proven safety countermeasures and conduct research on emerging and innovative safety countermeasures to remove conflict points. Proven Safety Countermeasures include roundabouts, reduced conflict intersections by restricting turning movements at intersections, and leading pedestrian intervals at traffic signals.

Initiate early outreach in the planning and zoning stages and educate on the importance of access management to reduce potential VRU-involved traffic crashes.

Strategy #3: Improve VRU visibility and driver awareness of VRUs.

Implement and promote the benefits of proven safety countermeasures to raise awareness such as lighting, intersection signage and striping, curb extensions and sight distance improvements, medians and pedestrian refuge islands, pedestrian countdown signals, and crosswalk visibility enhancements (e.g., rapid flashing beacons).

Strategy #4: Separate VRUs from adjacent motor-vehicle traffic

Implement separate infrastructure for VRU travel, including ADA compliant sidewalks and walkways, multi-use pathways, and protected bicycle lanes.

Strategy #6: Conduct VRU safety studies.

Continue utilizing VRU walking audits or site investigations (e.g., safe routes to schools or safe routes to destinations) to identify VRU infrastructure barriers, challenges, and needs.

Education and Enforcement Solutions

Strategy #1: Conduct public outreach and education focused on the benefits of and how to navigate enhanced or new intersection designs and safety treatments.

Develop and distribute intersection design (e.g., roundabouts) and safety treatment (e.g., RRFBs and LPIs) fact sheets for English and non-English community members. Continue engaging with community groups and active transportation leaders.

Strategy #2: Educate the public on safety measures specifically impacting VRUs.

Continue to amplify Vision Zero messaging and the dangers of speeding to the general public.

Educate officials regarding the safety countermeasures and benefits for VRUs, such as speed bumps, roundabouts, bike boxes, bicycle lanes, and multi-use paths. Emphasize the significance of these measures in enhancing network safety, supported by data and proven studies.

Strategy #3: Continue to perform high visibility enforcement.

Continue to conduct high visibility enforcement to increase awareness of and compliance with traffic laws that protect the safety of pedestrians and bicyclists.

6.0 Conclusion

The assessment of VRU safety in Indiana has revealed critical insights and provided a comprehensive understanding of the challenges and opportunities within the state's transportation network. Arterial streets, interstate crossings, and high-speed roadways have been identified as key areas where VRU safety concerns are most prevalent. These areas often lack essential safety infrastructure, such as adequate sidewalks, crosswalks, and proper lighting, contributing to heightened safety risks for non-motorized road users.

The stakeholders have highlighted that various demographic groups, including children, people with disabilities, low-income individuals, those without vehicles, the elderly, and non-English speakers, are particularly vulnerable in terms of safety. Addressing these vulnerabilities involves a multifaceted approach, emphasizing education, awareness, and targeted safety improvements.

To mitigate these identified challenges and enhance VRU safety, a set of key takeaways and strategies have been outlined. These strategies include infrastructure-based solutions, such as reducing vehicle travel speeds, implementing safety countermeasures, and improving VRU visibility. Additionally, education and enforcement initiatives have been recommended to promote safe road behavior among both motorists and VRUs.

The ongoing and upcoming safety projects highlight Indiana's commitment to addressing safety issues, with a focus on improving infrastructure, enhancing safety at high-risk corridors and intersections, and engaging the community in safety measures.

In summary, Indiana is taking a proactive approach to VRU safety, recognizing the importance of creating an inclusive and safe transportation environment for all users of Indiana's streets, roads, and highways. By implementing the proposed strategies and actions, Indiana aims to reduce the safety risks for VRUs and enhance overall road safety across the state. This commitment aligns with the overarching objective of Vision Zero, placing a strong emphasis on safety and prioritizing the well-being of all individuals on the road. Vision Zero, is a multinational road safety initiative and philosophy, aims to achieve a transportation system with zero fatalities or serious injuries involving road traffic. Fundamentally, Vision Zero asserts that the occurrence of loss of life or severe injuries on the roads is unacceptable and advocates for the preventability of these incidents.

Appendix A. Acronyms and Glossary

Acronyms

- AASHTO – American Association of State Transportation Official
- ADA – Americans with Disabilities Act
- ANSI – American National Standards Institute
- ARIES – Automated Reporting Information Exchange System
- CFR – Code of Federal Regulations
- FHWA – Federal Highway Administration
- GIS – Geographic Information System
- GPS – Global Positioning System
- HSIP – Highway Safety Improvement Program
- IIJA – Infrastructure Investment and Jobs Act
- INDOT – Indiana Department of Transportation
- INLTAP – Indiana Local Technical Assistance Program (INLTAP)
- LPI – Leading Pedestrian Intervals
- LOCUS – Location-based Services Data and Big Data Analytics
- MCCOG – Madison County Council of Governments
- MPO – Metropolitan Planning Organization
- NHTSA – National Highway Traffic Safety Administration
- RRFB – Rectangular Rapid-Flashing Beacons
- SS4A – Safe Streets and Roads for All
- SHSP – Strategic Highway Safety Plan
- VRU – Vulnerable Road User

Glossary

Vulnerable Road User – Federal Highway Administration (FHWA) defines a Vulnerable Road User (VRU) as a non-motorist with a fatality analysis reporting system attribute code for: a pedestrian (including a highway worker on foot in a work zone); a bicyclist or other cyclist; or a person on a personal conveyance or an injured person that is, or is equivalent to, a pedestrian or pedal cyclist as defined in the ANSI (American National Standards Institute) D16.1-2007 (see 23 U.S.C. 148(a)(15) and 23 CFR (Code of Federal Regulations) 490.205).

Horse Drawn Conveyance – A light, simple, two-wheel or four-wheel carriage, buggies, or farm wagon pulled by one or more horses.

Global Positioning System – The global positioning system (GPS) is a network of satellites and receiving devices used to determine the location of something on Earth. GPS receivers provide location in latitude, longitude, and altitude. They also provide the accurate time.

LOCUS – LOCUS (Location-based Services Data and Big Data Analytics) is a transportation data analytics platform that captures the movement of travelers/vehicles and the performance of the transportation system across a region on an ongoing basis. This is a proprietary data analytics platform, which is not publicly available. The platform derives its source data from Location Based Service data collected from mobile phones and other global positioning system technologies.

Intersection – An intersection is a junction or an area of the roadway where two or more roads cross or meet. An intersection can be four-way (or crossroads), three way (T-junction or Y-junction), or five or more ways.

Interchange – An interchange is a system of interconnecting roadways in conjunction with one or more grade separations that provides for the movement of traffic between two or more roadways on different levels.

Underpass – Pedestrian underpasses allow for the uninterrupted flow of pedestrian movement separate from vehicle traffic. Underpasses are provided where no other pedestrian crossing facility is available.

Appendix B. List of Tier-1 High-Risk VRU Corridors and Intersections

Urban Tier-1 High-Risk Corridors								
Rank	Corridor Name	Start	End	City, County	Total VRU Score	Income Equity	Racial Minority	Vehicle Ownership Above State Average
1	S Clinton St.	E Baker St.	E Superior St.	Fort Wayne, Allen	92	Yes	Yes	No
2	E Jefferson Blvd	S Clinton St.	S Hanna St.	Fort Wayne, Allen	77	Yes	Yes	No
3	Washington St.	N Capitol Ave	N Delaware St.	Indianapolis, Marion	75	No	No	No
4	S Delaware St.	E Maryland St.	Washington St.	Indianapolis, Marion	75	No	No	No

Rural Tier-1 High-Risk Corridors								
Rank	Corridor Name	Start	End	City, County	Total VRU Score	Income Equity	Racial Minority	VRU Trip
1	W Broadway St.	Side St.	N Middlestadt St.	Monon, White	75	Yes	Yes	No
2	N Madison St.	W Broadway St.	W Harrison St.	Monon, White	75	Yes	Yes	No
3	W Clifton Rd.	W Clifton Rd.	N Stout Rd.	Liberty, Union	73	No	No	Yes
4	W Main St.	N Meridian St.	S Moss St.	Jasonville, Greene	61	Yes	No	No
5	Railroad St.	E Sycamore St.	E Main St.	Jasonville, Greene	61	Yes	No	No
6	S Bower St.	W New York St.	W Culver Rd.	Knox, Starke	61	Yes	No	No
7	E Culver Rd.	S Main St.	W Culver Rd.	Knox, Starke	61	Yes	No	No
8	S Section St.	W Washington St.	W Fehon St.	Sullivan, Hancock	61	Yes	No	No

Rural Tier-1 High-Risk Corridors								
Rank	Corridor Name	Start	End	City, County	Total VRU Score	Income Equity	Racial Minority	VRU Trip
9	W County Rd. 300 N	N County Rd. 400 W	N 500 W	Frankfort, Hancock	60	No	No	No
10	County Rd. 16	County Rd. 43	E County Line Rd.	Middlebury, Elkhart	60	No	No	No
11	N County Rd. 425 E	E State Rd. 258	N County Rd. 425 E	Seymour, Jackson	60	No	No	No
12	E County Line Rd.	S Toon Rd.	S Energy Dr.	Odon, Daviess	51	Yes	No	Yes
13	E US Highway 6	N County Rd. 450 E	N County Rd. 500E	Valparaiso, Porter	51	Yes	No	Yes
14	E Devonald Ave	N Scott St.	E Devonald Ave	Otter Creek Township, Vigo	51	Yes	No	Yes
15	N Stevenson St.	E Devonald Ave	E Rose Hill Ave	Otter Creek Township, Vigo	51	Yes	No	Yes
16	W Franklin St.	N Washington St.	Pearl St	Delphi, Carroll	51	Yes	No	Yes

Urban Tier-1 High-Risk Intersections						
Rank	Intersection	City, County	Total VRU Score	Income Equity	Racial Minority	Vehicle Ownership Above State Average
1	N High School Rd & W 38 th St.	Indianapolis, Marion	55	Yes	Yes	Yes
2	E Jefferson Blvd & Lafayette St.	Fort Wayne, Allen	47	Yes	Yes	No
3	E Jefferson Blvd & S Clinton St.	Fort Wayne, Allen	47	Yes	Yes	No
4	Washington Ave & US 41	Evansville, Vanderburgh	47	Yes	Yes	No
5	W Lloyd Expy & S Rosenberger Ave	Evansville, Vanderburgh	47	Yes	No	Yes
6	E 49 th Ave & Broadway	Gary, Lake	47	Yes	Yes	No

Rural Tier-1 High-Risk VRU Intersections

Rank	Intersection	City, County	Total VRU Score	Income Equity	Racial Minority	VRU Trip Score
1	W Broadway St. & N Madison St.	Greenwood, White	75	Yes	Yes	No
2	W Broadway St. & N Race St.	Monon, White	75	Yes	Yes	No
3	W Clifton Rd. & N US Highway 27	Liberty, Union	74	No	No	Yes
4	E Main St. & Railroad St.	Henryville, Greene	61	Yes	No	No
5	E State Road 258 & N County Road 425 E	Seymour, Jackson	60	No	No	No
6	N Gospel St. & Monon Dr.	Paoli, Orange	51	Yes	No	Yes
7	US Highway 231 N & E County Line Rd.	Linden, Greene	51	Yes	No	Yes
8	W State Rd. 60 & N Hitchcock Rd.	Salem, Washington	51	Yes	No	Yes