



BELTRAMI
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Comprehensive Safety Action Plan

XXXX XX, 2026





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Introduction

Safe Streets for All (SS4A)

This Comprehensive Safety Action Plan (CSAP) was prepared with funding from the federal Safe Streets and Roads for All (SS4A) discretionary program. The Bipartisan Infrastructure Law (BIL) established the SS4A program to fund improvements and strategies to prevent roadway fatalities and serious injuries of all users of highways, streets, and roadways: pedestrians, bicyclists, public transportation users, motorists, and commercial vehicle operators. The program includes \$5 billion in appropriated funds over five years, 2022-2026. The SS4A program supports the U.S. Department of Transportation's (USDOT's) National Roadway Safety Strategy and a goal of zero roadway deaths using a Safe System Approach.

Plan Purpose and Objectives

The Beltrami County Comprehensive Safety Action Plan (CSAP), hereafter referred to as “the plan” or “CSAP,” is a comprehensive, data-driven strategy to identify and address roadway safety issues on the County’s transportation system. The purpose of the CSAP is to reduce the occurrence and severity of traffic crashes through targeted project recommendations, policy guidance, and coordinated safety strategies.

The Safety Action Plan is intended to help Beltrami County and its numerous stakeholders:

- Reduce fatalities and serious injuries on the County transportation system. Throughout this document, fatal and serious injury crashes are referred to as “severe crashes.”
- Prioritize safety improvements based on rigorous analysis of crash data, input from local stakeholders, and feedback from members of the traveling public.
- Guide county decision-making related to roadway design, infrastructure investments, policy development, and complementary safety initiatives that improve outcomes for all roadway users.

The CSAP provides a framework for Beltrami County to proactively address safety challenges and align future investments with strategies proven to reduce fatal and serious injury crashes.



Leadership Commitment and Goal Setting

Beltrami County's Comprehensive Safety Action Plan builds upon the County's adopted Toward Zero Deaths (TZD) commitment and prior County Road Safety Plans (CRSP). Rather than establishing entirely new goals, this plan translates the County's existing safety priorities into a framework consistent with the Federal Highway Administration's Safe Streets and Roads for All (SS4A) program requirements.

This approach ensures continuity with previously adopted policies while strengthening the County's ability to track progress, prioritize investments, and implement effective safety strategies. The following vision and goals reflect both the County's established direction and the Safe System approach, emphasizing proactive, data-driven decision-making and the long-term elimination of fatal and serious injury crashes.

County Board Commitment

Beltrami County, by resolution and action, has committed to a safe system approach with a long-term goal of zero roadway fatalities and serious injuries. The County Board approved the resolution at its regular meeting on **September xx, 2026**.

See the Appendix for the executed County Board commitment resolution.

Vision

Beltrami County is committed to eliminating traffic fatalities and serious injuries on its roadway system through a proactive, data-driven, and community-supported approach to transportation safety.

Core Safety Goal

Beltrami County will reduce fatal and serious injury crashes on its roadway system, aiming to reduce them by at least **1 per year and, over time, achieve zero traffic fatalities**.

This goal reflects the County's adopted Toward Zero Deaths commitment and provides a measurable benchmark for tracking progress.

Supporting Goals

To achieve this outcome, the County will focus on the following supporting goals, which align with SS4A requirements and build upon the County's existing safety planning framework:

- 1. Reduce Severe Crashes Through Targeted Investment**
 - a. Identify and prioritize locations and systemic risk factors associated with fatal and serious injury crashes and implement safety improvements that address these risks.
- 2. Advance Implementation of Safety Projects**



- a. Deliver safety improvements on a consistent basis, with a goal of implementing approximately two safety projects per year and advancing priority projects identified through the CRSP and this Action Plan.

3. Use Data-Driven Decision Making

- a. Apply crash data, roadway characteristics, and systemic safety analysis to guide project selection, policy decisions, and investment priorities.

4. Track Progress and Maintain Accountability

- a. Monitor safety outcomes and implementation progress through ongoing reporting, including coordination with the County's Transportation Improvement Program and annual reporting processes.

5. Strengthen Coordination and Build Support

- a. Work collaboratively with County leadership, partner agencies, and the public to build understanding of roadway safety issues and support for implementing safety improvements.

Implementation Alignment

These goals are supported by the County's existing policies and processes for prioritizing and delivering transportation projects. Safety investments will be coordinated with the County's Transportation Improvement Program, maintenance activities, and available funding opportunities to ensure that projects are both impactful and feasible.

Together, this vision and goal framework provides a clear, consistent direction for reducing severe crashes while aligning with federal SS4A requirements and the County's long-standing commitment to improving roadway safety.



Planning Structure

Task Force

The Comprehensive Safety Action Plan was guided by a dedicated task force of community leaders and professionals who brought a wealth of expertise and perspectives to the process.

The Task Force brought together partners from transportation, public safety, local government, health, and education to support development of the plan. Members reviewed safety data, helped identify priority locations, and shaped strategies that reflect local needs and on-the-ground experience. Their input helped ensure the plan is practical and responsive to the region's most pressing safety challenges.

Table 1: Task Force Membership

Task Force Members	Organization
JT Anderson	MnDOT D2 District Engineer
Michelle Rognerud	MnDOT D2 Traffic Engineer
Alex Osborn	MnDOT D2 Traffic
Sue Johnson	Northwest MN TZD Coordinator
Lt. Brad Norland	MN State Patrol
Becky Putzke	MN DPS NW Law Enforcement Liaison
Jason Riggs	Beltrami Co Sheriff
Jarrett Walton	Beltrami Co Chief Deputy Staff
Chris Muller	Beltrami Co Emergency Management Director and PIO
Mike Mastin	Bemidji Police Chief
David Lazella	Bemidji Police Captain
David Markert	Bemidji Police Sargent
Thomas Barry	Beltrami Co Attorney
Amy Bowles	Beltrami Co HHS Social Worker
Jeremy Olson	Bemidji School Superintendent
Monica Gregerson	Bemidji School District Transportation Safety Manager
Girma Feyissa	MnDOT State-aid Traffic Safety Engineer
Brian Ketring	MnDOT D2 DSAE
Kristi Sebastian	FHWA Safety/Operations Engineer
J. Carlson	Beltrami Co Commissioner
S. Winger	Beltrami Co Commissioner
Sam Anderson	Bemidji City Engineer
Justin Sherwood	Bemidji Fire Chief



Task Force members also served as ambassadors for the plan by communicating its purpose and encouraging community participation in events and surveys. Task Force members also helped finalize the Focus Group approach and invitees.

Task Force Communication Toolkit

A communications toolkit was developed early in the project to support the Task Force in its ambassador role and create a consistent foundation for outreach. It provided clear, plain-language messaging and cohesive branding that members could share through their organizations and networks to introduce the project, explain its purpose, and show how community input would shape the plan.

The toolkit included ready-to-use materials for digital, print, and in-person outreach, allowing Task Force members and partners to promote the project in a coordinated, recognizable way across the county. These materials directed residents and partners to the survey and interactive feedback map while reinforcing a shared countywide message through trusted local messengers.

The communications toolkit included:

- Plain-language project messaging and email templates
- Social media graphics for Facebook and Instagram
- Printable posters in 8.5x11 and 11x17 formats
- Presentation materials for meetings and briefings



Facebook



Instagram



11x17 Poster



8.5x11 Poster



Presentation

Task Force Survey

A Microsoft Forms survey was distributed to members of the Beltrami County SS4A Task Force to gather stakeholder input on transportation safety priorities across the county. **The survey was designed to support the development of the CSAP by identifying key safety concerns, potential improvement strategies, and priority areas for both rural and urban roadways.** Respondents represented a range of disciplines and perspectives, including engineering, public health, emergency services, education, and law enforcement.

Six Task Force members completed the survey. Responses showed strong support for roadway safety improvements, particularly visible, proven strategies such as retroreflective sign strips, lighting, side paths, bike lanes, and divided roadways. Participants also emphasized the need to improve pedestrian and bicycle infrastructure, strengthen rural roadway safety through treatments such as curve markings and offset intersections, and use data-driven approaches to guide investments in line with community needs and available funding. Feedback further indicated a need for more education and outreach regarding less-familiar safety treatments, including delineators, dynamic curve signing, and plowable centerline reflective markers. Overall, the survey helped **prioritize roadway safety strategies** and guide future safety investments in Beltrami County.

Task Force Meeting Summaries

The first Task Force meeting on December 11, 2025, introduced stakeholders to the Comprehensive Safety Action Plan effort, including an **overview of the SS4A program, project goals, team roles, and the overall schedule.** Participants from engineering, education, enforcement, emergency services, public health, and other community interests shared perspectives on traffic safety concerns and identified opportunities for



collaboration throughout the planning process. Initial findings from the crash data were presented to begin a discussion of existing safety trends and potential focus areas. The meeting also introduced the project's public engagement strategy and set expectations for ongoing Task Force participation through a series of hybrid meetings.

The second Task Force meeting on February 9, 2026, focused on **engagement progress and expanded discussion of safety issues identified through outreach**. Updates covered community engagement activities, including a public event in Kelliher, focus groups, and the online survey and mapping tools. The project team also shared updated crash data analysis to inform discussions of transportation safety needs and priorities across Beltrami County. Participants provided organization-specific updates, shared questions and observations about transportation safety, and reviewed upcoming milestones and next steps in developing the CSAP.

The third Task Force meeting on May 28, 2026, focused on reviewing the final engagement efforts, presenting a **detailed analysis of crash data trends and contributing factors, and introducing early prioritization areas for consideration**. The project safety experts walked through potential strategies and countermeasures to address key safety concerns identified throughout the study process. Task Force members also participated in interactive feedback activities using Mentimeter to share input on proposed strategies, engagement findings, and additional considerations that should inform the final recommendations and implementation priorities.



Public Engagement and Collaboration

Public engagement for the Comprehensive Safety Action Plan was designed as a coordinated strategy from the outset, integrating outreach and communications rather than relying on stand-alone efforts. That strategy was grounded in an early communications toolkit that established clear, plain-language messaging, consistent visual branding, and ready-to-use materials for multiple platforms and audiences. The toolkit enabled the Task Force, County staff, and partner organizations to begin communicating about the plan immediately, broaden outreach, and reinforce a shared message across the county.

Building on this foundation, the engagement approach used three main tactics to gather meaningful, actionable input: an active **Task Force** to guide the process, a **countywide survey** supported by an **interactive feedback map** to collect broad public input, and targeted **focus groups** to explore key safety issues in greater depth.

Supporting activities included a **community event** and **targeted outreach** to raise awareness, strengthen local partnerships, and encourage participation in the survey and feedback tools.

This integrated approach was especially important in Beltrami County’s large, diverse, and mostly rural setting, where many residents live outside Bemidji in small communities and unincorporated areas with distinct transportation safety concerns. Reaching those residents required flexible outreach methods, visible in-person engagement, and consistent messaging to support inclusive, countywide participation.

Figure 1: Pop-Up Event in Beltrami County



Engagement Phases

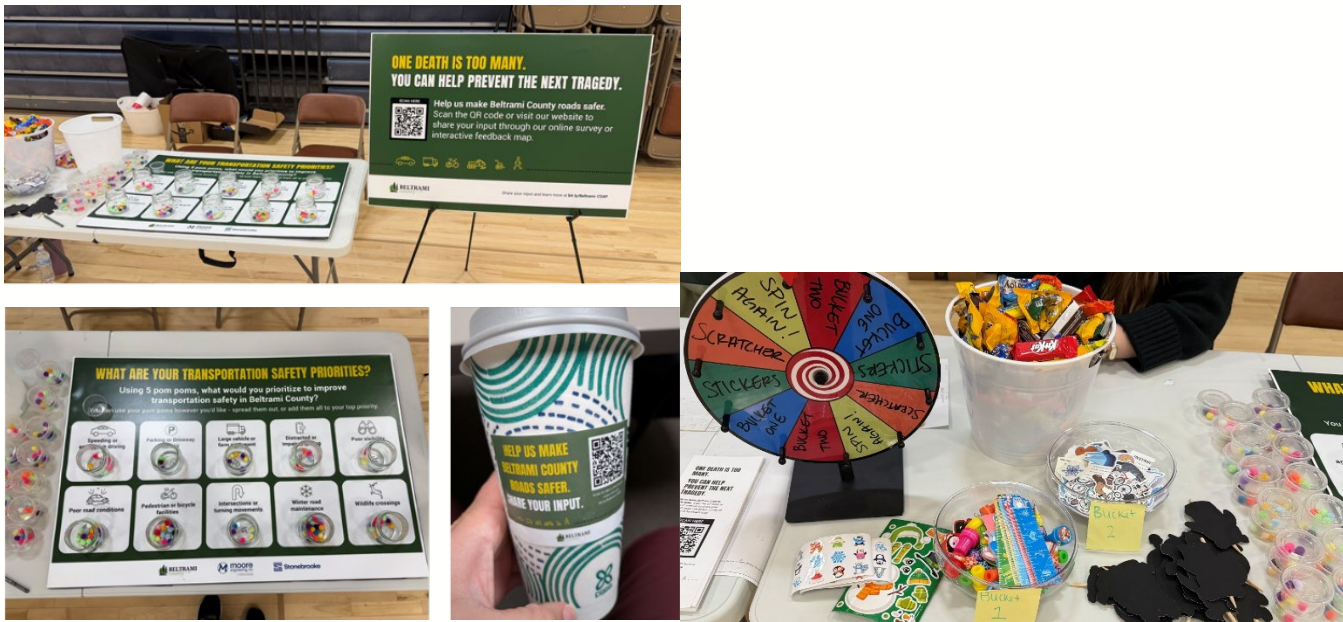


Public engagement for the Beltrami County CSAP occurred in **two main phases**, aligned with the project timeline. Each phase included targeted activities to gather input, validate findings, and communicate with community members and partners.

Phase 1: Awareness and Issue Identification

The public engagement team aimed to meet community members where they already gather by identifying local events and opportunities that could support broad participation in the CSAP process. The team explored community events, sporting events, and other tabling opportunities, but many were not a good fit because of timing, audience alignment, or logistical constraints. In response, and in coordination with local partners and community organizations, the team helped establish and participate in the first annual Winter Festival as a new engagement opportunity aligned with community interests and schedules. The event provided an accessible, welcoming setting to engage residents, businesses, and stakeholders and gather meaningful feedback.

Outreach Methods



Winter Festival

The Winter Festival was coordinated with the Public Health Department as part of the Community Health Assessment process. Hosted by Kelliher Public School, the event brought together nearly **200 residents** and local businesses and gave community members an opportunity to engage directly with more than 30 local organizations and learn about the CSAP. This joint effort connected transportation safety with broader public health and quality-of-life priorities while encouraging discussion about roadway safety concerns, mobility challenges, and potential improvement opportunities across Beltrami County.

Approximately 82 attendees visited the CSAP engagement booth to review crash maps, participate in survey activities, and share feedback on transportation safety issues affecting their community. A survey activity based on Question 7 of the online survey was used to keep in-person and online input consistent and allow results to be compared and combined across methods (“What are your transportation safety priorities?”). The hands-on



format mirrored the survey framework while making participation more accessible and engaging in a public event setting.

Figure 2: Board from Engagement Event

WHAT ARE YOUR TRANSPORTATION SAFETY PRIORITIES?

Using 5 pom poms, what would you prioritize to improve transportation safety in Beltrami County?

You can use your pom poms however you'd like - spread them out, or add them all to your top priority.

 Speeding or aggressive driving 	 Parking or Driveway Access 	 Large vehicle or farm equipment 	 Distracted or Impaired driving 	 Poor visibility
 Poor road conditions 	 Pedestrian or bicycle facilities 	 Intersections or turning movements 	 Winter road maintenance 	 Wildlife crossings

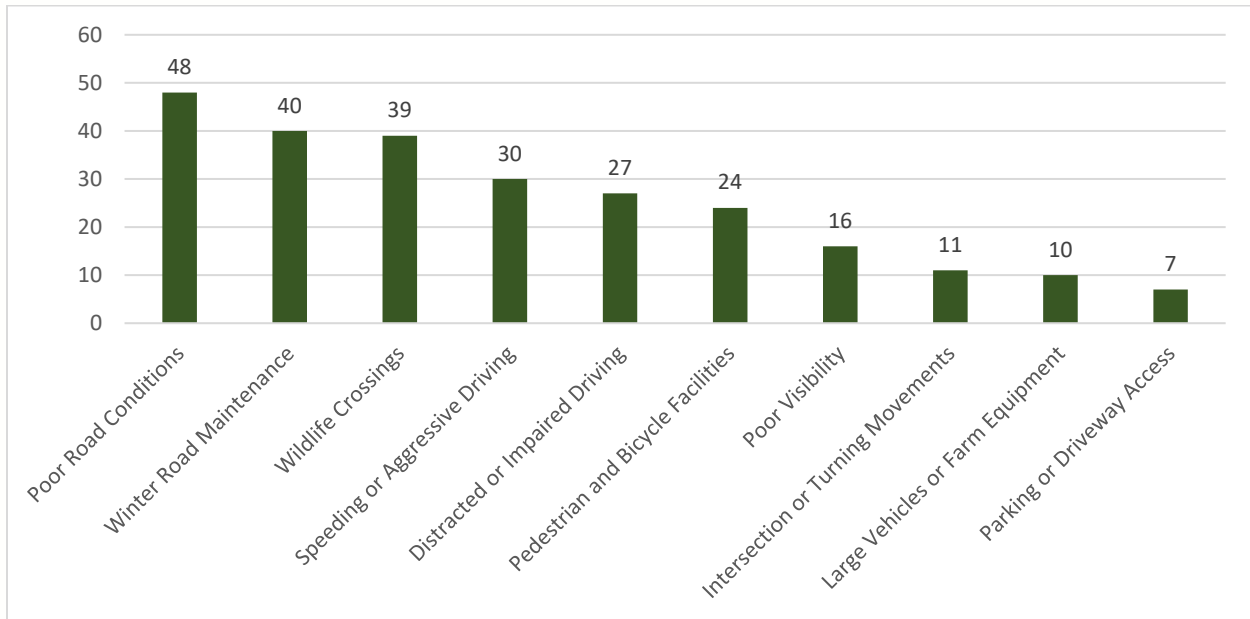




Results from the engagement activity reinforced and expanded on patterns seen in the online survey, highlighting several key transportation safety issues affecting residents across Beltrami County.



Figure 3: What are your Transportation Priorities?



Feedback collected during the Winter Festival provided valuable insight into community perceptions of transportation safety and helped identify priority issues for the CSAP.

Online Survey

An online survey was developed as part of the CSAP engagement process to gather input from residents and transportation system users across the county. It gave community members an opportunity to identify safety concerns, highlight priorities, and share perspectives on transportation conditions and potential improvements.

In total, 185 individuals completed the survey, providing feedback that helped inform the plan and reinforce key safety themes identified throughout the engagement process.

Survey Feedback Highlights

- Safer walking and biking conditions
- Reduced speeding and aggressive driving
- Safer school access
- Better maintenance and winter operations
- Improved intersection safety
- Greater investment in multimodal transportation

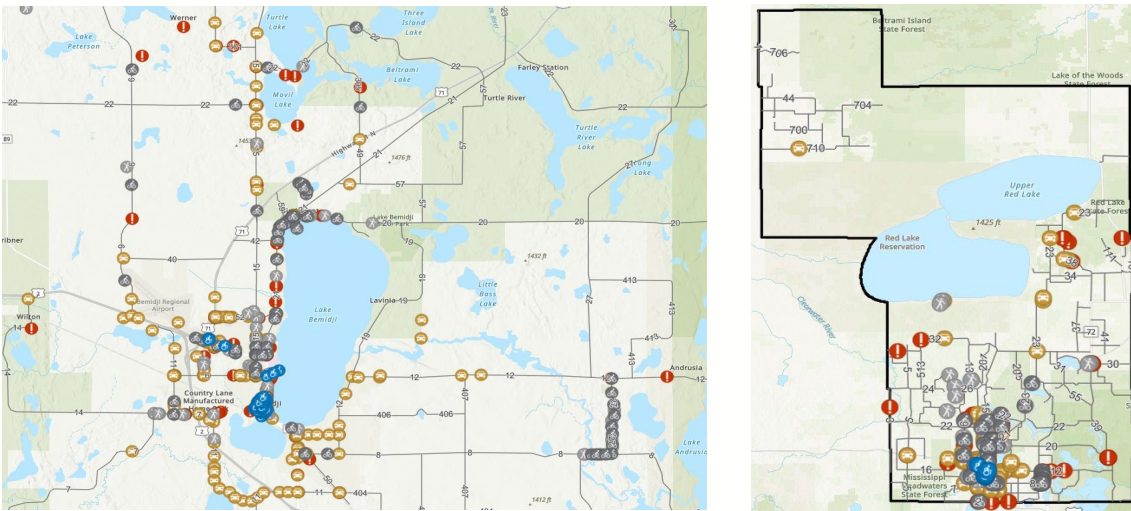
Online Map

An online comment map was used to collect input on specific transportation safety concerns by location. The interactive tool allowed residents and transportation system users to pinpoint places where they experience safety issues. A total of **450 comments were received and categorized by topic area**. Driving conflict concerns accounted for the largest share with 182 comments, followed by general safety concerns with 98 comments.



Additional feedback included 68 comments on bicycle safety, 67 on pedestrian safety, and 35 on accessibility concerns. This feedback provided location-specific insight on accessibility, pedestrian conflicts, bicycling conditions, driving behavior, and overall transportation safety. The map helped identify recurring concerns, highlight priority corridors and intersections, and reinforce themes that emerged through other engagement activities. **The majority of comments received were concentrated within the Bemidji area and surrounding communities.**

Figure 4: Beltrami and Bemidji Comment Maps



Phase 1 Key Themes

Several consistent transportation safety themes emerged during Phase 1. A **major focus was pedestrian and bicycle safety**, with participants frequently identifying concerns about missing sidewalks and sidewalk gaps, unsafe crossings and intersections, limited bicycle infrastructure and connectivity, and sidewalks directly adjacent to high-speed traffic. Safe walking and biking access near schools was repeatedly emphasized, along with challenges caused by snow-covered sidewalks and other winter accessibility barriers.

Traffic operations and driver behavior were also significant concerns across the county. Residents frequently cited speeding on major corridors, aggressive passing and tailgating, red-light running, distracted driving, and other reckless behavior. Concerns were also raised about signal timing, drivers failing to yield to pedestrians, and generally unsafe driving conditions in both urban and rural areas.

Intersection safety was another recurring theme. Participants highlighted poor visibility, near misses and crashes, driver confusion, high-speed turning movements, and inadequate signage at intersections and crossings. Several comments also noted difficulties navigating roundabouts, trail crossings, and other complex roadway configurations.

Roadway maintenance and surface conditions were also common concerns. Community members cited potholes, rough pavement, poor grading of gravel roads, faded pavement markings, snow and ice removal practices, and snow piles that reduce visibility at intersections and driveways. Many emphasized the importance of maintaining existing infrastructure to improve safety and reliability.



Finally, **school and youth transportation safety emerged as an important priority.** Feedback frequently focused on the need for safe walking and biking routes to schools, better crosswalk visibility, fewer traffic conflicts near school zones, and safer connections to parks, trails, and afterschool programs.

Phase 2: Strategy Development and Validation

Focus Group Overview

Five focus groups were conducted to better understand transportation safety concerns from a range of user perspectives. Although many themes overlapped, each group offered distinct insight into specific challenges and needs within the transportation system.

Focus Group #1 Active Transportation (Non-Motorized Transportation)

The Active Transportation focus group occurred on April 13, 2026. Participants in this focus group highlighted a strong need for improved safety and connectivity for people walking and biking in Beltrami County. Many attendees identified specific high-risk locations, including busy intersections, high-speed rural corridors, and areas around Lake Bemidji where traffic volumes, poor road conditions, and lack of shoulders or bike infrastructure make travel uncomfortable or unsafe. Concerns also included inconsistent availability of bike lanes, intersections that do not detect cyclists, and limited safe crossings of major highways. Participants emphasized that these barriers discourage biking as a mode of transportation, reinforcing a cycle in which low usage leads to reduced driver awareness and ongoing safety concerns.

The group broadly supported investments that prioritize connectivity and encourage more people to walk and bike, such as separated trails, wider shoulders, safer crossings, and traffic calming measures. At the same time, participants stressed the importance of maintenance, accessibility for all users, and thoughtful design, particularly at roundabouts and crossings for people with limited mobility or vision. There was also discussion about balancing recreation and commuting needs, especially as development expands beyond the urban core. Overall, participants expressed that building a more connected, visible, and well-designed active transportation network would improve safety, support commuting by bike and foot, and increase overall usage.

Focus Group #2 EMS, Transit, and Freight

The EMS and Transit focus group was held on April 24, 2026. Participants in the EMS and transit focus group emphasized roadway design and operational challenges affecting the safety and efficiency of buses, emergency vehicles, and other large vehicles. Key issues included narrow or complex intersections, a lack of turn lanes (particularly near the hospital), and congested corridors that make navigation difficult and increase the risk of crashes. Participants also noted poor road conditions on some county roads, limited shoulders in rural areas, and access challenges, such as narrow or obstructed driveways, which can delay emergency responses.

The group supported a mix of infrastructure improvements and education to address these concerns. Suggested strategies included adding turn lanes, reducing speeds in key corridors, installing dynamic speed feedback signs, and improving compliance with driveway access standards. While countermeasures like roundabouts were generally viewed positively for slowing traffic, participants noted ongoing confusion among drivers and the need for additional education. Accessibility concerns were also raised, particularly for pedestrians crossing busy



streets and for older adults, reinforcing the importance of designing solutions that work for all users while maintaining safe and efficient movement for transit and emergency services.

Focus Group #3 Aging and Disabled Populations

This focus group was held on April 28, 2026. Participants in the aging and disabled populations focus group emphasized the importance of designing transportation systems that prioritize safety, accessibility, and comfort for users of all abilities. A strong preference emerged for separated walking and biking facilities that reduce interactions with vehicle traffic, along with safer crossing opportunities such as curb extensions, refuge islands, and grade-separated crossings. Participants highlighted challenges with visibility, inconsistent lighting, and overly complex or excessive signage, noting that these can create confusion or barriers for people with low vision or cognitive limitations. Concerns were also raised about common roadway features, such as right turns on red, roundabouts, and multi-lane crossings, that can be particularly difficult or unsafe for individuals with mobility, vision, or hearing impairments.

The group also stressed the need for thoughtful design details and supportive education to ensure infrastructure is usable and effective. This includes incorporating accessible pedestrian signals and audible cues, ensuring detectable surfaces and properly aligned curb ramps, and maintaining predictable, easy-to-navigate pathways. Participants noted that some treatments, like dynamic speed signs or shared-use trails, must be carefully implemented to remain effective and accessible, with attention to user awareness and etiquette. Overall, the discussion reinforced the need for both targeted design solutions and a broader commitment to inclusive, universally accessible transportation systems to improve safety for aging and disabled individuals.

Focus Group #4 ATV/UTV/Snowmobile

This focus group took place on May 1, 2026. Participants in the ATV/UTV/Snowmobile focus group highlighted safety concerns primarily related to trail crossings, rural roadway conditions, and driver awareness. Confusion at crossings, particularly regarding right-of-way, and limited visibility at non-level (non-grade) crossings were identified as key risks, with past incidents underscoring the potential severity of these issues. Participants noted that in rural areas, drivers may not expect trail crossings, especially after long stretches without encountering them, increasing the need for better advance warning. Additional concerns included limited access to emergency services in remote areas, conflicts at private driveways, and a general need for increased education for both riders and drivers on safe interactions.

The group supported a combination of infrastructure improvements and education to enhance safety. Recommended strategies included improved, more consistent signage; lighting at crossings; LED stop signs; and better maintenance of clear zones to improve sightlines. Participants noted that some countermeasures, such as dynamic speed signs and access management techniques, can be effective when used appropriately, whereas others, such as J-turns, may be difficult for these users to navigate. Overall, participants emphasized the importance of clear, visible crossings, reduced conflict points, and targeted education campaigns to improve awareness and safety for both off-highway vehicle users and motorists.



Focus Group #5 General Safety

This focus group took place on May 1st. Participants in the general safety focus group identified key crash trends and priority corridors across Beltrami County, noting that many high-risk locations, such as CR 50 and the Irvine Avenue corridor, have experienced frequent crashes or recurring safety concerns. Participants observed that rural crash hotspots are often concentrated on trunk highways, while some recent local improvements are not yet reflected in available crash data. There was also interest in coordinating with neighboring jurisdictions and leveraging bundled or partnership-based funding approaches to address safety issues more effectively.

The group supported a range of infrastructure and non-infrastructure strategies to improve safety, with an emphasis on low-cost, high-impact treatments and ongoing maintenance. Strong support was expressed for measures such as access management, improved clear zones, enhanced pavement markings, lighting, and consistent signage to improve visibility and reduce conflicts. While treatments such as roundabouts, passing lanes, and rumble strips were generally seen as beneficial, participants noted trade-offs in user experience, speed, and accessibility. Education and outreach, particularly for youth and safe routes to school, were also highlighted as important complements to infrastructure. Overall, participants emphasized a balanced, systemwide approach that combines targeted investments, maintenance, and education to improve safety for all road users.

Phase 2 Key Themes

Overall, feedback across the engagement groups was highly consistent and reinforced many of the transportation safety concerns identified throughout the planning process. While these themes were not unexpected, the frequency and consistency with which they were raised helped validate their importance to residents and system users.

The most common concerns centered on visibility, vehicle speeds, and safety challenges at intersections and crossings. Participants frequently identified limited sight distance, difficulty crossing busy roads, and unsafe driver behavior in both urban and rural settings. Safety for pedestrians and bicyclists, especially near schools, parks, and downtown areas, was also a recurring topic.

Roadway maintenance and overall condition were another major area of discussion. Residents cited concerns about shoulder conditions, potholes, pavement quality, brush clearing, pavement markings, snow removal, and winter maintenance. Many comments emphasized the importance of maintaining existing infrastructure to support safe, reliable travel year-round.

Several discussions also highlighted trade-offs among different user groups and safety strategies. In particular, participants expressed differing views on rumble strips, roundabouts, and roadway shoulders. Some saw these treatments as beneficial for motor vehicle safety, while others noted challenges they can create for bicyclists, pedestrians, and accessibility. These discussions underscored the importance of balancing the needs of all roadway users when evaluating future transportation improvements and safety measures.



Additional Community-Identified Safety Concern

Through the public comment mapping tool and subsequent County Board discussion, concerns were raised regarding the pedestrian and bicycle trail crossing of CSAH 20 within Lake Bemidji State Park. The crossing is located in a rural setting along a high-speed roadway (55 mph), where trail users must cross CSAH 20 to access the trail system on both sides of the roadway.

Based on existing conditions, pedestrian and traffic volumes, conventional crossing treatments such as a Rectangular Rapid Flashing Beacon (RRFB) are not currently warranted at this location. Given the roadway speed and rural context, a grade-separated crossing, such as a tunnel, would likely provide the greatest safety benefit by eliminating conflicts between trail users and motor vehicles. A preliminary planning-level estimate prepared by Beltrami County identified an approximate cost of \$1.5 million for a potential tunnel crossing. While not included among the Plan's prioritized actions, this location is documented as a community-identified safety concern for future consideration should funding opportunities become available.

Conclusion

Overall, the engagement process provided valuable insight into transportation safety concerns, priorities, and experiences across Beltrami County. Feedback from focus groups, the online survey, and the interactive comment map revealed consistent themes related to visibility, speeding, intersection safety, accessibility, maintenance, and multimodal connectivity. Although participation varied by engagement method, the input was notably consistent, reinforcing key issues and helping shape a Comprehensive Safety Action Plan that reflects the needs of residents and users of all ages, abilities, and travel modes.



Safety Analysis

The crash analysis is an important step in supporting the preparation of Beltrami’s Comprehensive Safety Action Plan. It was a multi-level prioritization exercise focused on three specific outcomes:

1. Identify the types of crashes that are either over-represented compared to available state-wide data or are occurring in large numbers and, therefore, represent a high-priority target for reduction.
2. Identify the locations along Beltrami’s roadway system where crashes involving injuries and the targeted crash types occur. These locations represent the County’s High Injury Network, and the at-risk locations are considered to be priorities for safety investment.
3. Identify a short list of safety strategies and countermeasures that have proven effective at mitigating high-priority crashes and then develop a recommended list of safety projects, which are the deployment of specific high-priority strategies at specific high-priority locations.

The initial step in the crash analysis involved assembling a data set of road segments, intersections, and curves from Beltrami’s Road Network that were included in the study.

Beltrami County Roadway Network

Beltrami County owns and maintains 750 miles of roads. Table 2 breaks down the road network within Beltrami County by lane-mileage. The data indicates that MnDOT owns and operates approximately 12% of the road network, while Beltrami County maintains approximately 32%.

Table 2: Beltrami County Roadway Network

Route System	Lane-Miles	Percentage of System
County State Aid Highway (CSAH)	930.65	20.3%
US Trunk Highways (USTH)	257.95	5.6%
MN Trunk Highways (MNTH)	253.46	5.5%
Municipal State Aid Street (MSAS)	42.95	0.9%
Township Roads (TWNS)	1,523.11	33.2%
Municipal Roads (MUN)	215.26	4.7%
County Road (CR)	499.47	10.9%
Other (NATF/UTWN/Ramp/IND/PRIV/Blank)	870.59	19.0%
TOTAL	4,593.44	100%



Table 3: Beltrami County-Operated Network

Route System	Miles
Paved County State Aid Highway (CSAH)	389.65
Gravel County State Aid Highway (CSAH)	75.65
Paved County Road (CR)	17.1
Gravel County Road (CR)	229.32

This road network was separated into segments and intersections. Roadway feature data were also collected, including roadway cross-sections, speed limits, traffic volumes, adjacent land uses, and traffic control devices.

This resulted in the identification of 2,880 roadway segments, 1,182 intersections, and 592 curves. The tables below present the information and features collected for the segments, curves, and intersections.

Table 4: Segment Information and Features Collected

Segment Information and Features Collected				
Segment No.	GIS Map Segment ID No.	Route System	Route No.	Street Name
FROM	TO	Length (Mi.)	Fatal Crashes	Serious Crashes
Minor Crashes	Bicycle Crashes	Pedestrian Crashes	Access Points	Access Density
Land Use	Area Type & Context	Functional Classification	ADT	Speed Limit
Driving Lane Width	Curb & Gutter presence	No. of Lanes	Road Type	Traffic Control Device
Pedestrian Crossing Features	Sidewalks Present	Trails Present	GIS Map Coordinates	Google Map hyperlink
Surface Type	Lane Width	Shoulder Width	Total Shoulder Width	Road Width
Number of Curves	Curve Density	Fixed Objects in ROW	Edge Risk	



Table 5: Intersection Information and Features Collected

Intersection Information and Features Collected				
Intersection No.	GIS Map Intersection ID No.	Route System	Route No.	Street Name
Cross Street	Fatal Crashes	Serious Crashes	Minor Crashes	Bicycle Crashes
Pedestrian Crashes	Access Points	Access Density	Land Use	Area Type & Context
Geometry (skew)	Functional Classification	No. Lanes Major Approach	No. Lanes Minor Approach	Traffic Control Device
Major Approach Turn Lane Configuration	Major Approach Left Turn Lane Phasing	Pedestrian Crossing Features	Sidewalks Present	No. of Lanes Bikes/Peds Cross
Major ADT	Minor ADT	Minor % of Major	Volume Cross Product	Entering Volumes
Major Approach Speed	Minor Approach Speed	GIS Map Coordinates	Google Map hyperlink	Stop Within 5 Miles
Adjacent Development Presence	Adjacent Curve Presence	Adjacent Railroad Crossing		

Table 6: Curve Information and Features Collected

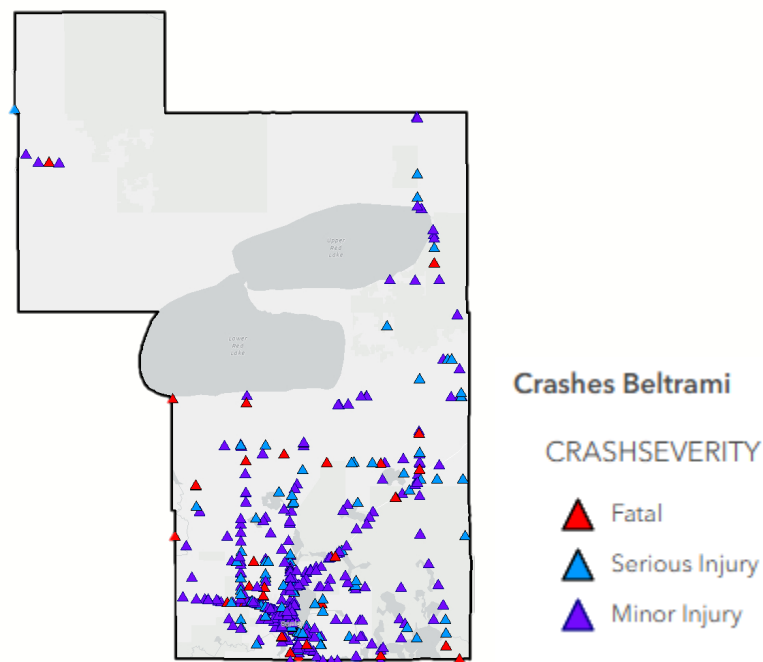
Segment Information and Features Collected				
Curve No.	GIS Map Curve ID No.	Route System	Route No.	Fatal Crashes
Serious Crashes	Minor Crashes	Bicycle Crashes	Pedestrian Crashes	Google Map hyperlink
Surface Type	Speed Limit	ADT	Curve Radius (Feet)	Curve Risk Factor
Existing Chevrons	Adjacent Intersection	Visual Trap	Shoulder Type	Shoulder Width
Road Width	Fixed Objects in ROW	Edge Risk	Lane Width	



Crash Data and Identification of Priority Crash Types

The second step in the crash analysis involved assembling a data set of crashes that occurred at individual locations within the County.

Figure 5: Beltrami County Crashes



The list of crashes for the analysis was obtained from the Minnesota Crash Mapping and Analysis Tool 2.0 (MnCMAT). Crash records contain standard data collected by the reporting officer, including location, date, time, age, gender, physical condition, seat belt use, environmental conditions, contributing factors, road geometry, severity, collision type, and other details.

Data for the years 2015 through 2024 (the last full year for which data were available) was collected.

The initial list of crashes included only those resulting in fatalities (K) or serious injuries (A), consistent with current practices in Minnesota. This effort determined that there were 46 crashes involving fatalities and 112 crashes involving serious injuries for a total of 158 K+A crashes in Beltrami County during the ten-year study period.



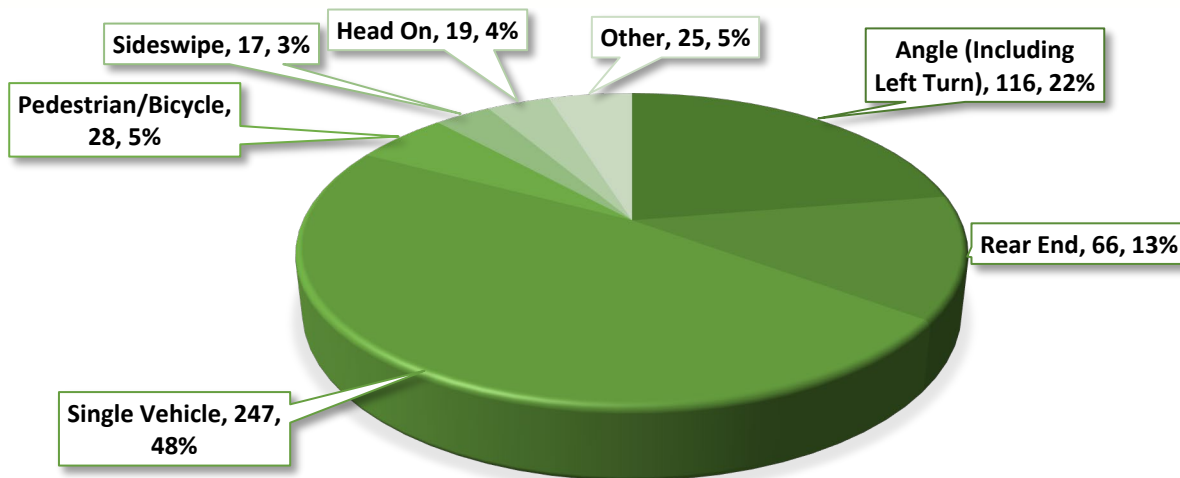
Table 7: 2015 to 2024 Beltrami County Crash Data

Crash Data 2015 – 2024												
Severity	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
K	6	3	4	5	5	5	7	1	6	4	0	46
A	6	17	19	9	9	8	6	17	12	9	0	112
B	36	48	52	47	30	30	28	29	31	29	0	360
Total	48	68	75	61	44	43	41	47	49	42	0	518

While fatal (K) and serious injury (A) crashes were the primary focus for identifying severe crash trends and establishing the County's safety goals, the analysis was expanded to include minor injury (B) crashes when evaluating crash types and systemic risk factors. Because K and A crashes are relatively infrequent in Beltrami County, including B crashes, a larger dataset was provided that improved the ability to identify recurring crash patterns, contributing roadway characteristics, and locations with elevated crash risk. This approach is consistent with systemic safety analysis practices that use a broader set of crash data to better understand underlying safety issues and to guide the selection of countermeasures. These 518 K+A+B crashes were then disaggregated by crash type; see the figure below. The results of this effort suggest that the following types of crashes should be considered a high priority for mitigation:

- Single Vehicle Crashes – 48%
- Angle Crashes (including Left Turns) – 22%
- Rear End Crashes – 13%
- Pedestrian/Bicycle – 5%

Figure 6 Crash Type Summary



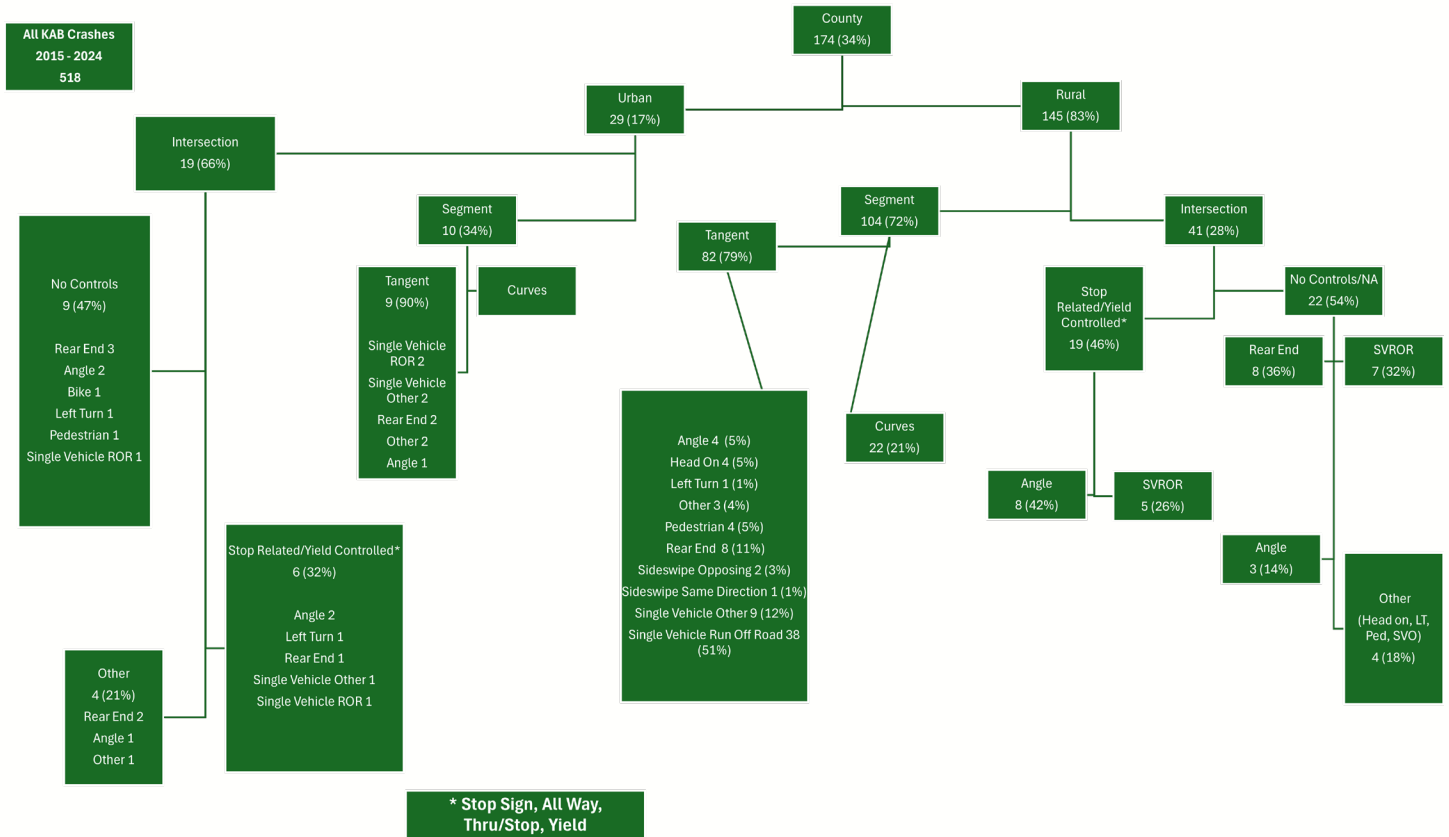


Key findings from the crash analysis include:

- 80.1% of injury crashes occurred on 32.3% of the roadway network: US Trunk Highways (USTH), Minnesota Trunk Highways (MNTH), County State-Aid Highways (CSAH), and Municipal State-Aid Highways (MSAS) are all overrepresented among injury crashes
- Single-vehicle crashes, especially single-vehicle run-off-road crashes, were the most common crash type across Beltrami County
- Severely skewed intersections were a major risk factor for crashes: severely skewed intersections were 4.5 times overrepresented among urban intersection crashes and 2.5 times overrepresented among rural intersection crashes
- Rural intersections near railroad crossings were 9.5 times overrepresented among rural intersection crashes
- High-volume urban intersections (AADT > 7,500) and roadways with cross-sections exceeding four lanes were roughly 5 times overrepresented among urban intersection crashes involving cyclists and pedestrians
- Rural curves with 750 – 1,000 foot radii were 2.5 times overrepresented among crashes along rural curves



Figure 7: Crash Data Evaluation Approach





Identification of High Injury Network and At-Risk Locations

The 518 K+A+B crashes in the data set were located using MnCMAT, and it was determined that these crashes are not uniformly distributed, nor is every location equally likely to experience a crash on Beltrami's road network. It was also determined that these crashes were over-represented at specific locations that could be identified first by Route System and then within each category by features including functional classification, roadway cross-section, speed limit, traffic volume, land use, and at intersections – the type of traffic control device.

The disaggregation of K+A+B crashes by Route System found that crashes were over-represented along US Trunk Highways (USTH), State highways (MNTH), County State Aid Highways (CSAH), and Municipal State Aid Streets (MSAS). These roads account for 32.3% of the road network mileage in Beltrami but 80.1% of the K+A+B crashes; thus, they represent our High Injury Network.

State-Aid roads (USTH, MNTH, CSAH, MSAS) were designated as Beltrami's High Injury Network

To further support the designation of the High Injury Network, crash densities (K+A+B crashes/mile/year) were computed for each Route System component. The US, State, CSAH, and MSAS routes had the highest crash densities, 0.045, 0.045, 0.017, and 0.058, respectively. Collectively, these routes had an average crash density of 0.028 K+A+B crashes/mile/year, which is 2.5 times the Countywide average of 0.011 K+A+B crashes/mile/year, which provides additional support for their designation as Beltrami's High Injury Network (HIN).

Table 8: K+A+B Crashes by Route System

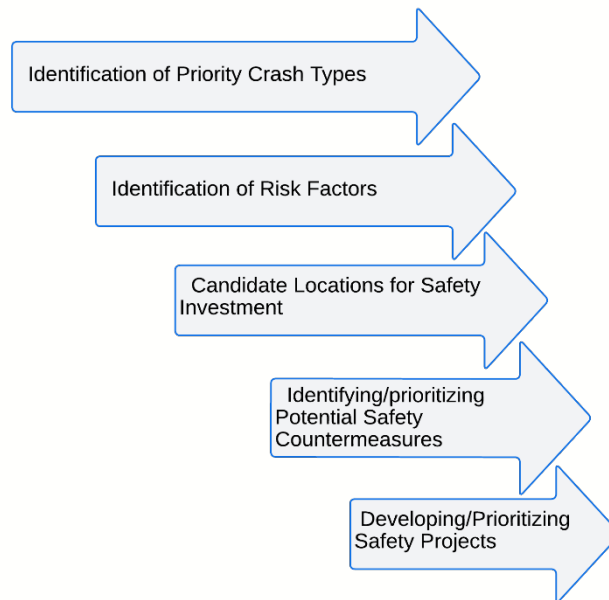
K+A+B Crashes by Route System						
Route System	In HIN?	Miles	% Network	K+A+B Crashes	% Crashes	Crash Density (Crashes/Mile/Year)
CSAH	Yes	930.65	20.3%	162	31.3%	0.017
USTH	Yes	257.95	5.6%	115	22.2%	0.045
MNTH	Yes	253.46	5.5%	113	21.8%	0.045
MSAS	Yes	42.95	0.9%	25	4.8%	0.058
Township	No	1,523.11	33.2%	42	8.1%	0.003
Municipal	No	215.26	4.7%	29	5.6%	0.013
County Road	No	499.47	10.9%	11	2.1%	0.002
Private	No	-	-	5	1.0%	-
Indian Service	No	-	-	4	0.8%	-
Other	No	870.59	19	12	2.3%	0.001
TOTAL	-	4,593.44	100%	518	100%	0.011
TOTAL HIN	Yes	1,485.01	32.3%	415	80.1%	0.028



To support the definition of at-risk locations and identification of priority candidates for safety investment along the HIN, a comprehensive safety analysis was completed – a traditional approach that identified high crash locations (defined as averaging at least one K+A+B crash per year) and a systemic approach that identified risk based on the presence of specific roadway design, speed, traffic volume, and land use characteristics similar to the attributes at the locations with crashes.

Systemic Risk Assessment

Figure 8: Systemic Risk Assessment



The systemic risk assessment process was developed to help safety analysts identify locations for safety investment by predicting crash potential in systems with few or no high-crash locations and crash densities of priority crash types that are too low to reliably identify places of concern.

The systemic assessment in Beltrami was conducted consistently with the process documented in FHWA’s Systemic Safety Project Selection Tool (FHWA-SA-13-019, July 2013) and consisted of the steps shown above.

Priority Crash Types

A review of the crash information provided by MnCMAT 2.0 found that the most common types of K+A+B crashes on Beltrami’s road network were Single Vehicle Run Off Road (195), Angle (105), and Rear-End (66) crashes. These crash types accounted for more than 70% of all crashes and were selected as priority crash types.

Crashes involving Pedestrians and Bicycles accounted for 5.4% of K+A+B crashes in Beltrami and were also selected as a priority crash type due to the vulnerability of these types of road users.

Risk Factors

The locations where the priority crash types occurred were reviewed, and the roadway, curve, and intersection features were documented. Further analysis was then conducted to determine which characteristics were



overrepresented. Therefore, candidates are part of a package of risk factors used to predict which intersections, curves, and segments are at risk of future crashes.

Risk Factors

Characteristics of the road network that contribute to the likelihood or severity of crashes on that network

The analysis resulted in the selection of the following characteristics for use as risk factors:

Intersections – Urban Vehicles

Table 9: Beltrami County Intersection Risk Factors

Risk Factor	Risk Factor Criteria	% KAB Crashes	% of Intersections	Ratio	Beltrami Data Finding
Alignment Skew	Major skew on approach alignment	25.0%	5.6%	4.47x	Severely skewed urban intersections account for 25% of urban KAB crashes despite representing only 5.6% of intersections, driven by poor sight lines and difficult speed judgments.
Major Approach Speed	35, 40, or 45 mph on major approach	75.0%	36.4%	2.06x	Urban intersections with major approach speeds of 35–45 mph account for 75% of urban KAB crashes despite representing only 36.4% of intersections.
Context Zone	Commercial	25.0%	20.3%	1.23x	Urban intersections in commercial areas account for 25% of KAB crashes despite representing only 20.3% of intersections.
Entering Traffic Volume	>2,500 vehicles/day entering volume	87.5%	41.3%	2.12x	Higher-volume urban intersections are overrepresented in KAB crashes, reflecting increased conflicts and fewer acceptable gaps for turning and crossing movements.
Traffic Control Device	Signal	0.0%	1.4%	0.00x	CRSP 3 Risk Factor — Beltrami rural sample size too small for a reliable estimate.
Leg Configuration	4-leg intersection	62.5%	39.2%	1.60x	Four-leg urban intersections are 1.6x overrepresented — 62.5% of urban KAB crashes at 39.4% of urban intersections; four-leg configurations create more conflict points and crossing movements than T-intersections, particularly impactful in urban environments with pedestrian and bike activity

KAB = Fatal + Serious + Minor crashes. Ratio = % KAB Crashes ÷ % of Intersections.



Figure 9: Urban Intersection Crashes by Alignment Skew

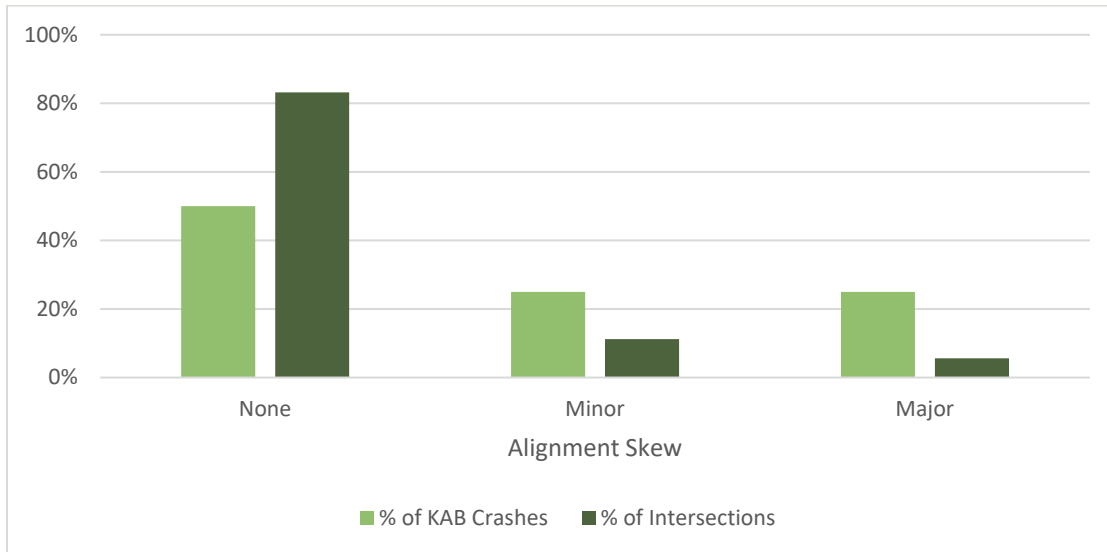


Figure 10: Urban Intersection Crashes by Major Approach Speed Limit

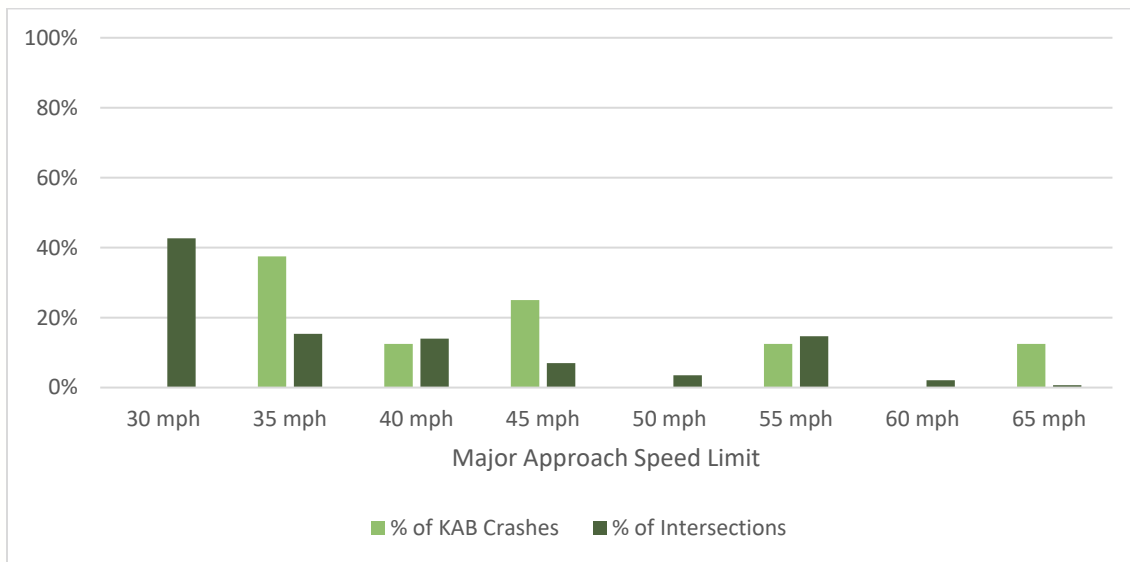




Figure 11: Urban Intersection Crashes by Context Zone

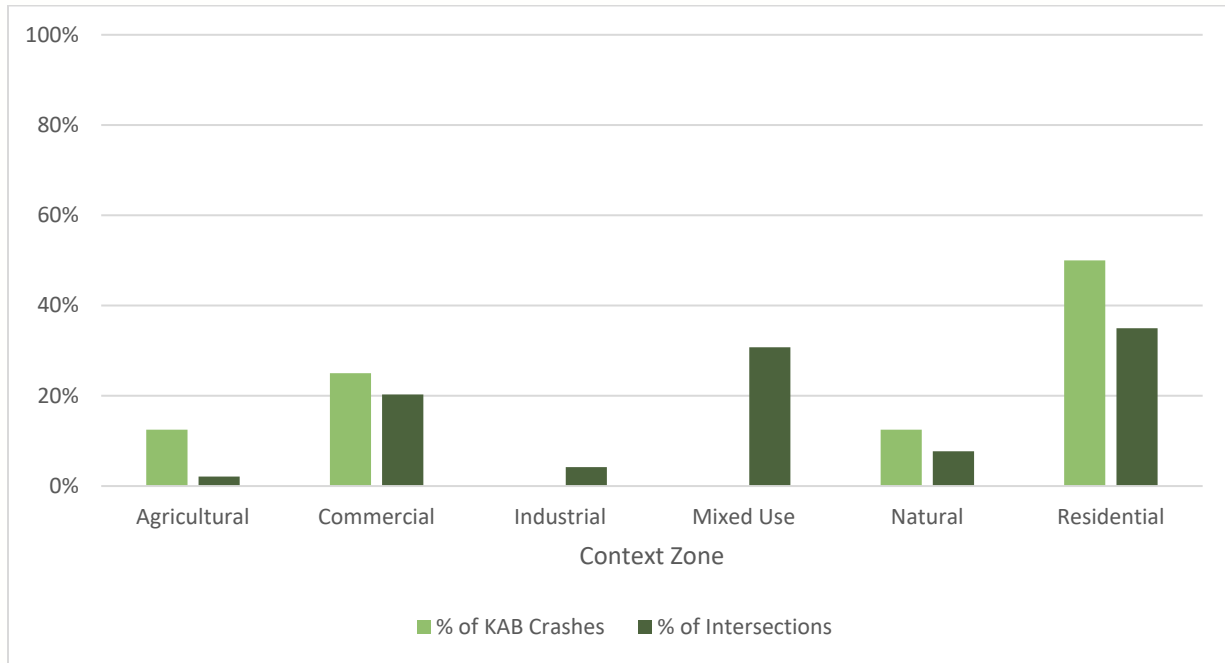


Figure 12: Urban Intersection Crashes by Entering ADT

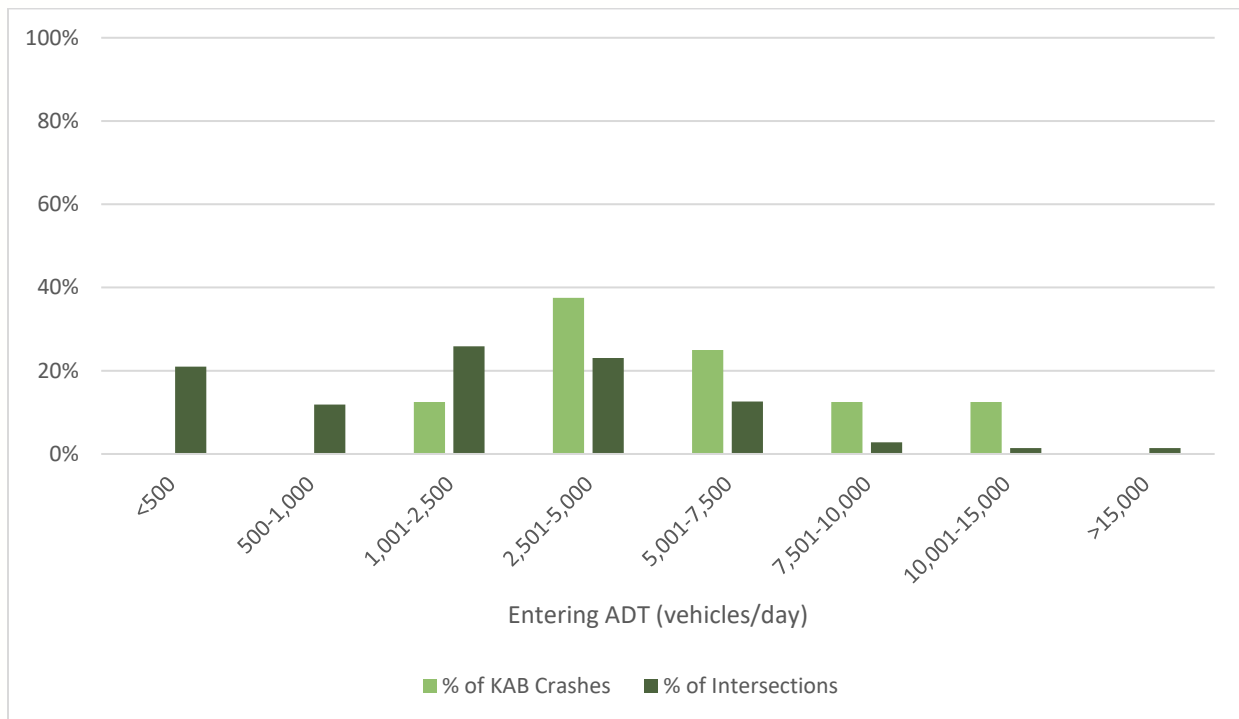




Figure 13: Urban Intersection Crashes by Traffic Control Device

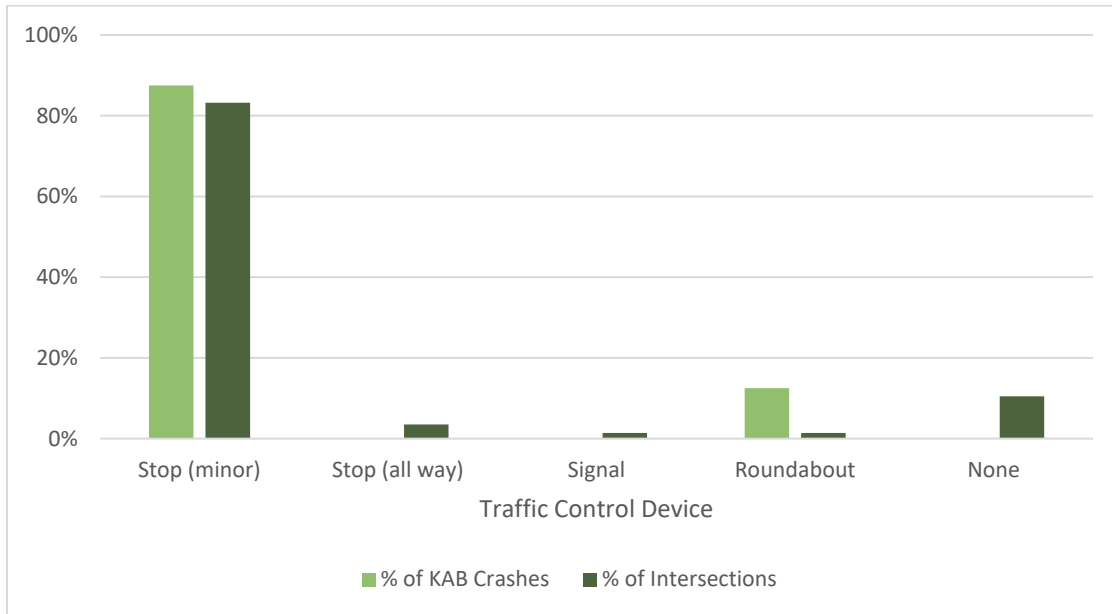
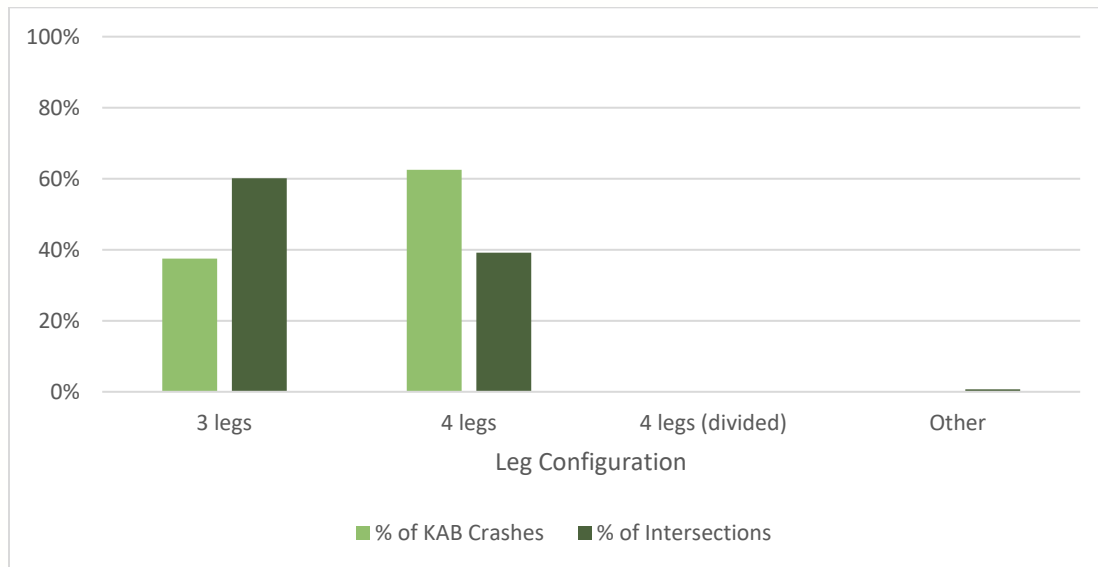


Figure 14: Urban Intersection Crashes by Leg Configuration





Intersections – Urban Bike/Ped

Table 10: Beltrami County Urban Intersection Bike & Pedestrian Risk Factors

Risk Factor	Risk Factor Criteria	% BP Crashes	% of Intersections	Ratio	Beltrami Data Finding
Entering ADT	>7,500 vehicles/day	33.3%	5.6%	5.95x	Urban intersections with 10,001–15,000 entering vehicles/day are 24x overrepresented in bike/ped crashes — 33% of BP crashes at only 1.4% of intersections; highest-volume urban intersections concentrate pedestrian and cyclist conflict despite n=3 caution
Lanes Crossed	4+ lanes to cross	33.3%	7.7%	4.33x	Urban intersections requiring 4+ lane crossings are 4.3x overrepresented — 33% of BP crashes at 7.7% of intersections; wider crossings extend pedestrian exposure time and increase conflict with turning vehicles
Adjacent Development	Yes	100.0%	96.5%	1.04x	Adjacent development is present at 97% of urban intersections and 100% of BP crash locations — no meaningful differentiation (ratio 1.04x); adjacent development is too uniformly present in the urban network to serve as a useful risk discriminator for bike/ped crashes
Sidewalk	Some or None	100.0%	95.1%	1.04x	CRSP 3 Risk Factor — Beltrami rural sample size too small for reliable estimate.
Traffic Control Device	Signal	0.0%	1.5%	0.00x	CRSP 3 Risk Factor — Beltrami rural sample size too small for reliable estimate.

BP = combined Bike + Pedestrian crashes (n=3). Ratio = % BP Crashes ÷ % of Intersections. Small sample — interpret with caution.

Figure 15: Urban Bike+Ped Crashes By Entering ADT

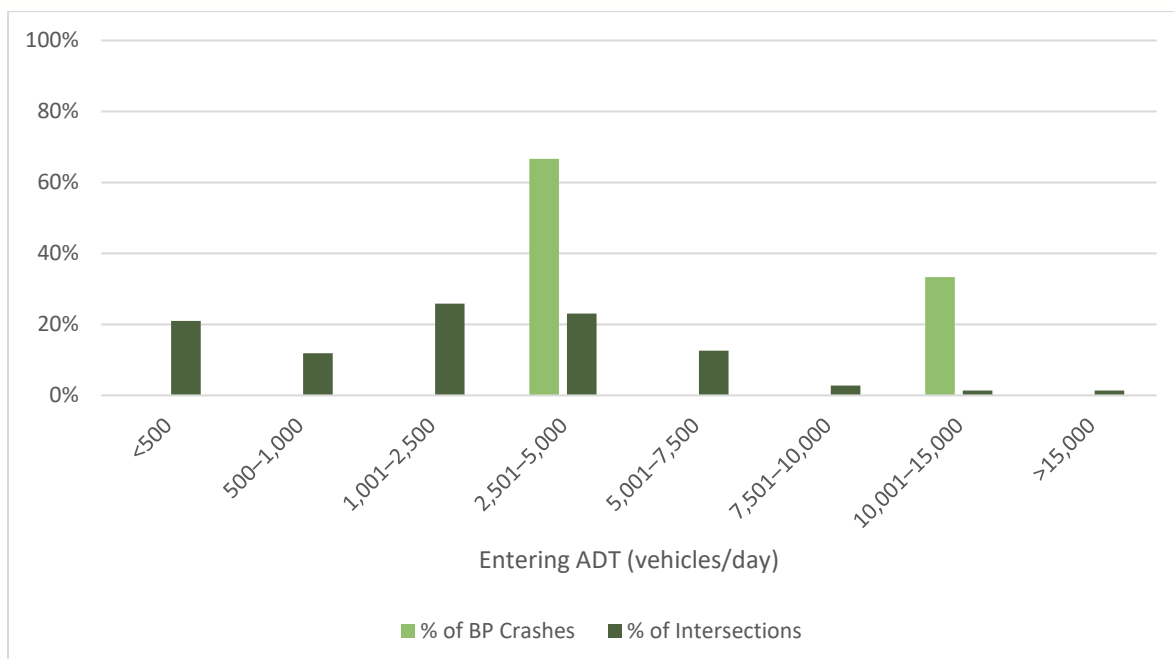




Figure 16: Urban Bike+Ped Crashes By Lanes To Cross

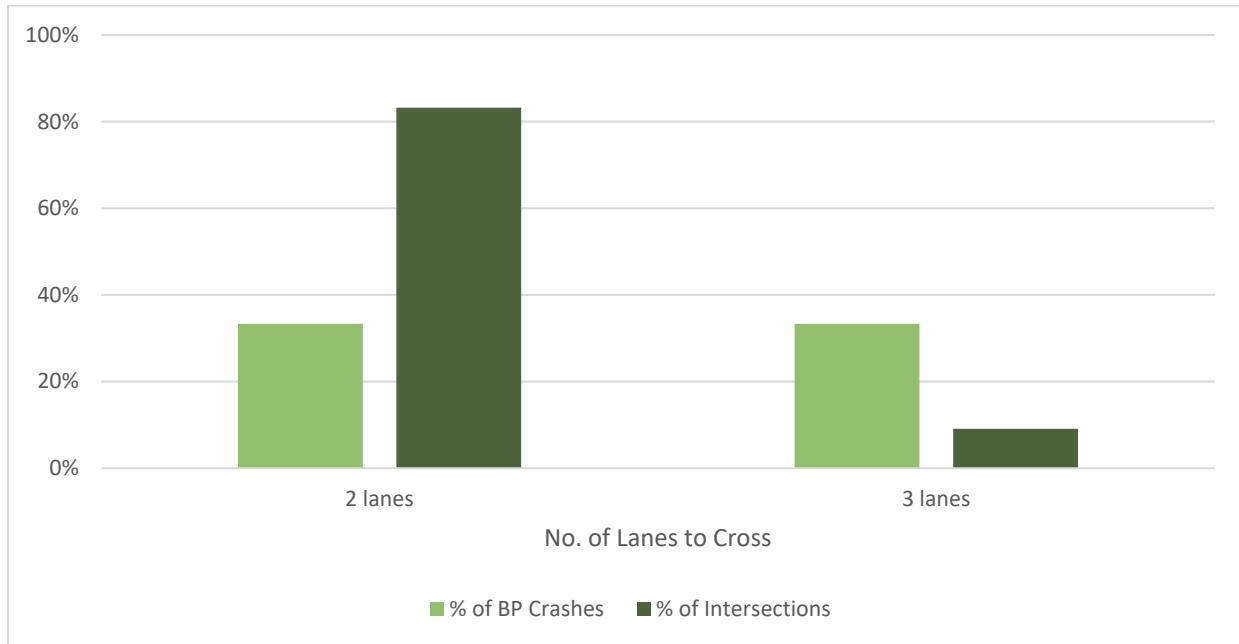


Figure 17: Urban Bike+Ped Crashes By Traffic Control Device

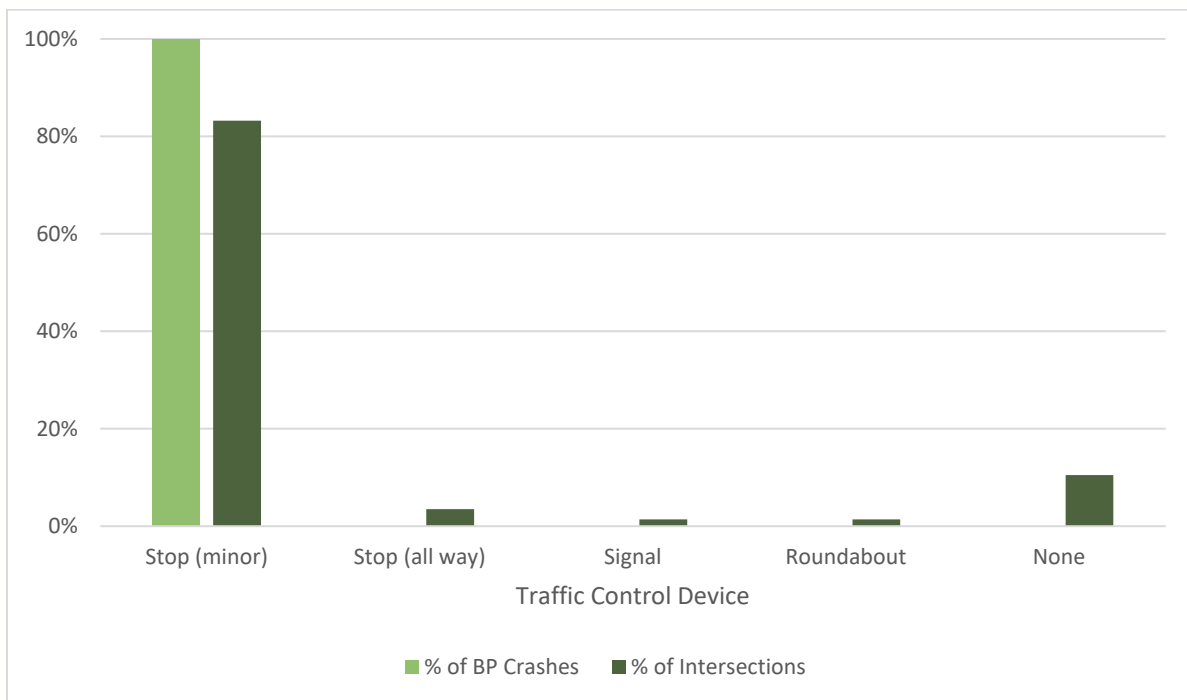




Figure 18: Urban Bike+Ped Crashes By Adjacent Development

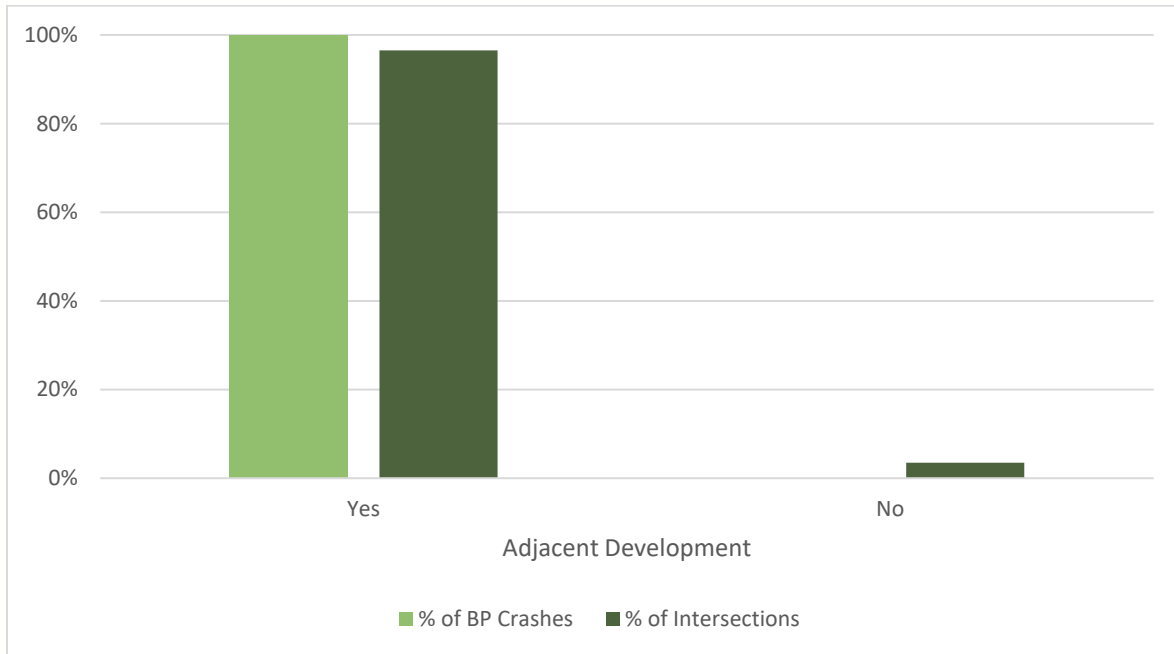
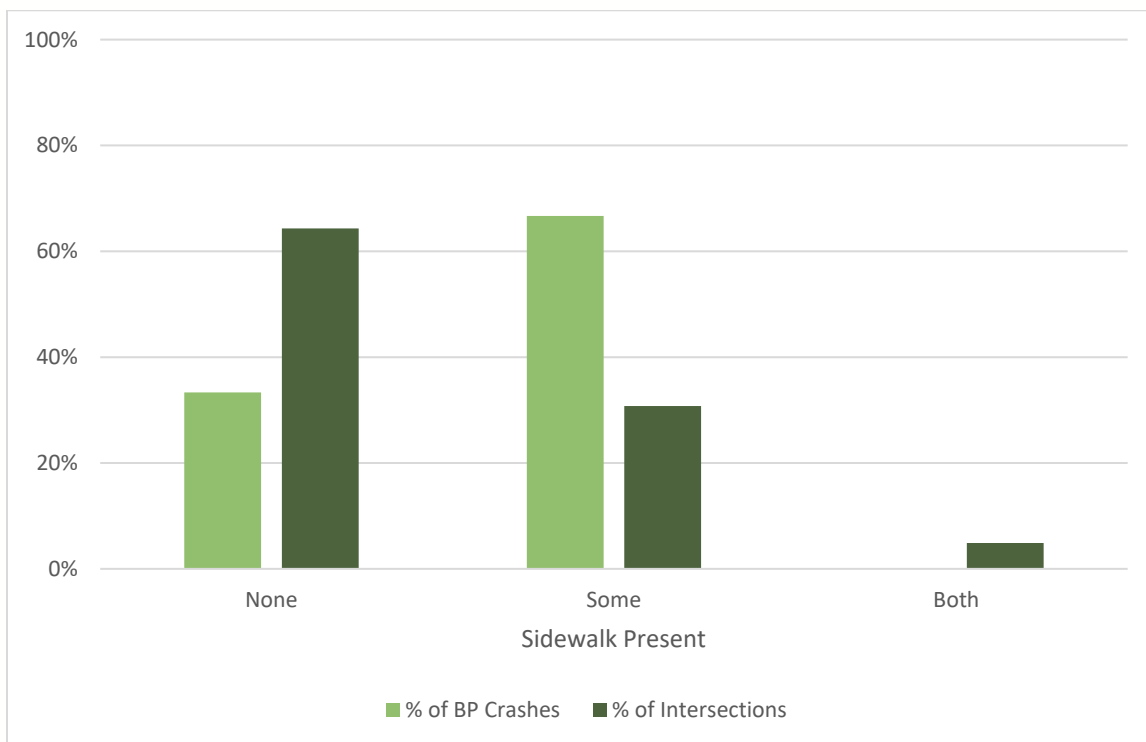


Figure 19: Urban Bike+Ped Crashes by Sidewalk Present





Intersections – Rural

Table 11: Beltrami County Rural CSAH/CR Intersection Risk Factors

Risk Factor	Risk Factor Criteria	% KAB Crashes	% of Intersections	Ratio	Beltrami Data Finding
Adjacent Railroad Xing	Railroad crossing within the influence area	4.3%	0.4%	9.46x	Rural intersections near railroad crossings are 9.6x overrepresented — dual-task attention demands (watching for trains + managing intersection) significantly elevate crash risk; small sample (4 intersections, 2 KAB crashes)
Entering Traffic Volume	>1,000 vehicles/day entering volume	74.5%	29.8%	2.50x	Rural intersections with entering volumes above 1,000 vehicles/day are 2.5x overrepresented in KAB crashes — higher traffic volumes increase conflict frequency and reduce gaps for crossing vehicles, elevating crash risk on rural approaches that lack signalization or turn-lane controls
Distance from Previous Stop	>5 miles	23.4%	24.9%	0.94x	CRSP 3 Risk Factor — Beltrami rural sample size too small for a reliable estimate.
Adjacent Curve within 250'?	Yes	23.4%	36.2%	0.65x	CRSP 3 Risk Factor — Beltrami rural sample size too small for a reliable estimate.
Alignment Skew	Major skew on approach alignment	14.9%	5.8%	2.55x	Severely skewed rural intersections are 2.5x overrepresented — skew reduces sight distance and makes it harder to judge oncoming vehicle speeds, a critical issue on rural high-speed approaches
Leg Configuration	4-leg intersection	40.4%	21.7%	1.86x	Four-leg rural intersections are 1.9x overrepresented — 40% of rural KAB crashes occur on 22% of rural intersections; four-leg intersections create more conflict points than T-intersections and account for the majority of severe rural crashes
Adjacent Development	Development adjacent to the intersection	80.9%	64.3%	1.26x	Rural intersections with adjacent development are 1.3x overrepresented — development introduces access points, pedestrian activity, and distraction near the intersection; 80.9% of rural KAB crashes occur at intersections with adjacent development, despite representing only 64.3% of rural intersections

KAB = Fatal + Serious + Minor crashes. Ratio = % KAB Crashes ÷ % of Intersections.



Figure 20: Rural Intersection Crashes by Adjacent Railroad

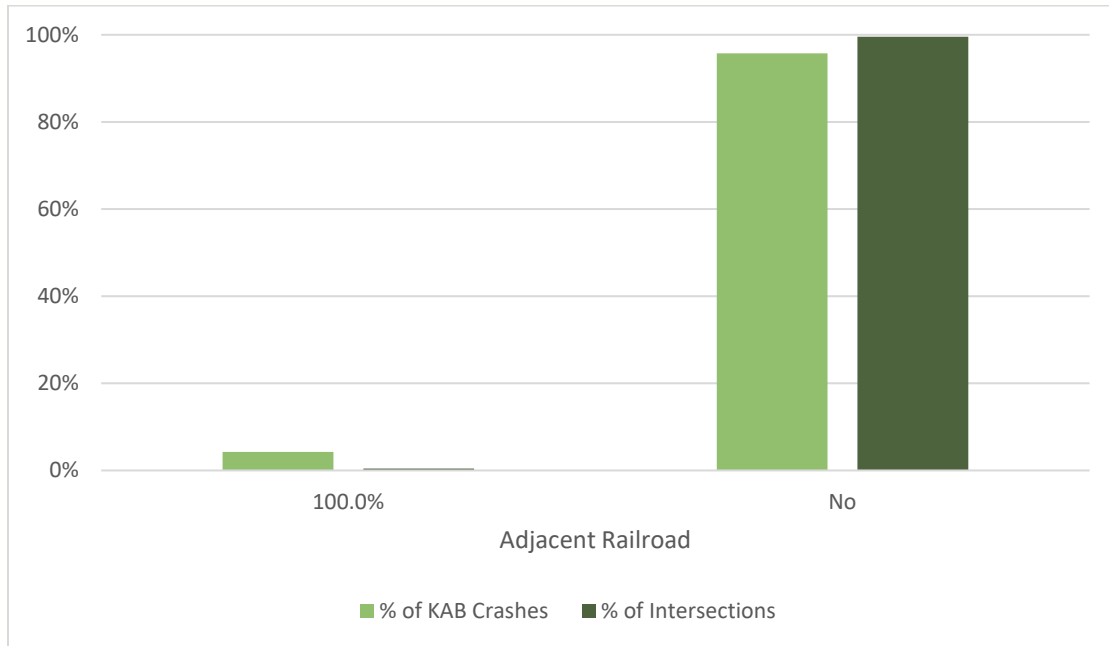


Figure 21: Rural Intersection Crashes by Entering ADT

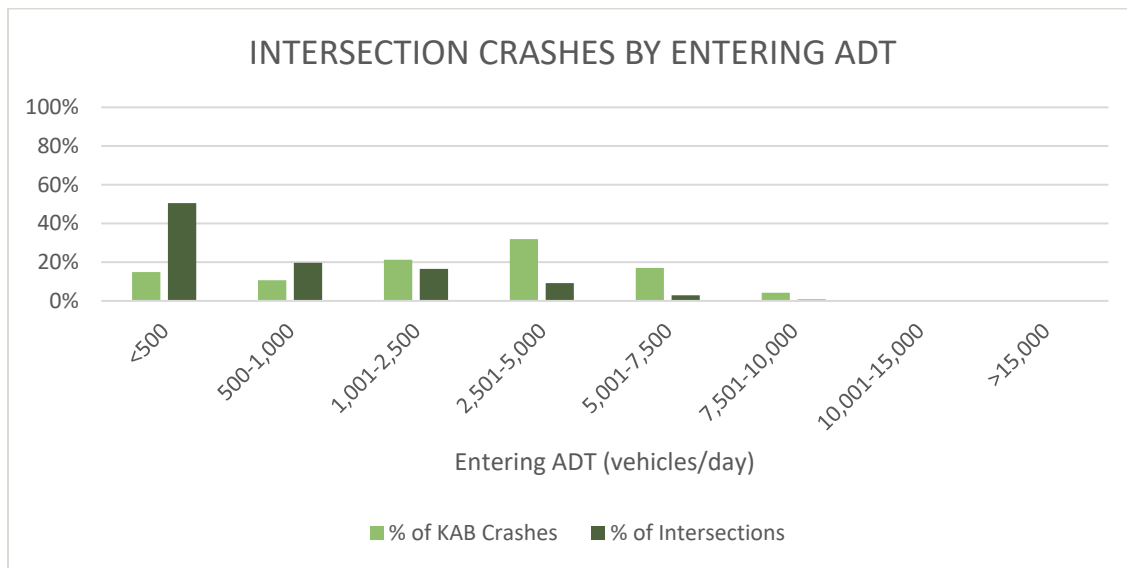




Figure 22: Rural Intersection Crashes by Previous Stop

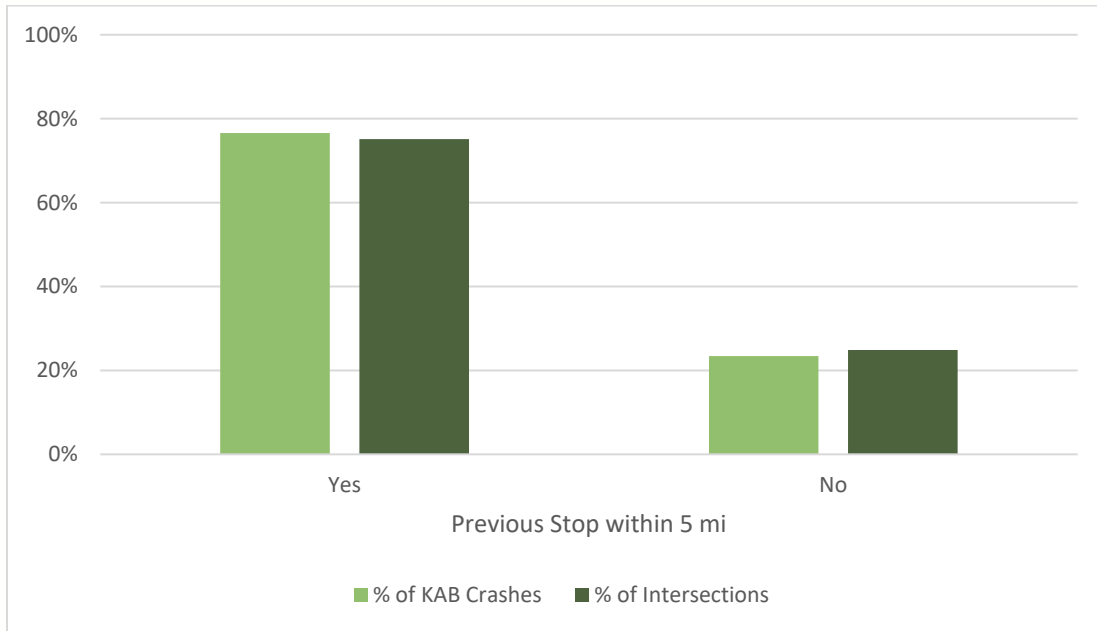


Figure 23: Rural Intersection Crashes by Adjacent Curve

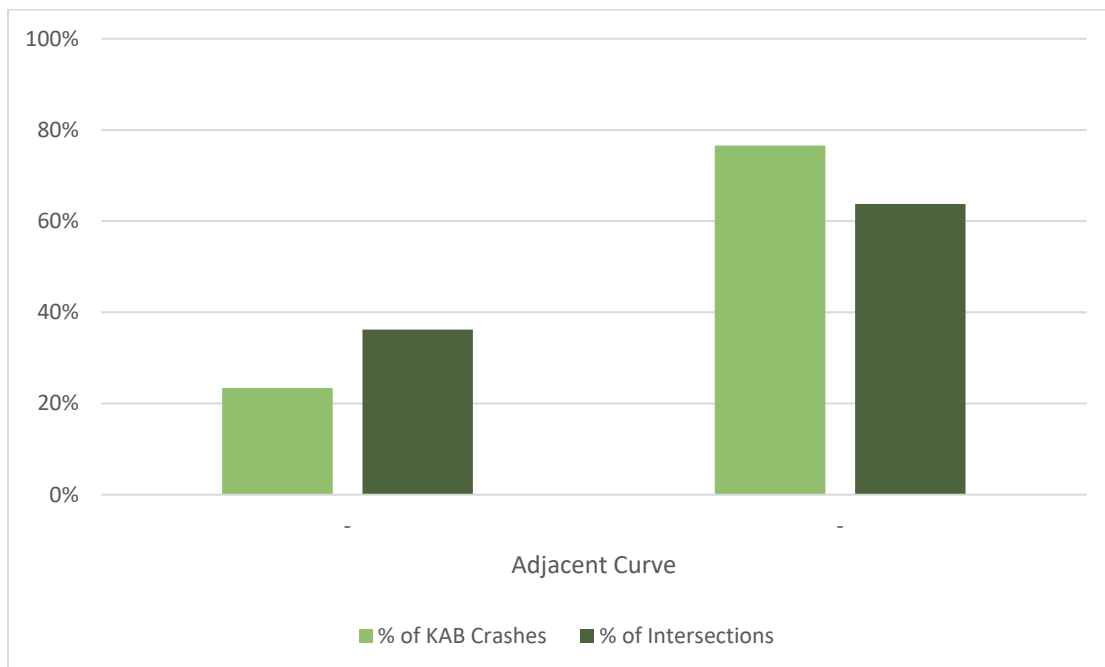




Figure 24: Rural Intersection Crashes by Alignment Skew

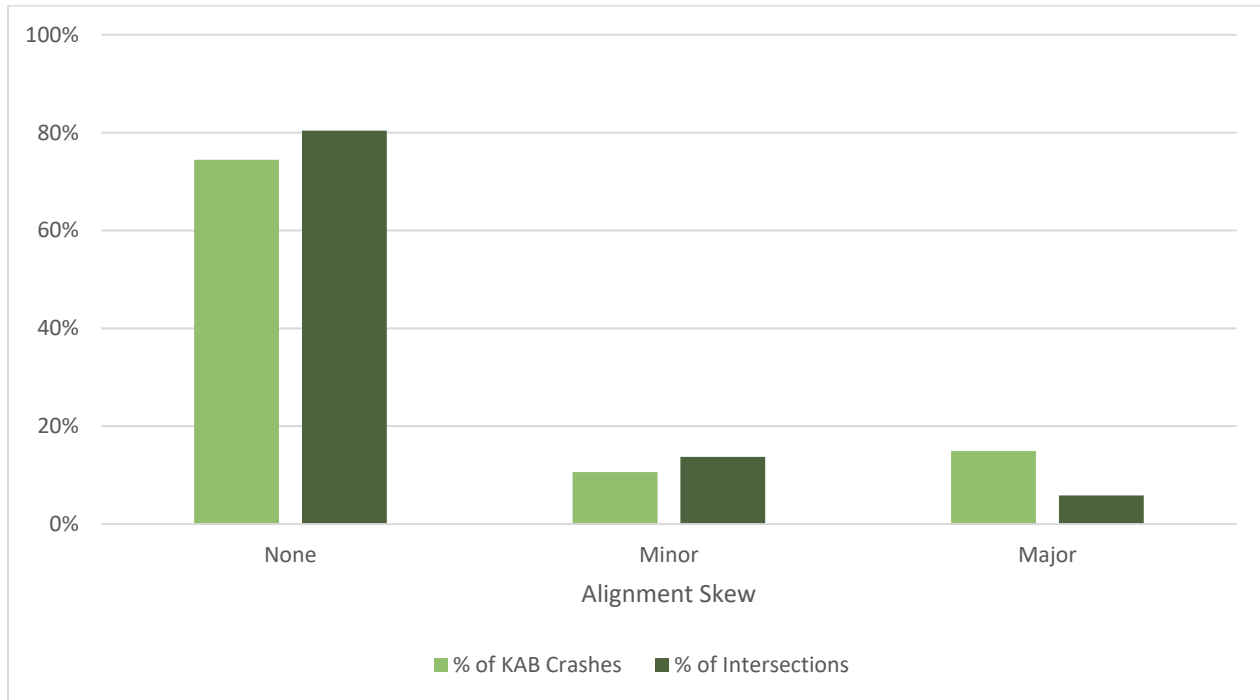


Figure 25: Rural Intersection Crashes by Leg Configuration

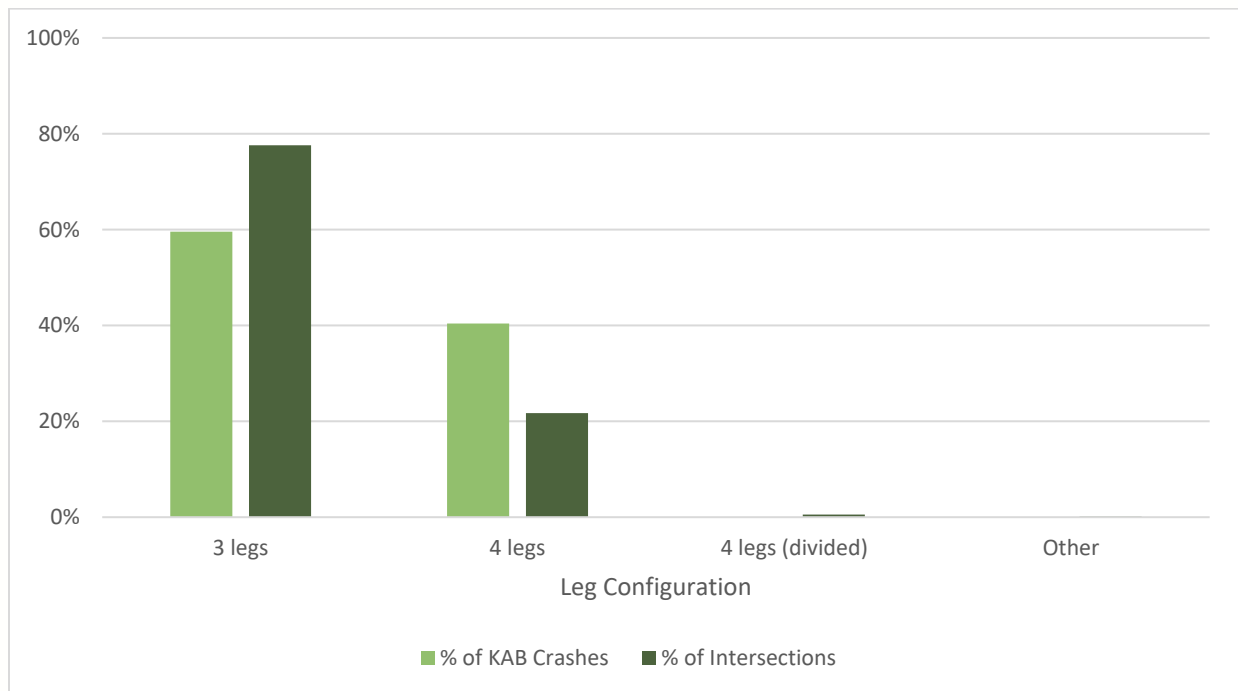
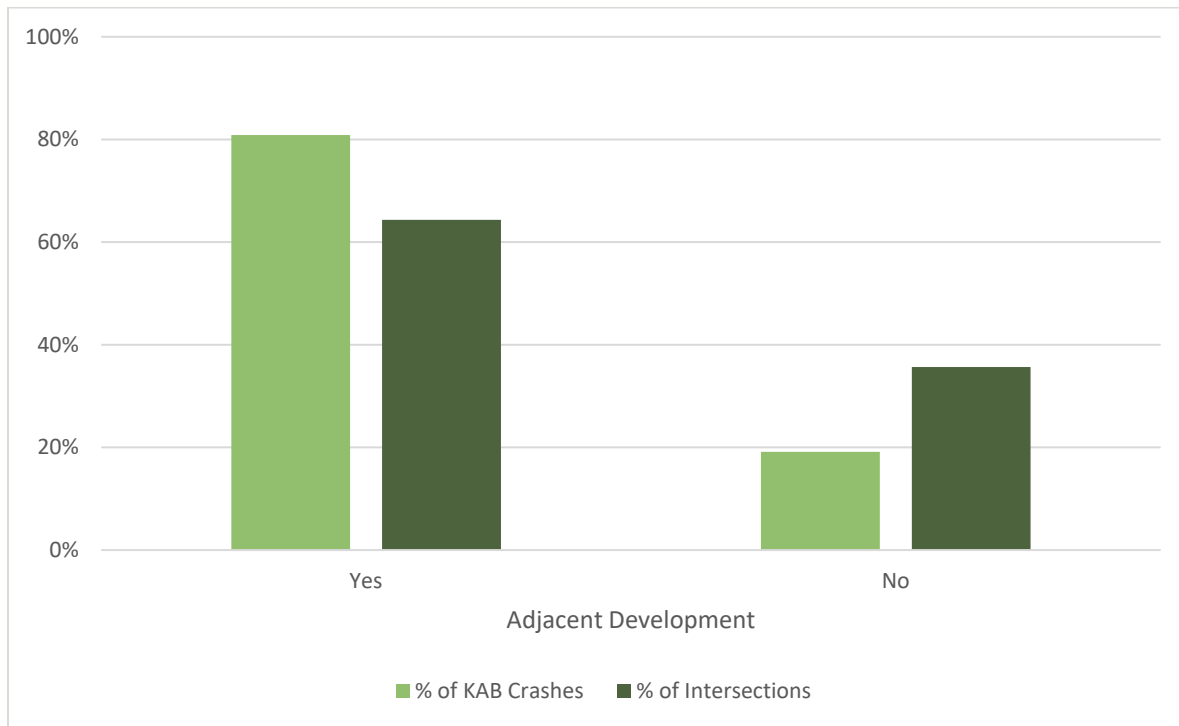




Figure 26: Rural Intersection Crashes by Adjacent Development



Segments – Urban

Table 12: Urban Paved CSAH/CR Network — Risk Factor Analysis

Risk Factor	Risk Factor Criteria	% KAB Crashes	% of Mileage	Ratio (KAB % / Seg %)	Interpretation
Traffic Volume (ADT)	Greater than 2,500 vehicles/day	91.7%	56.6%	1.62x	Urban paved segments with ADT >2,500 account for 91.7% of KA crashes despite representing only 56.6% of urban paved mileage.
Speed Limit	30 or 45 MPH	91.7%	85.7%	1.07x	Urban paved segments with 30 or 45 mph speed limits account for 91.7% of KA crashes despite representing 85.7% of urban paved mileage.
Context Zone	Mixed Use	58.3%	42.8%	1.36x	Mixed-use urban segments account for 58.3% of KA crashes despite representing only 42.8% of urban paved mileage.
Access Density	40 or more per mile	75.0%	33.7%	2.23x	Beltrami's urban sample size (3 KA crashes) is too small for a reliable estimate, though all crashes occurred on high-access-density segments.
Road Width	>36'	91.7%	72.7%	1.26x	Wider urban paved segments (>36 ft) account for 91.7% of KA crashes despite representing only 72.7% of urban paved mileage.

¹ Ratios = % of KAB Crashes (urban paved) ÷ % of Urban Paved Lane-Miles (30.5 mi). Based on 71 urban paved CSAH/CR segments, 3 KAB crashes. Caution: small sample — ratios are directional only and should not be over-interpreted.



Figure 27: Urban Segment Crashes by ADT

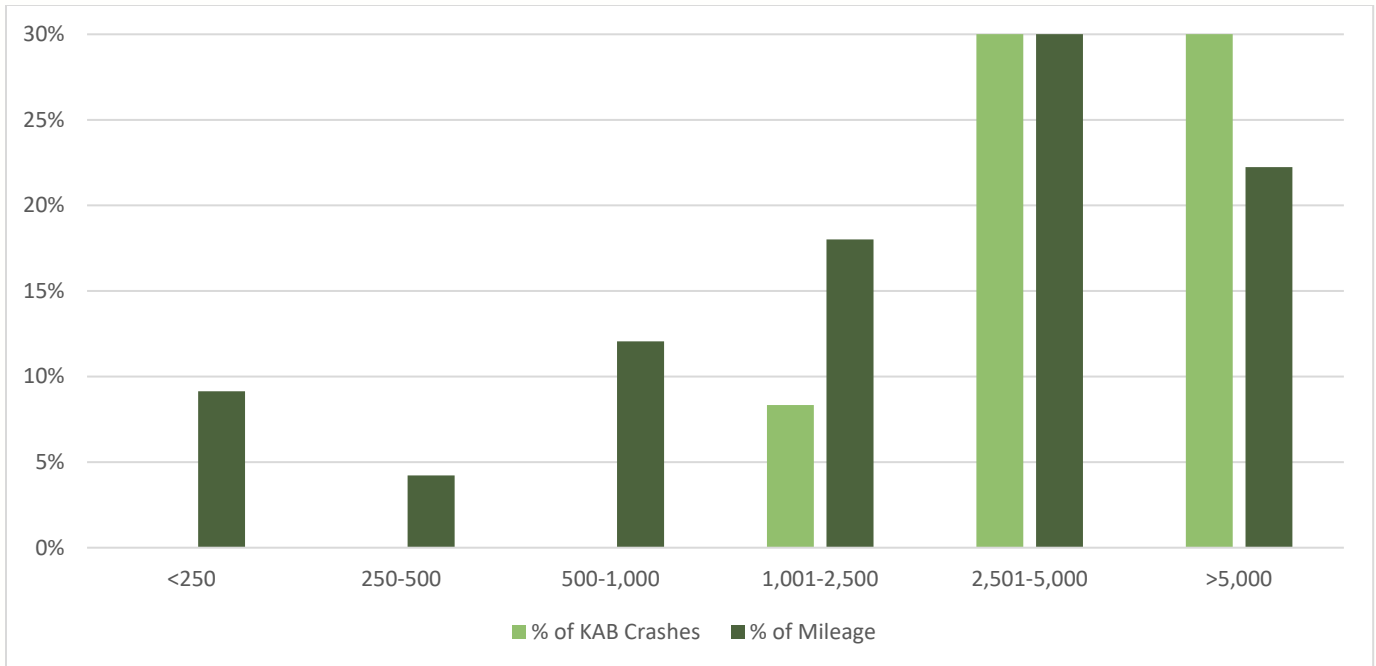


Figure 28: Urban Segment Crashes by Speed Limit

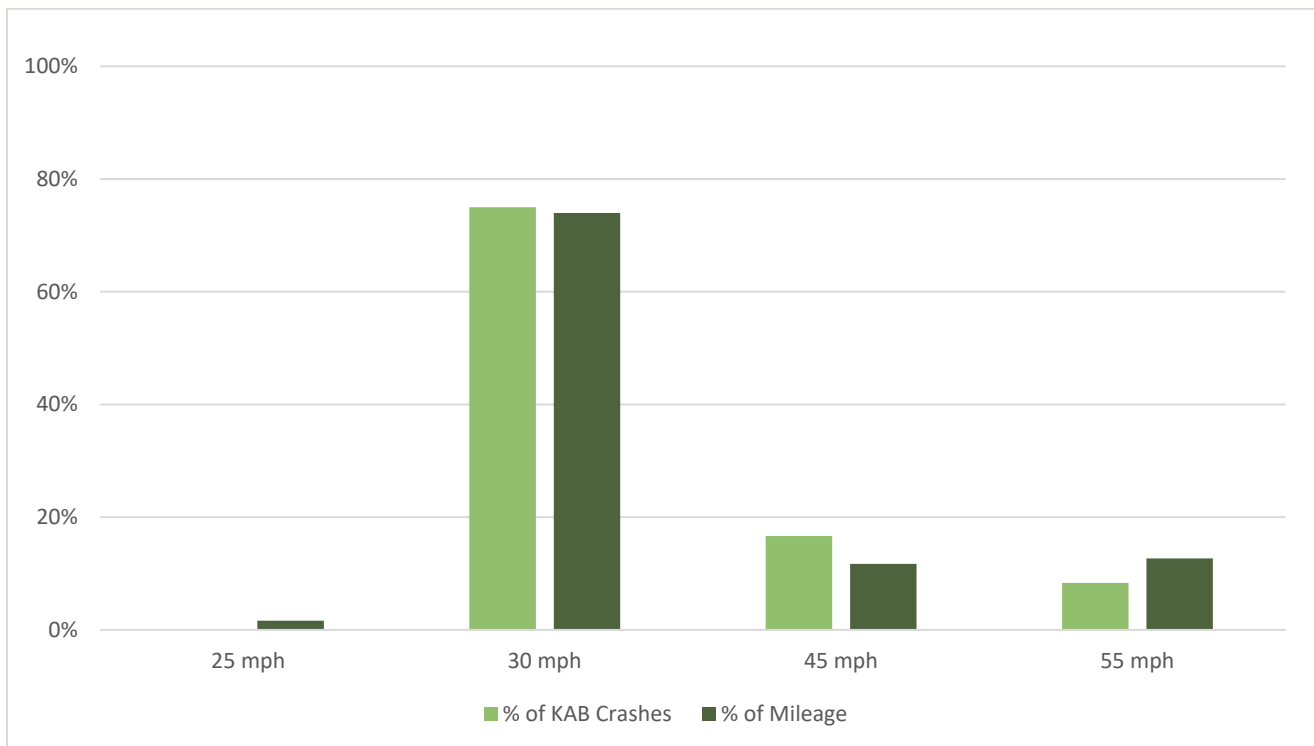




Figure 29: Urban Segment Crashes by Context Zone

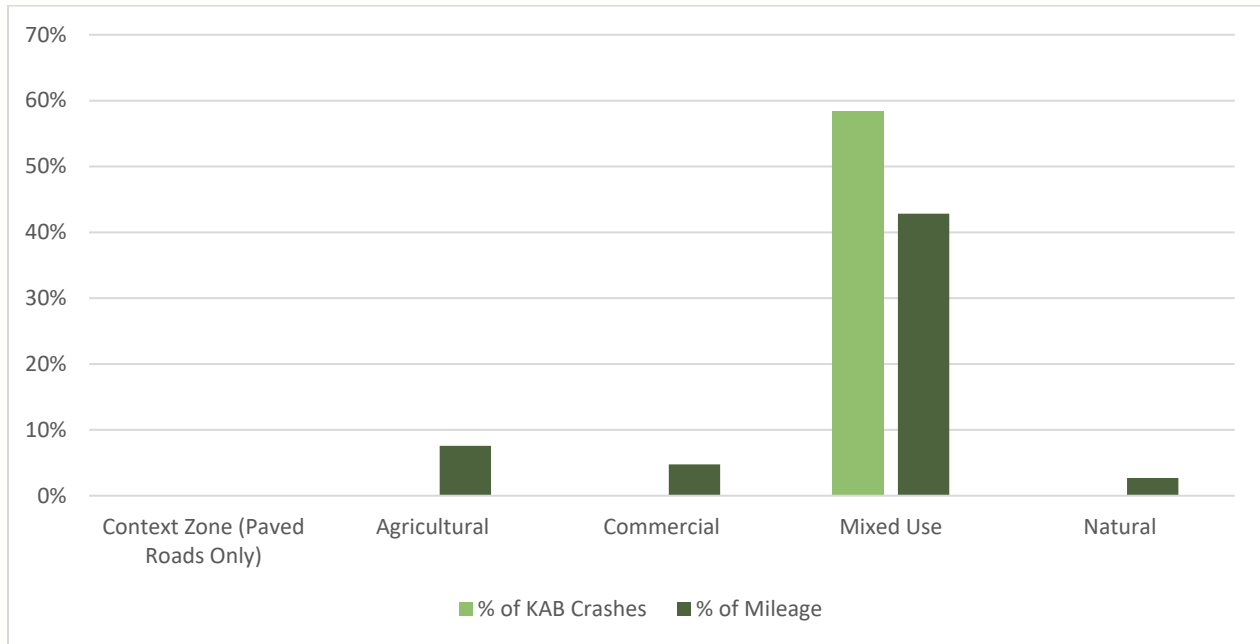


Figure 30: Urban Segment Crashes by Access Density

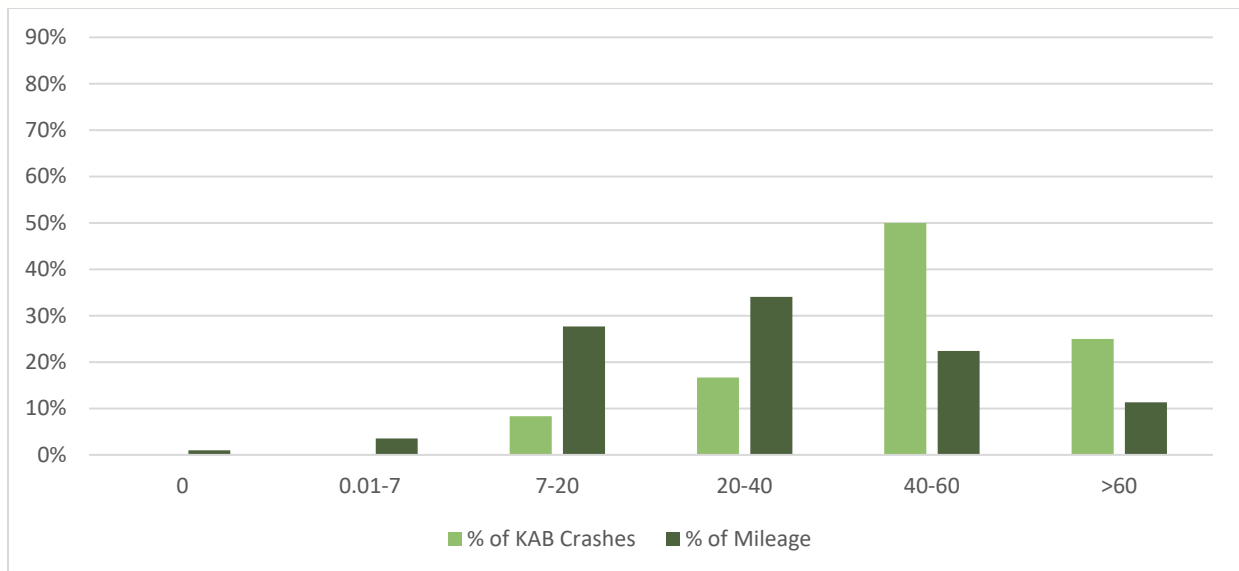
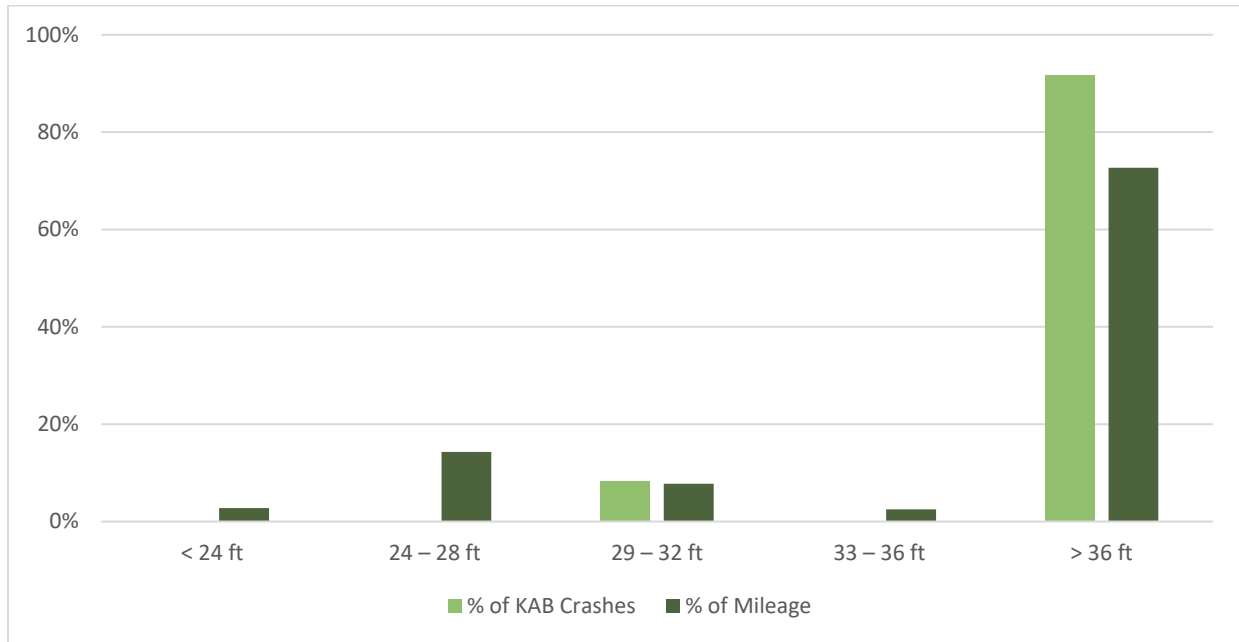




Figure 31: Urban Segment Crashes by Road Width



Segments – Rural

Table 13: Rural Paved CSAH/CR Network — Risk Factor Analysis

Risk Factor	Risk Factor Criteria	% KAB Crashes	% of Mileage	Ratio (KAB % / Seg %)	Interpretation
Traffic Volume (ADT)	> 500 vehicles/day	73.4%	52.6%	1.39x	CRSP 3 Risk Factor — Beltrami rural sample size too small for a reliable estimate.
Edge Risk	2S (useable shoulder/ fixed objects) OR 3 (no shoulder/fixed objects)	94.9%	92.4%	1.03x	Segments with fixed roadside objects and no usable shoulder account for 94.9% of rural KAB crashes despite representing 92.4% of rural paved mileage.
Curve Density	0.1 - 1.3 curves/mile	46.0%	43.0%	1.07x	Rural paved segments with 0-1.3 curves/mile account for 46.0% of KAB crashes despite representing 43.0% of rural paved mileage.
Access Density	7 or more per mile	91.1%	92.5%	0.99x	CRSP 3 Risk Factor — Beltrami rural sample size too small for a reliable estimate.

¹ Ratios = % of KAB Crashes (rural paved) ÷ % of Rural Paved Lane-Miles (377.5 mi). Based on 150 rural paved CSAH/CR segments, 39 KAB crashes. Factors with a ratio > 1.0x are overrepresented; ratios < 1.0x are underrepresented.



Figure 32: Rural Segment Crashes by ADT

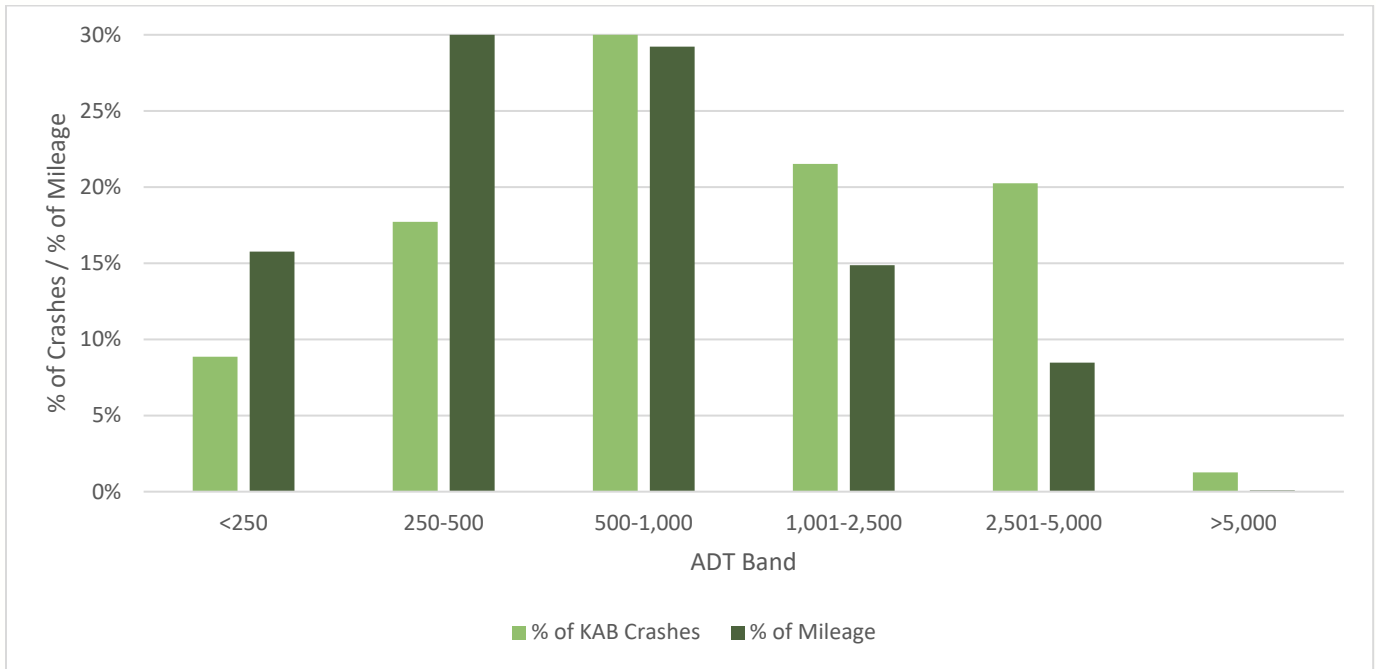


Figure 33: Rural Segment Crashes by Edge Risk

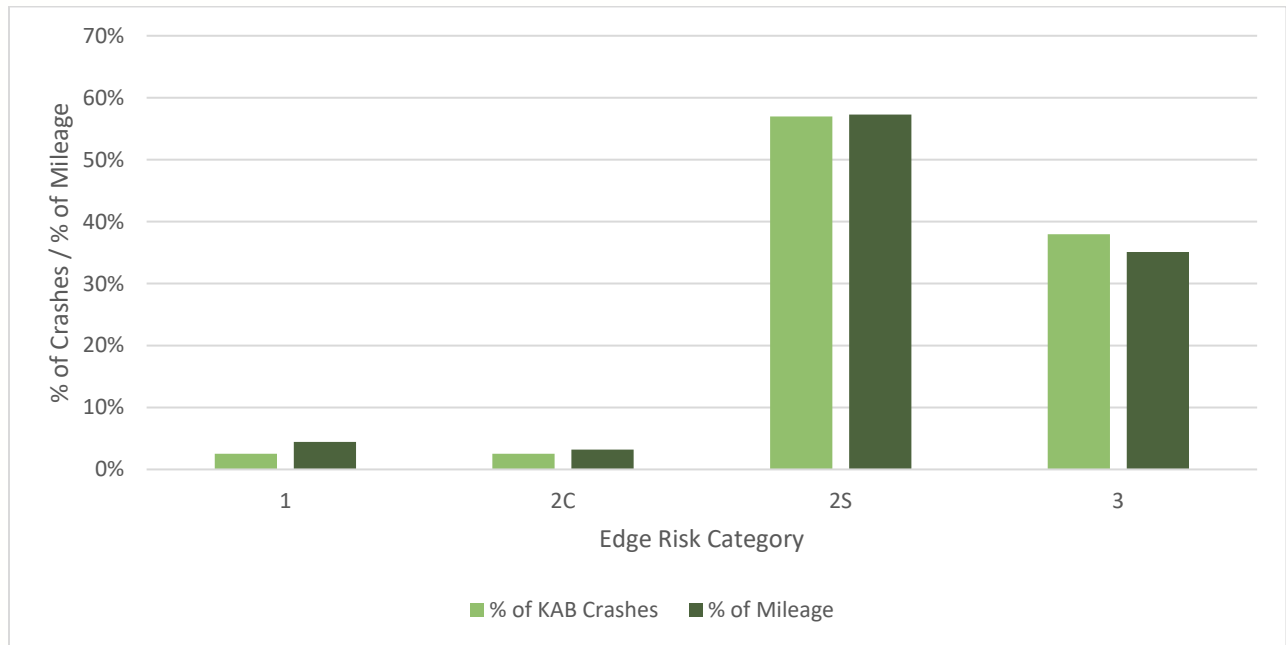




Figure 34: Rural Segment Crashes by Curve Density

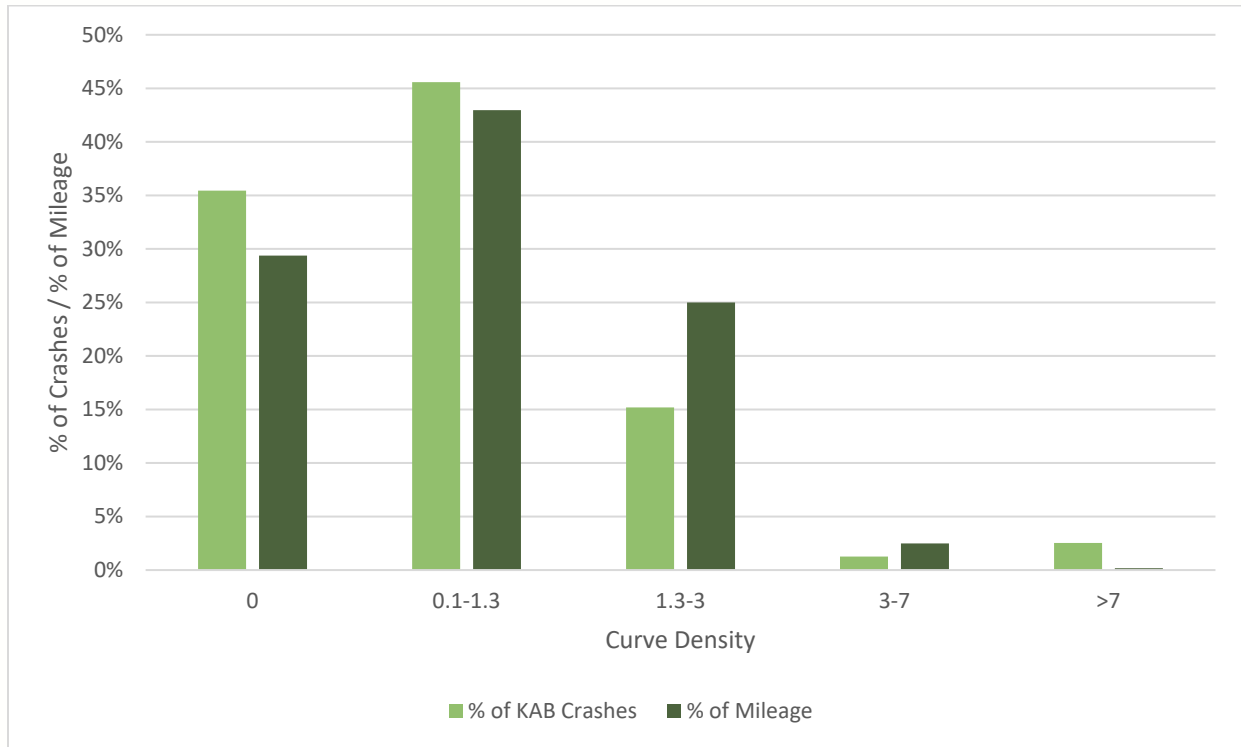
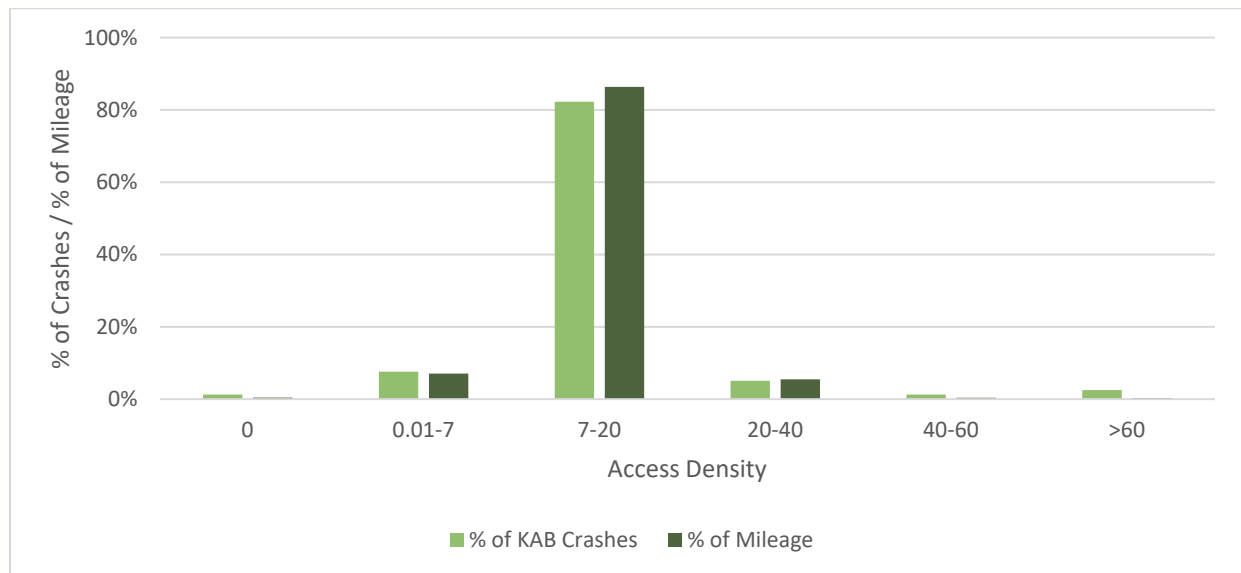


Figure 35: Rural Segment Crashes by Access Density





Curves

Table 14: Beltrami County Paved Curve Risk Factors

Risk Factor	Risk Factor Criteria	% KAB Crashes	% of Mileage	Ratio (KAB % / Seg %)	Interpretation
ADT	750–1,000 vehicles/day (paved)	26.1%	6.1%	4.31x	Curves with 750–1,000 ADT are 4.3x overrepresented in KAB crashes — moderate-volume rural paved curves carry disproportionate risk
Curve Radius	750–1,000 ft radius (paved)	52.2%	20.5%	2.54x	Mid-radius curves (750–1,000 ft) are 2.5x overrepresented — drivers may underestimate curve sharpness at these gradual-appearing radii
Edge Risk	Class 2C — little/no shoulder, adequate clear zone (paved)	47.8%	28.9%	1.65x	Curves with steep cut slopes account for 48% of KAB crashes while making up 29% of paved curves — most prevalent high-risk edge condition
Shoulder Width	> 4'	56.5%	44.5%	1.27x	Paved curves with wider shoulders (> 4 ft) account for 56.5% of KAB crashes while representing 44.5% of paved curves — 1.3x overrepresented; wider-shoulder curves tend to occur on higher-volume, higher-speed corridors where crash severity is elevated
Lane Width	12' lanes	69.6%	59.5%	1.17x	Paved curves with standard 12 ft lanes account for 69.6% of KAB crashes while representing 59.5% of paved curves — 1.2x overrepresented; 12 ft is the dominant lane width on higher-design-speed rural corridors where operating speeds at curves are greater
Road Width - paved	> 32'	60.9%	51.6%	1.17x	Wider paved curves (> 32 ft road width) account for 60.9% of KAB crashes while representing 51.6% of paved curves — 1.2x overrepresented; wider roads are associated with higher design speeds and greater operating speeds through curves, increasing crash severity when departures occur
Adjacent Intersection	Presence of adjacent intersection within the curve	60.9%	52.4%	1.16x	Paved curves with an adjacent intersection account for 60.9% of KAB crashes while representing 52.4% of paved curves — 1.2x overrepresented; intersections within a curve compound risk by requiring drivers to simultaneously manage curve tracking and intersection decision-making, increasing the likelihood of lane departure or conflict

KAB = Fatal + Serious + Minor crashes. Ratios based on paved curves unless noted. Ratio = % KAB Crashes ÷ % of Curves.



Figure 36: Curve Crashes by ADT

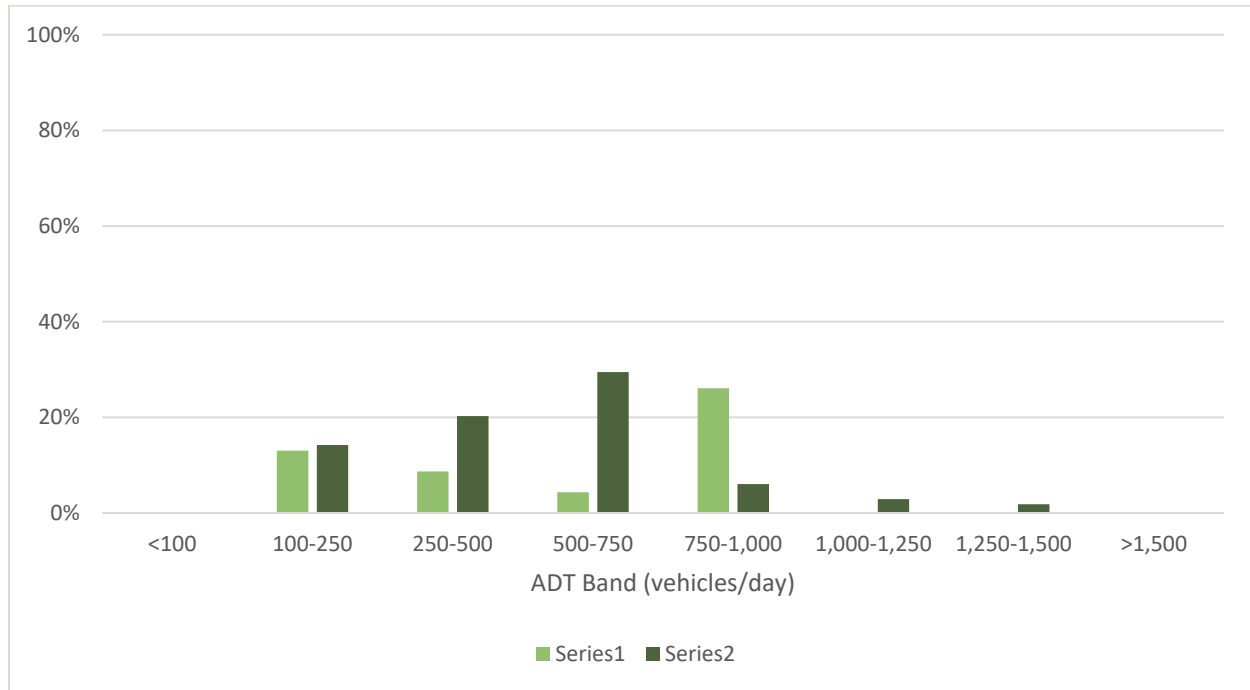


Figure 37: Curve Crashes by Radius

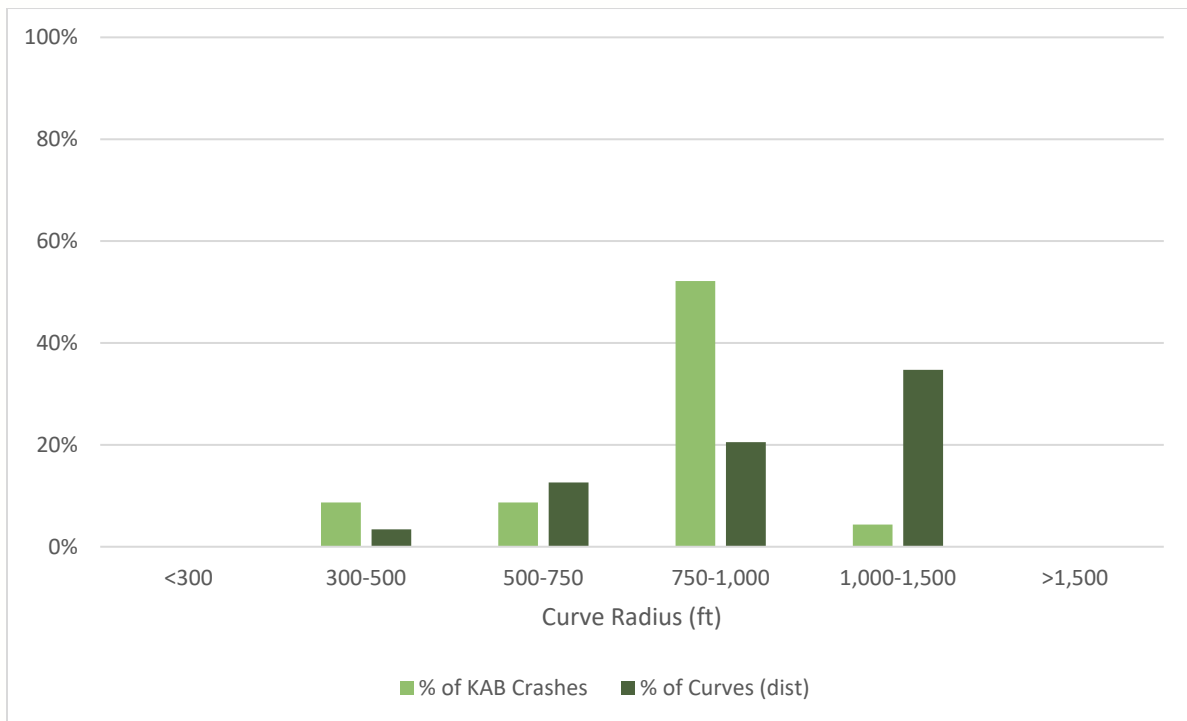




Figure 38: Curve Crashes by Edge Risk

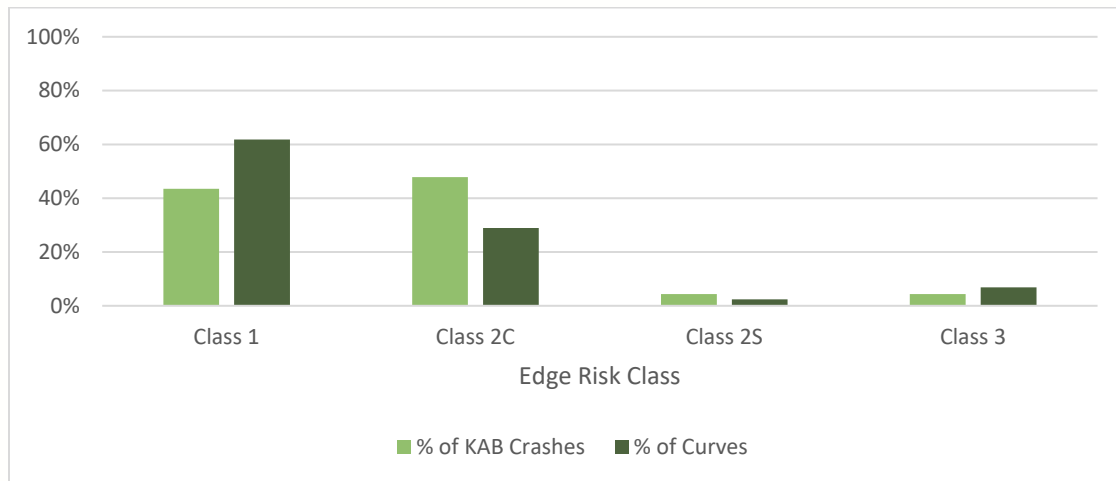


Figure 39: Curve Crashes by Road Width

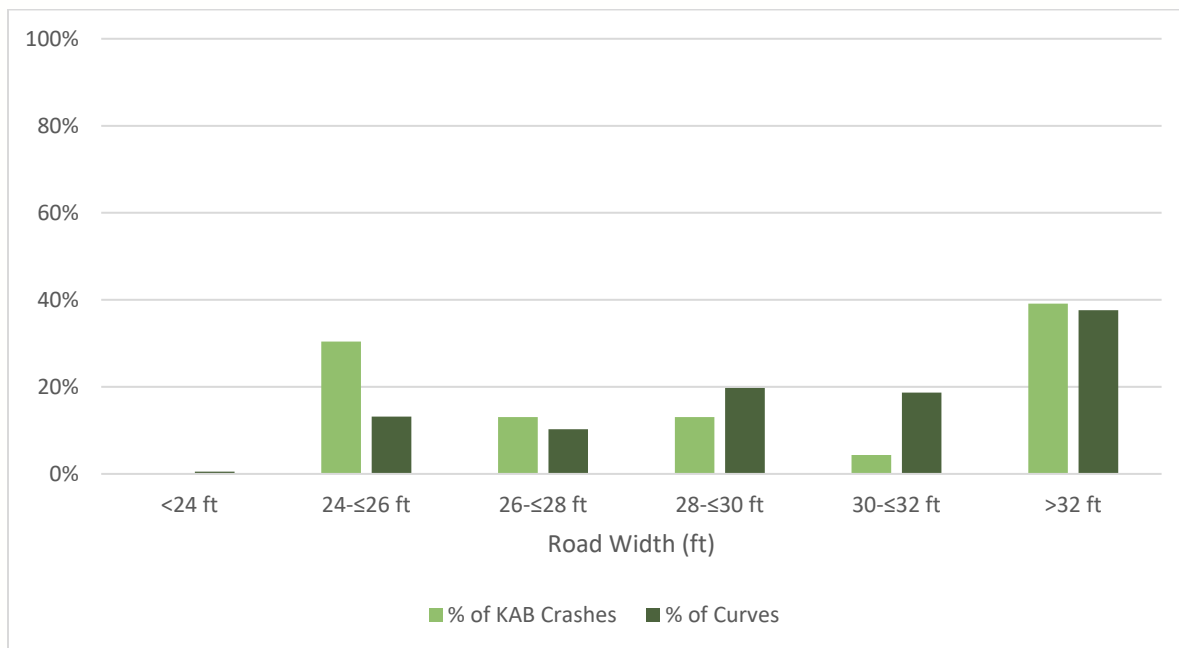




Figure 40: Curve Crashes by Shoulder Width

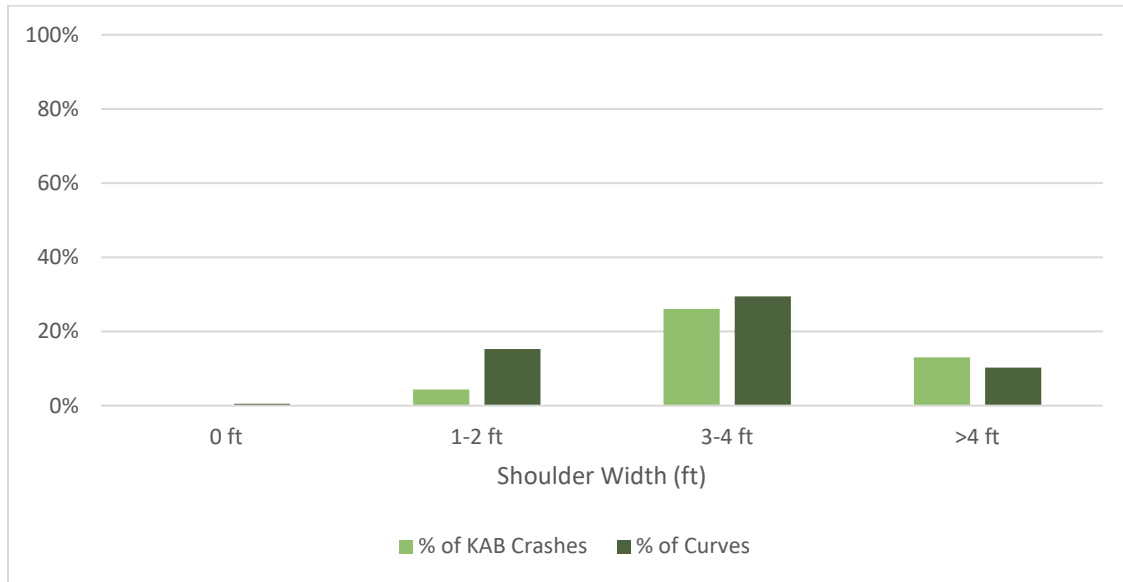


Figure 41: Curve Crashes by Lane Width

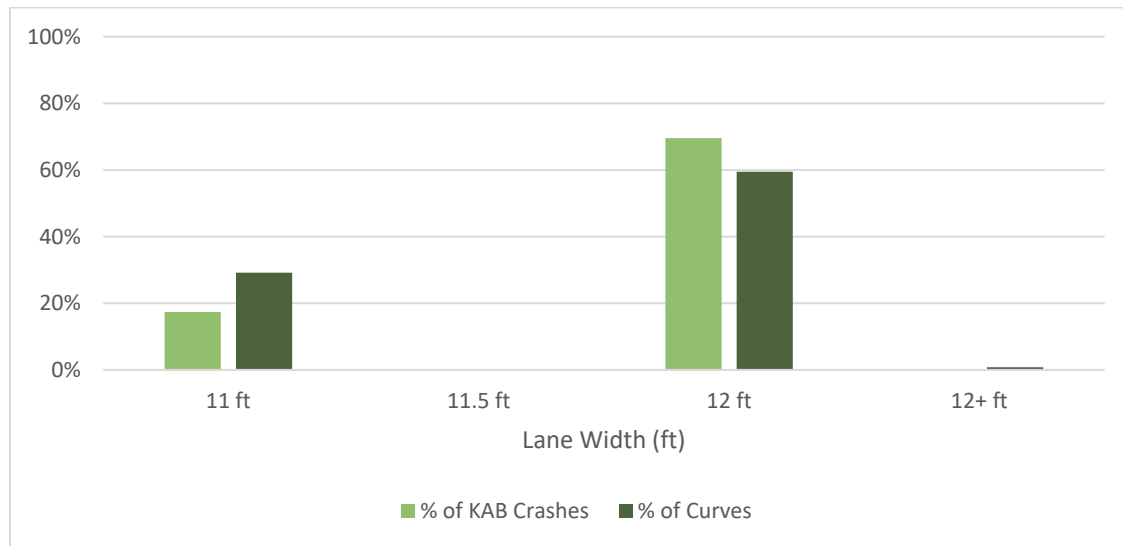
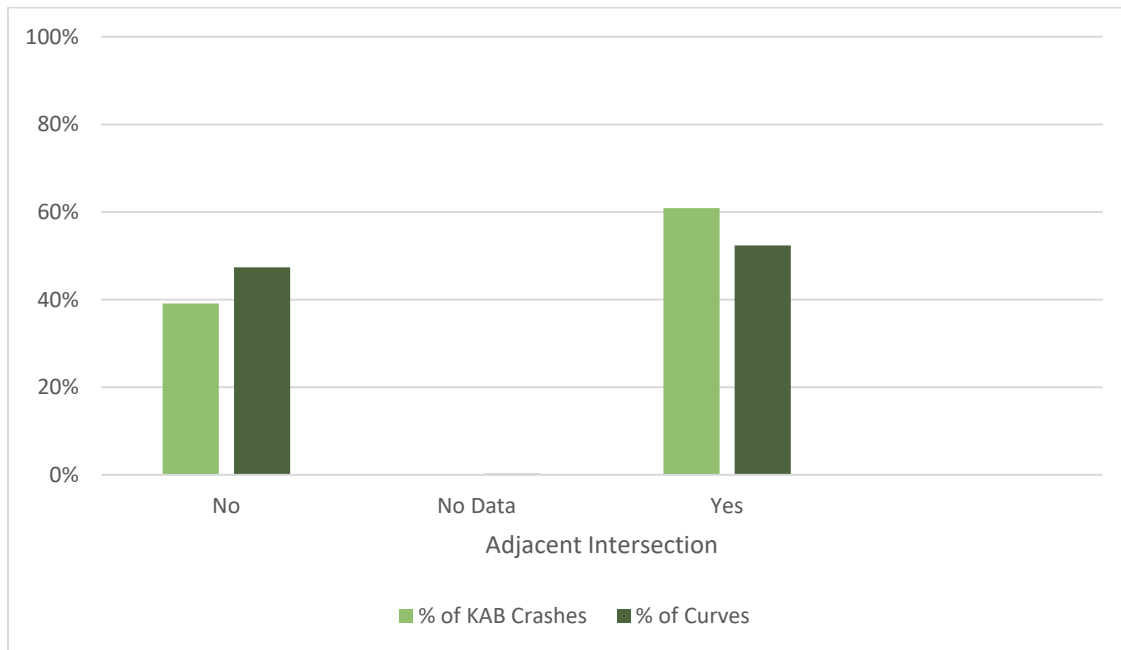




Figure 42: Curve Crashes by Adjacent Intersection





Policy and Process Review

This Policy Review supports implementation of Beltrami County's Vision Zero goal to eliminate traffic fatalities and serious injuries. It evaluates how current policies, plans, standards, and practices influence transportation safety and identifies opportunities to better align with the Safe System Approach.

The review also fulfills Safe Streets and Roads for All requirements by documenting existing conditions, identifying gaps, and recommending practical improvements that can be integrated into routine County decision-making.

The Policy Review establishes a baseline understanding of how safety is currently addressed and highlights areas where greater consistency or clarity could strengthen long-term outcomes. It serves as a bridge between Safety Action Plan strategies and implementation.

Policy Review Framework

This review is grounded in the **Safe System Approach**, which recognizes that people make mistakes and emphasizes designing a transportation system that prevents those mistakes from resulting in fatal or serious injuries.

Beltrami County's **Vision Zero** commitment aligns with state and national safety initiatives and establishes the elimination of fatal and serious-injury crashes as a long-term goal.

Federal and State Policy Context

Transportation safety efforts in Beltrami County are guided by federal and state frameworks that emphasize reducing fatal and serious injury crashes.

At the federal level, the [National Roadway Safety Strategy](#) establishes a goal of zero traffic fatalities and promotes the Safe System Approach, which focuses on safer roads, safer speeds, and reduced crash severity.

The [Safe Streets and Roads for All \(SS4A\) Grant Program](#) builds on this framework by encouraging communities to evaluate existing policies and integrate safety into routine decision-making.

At the state level, Minnesota's [Toward Zero Deaths program](#) provides a long-standing framework for coordination across engineering, enforcement, education, and emergency response.

MnDOT's [Strategic Highway Safety Plan](#) further reinforces these priorities and emphasizes data-driven decision-making, systemic safety improvements, and strategies to reduce crash severity across all roadway types.

Together, these federal and state frameworks provide the foundation for Beltrami County's Safety Action Plan and support alignment with current best practices for reducing fatal and serious injury crashes.

Existing Beltrami County Policies and Plans



Transportation, Planning, and Safety Context

Beltrami County has an established foundation for transportation safety planning, including the [Beltrami County Road Safety Plan \(2020\)](#) and participation in statewide safety initiatives. These efforts reflect a data-driven approach to improving safety outcomes.

Safety is incorporated into project development, though the level of integration may vary by project type and funding source. The Safety Action Plan provides an opportunity to improve consistency in how safety considerations are applied.

Beltrami County also participates in traffic safety programming through coordination with state and regional partners, including involvement in [Toward Zero Deaths](#) initiatives. These efforts support education, enforcement, and engineering strategies to reduce high-risk behaviors and improve overall roadway safety.

Land Use and Community Planning

Land use and development patterns play an important role in shaping transportation safety outcomes. The [Beltrami County Comprehensive Plan](#) (2024) provides a framework for coordinating transportation investments with growth, development, and community needs.

Local comprehensive plans, including the [City of Bemidji Comprehensive Plan](#) (2024), provide additional context in areas where County roadways serve more urban or transitional environments. These plans emphasize multimodal access, connectivity, and equitable transportation outcomes, particularly at county and city interfaces.

Together, these plans highlight the importance of coordinating transportation decisions with land use, development, and community priorities.

Accessibility and Equity

The County's [ADA Transition Plan](#) (2014) identifies barriers in the public right-of-way and establishes priorities for accessibility improvements. This provides an important foundation for improving safety and usability for all users.

Beyond ADA requirements, the Safety Action Plan recognizes the need to more consistently consider pedestrian, bicycle, and other vulnerable road users, particularly in developed areas or locations with higher activity levels.

Trails, Multimodal Systems, and Recreation

The [Beltrami County Recreational Trails Plan](#) (2006) provides guidance on managing recreational travel across county lands and roadway interfaces. Recreational uses, including ATV and snowmobile travel, introduce unique safety considerations where these systems intersect with County roads.

These interactions highlight the importance of visibility, clear delineation, and consistent expectations for all users.

Enforcement and Emergency Response

Enforcement and emergency response are critical components of transportation safety and support the Safe System Approach through coordination with engineering and education strategies.



The [Beltrami County Sheriff's Office](#) provides traffic enforcement and incident response on County roadways, including addressing high-risk behaviors such as speeding, impaired driving, and failure to yield. Targeted enforcement supports safer roadway behavior and can complement engineering and policy improvements.

Emergency response providers, including law enforcement, emergency medical services, and fire departments, play a key role in reducing the severity of crash outcomes through timely response and coordinated incident management. Roadway design, signage, and addressing practices can influence how quickly emergency responders can locate and access crash sites.

Within a Safe System framework, enforcement and emergency response are part of a shared responsibility model. Continued coordination between County departments and partner agencies supports more effective safety outcomes and reinforces consistent systemwide practices.

Existing Policies, Ordinances, and Procedures

In addition to broader planning documents, the County maintains several policies and procedures that influence safety outcomes:

Right-of-Way Ordinance

The county highway department should be contacted before performing any work in the right-of-way of a county highway. Anyone who fails to do so will be responsible for corrective work and its associated costs. Contractors and individuals working in the right-of-way must be registered with the highway department and have an up-to-date certificate of insurance on file.

Design Standards

Low-volume county roads follow AASHTO standards. Township roads maintained by the county are 28 feet wide at a minimum. No obstructions may exist within 24 feet of the centerline. Ditches shall be at least 2 feet deep and 3 feet wide. Slopes adjacent to the roadway must be at least 3:1 (horizontal to vertical).

Pavement markings and roadway signs are important for routine travel and public safety. Pavement markings will be provided and maintained on all paved County highways, with the frequency and extent of maintenance based on traffic levels, pavement conditions, and engineering judgment. Traffic signs required by the Minnesota Manual on Uniform Traffic Control Devices will be provided and maintained. Signs identified as guidance, supplemental, or optional will generally not be provided or maintained unless determined appropriate based on engineering judgment, roadway conditions, or other operational considerations.

All-Terrain Vehicles (ATVs)

The County's ATV ordinance allows Class 1 ATVs to operate on the right-hand side of all County gravel roads. Additional County roads, including paved roads, may be designated as ATV routes through the County's permitting process.

Snow and Ice Control Policy

Due to resource constraints, Beltrami County does not have a bare road policy. Snowplows are not dispatched until after snowfall stops, and snow removal occurs only when there is 1-2 inches of snow on bituminous roads and 4 inches on gravel roads.



Snowplow shifts start between 3 and 6 a.m. and last up to 12 hours. The highest priority facilities are bituminous-surfaced county roads, followed by gravel-surfaced county roads and township roads. Snowplows first carve passable lanes, then widen them to the edge of the shoulders. Beltrami County seeks to have bituminous routes open within 4 hours and the entire system open within 48 hours.

Bituminous routes are divided into three levels: priority, primary, and secondary. Priority routes should have bare wheel paths in both directions; primary routes should have intermittent bare wheel paths with sanded hills and intersections; secondary routes should have one wheel path in each lane, with intermittent bare pavement and sanded hills and intersections.

Aggregate Stabilization Policy

Stabilization and dust control reduce summer maintenance needs (e.g., blading and re-graveling). Dust control treatment is typically applied in June to the centermost 20 feet of the roadway.

Driveway Approaches

All driveway approaches connecting to a county highway must be approved by the county highway department before construction. Roads intersecting with county highways are required to meet MnDOT standards, and all county highway access points should be perpendicular to the roadway. If possible, new access points should be aligned with existing entrances on the opposite side of the road to create four-way intersections. Access points to adjacent commercial areas should be combined wherever possible. Access locations near intersections should be placed on the roadway with the lower functional classification or traffic volume.

All roads, entrances, and driveway approaches connecting to a county road must receive approval prior to construction. Proposed accesses are reviewed to improve their design and placement, maintain adequate drainage, and promote safe and efficient traffic operations. Proper placement and spacing of access points can improve traffic flow and safety by reducing potential conflicts. The overall goal is to minimize traffic conflicts and promote safe access to County roads.

Oversized and Overweight Movement

Beltrami County requires permits for oversized or overweight vehicles (including mobile homes) that exceed legal limits. This ensures public safety and protects infrastructure from damage.

Assessment of Current State of Practice

Strengths

Beltrami County has several strengths that support implementation of the Safety Action Plan:

- Strong County Board leadership and support
- A clear Vision Zero commitment
- Established data-driven safety planning practices
- Coordination across engineering, enforcement, and education.



Gaps and Limitations

While Beltrami County has a strong foundation for transportation safety, the Policy Review identified several gaps and limitations that may affect the consistency and effectiveness of safety outcomes across the County's roadway system.

Safety principles are not consistently formalized across projects, and the degree to which safety considerations influence decision-making can vary by project type, funding source, or location. While safety is routinely considered, the absence of clearly defined, systemwide expectations can make it challenging to ensure consistent application of Vision Zero and Safe System principles.

Several existing plans that influence transportation decisions, including older multimodal and accessibility documents, **predate the formal adoption of Safe System and Vision Zero frameworks**. As a result, these plans may not explicitly reflect current best practices for preventing fatal and serious injury crashes, even though many of their underlying goals remain relevant.

Four county policies and plans predate the adoption of the County Roadway Safety Plan in April 2020.

- *Road Construction Design Standards* policy was adopted in July 2010. It specifies standards for County Roads (CRs), but does not apply to County State-Aid Highways (CSAHs), which have their own design standards. The latest update to the MnDOT Facility Design Guide is from 2026.
- *Roadway Signing and Pavement Marking Policy* was adopted in December 2011. The latest update to the Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD) was published in January 2026.
- *Snow and Ice Control Policy* was adopted in December 2011. The recommendations regarding temperature thresholds for salt effectiveness, as well as salt-to-sand ratios, remain applicable, though the latter should note that ratios above 8-10% would yield greater melting.
- *Aggregate Stabilization Policy* was adopted in December 2011. The recommendations are still applicable.

Multimodal and ADA considerations can vary by project type and location, particularly on County roadways that serve different functions in rural, transitional, and urban contexts. This variability may lead to inconsistent treatment of vulnerable road users or of accessibility needs, especially at county-city interfaces or along corridors experiencing changing land-use conditions.

Finally, **jurisdictional coordination is often project-specific rather than systemic**. While coordination with state, city, and township partners occurs regularly, there are opportunities to strengthen routine, proactive collaboration so that safety strategies are applied more consistently across jurisdictional boundaries and roadway networks.

Policy and Process Opportunities

The Safety Action Plan establishes a clear direction for Beltrami County:

- Fatal and serious injury crashes are preventable



- Safety outcomes should guide decisions across planning, design, and operations
- Systemic safety improvements should be applied across the network, not only at high-crash locations

This section identifies opportunities to strengthen County policies, procedures, and decision-making processes to better align with these principles.

Recommended Policy/Procedure Updates

The following topics are appropriate for consideration as formal updates or additions to County policy.

Access Management

Beltrami County should consider adopting a formal access management policy to reduce conflict points and improve consistency in decision-making across the roadway system.

Draft Policy Language can be found in the Appendix.

Gravel Road Signage

Beltrami County should consider adopting formal standards for signage at curves and intersections along gravel roads.

Draft Policy Language can be found in the Appendix.

Pavement Maintenance

Beltrami County should consider adopting minimum inspection and repainting frequencies for critical pavement markings on Beltrami County roadways, including stop bar, stop ahead, turn arrow, and railroad crossing markings.

Draft Policy Language can be found in the Appendix.

Lane Departure Crashes

Beltrami County should consider adopting a formal policy to address lane-departure crashes, the most common type of crash in the county.

Draft Policy Language can be found in the Appendix.

Systemic Safety Approach

Policy Direction

Beltrami County will prioritize proactive, systemwide safety improvements to reduce risk across the transportation network.

Draft Policy Language

The County will:

- Implement low-cost, high-impact countermeasures such as curve delineation, enhanced signing, and pavement markings



- Apply systemic safety treatments based on roadway risk factors, not solely crash history
- Incorporate findings from the County Road Safety Plan and Safety Action Plan into routine decision-making.
- Address shoulder conditions and edge drop-offs as part of maintenance operations
- Use condition-based thresholds to guide maintenance prioritization where feasible

Multimodal Considerations

Policy Direction

Beltrami County will improve consistency in how multimodal and accessibility needs are considered across projects.

Draft Policy Language

The County will:

- Consider pedestrian, bicycle, and ADA needs during project scoping and design
- Prioritize safety improvements in developed and transitioning areas
- Coordinate with local jurisdictions to support safe multimodal connections at system interfaces

County-Level Guidance in Local Projects

Beltrami County may consider developing additional guidance for local project coordination, particularly where County roads intersect with city or township systems.

Future guidance could address:

- Pedestrian crossings
- Intersection lighting
- Signing consistency
- Speed management approaches

This guidance would support consistency across jurisdictions and align local projects with County safety priorities.

Institutionalizing Vision Zero and Safe System

Beltrami County can strengthen implementation by embedding safety principles into routine decision-making processes.

This includes:

- Incorporating Safe System concepts into planning, scoping, design, and operations
- Reinforcing shared responsibility across departments and partner agencies
- Establishing consistent expectations for reducing fatal and serious injury crashes



Institutionalizing these principles helps ensure that safety remains a core consideration across all County transportation activities.

Project Development and Programming

There is an opportunity to consistently incorporate safety performance into project selection and prioritization.

This may include:

- Using crash severity data and systemic risk factors to guide investment decisions
- Considering the exposure of vulnerable road users in project prioritization
- Balancing corridor-level and systemwide safety improvements

Strengthening this process supports more strategic use of limited funding and aligns investments with Safety Action Plan goals.

Multimodal and Vulnerable Road User Safety

Beltrami County can improve the consistency with which multimodal needs are addressed across projects and corridors.

This is particularly important in areas with:

- Higher traffic volumes
- Increased development pressure
- Greater pedestrian or bicycle activity

Clarifying expectations for multimodal accommodation during routine roadway projects can support safer outcomes and improve equity in transportation investments.

Enforcement, Education, and Partnerships

Aligning enforcement and education efforts with identified safety priorities can enhance overall effectiveness.

Opportunities include:

- Focusing enforcement on high-risk behaviors such as speeding and impaired driving
- Coordinating education efforts with local and regional partners
- Aligning strategies with identified crash trends and high-risk locations

Continued coordination among engineering, enforcement, and education partners supports a shared responsibility approach and reinforces consistent safety messaging.

Plan Alignment and Modernization

The Safety Action Plan can serve as a framework for aligning existing policies and plans with current Vision Zero and Safe System principles.



Rather than immediately updating all policies, the County can:

- Identify priority areas for future updates
- Gradually modernize policies over time
- Maintain flexibility while improving consistency

This approach supports continuous improvement while minimizing disruption to existing processes.



Safety Strategies

A comprehensive list of safety countermeasures (See Appendix – Beltrami Safety Strategies) was assembled for Beltrami County for each of the selected priority crash types: Single Vehicle, Right Angle, Rear End, and Pedestrian/Bicycle.

A short list of countermeasures was developed from the comprehensive lists of strategies in FHWA's Proven Safety Countermeasures and MnDOT's Big Book of Ideas. MnDOT initially developed the Big Book of Ideas as an educational tool to provide county engineers with basic training and a short list of practical strategies matched to their identified priority crash types.

The Big Book of Ideas is itself a short list of safety countermeasures taken from the National Cooperative Highway Research Program Report 500 Series. These 24 volumes identify more than 600 safety countermeasures, with one dedicated to AASHTO's Safety Emphasis areas, including infrastructure-related improvements to address intersections, pedestrian/bicycle, road departure, and head-on crashes. The list of safety strategies adopted for the Beltrami County Comprehensive Safety Action Plan (CSAP) includes:

Urban Segments

- Lighting
- High Visibility Crosswalk Markings
- Rectangular Rapid Flashing Beacon (RRFB) At Midblock Crossings
- Dynamic Speed Feedback Sign
- Sidewalks
- Plowable Centerline Reflective Markers
- Road Diet
- Access Management
- Ped Refuge Island / Median Island

Urban Intersections

- Lighting
- High Visibility Crosswalk Markings
- Rectangular Rapid Flashing Beacon (RRFB) At Midblock Crossings
- Dynamic Speed Feedback Sign
- Sidewalks
- Plowable Centerline Reflective Markers
- Road Diet
- Access Management
- Ped Refuge Island / Median Island



Urban Intersections – Bike / Ped

- Lighting
- High Visibility Crosswalk Markings
- Rectangular Rapid Flashing Beacon (RRFB) At Midblock Crossings
- Dynamic Speed Feedback Sign
- Sidewalks
- Plowable Centerline Reflective Markers
- Road Diet
- Access Management
- Ped Refuge Island / Median Island

Rural Segments

- Shoulder / Edge Line Rumble Strip
- Centerline Rumble Strip
- Plowable Centerline Reflective Markers
- Clear Zone Maintenance / Enhancement
- Safety Edge
- Shoulder Paving (2', 4', 6')
- Non-recoverable In slope Protection (Guardrail)
- Access Management

Rural Curves

- Chevrons
- Delineators
- Dynamic Curve Signing
- 6" / 8" Pavement Marking
- Clear Zone Maintenance / Enhancement
- Roadside Barrier / Guardrail
- High Friction Surface Treatment (HFST)
- Pave Shoulders
- Lighting

Rural Intersections

- Upgrade Signs / Oversized Regulatory Signs
- Transverse Rumble Strips
- LED / Flashing Beacon Stop Signs
- Remove Skew / Realign Intersections
- Turn Lanes (Offset / Channelized)
- Roundabout



- J-Turn / RCUT
- All-Way Stop / Yield
- Streetlights and Approaches
- Remove Sightline Obstructions

Figure 43: Safety Countermeasures

Proven Safety Countermeasure	Tier 1 Remove Severe Conflicts	Tier 2 Reduce Vehicle Speeds	Tier 3 Manage Conflicts in Time	Tier 4 Increase Attentiveness and Awareness
Speed Management				
 <u>Appropriate Speed Limits for All Road Users</u>		✓		
 <u>Speed Safety Cameras</u>		✓		
 <u>Variable Speed Limits</u>		✓		✓
Pedestrian/Bicyclist				
 <u>Bicycle Lanes</u>	✓			
 <u>Crosswalk Visibility Enhancements</u>				✓
 <u>Leading Pedestrian Interval</u>			✓	
 <u>Medians and Pedestrian Refuge Islands</u>	✓	✓		
 <u>Pedestrian Hybrid Beacons</u>			✓	
 <u>Rectangular Flashing Beacons (RRFB)</u>				✓
 <u>Road Diets</u>	✓	✓		
 <u>Walkways</u>	✓			
Roadway Departure				
 <u>Enhanced Delineation for Horizontal Curves</u>				✓
 <u>Longitudinal Rumble Strips and Stripes</u>				✓
 <u>Median Barriers</u>	✓			



Figure 44: Safety Countermeasures Continued

Proven Safety Countermeasure	Tier 1 Remove Severe Conflicts	Tier 2 Reduce Vehicle Speeds	Tier 3 Manage Conflicts in Time	Tier 4 Increase Attentiveness and Awareness
Roadway Departure (continued)				
 <u>Roadside Design Improvements at Curves</u>	✓			
 <u>SafetyEdgeSM</u>	✓			
 <u>Wider Edge Lines</u>				✓
Intersections				
 <u>Backplates with Reflective Borders</u>				✓
 <u>Corridor Access Management</u>	✓			
 <u>Dedicated Left and Right Turn Lanes at Intersections</u>	✓			
 <u>Reduced Left Turn Conflict Intersections</u>	✓			
 <u>Roundabouts</u>	✓	✓		
 <u>Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections</u>				✓
 <u>Yellow Change Intervals</u>			✓	
Crosscutting				
 <u>Lighting</u>				✓
 <u>Local Road Safety Plans</u>	✓	✓	✓	✓
 <u>Pavement Friction Management</u>	✓	✓		
 <u>Road Safety Audit</u>	✓	✓	✓	✓



Project Selection

The primary objective of this effort is to provide Beltrami County with a prioritized list of suggested safety projects – a specific safety strategy for each identified high-risk intersection, segment, and curve – that can be proactively implemented to reduce the identified high-risk crash types.

The effort to describe safety projects focused on consistency across the County—placing a high priority on developing similar projects for locations with similar characteristics throughout the County’s road network. Project development decision trees were prepared to help achieve this high level of consistency.

Preventing right-angle and rear-end crashes at intersections is a priority, and the crash data indicates a focus on both Traffic Signals and STOP-controlled intersections. At traffic-controlled intersections, strategies focus on improving the conspicuity of signal heads, partnering with law enforcement to increase enforcement of red light running, and replacing traffic signals with Roundabouts at intersections with a history of crashes. At lower volumes, STOP-controlled intersection strategies focus on upgrading signs and pavement markings, and at the few locations where the minor road volume is greater than 50% of the total entering traffic, conversion to All-Way STOP.

Decision Trees

Figure 45: Urban Intersection – Bike / Pedestrian Decision Tree

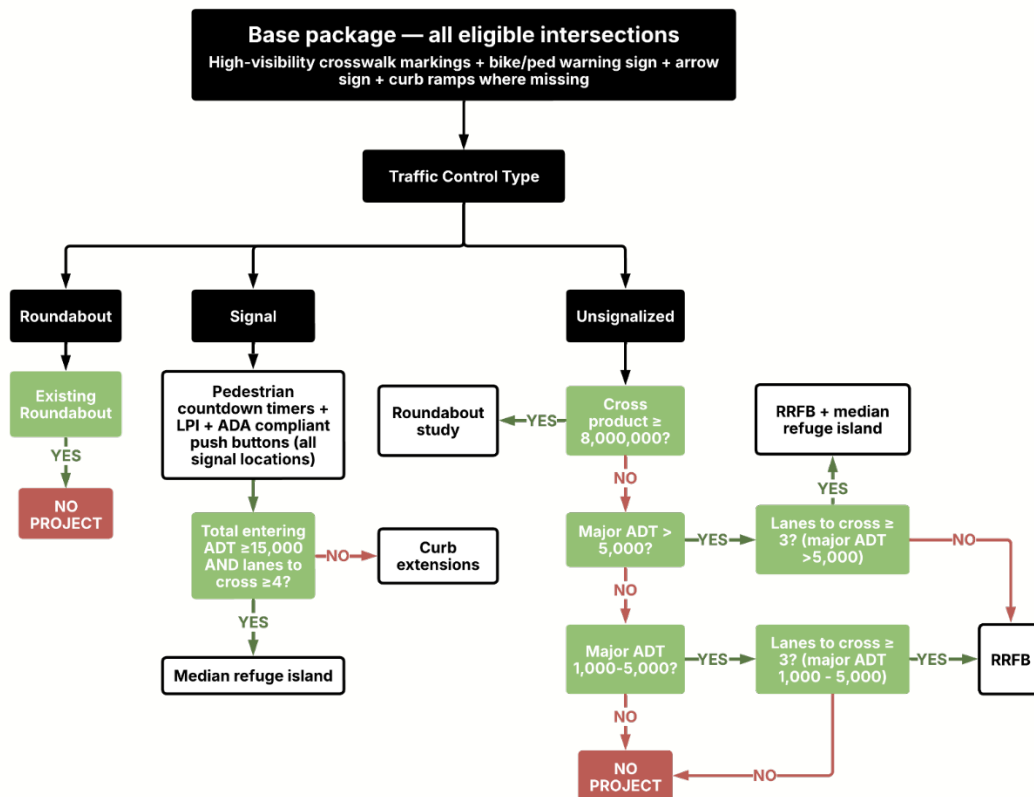




Figure 46: Urban Intersection – Vehicle Decision Tree

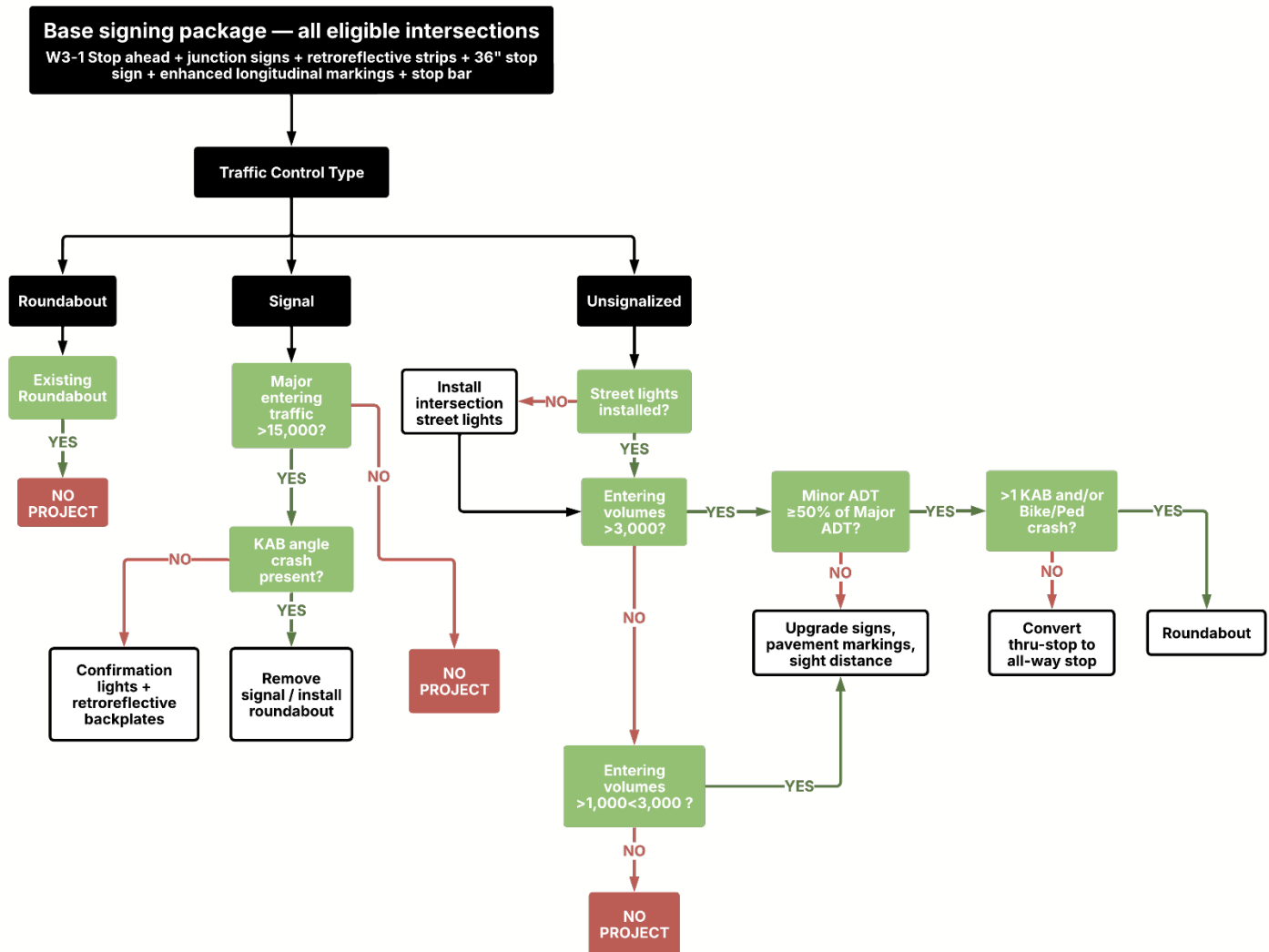




Figure 47: Rural Intersection Decision Tree

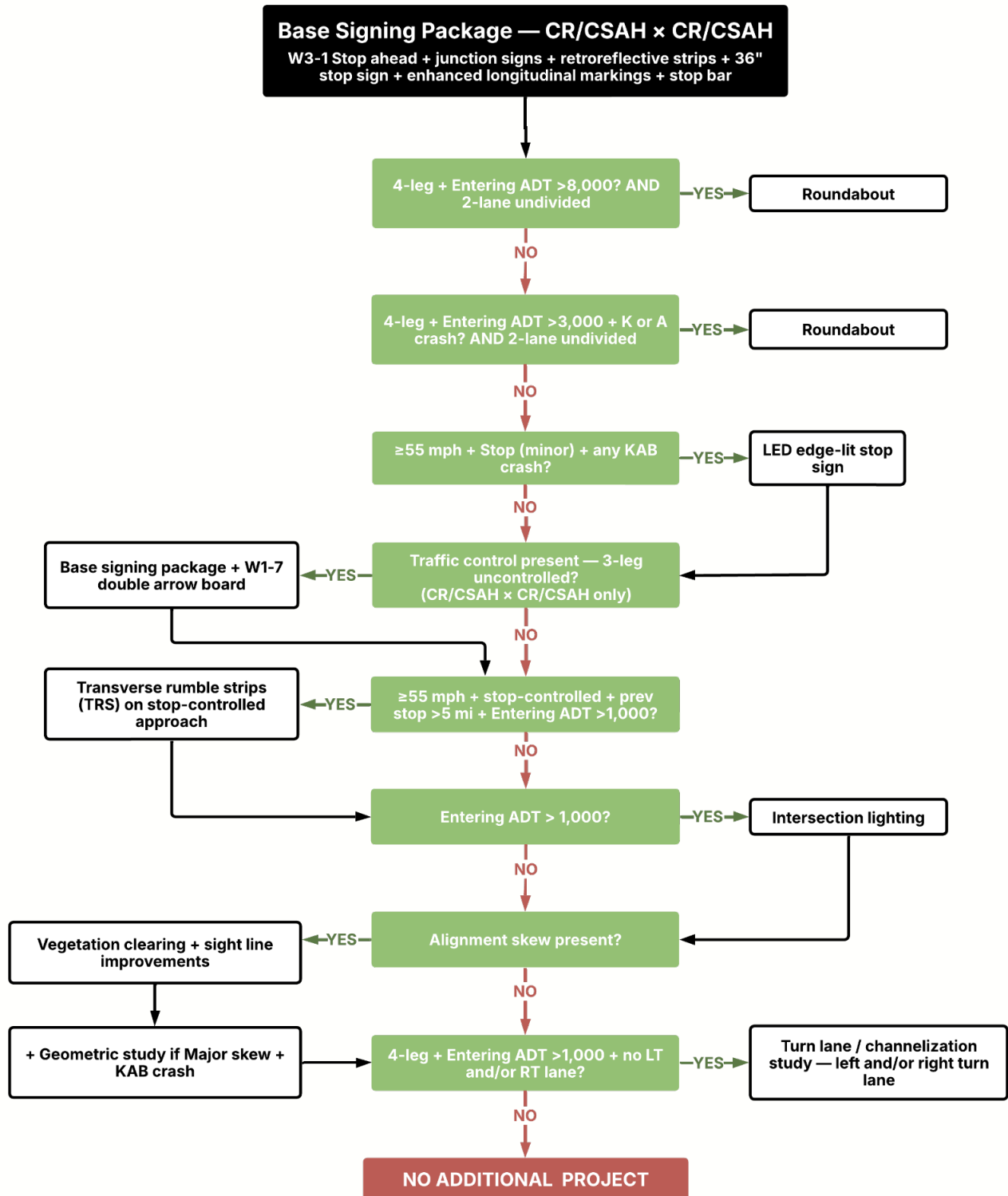




Figure 48: Rural Curve Decision Tree

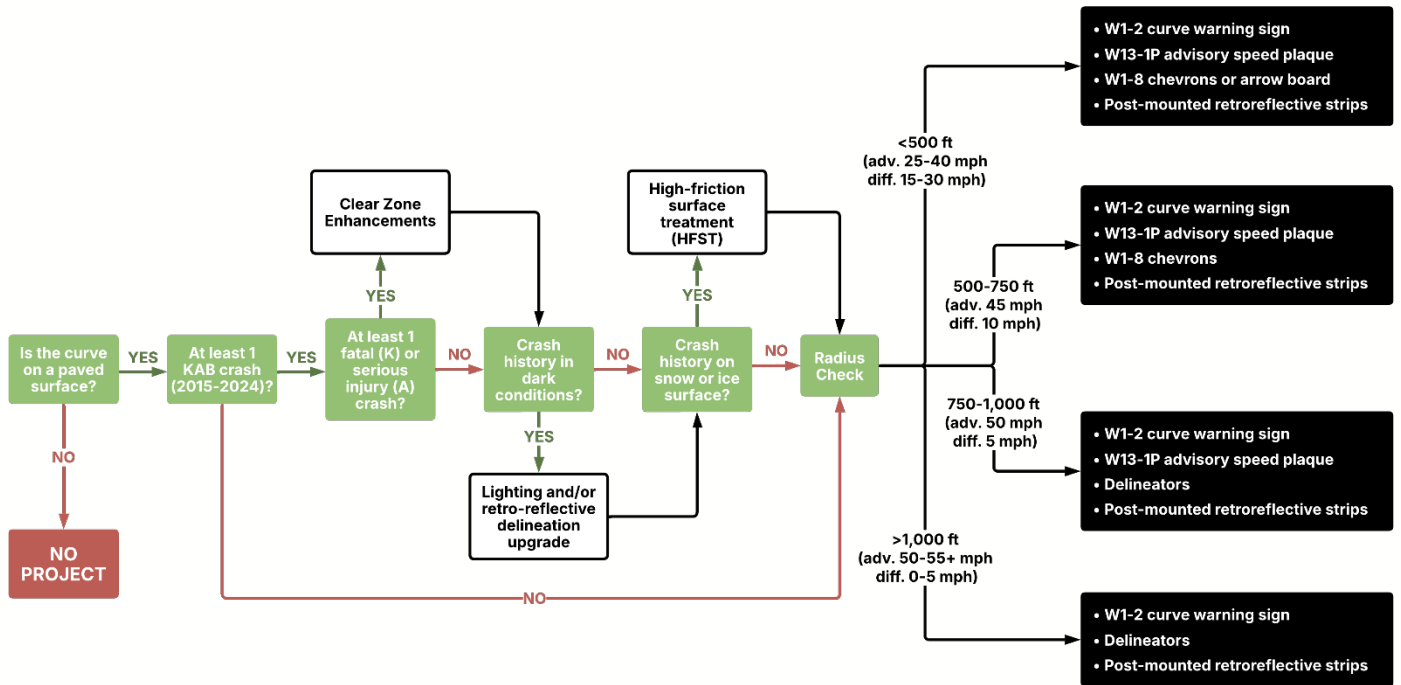


Figure 49: Rural Segment Decision Tree

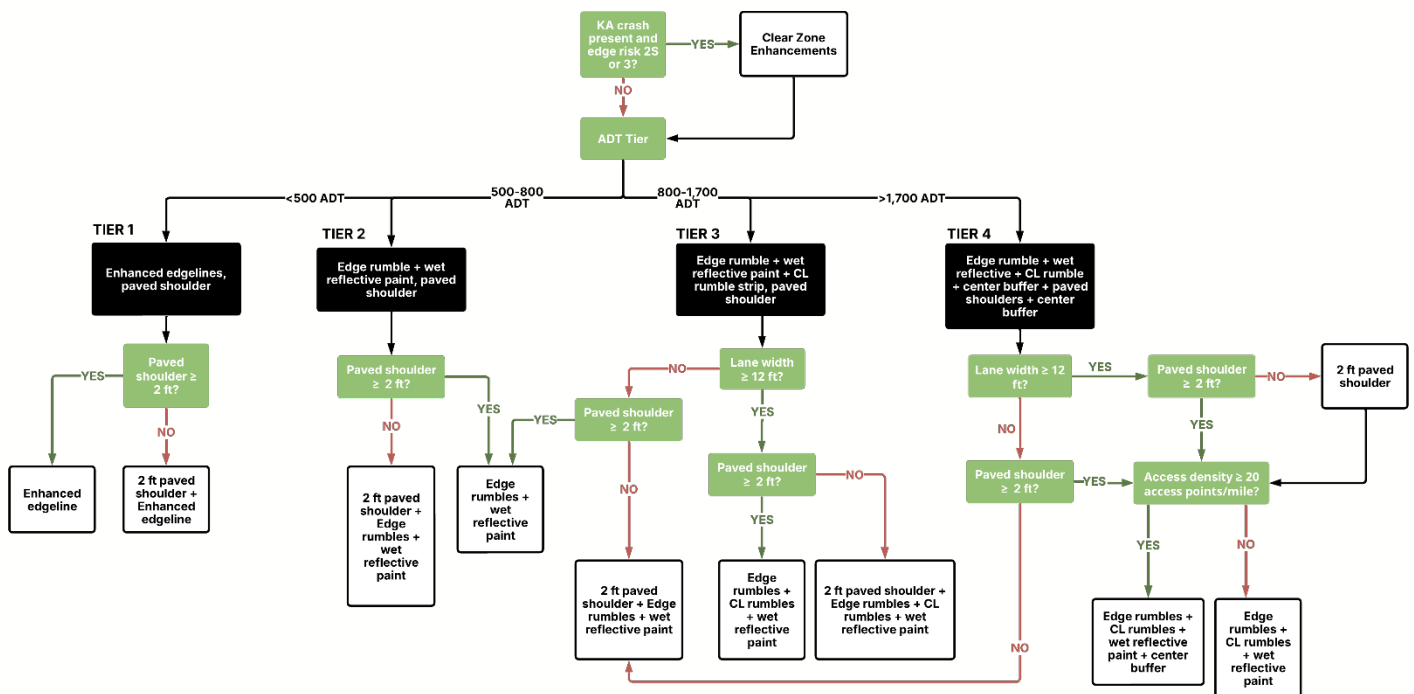




Figure 50: Urban Segment Decision Tree

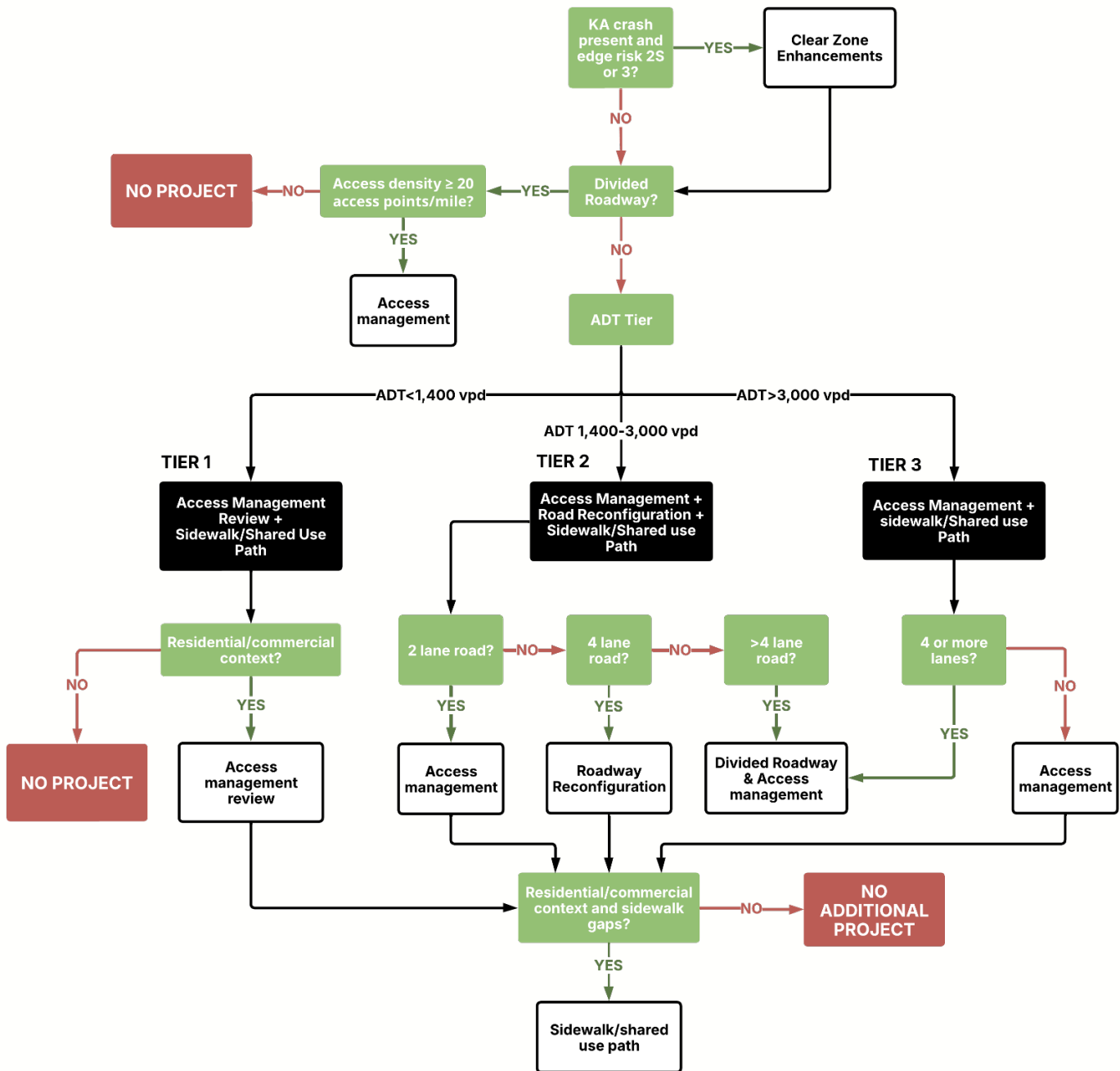
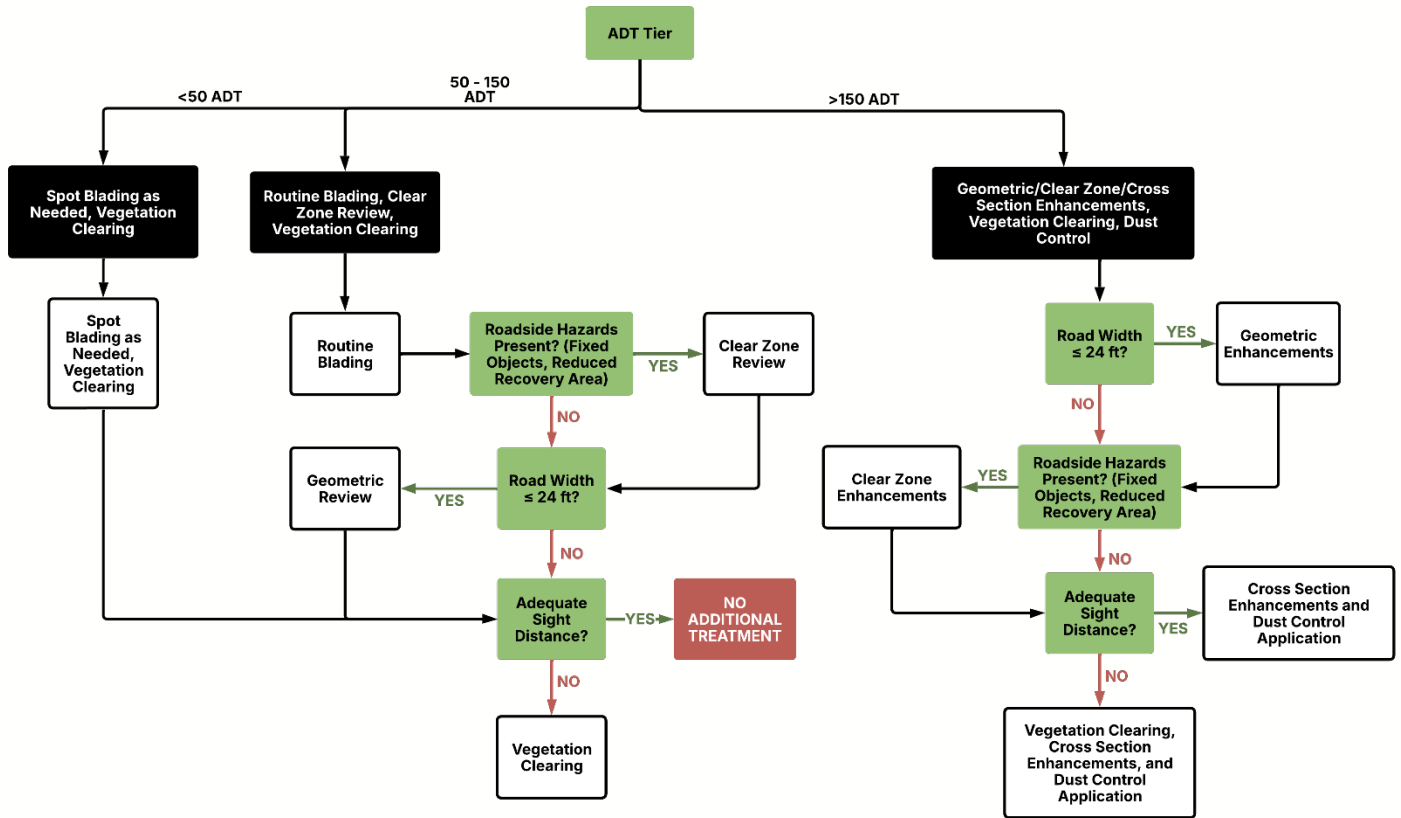




Figure 51: Gravel Decision Tree





The systemic risk assessment process identified at-risk intersections and segments considered priorities for safety project development, and decision trees document the process that considered intersection control, roadway features, and traffic volumes. This process resulted in the identification of a suggested safety project at most of the priority locations. The full list of suggested projects can be found in the Appendix.

These suggested safety project strategies are based on the information gathered from the initial analysis and are for planning purposes. Additional analysis of existing conditions at the proposed project locations and a review of existing studies, such as Safe Routes to School, should be completed before moving forward. The specific recommendations and implementation measures may each require further study and evaluation, depending on their location and area.



Progress and Transparency

To track progress toward achieving this plan's vision and goals, Beltrami County will monitor the following performance measures. These measures are directly aligned with the plan's goals and provide a clear framework for evaluating safety outcomes, implementation progress, and overall effectiveness over time.

Table 15: Performance Measurement

Goal Area	Performance Measure	Baseline	Target	Data Source	Reporting Frequency
Reduce Severe Crashes Through Targeted Investment	Number of fatal crashes	5 (5-year avg)	Decrease annually toward zero	MnCMAT/Citian	Annual
	Number of serious injury crashes	10 (5-year avg)	Decrease annually	MnCMAT/Citian	Annual
	Fatal + serious injury crashes (K+A)	15 (5-year avg)	Reduce by at least 1 per year	MnCMAT/Citian	Annual
	Number of high-risk locations or systemic risk factors addressed	Varies by type	Increase annually	County analysis/project tracking	Annual
Advance Implementation of Safety Projects	Number of safety projects implemented	~2 per year	~2 per year	County TIP/project tracking	Annual
	Percent of CRSP/CSAP projects completed	TBD	50% of identified projects by 2030	County tracking	Annual
Use Data-Driven Decision Making	Use of crash and roadway data in project selection (qualitative checklist or documentation)	Existing practice	Documented and consistently applied	Internal documentation	Ongoing
Track Progress and Maintain Accountability	Annual safety performance reporting completed	Existing practice	Annual reporting is completed each year	County reports / TIP	Annual
	Progress tracking of implemented projects and outcomes	TBD	Updated annually	County tracking systems	Annual