METROCOG

Regional Comprehensive Safety Action Plan

Metro COG Disclaimer

This plan is made possible by a Planning Grant through the Safe Streets and Roads for All (SS4A) Program. This program provides financial support for planning, design, infrastructure, behavioral, and operational initiatives to prevent death and serious injury on roads and streets.

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The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) Regional Comprehensive Safety Action Plan (CSAP) is a product of a collaborative effort and commitment from Metro COG staff, the Study Review Committee (SRC), Transportation Technical Committee (TTC), and Policy Board. The Project team would also like to acknowledge stakeholders and community members within the region who participated and provided instrumental feedback to guide the CSAP.

Metro COG Staff

- Adam Altenburg, Project Manager
- Ben Griffith, Executive Director
- Jaron Capps, Assistant Project Manager

Study Review Committee

- Aaron Murra, North Dakota Department of Transportation - Fargo District
- Andrew Wrucke, City of West Fargo
- Cheryl Stetz, Metropolitan Bicycle & Pedestrian Committee Representative
- Clay Lexen, City of Moorhead
- Dan Hanson, City of West Fargo
- Don Lorsung, City of Dilworth
- Jace Hellman, City of Horace
- Jonathan Atkins, City of Moorhead
- Jordan Smith, MATBUS
- Justin Sorum, Clay County
- Kelly Krapu, Freight Advisory Committee Representative
- Maegin Elshaug, City of Fargo
- Kristen Sperry, Federal Highway Administration – North Dakota Division
- Kyle McCamy, City of West Fargo
- Mary Safgren, Minnesota Department of Transportation
- Peyton Mastera, City of Dilworth
- Tom Soucy, Cass County

Transportation Technical Committee (TTC)

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- Jonathan Atkins, City of Moorhead
- Julie Bommelman, Fargo Transit
- Nicole Crutchfield, City of Fargo
- Jeremy Gorden, City of Fargo
- Cole Hansen, Cass County
- Jace Hellman, City of Horace
- Robin Huston, City of Moorhead
- Matthew Jacobson, Clay County
- Kelly Krapu, Freight Representative
- Don Lorsung, City of Dilworth
- Aaron Nelson, City of West Fargo
- Joe Raso, GFMEDC
- Mary Safgren, MnDOT – District 4
- Justin Sorum, Clay County
- Tom Soucy, Cass County
- Brit Stevens, NDSU
- Lori Van Beek, Moorhead Transit
- Kyle McCamy, City of West Fargo
- Wayne Zacher, NDDOT Local Government

Policy Board

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- Rory Jorgenson, West Fargo City Commission
- Denise Kolpack, Fargo City Commission
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- Ryan Nelson, Moorhead City Council
- Brad Olson, West Fargo City Commission
- Dave Piepkorn, Fargo City Commission
- Art Rosenburg, Fargo Planning Commission
- John Strand, Fargo City Commission
- Thomas Schmidt, Fargo Planning Commission
- Miranda Tasa, Fargo Planning Commission
- Michelle Turnburg, Fargo City Commission
- Deb White, Moorhead City Council

LETTER FROM METRO COG

Dear Residents,

Every day, over 135,000 residents in the Fargo-Moorhead area rely on our regional transportation network to reach their destinations. Sadly, not everyone makes it home safely. Since 2017, more than 350 people on Fargo-Moorhead roadways have died or suffered severe, life-altering injuries. Disturbingly, both national and local data highlight a sobering truth: vulnerable road users – people bicycling, walking, or traveling by motorcycle - face a higher risk of fatal or serious injuries compared to other road users.

While we cannot reverse lives lost or the terrible life-long consequences of debilitating injuries, we can take proactive steps to prevent future traffic crashes. **This plan is our region's first ever Regional Comprehensive Safety Action Plan.** It provides the Fargo-Moorhead area with a framework of innovative strategies and implementation actions that will ensure crash reductions and support federal safety initiatives. It identifies a high injury network of roads that deserve prioritized safety investments. And it marks our commitment to rethinking how we address safety on our roads.

Central to this plan is the Safe Systems approach, which prioritizes the safety of all road users through comprehensive strategies. This involves designing roadways that are safe for everyone, managing speeds to reduce crash severity, ensuring vehicles are safe, and promoting safe behavior among all users. Achieving these goals demands collaboration across various fields, including planners, engineers, community advocates, public health experts, educators, and law enforcement, with vital support from local elected officials and policymakers.

This plan affirms Metro COG's commitment to creating environments where human mistakes do not lead to fatalities or serious injuries.

One death on our roadways is one death too many.

Ben Griffith

Fargo Moorhead Transportation Planning Organization Executive Director

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ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
BIL	Bipartisan Infrastructure Law
EMS	Emergency Medical Services
FHWA	U.S. Federal Highway Administration
HIN	High Injury Network
HSIP	Highway Safety Improvement Program
KABCO	Injury Severity Scale: K: Fatal Injury A: Suspected Serious Injury B: Suspected Minor Injury C: Possible Injury O: No Apparent Injury
LRSP	Local Road Safety Program
Metro COG	Fargo-Moorhead Metropolitan Council of Governments
MnDOT	Minnesota Department of Transportation
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan, called Metro Grow
NCHRP	National Cooperative Highway Research Program
NDDOT	North Dakota Department of Transportation
RRFB	rectangular rapid flash beacon
CSAP	Regional Comprehensive Safety Action Plan for the Fargo-Moorhead Area
SHSP	Strategic Highway Safety Plan
SS4A	Safe Streets and Roads for All
SRC	Study Review Committee
SRTS	Safe Routes to School
TTC	Transportation Technical Committee
VRU	Vulnerable Road User

CHAPTER 1 WHY A COMPREHENSIVE SAFETY ACTION PLAN?

National Context

The Bipartisan Infrastructure Law (BIL) enacted by the U.S. Congress in 2021 established the Safe Streets and Roads for All (SS4A) Grant Program. The SS4A program provides discretionary grants to local, regional, and Tribal governments focused on the prevention of deaths and serious injuries on our local and regional roadway system. The SS4A program helps to implement the U.S. Department of Transportation's (USDOT) National Roadway Safety Strategy, which focuses on eliminating deaths and serious injuries across the nation's roadway system.

Fargo-Moorhead's Regional Comprehensive Safety Action Plan (CSAP) is the basic building block to guiding local and regional approaches through projects and strategies to address safety risks on the roadway system. The CSAP uses analysis of historic crash information combined with roadway system user and community input to identify projects and strategies. The U.S. Department of Transportation has adopted a Safe System Approach, which is a guiding paradigm in the development of the CSAP.

The Approach to Traffic Safety

The Safe System Approach is the foundational strategy for the Vision Zero movement and is proven to substantially reduce fatalities and serious injuries. USDOT has adopted the Safe System Approach to address contributing crash factors and promote layers of protection to prevent crashes and mitigate crash severity. This approach recognizes that humans make mistakes, humans are vulnerable, and redundant measures are needed to protect all road users.

Traditional Approach

- Traffic deaths are inevitable
- Aims to fix humans
- Expects perfect human behavior
- Prevents crashes
- Exclusively addresses traffic engineering
- Doesn't consider disproportionate impacts

VS.

Safe System Approach

- Traffic deaths are preventable
- Aims to fix systems
- Humans make mistakes
- Prevents fatal and serious crashes
- Considers the roadway system as a whole
- Considers road safety as an issue of social equity

Metro COG's CSAP opens the door to SS4A implementation funds for the region:

An adopted Safety Action Plan is required for local jurisdictions to be eligible for discretionary SS4A funding (implementation & planning/demonstration).

The Safe System Approach is guided by five core elements.

Figure 1 Core Elements of the Safe System Approach

1

SAFE ROAD USERS

All road users, including those walking, biking, riding, and driving, should always operate in a safe and responsible manner when on the roadway.

2

SAFE SPEEDS

Safer speed setting, education, and enforcement are promoted across all road environments to reduce kinetic forces associated with crashes to a tolerable level on the human body.

3

SAFE VEHICLES

Vehicles are designed incorporating the latest technology and used in appropriate ways (such as always wearing a seat belt) to minimize crash severity and frequency.

4

SAFE ROADS

Roads are designed to accommodate human mistakes, encourage safe behavior, and reduce crash severity and frequency.

5

POST-CRASH CARE

Receiving quick emergency medical care following a crash is essential to assist those who have been injured and to reduce fatalities.

Vulnerable Road Users

Vulnerable road users are defined by the Federal Highway Administration (FHWA) as people walking, biking, or rolling. People within a motor vehicle or on a motorcycle are not included in this definition. Vulnerable road users are unprotected from motor vehicles and are therefore especially vulnerable to the devastating impact of a motor vehicle crash. According to the National Highway Traffic Safety Administration, vulnerable road users accounted for a growing share of all roadway fatalities in recent years.[1] Just between the years 2020 and 2021, pedestrian fatalities were estimated to have increased by 13 percent and bicyclist fatalities by five percent. **The U.S. Department of Transportation labels this increase in fatalities with respect to vulnerable road users as a crisis and that "substantial, comprehensive action to significantly reduce serious and fatal injuries on the Nation's roadways."** It must also be added that the conditions and areas with additional risk to vulnerable road users likewise should be included in this call for action.

Vulnerable Road Users are more at risk of injury in crashes:

In the Fargo-Moorhead Area, 22% of vehicular crashes result in injury (KABC), whereas more than 93% of crashes involving a bicyclist or pedestrian result in injury (KABC).

1 *https://www-fars.nhtsa.dot.gov/Main/index.aspx*

CHAPTER 2 MULTIMODAL SAFETY IN THE FARGO-MOORHEAD AREA

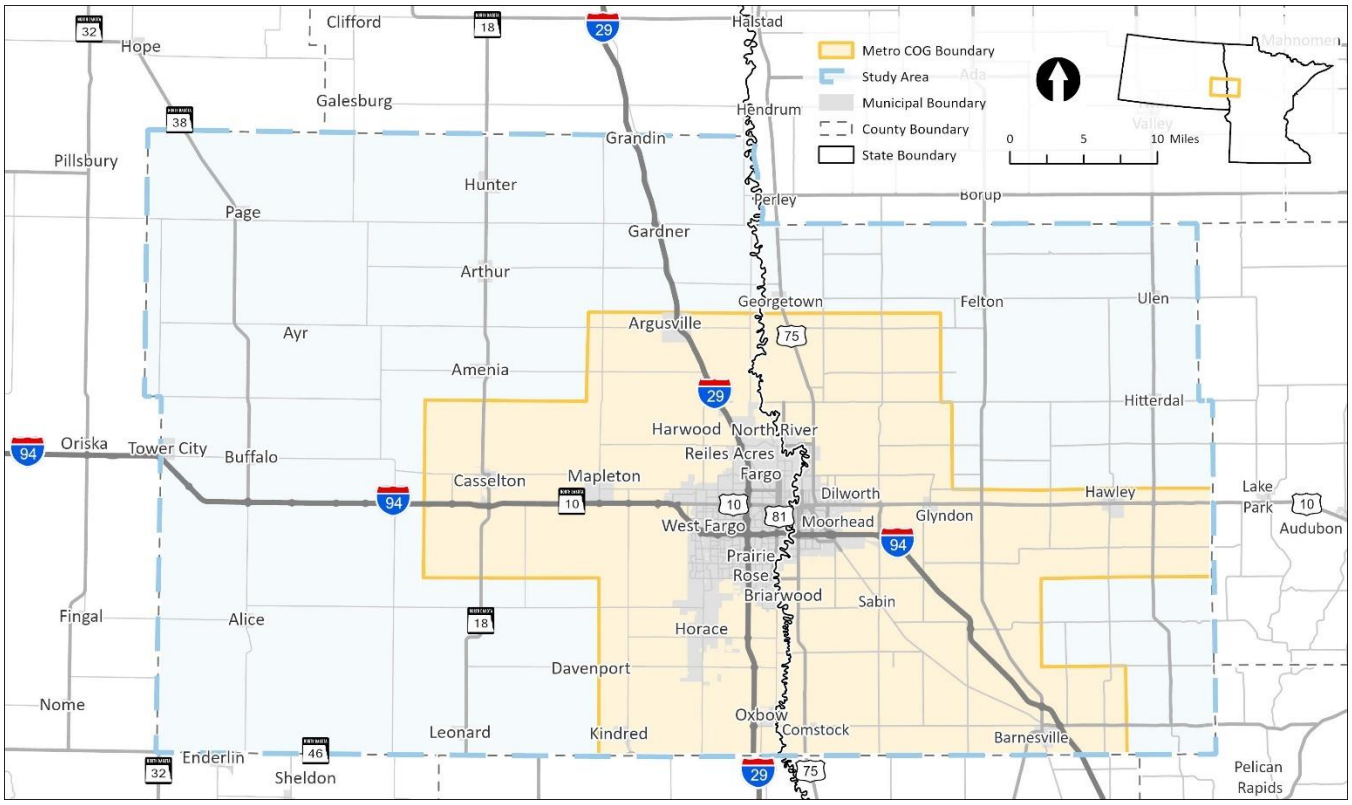
About Metro COG

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) is the federally designated Metropolitan Planning Organization (MPO) for the Fargo-Moorhead Area. MPOs help facilitate implementing agencies (including municipal planning and engineering departments, county highway departments, and state departments of transportation) to prioritize their transportation investments in a coordinated way consistent with regional needs, as outlined in a metropolitan transportation plan. The mission of Metro COG is to harmonize the activities of federal, state, and local agencies, render technical assistance, and encourage public participation in the development of the area. Metro COG brings communities together to prioritize, coordinate, and fund transportation projects in the region, while supporting regional land use, environmental, and economic objectives.

The Fargo-Moorhead Metropolitan Planning Area[2] serves a bi-state area that includes the cities of Fargo and Moorhead, 10 additional cities, 14 townships in Cass County, North Dakota, and 16 townships in Clay County. Metro COG's boundary was most recently expanded in 2013 and encompasses contiguous areas that are or are likely to become urbanized within the 20+ year planning period as well as other areas containing important regional transportation corridors, as shown in Figure 2. Federal rules require the designation of MPOs in urbanized areas of 50,000 or more in population as a condition for spending Federal highway and transit funds. Metro COG is the official transportation policy-making organization responsible for administering the cooperative, comprehensive regional transportation planning and decision-making process for the Fargo Moorhead Area.

As the MPO, Metro COG is required to develop and maintain a long-range multi-modal regional transportation plan every five years. It develops special plans and studies and collects data to help inform and drive implementation of the regional transportation plan and approves federal funding for transportation projects through the annual Transportation Improvement Program (TIP). While Metro COG provides regional coordination and approves use of Federal transportation funds within the metropolitan planning area, responsibility for the implementation of specific transportation projects lies with NDDOT, MnDOT, City of Fargo, City of Moorhead, and other local units of government as transportation providers.

Figure 2 Metro COG Map



Metro COG is governed by two committees

The first is the Policy Board, the executive body of Metro COG. The Policy Board is Metro COG's decision-making arm comprised of 16 voting members who represent the metropolitan planning area. The Policy Board consists of at least three-quarters elected officials, and each jurisdiction's voting power is based on its approximate share of the area's population.

The second is the Transportation Technical Committee (TTC). The TTC advises the Policy Board on technical matters related to transportation planning in the region. The committee is made up of planning and engineering from local jurisdictions, transit agencies, and representatives of NDDOT, MnDOT, higher education, freight, economic development, and the Metropolitan Bicycle and Pedestrian Committee, which is a subcommittee of the TTC.

Why Metro COG Needs a Comprehensive Safety Action Plan

The loss of even one human life on a roadway is unacceptable. From 2018 – 2022, 351 people suffered severe injuries or died from roadway crashes within the Metro COG region. Hundreds more experienced life altering and serious injuries. By 2050, the population in the Fargo-Moorhead area is expected to grow to over 357,000, adding approximately 107,000 additional residents and users of the roadway network to drive, bike, walk, and roll. With this increased growth comes increased potential for collisions.

Cities and counties within the region must collaborate with Metro COG, MnDOT and NDDOT to work toward the shared goal of improving safety for all roadway users and access to medical facilities when crashes do occur.

Population Growth

Multimodal Demand

Regional Public Health

Metro COG also acknowledges that connectivity for all roadways users is imperative. With population growth expected over the next 30 years, the region's roadways will become burdened, affecting residents' quality of life. The region must continue to identify and fill gaps within the region's bicycle, pedestrian, and transit network to encourage healthy communities.

Vision and Goals

Metro COG desires transformative change in order to achieve its vision for the safety of its transportation infrastructure. This plan **establishes a vision of zero traffic deaths and severe injuries** on streets within the Fargo-Moorhead Area, with a specific goal of a 55 percent reduction from 2022 statistics to 39 or fewer fatalities or serious injuries per year by 2040.

Eliminating fatalities and serious injuries requires the region's transportation leadership and staff to priortize the issue, and to work closely with its transportation partners to do the same. Achieving the vision requires tremendous effort focused on physical engineering efforts and various non-engineering efforts, such as education, enforcement, and agency collaboration. **Metro COG's vision will be measured on an annual basis starting in 2025, by the percent reduction in fatal and serious injury crashes.**

Vision

Zero traffic deaths and severe injuries on streets within the Fargo-Moorhead Area

Goal

55 percent reduction in fatal and serious injuries crashes by 2040, which equates to 39 fatal or serious injury crashes or fewer

CHAPTER 3 STATE OF PRACTICE

Several plans, policies, and programs address road safety at the national, state, and local levels. State and local laws governing the operation of motor vehicles are primarily designed to promote road safety.

National policies and programs include the Complete Streets movement, Safe Routes to School (SRTS), Operation Lifesaver, and the Americans with Disabilities Act (ADA). These policies emphasize the need to accommodate all travel modes.

Statewide plans that emphasize enhancing safety include:

- NDDOT Vision Zero Strategic Highway Safety Plan (2024)
- Minnesota Strategic Highway Safety Plan (2020)
- MnDOT Vulnerable Road User Safety Assessment (2023)
- North Dakota Local Road Safety Program (LRSP)
- Minnesota County Road Safety Plans

At the local level, the communities within the Fargo-Moorhead area lead traffic safety efforts focusing on local priorities and recommendations for future road improvements within their jurisdiction. The communities within Fargo-Moorhead Area continue to coordinate with Metro COG; however, their Safety Action Plans and analysis may differ slightly due to the difference in priorities and scale - regional vs. local community-based.

Metro COG and its local partners have also completed the following plans, policies, and programs. These documents include a wide range of activities the region is undergoing to address roadway safety.

- Metro GROW: 2045 Metropolitan Transportation Plan (2020)
- Metro COG's Complete Streets Policy (2010)
- Fargo-Moorhead Metropolitan Bicycle & Pedestrian Plan (2022)
- Fargo Safe Routes to School Plan (2020)
- Fargo Transportation Plan (2024)
- Moorhead Safe Routes to School Plan (anticipated 2024)
- Dilworth-Glyndon-Felton Safe Routes to School Plan (2023)
- West Fargo Traffic Calming Study (2021)
- Fargo-Moorhead Metro Bikeways Gap Analysis (2019)

See **Appendix 1** for additional information on local, regional, and state safety plans and policies guiding the Metro COG region.

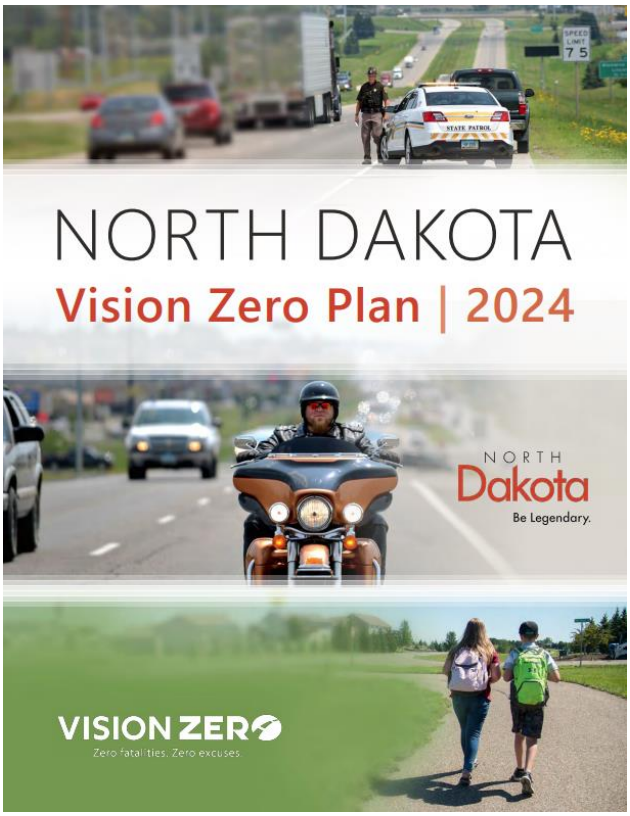
NDDOT Vision Zero Strategic Highway Safety Plan (2024)

The North Dakota Vision Zero Strategic Highway Safety Plan (SHSP) is a policy plan within the North Dakota Vision Zero program that aims to provide a framework to guide all statewide traffic safety activity, including but not limited to:

- Widespread public education/outreach
- Working with the legislature to ensure state laws represent best practices in traffic safety
- High visibility enforcement of existing laws
- Technology advancements
- Infrastructure/road safety improvements

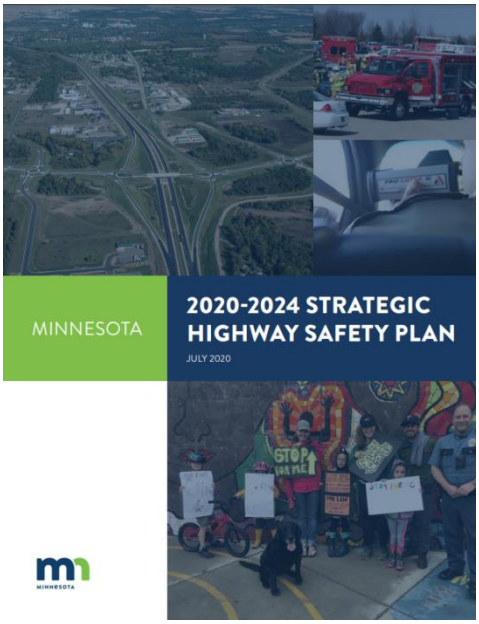
The SHSP is driven by data and collaboration, which includes analyzing recent crash trends, identifying safety emphasis areas, developing and prioritizing comprehensive safety strategies which ultimately lead to project programming, project development, implementation, and progress monitoring and evaluation.

The SHSP is updated every five years to reflect crash trends and emerging safety strategies. Stakeholder and public engagement input is vital in informing strategies; stakeholder input is collected through webinars, workshops, and steering committee meetings.



Minnesota Strategic Highway Safety Plan (2020)

The MnDOT Strategic Highway Safety Plan (SHSP) is a policy plan within the Minnesota Toward Zero Deaths (TZD) program that aims to provide a framework for strategies involving enforcement, education, engineering, and emergency medical services and trauma systems. The SHSP also serves as a tool to address safety issues on public roads. The SHSP is driven by data and outreach, which includes analyzing recent crash trends, identifying and prioritizing focus areas into one of four categories (core, strategic, support solutions, and connected), strategies with specific actions identified, and implementation to guide traffic safety partners to using this Plan effectively.



The plan is divided into focus areas that represent common crash types or causes of crashes, with associated strategies and tactics for addressing each. While the plan focuses on all modes of transportation, there are key takeaways for people who walk and bike. Specifically, relevant focus areas include pedestrians, bicyclists, and more general categories that pose risks to people walking and biking such as intersections, speed, and inattentive drivers.

MnDOT Vulnerable Road User Safety Assessment (2023)

The Vulnerable Road User Safety Assessment conducted for MnDOT is a comprehensive evaluation identifying high risk areas and developing strategies to improve the safety of people biking, people walking, and other vulnerable road users such as people with disabilities. States are required by federal law to conduct a vulnerable road user safety assessment every five years.

The evaluation aims to understand the most pressing challenges faced by vulnerable road users and identify areas where improvements can be made across the transportation system. The assessment developed statewide High Injury Network (HIN) specific to people walking, biking, and rolling.

North Dakota Local Road Safety Program (2012-2015)

The Local Road Safety Program (LRSP) was implemented for all of the regions in North Dakota and prepared as part of North Dakota's statewide highway safety planning process between 2012-2015. Although pre-Vision Zero (current SHSP), the LRSP is the result of a data-driven process, with a goal to reduce severe crashes by documenting at-risk locations, identifying effective low-cost safety improvement strategies, and better positioning each region in North Dakota to compete for available safety funds.

The LRSP provides a list of priority safety projects for each region, which is made up of local governments including counties and larger cities. At risk locations along the county/local road system were considered candidates for safety investment, including road segments, horizontal curves, and intersection with multiple severe crashes. At risk locations also considered road geometry and traffic characteristics like other locations in North Dakota where similar severe crashes have occurred.

Proven, effective, low-cost safety countermeasures, such as rumble strip/stripes, modified intersection design, enhanced signing/markings, ITS signing applications, and lighting, were assigned to high-priority locations. Each plan resulted in a report that highlighted high-priority intersections, segments, and curves and identified projects for implementation. Highway Safety Improvement Plan (HSIP) funding application forms were created for each project to facilitate applying for funding. For each local road agency, a workshop was held with safety partners (enforcement, education, emergency services, and engineering).

Local jurisdictions are encouraged to update their LRSP in a timely manner to reflect SHSP policy direction, current crash trends, and changes to traffic including the transportation system.

Minnesota County Road Safety Plans (2008-Present)

The initial County Road Safety Plans were completed between 2008 and 2013. MnDOT began working with counties to update the plans in 2016 and to date has completed 30 updated plans, with an additional 12 estimated to be completed by the end of 2024.

The goal is to develop a plan that provides a prioritized list of safety projects for the counties to implement. Key steps included analysis of severe crashes, data collection of existing roadway features and data-driven systemic analysis to prioritize locations. Proven, effective, low-cost safety countermeasures, such as rumble strip/stripes, modified intersection design, enhanced signing/markings, ITS signing applications, and lighting, were assigned to high-priority locations. Each plan resulted in a report that highlighted high-priority intersections, segments, and curves and identified projects for implementation. Highway Safety Improvement Plan (HSIP) funding application forms were created for each project to facilitate applying for funding. For each county, a workshop was held with safety partners (enforcement, education, emergency services, and engineering).

Metro Grow: 2045 Metropolitan Transportation Plan (2020)

Metro Grow is the Fargo-Moorhead Area's which looks at the region's transportation system needs through the year 2045. As the recognized MPO for the area, Metro COG updates its MTP every five years to establish a locally-rooted vision for how the region's transportation system should evolve over time. It identifies community goals, needs, priorities, and future investments. The MTP considers motor vehicle, transit/MATBUS, bicycle, pedestrian, and freight systems in the Metro COG area.

Metro COG's current safety policy comes directly from the organization's adopted MTP.

Table 1 Metro COG's Safety Policy

Goal	
System Safety & Security – Provide a transportation system that is safer for all users and resilient to incidents.	
Objectives	**Project Prioritization Metrics**
Reduce the number and rate of crashes.	Review crash modification factors to determine potential project impact on safety categories.
Reduce the number and rate of serious injury and fatal crashes.	
Reduce the number of bicycle and pedestrian crashes.	
Reduce the number of bus-involved crashes.	Project has potential to reduce bus-involved crashes along an existing bus route.
Identify strategies to make transportation infrastructure more resilient to natural and manmade events.	Project has potential to reduce flooding or other hazard risk.
Policy Objective: collect better bicycle and pedestrian data for future planning efforts.	Policy Objective. Could provide bonus points to projects that include bike and pedestrian counting technology.
Policy Objective: improve transit system security.	Policy Objective. No project scoring.

Several other Metro Grow plan goals weave together other elements that have auxiliary safety benefits through enhanced walking and biking facilities, maintenance of existing facilities, and improved access.

Figure 3 Metro Grow Plan Goals

Metro COG's Complete Streets Policy (2010)

Consistent with federal guidance and regulation, Metro COG's complete streets policy incorporates safety of all roadway users as a primary component.

Policy Statement: Complete Streets is an on-going and comprehensive planning, design, construction, and operations process, with a long-range perspective, aimed at improving safety, usability, and quality of life. By embracing Complete Streets, Metro COG seeks to plan and program public rights-of-way that fully integrate and balance the needs of all street users, including bicyclists, pedestrians, transit users, commercial vehicles, emergency services vehicles and passenger vehicles. Users of all ages and abilities will be considered. The Complete Streets process will apply to street projects, including construction, reconstruction, and maintenance. Because Complete Streets are context sensitive, a Complete Street in one neighborhood may look very different from a Complete Street in another neighborhood, but both are designed to balance the safety and convenience for everyone using the public right-of-way. Successful achievement of this vision will result in the creation of a complete transportation network for all modes of travel (as opposed to trying to make each street perfect for every traveler), and may result in fewer crashes, lower severity crashes, improved public health, less air, water, and noise pollution, as well as lower overall transportation costs for the public and for their governing bodies.

As part of the adoption of this policy, Metro COG agreed to take the following action steps:

1) Integrate Complete Streets criteria in the development of the TIP, the Unified Planning Work Program (UPWP), and MTP
2) Promote the use of Context Sensitive Solutions planning
3) Support the development of a complete system of bikeways and pedestrian facilities, connected across the FM Metropolitan Area.

Many of the design and operations strategies in the policy include improvements to safety, such as roadway design that slows motor vehicles and/or limits access to provide greater safety for bicyclists, pedestrians, and motorists, narrowing pedestrian crossing distances, using traffic calming features, changing traffic signals to provide adequate pedestrian crossing time, and developing a maintenance schedule for bicycle facilities.

Fargo-Moorhead Metropolitan Bicycle & Pedestrian Plan (2022)

Updated every five years, the bicycle and pedestrian plan provides new and updated details about the people and communities in the Fargo-Moorhead area and includes information about how regional transportation systems support and/or inhibit people from walking and biking to desired destinations.

The plan provides recommendations for Metro COG's member jurisdictions, non-profit organizations, and community members to create better bicycle and pedestrian transportation systems, policies, and programs. The recommendations include: a bicycle network for people of all ages and abilities, improvements to pedestrian crossings, design guidelines, policy and program recommendations, and process improvements.

Guiding principles and objectives of the bicycle and pedestrian plan include: health and safety; maintenance; connectivity; equity; collaboration; and sustainability/environment.

Fargo Safe Routes to School Plan (2020)

The City of Fargo Safet Routes to School Plan was completed and adopted in February 2020. This plan updates the previous plan by including newly constructed schools and identifying areas of improvement surrounding each school throughout the City of Fargo. The plan also provides guidance on new installations, improvements, and suggested routes to each school.

Plan objectives include increasing the safety of students in the City of Fargo.

Moorhead Safe Routes to School Plan (Anticipated 2024)

The Safe Routes to School initiative aims to create physical and social environments to empower students, their families, and communities to walk and bike more often through policy change, infrastructure improvements, and programs.

Ultimately, a final report will be developed which will include identified issues and recommendations that can be used by the school district and local jurisdictions to make non-motorized travel to/from school safer and more attractive for students and families.

MINNESOTA
SAFE ROUTES TO SCHOOL

Fargo Transportation Plan (2024)

Traffic safety is a high priority in the Fargo Transportation Plan, with support for a vision of zero traffic-related fatalities using a safe system approach. The plan includes a five-year crash analysis spanning 2016-2020, identifying intersections and segments with crash rates above the average. The Fargo Transportation Plan calls out specific implementation activities, including Safe Routes to Schools programming and infrastructure improvements, the city's traffic calming policy, taking a safety-centered approach, and embracing innovative design. It includes a policy on complete streets to develop a transportation network that provides opportunities for multiple modes of travel and users of all ages and abilities.

Dilworth – Glyndon – Felton Safe Routes to School Plan (2023)

With changes to the school layouts and grade assignments at both the DGF Elementary School in Dilworth and DGF Middle/High School in Glyndon in 2022, it was necessary to develop a district-wide Safe Routes to School (SRTS) plan which would optimize students' safety as they walk and bike to school.

Ultimately, a final report has been developed which includes identified issues, and recommendations that can be used by the school district and local jurisdictions to make non-motorized travel to/from school safer and more attractive for students.

West Fargo Traffic Calming Study (2022)

The West Fargo Traffic Calming Study will address complaints received from West Fargo residents about excessive traffic speeds by researching and understanding the traffic calming issue, identifying traffic calming techniques, engaging the public for feedback throughout the study process, providing planning-level cost estimates, identifying funding sources for implementation, providing tools for the City to make decisions about future traffic calming issues, and compiling an approachable and user-friendly study document for West Fargo regarding traffic calming within the city.

Six (6) priority locations have been identified by the City of West Fargo due to complaints from residents about excessive traffic speeds:

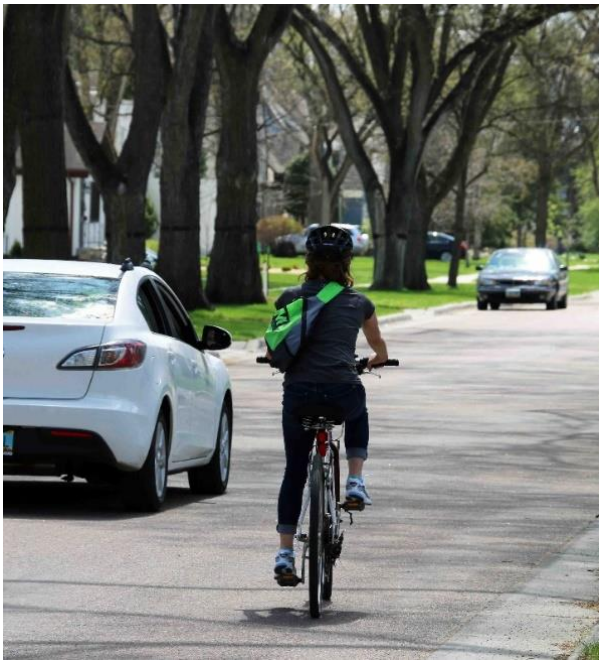
- 2nd Street East, south of 32nd Ave E
- 15th Avenue East, between 6th and 9th St E
- 16th Street East, south of 13th Ave E
- 7th Street West, between 15th and 19th Ave W
- 10th Street West, south of 13th Ave W
- Beaton Drive, between Sheyenne St and 9th St E

Analysis found that in many cases, local and collector classified neighborhood roadways in West Fargo are built much wider than the recommended minimums for an urban neighborhood setting, with existing driving-lanes ranging anywhere from 12 to 20 feet wide.

Figure 4 Traffic Calming Measures in West Fargo

Fargo-Moorhead Metro Bikeways Gap Analysis (2019)

The gap analysis developed planning-level concept alternatives for closing 16 gaps in the existing bikeway network in the Fargo-Moorhead Area.



The project team considered a number of factors, including safety of people traveling on bicycles, when developing recommendations. From the over 600 total comments and over 300 community members engaged in the analysis, the top three bikeway gaps receiving the most support included:

- Gap 9: A crossing of the Red River near 40th Avenue South (Fargo) to Bluestem Performing Arts Center (Moorhead)
- Gap 8: One mile corridor on 25th Avenue South and 24th Avenue South between 18th Street South and 5th Street South (Fargo)
- Gap 5: Two miles of open space/park land adjacent to the Red River between 15th Avenue North and 32nd Avenue Northeast (Fargo)

CHAPTER 4 ENGAGING FARGO-MOORHEAD AREA COMMUNITIES

Stakeholder and public engagement is critical in ensuring the applicability and implementation of the safety strategies included in this plan. Community outreach was an important part of this plan and ensuring that decisions impacting the community adequately represent key concerns.

Phase I - Fall 2023 Engagement Events

The project team conducted various engagement activities in November and December of 2023, including:

- Pangea Event (in person)
- Online Survey
- Interactive Map (online)

The public shared ideas on their transportation experience, with a focus on better understanding the multimodal transportation experience and safety concerns. The team also sought to raise awareness on the general work of Metro COG and safety action plans.

In addition to the in-person event, Metro COG invited the public to provide feedback through an interactive map of the existing transportation system in the Fargo-Moorhead area. Participants were able to add pins and lines to indicate the location of their comments. The map was available for comment in Fall 2023 and received over 212 unique comments.

In total, overall engagement resulted in feedback from over 500 people encompassing many different themes by geography, safety concern, and mode of travel.

COMMON THEMES

Where do you feel unsafe traveling?

- 45th Street, Fargo
- 13th Ave S, Fargo
- Downtown Fargo River Path
- Interstate 29 (I-29)
- Interstate 94 (I-94) Interchanges

What safety concerns do you have traveling in this area?

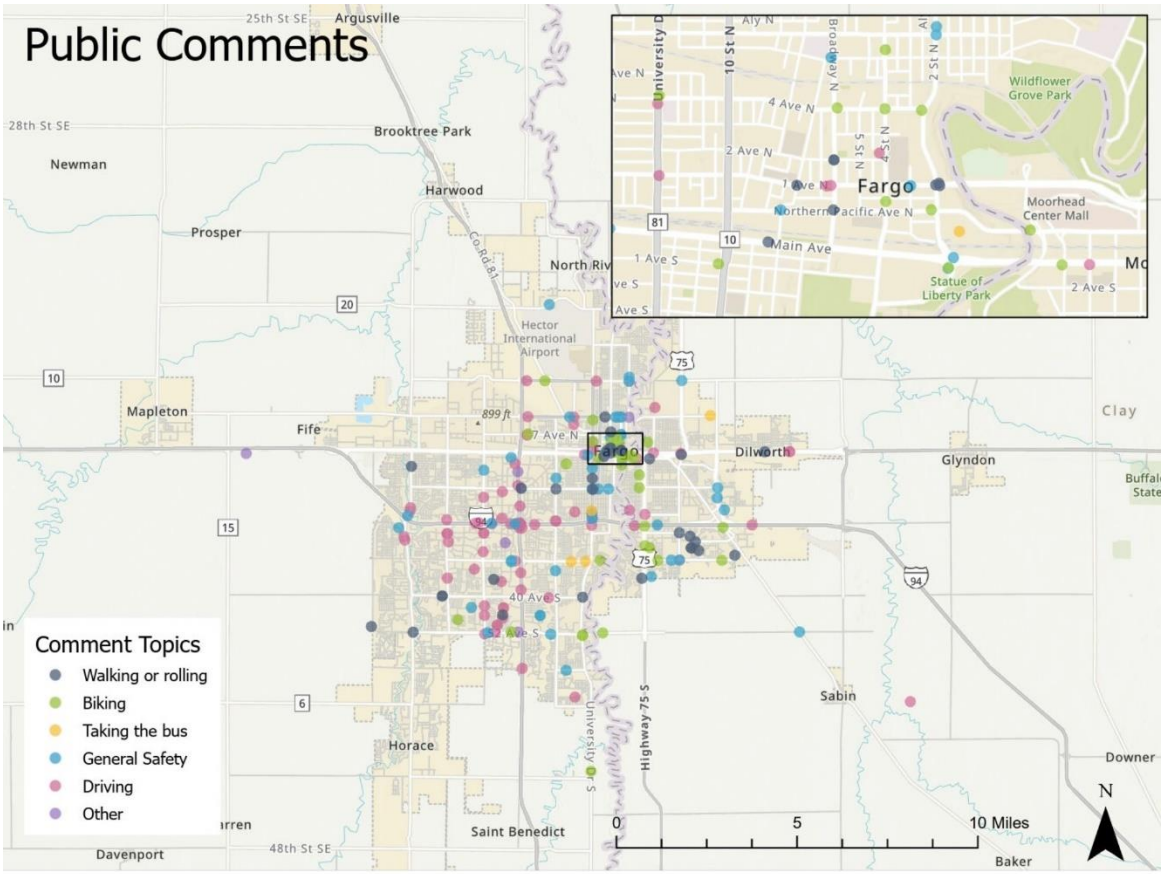
- High vehicle speeds
- Roadway signage and striping
- Bike and pedestrian infrastructure
- Lack of adequate lighting
- Lack of snow removal

INVESTMENTS PRIORITIES

What ideas do you have for improving transportation in the Fargo-Moorhead Area?

- Traffic calming measures with a focus on speed reduction
- Pedestrian signals and crosswalk striping
- Roadway signage to improve wayfinding
- Bike infrastructure such as seperate bike lanes
- Driver education with an emphasis on safety

Figure 5 Interactive Map Results



Phase II – Spring 2024 Engagement Events

The second round of engagement occurred in May and June 2024 and focused on sharing what the project team had learned thus far as well as testing ideas with the community. The engagement activities included:

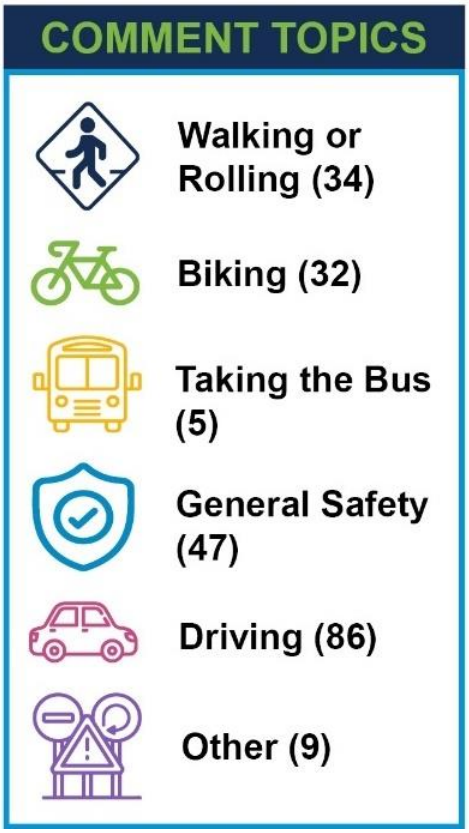
- Pop-Up Event at the International Market Plaza
- Bike Safety Rodeo

Key outcomes of the safety analysis, equity analysis, and list of potential transportation safety countermeasures were shared, along with the identified regional safety goals.

What was heard?

As a result of the robust public outreach and stakeholder engagement, the following key themes were gathered. These key themes assisted in informing recommended countermeasures as a part of this Safety Action Plan.

- Implement traffic calming measures to address high vehicle speeds in residential areas near school ones and recreational facilities.
- Improve traffic signals that cause traffic congestion due to delayed timing.
- Lack of Americans with Disabilities Act (ADA) facilities due to poor road conditions and pedestrian infrastructure.
- Expand pedestrian and bike networks to increase connectivity and promote mobility.
- Implement roadway striping improvements to address user visibility.
- Construct dedicated turn lanes to limit traffic congestion and vehicle collisions.
- Ensure adequate traffic signage and signals to improve user safety at identified locations such as intersection crossing, stop signs, yield signs, etc.
- Promote safe driving through traffic law enforcement.
- Address narrow roadways that limit ADA accessibility due to poor snow removal.



CHAPTER 5 DATA ANALYSIS

Crash Summary and Overview

Between 2018 and 2022, almost 19,000 crashes were recorded within the Fargo-Moorhead area, of which over 350 resulted in fatal or severe injuries. An analysis of these crashes was completed to identify crash trends among five modes: automobile, bicycle, pedestrian, motorcycle, and heavy vehicle. The analysis includes an examination of the crashes by mode by basic crash report variables such crash characteristics and contextual roadway factors. The crash trends identified Metro COG's crash profiles which highlight specific conditions that account for a large share of fatal and severe injury crashes. These crash profiles may be used by Metro COG and the Fargo-Moorhead region to help prioritize roadway safety investments in the future (See **Appendix 2** for the Safety Analysis).

Throughout the safety analysis, crash trends are summarized by "KA" indicating fatal and serious injury crashes and "BCO," which includes non-serious injuries. The KABCO injury scale is used and includes the designations shown in Table 2.

Table 2 KABCO Injury Scale

Severe (more injurious)	Non-Severe (less injurious)
K – involves a fatal injury **A** – incapacitating injury (serious injury)	B – non- incapacitating injury C – possible injury O – no injury or a property damage-only (PDO) crash

The crash analysis also analyzed key emphasis areas from crash data between 2018-2022, such as impairment, age, speeding, distracted driving, and use of seatbelts.

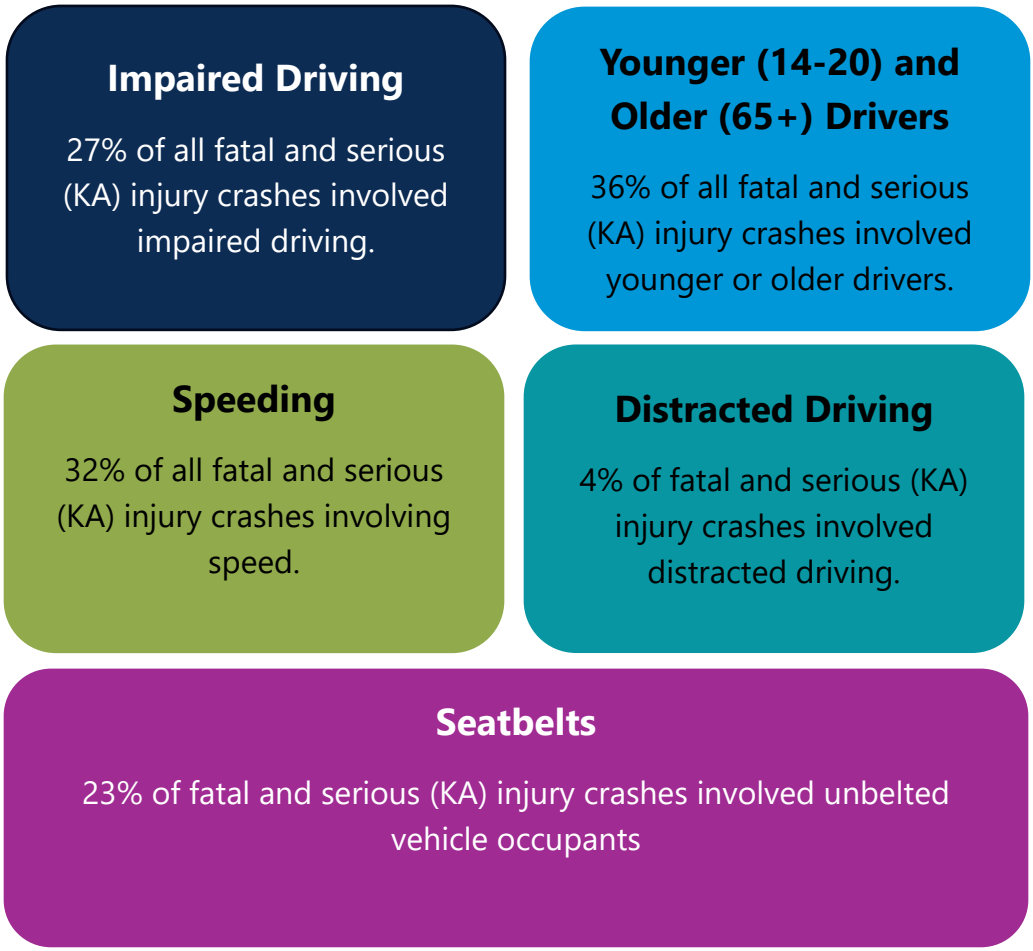
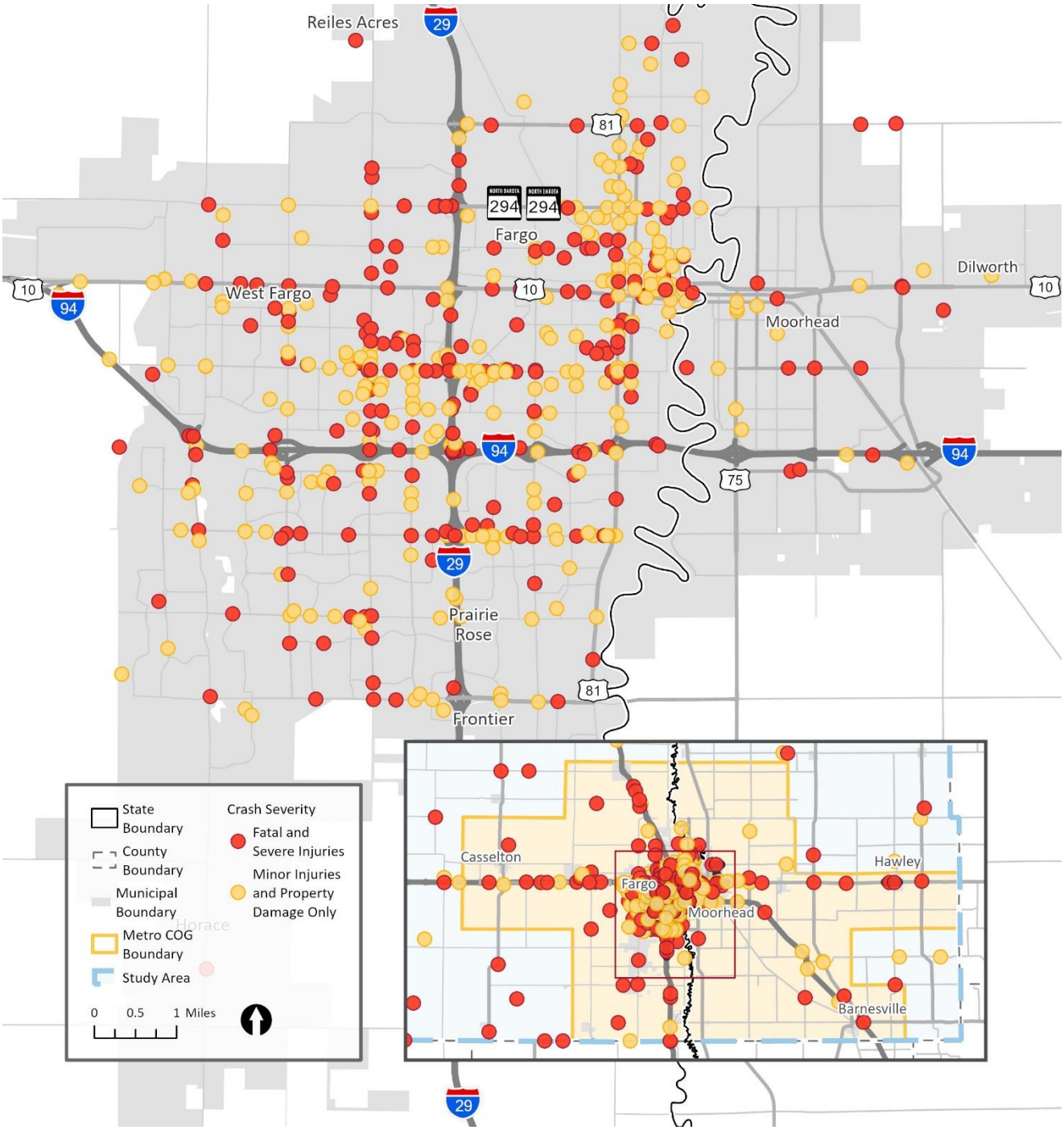


Figure 6 shows the crash density of fatal and serious injury crashes occurring between 2018 to 2022 within the region. The vast majority of serious injury crashes are concentrated around the state's trunk highway system.

Figure 6 Distribution of Crashes in the Fargo-Moorhead Area (2018-2022)



Key Takeaways from the crash and safety analysis include:

1) Arterials are the most dangerous streets in the Fargo-Moorhead area.
2) Severe and fatal crashes have increased over the past five years.
3) Winter is safer, despite more minor or property damage crashes.

4) People on bicycles, on foot, and driving motorcycles account disproportionately for severe and fatal crashes.
5) Pedestrian crash severity is worse at night.

Crash and Safety Analysis

Arterials are the most dangerous streets in the Fargo-Moorhead area

Best practices in safety action plans call for an analysis and prioritization of the most dangerous streets, creating thresholds that prioritize the top 1-3 percent of streets in the network. All roads across all functional classes and jurisdictions were analyzed. Interstate highways were excluded from the analysis.

Results from the analysis indicate that the vast majority of severe and fatal crashes occur on streets classified as arterials. In the road hierarchy, arterials sit right below interstates and typically are high-capacity roads, often with higher speeds. In the Fargo-Moorhead area, arterials are under the jurisdiction of cities, counties, and state departments of transportation.

Arterials frequently have higher speed limits. Higher driving speeds make a crash more likely due to reduced driver reaction time and longer braking distances. Higher speeds also correlate with increased severity of crashes and increased likelihood of fatal crashes. Vulnerable road users and motorcyclists are particularly at risk as speeds increase because of lack of exterior protection. Figure 7 and Figure 8 illustrate how the severity of crashes in the Fargo-Moorhead Area increases as speed increases, with a disproportionate impact to pedestrians.

Figure 7 Passenger Vehicle Crashes (2018-2022): Traffic Related Deaths and Serious Injuries by Speed Limit

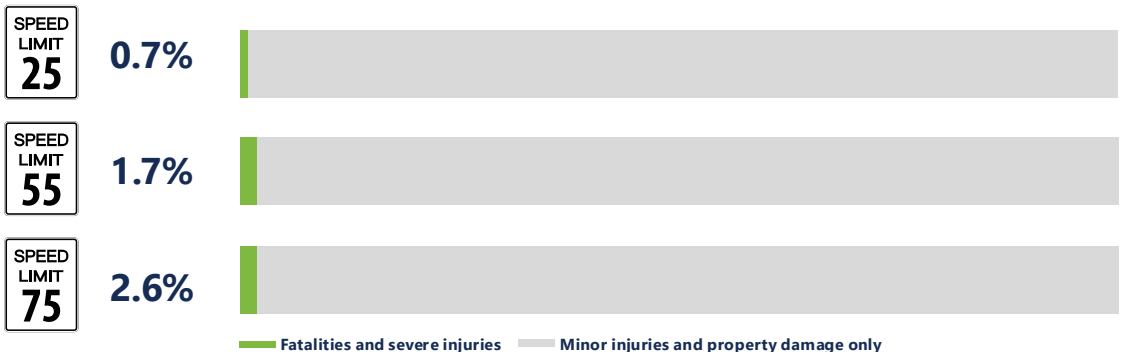
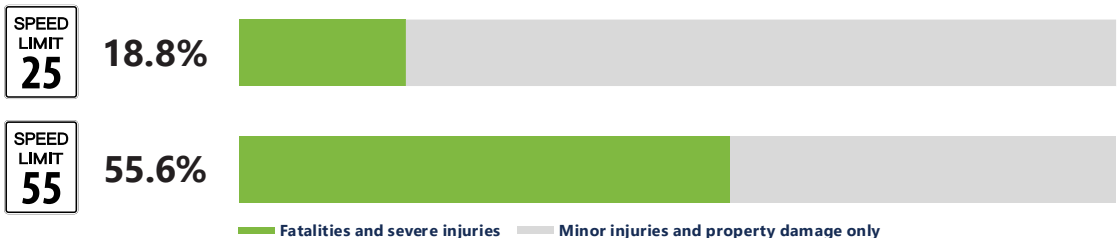


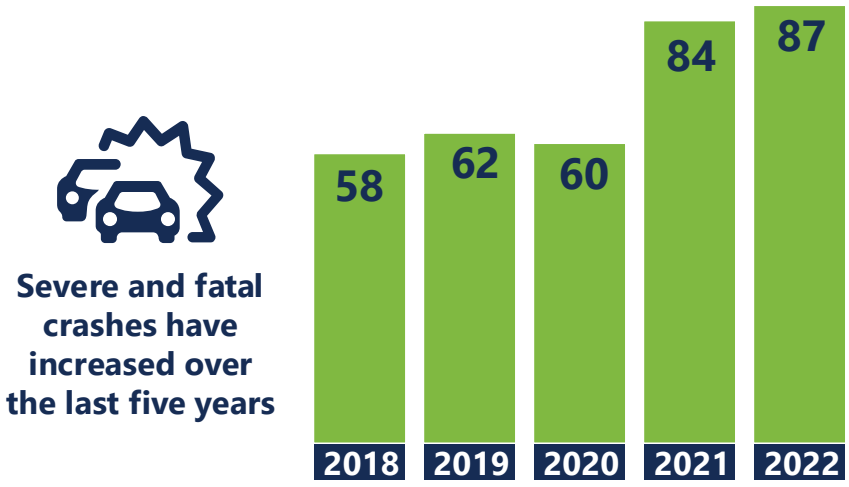
Figure 8 Pedestrian Crashes (2018-2022): Traffic Related Deaths and Serious Injuries by Speed Limit



Severe and fatal crashes have increased over the past five years

Within the Fargo-Moorhead area, over 18,900 crashes involving passenger vehicles, heavy vehicles, pedestrians, bicyclists, and motorcycles were recorded over the five-year period from 2018 to 2022. From the beginning to the end of the time period, severe and fatal crashes rose by eight percent. On average during this period there were 70 severe or fatal crashes annually.

Figure 9 Crash Severity Trends (2018-2022)

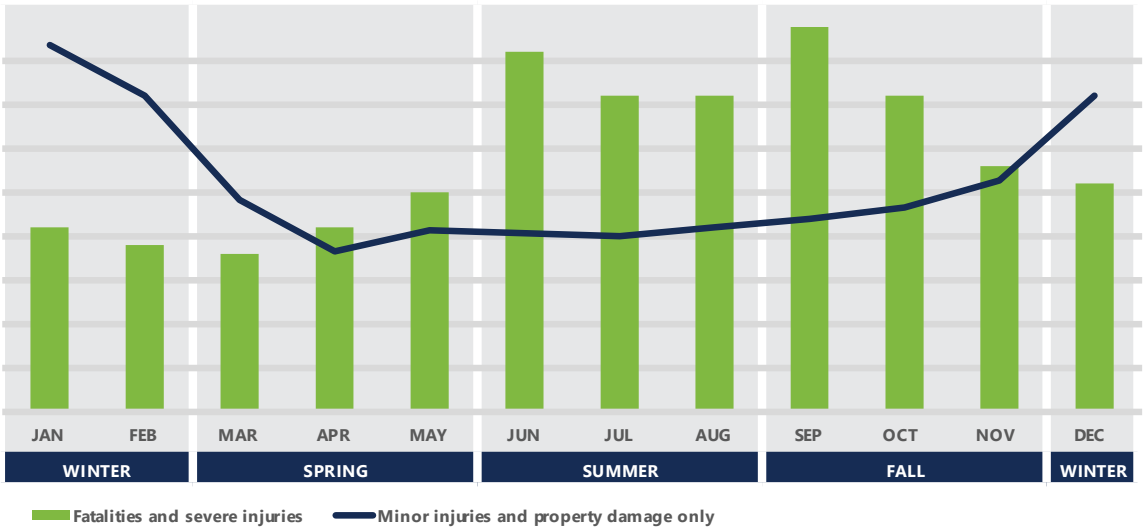


Winter is safer, despite more minor or property damage crashes

Severe and fatal crashes peak in early summer and then again in the fall, while property damage only crashes peak during the winter months (November through March). This trend in crash severity suggests that behavioral elements could be influencing relatively safer driving behavior during winter months (such as lower speeds). Winter weather, such as ice and snow could

result in elevated levels of property damage only crashes.

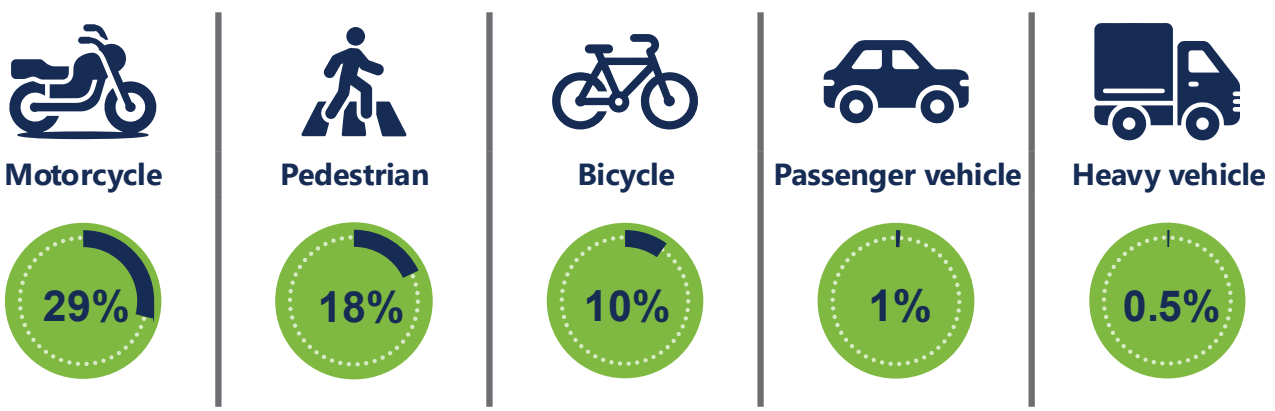
Figure 10 Crash Severity by Season (2018-2022)



People on bicycles, on foot, and driving motorcycles account disproportionately for severe and fatal crashes.

While the vast majority of crashes between 2018 and 2022 involved passenger vehicles, motorcyclists, pedestrians, and bicyclists were involved in a disproportionate number of serious injury and fatal (KA) crashes compared to passenger vehicles and heavy vehicles (Figure 11).

Figure 11 Crash Severity by Mode (2018-2022)

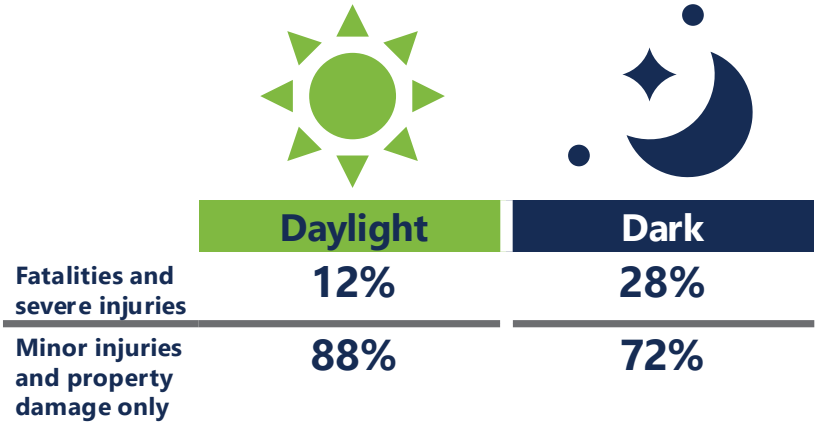


People riding motorcycles are particularly vulnerable - severe motorcycle crashes make up 29 percent of all motorcycle-involved crashes. By comparison, severe passenger vehicle crashes make up one percent of all passenger vehicle-involved crashes.

Pedestrian Crash Severity is Worse at Night

Lighting condition is listed on crash reports with options including daylight, sunrise or sunset, dark – lighted, and dark – not lighted. Most pedestrian-involved crashes regardless of severity occurred during daylight conditions. However, the likelihood of crash severity increased at night. When the sun was out, only 12 percent of pedestrian crashes resulted in fatalities or severe injuries. By comparison, at night, pedestrian crashes resulting in a fatality or severe injury increased to 28 percent.

Figure 12 Pedestrian Crash Severity by Time of Day (2018-2022)



Development of the High Injury Network

One of the outcomes of this plan is a High Injury Network (HIN) and a public dashboard [https://metrocog-ss4a-fmcog.hub.arcgis.com/]. A HIN consists of roadway corridors where a majority of severe crashes are occurring and serves to prioritize high risk locations and guide safety investments in the region. This moves beyond typical historical crash analysis and allows for a better description of the types of roadways and intersections in the Fargo-Moorhead area where users are the most at risk. This analysis included all roadways within Metro COG's boundaries except for interstate highways,

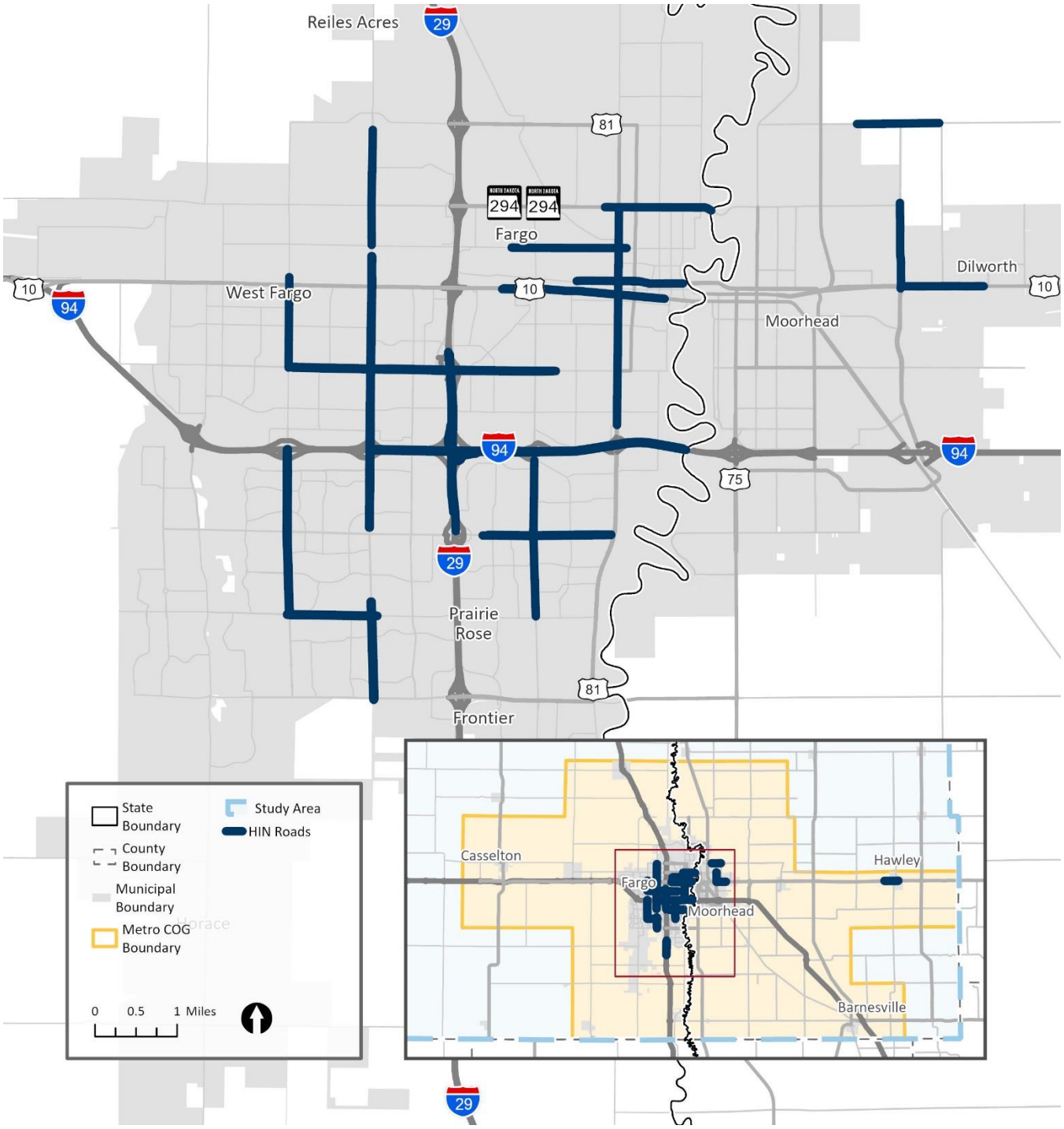
What is a High Injury Network?

The HIN identifies streets or locations where a high number of severe crash concentrations have occurred along a corridor-level segment for the most recent 5-year period (2018-2022). The high injury network represents a prioritized subset of Metro COG's overall regional transportation network, focusing on streets with the highest prevalence of severe crashes.

which were excluded from the analysis. The HIN systematic analysis allows Metro COG and partners to proactively work to minimize the occurrence and severity of crashes into the future.

To determine inclusion in the HIN, minimum thresholds were set high enough to imply a spatial pattern of severe crashes. The purpose of this is to ensure that the high priority locations in the HIN are not driven by just one severe crash. In general, the HIN represents composite crash score thresholds of 6.0 for all modes or above, which equates to the equivalent of at least two life-changing crashes per mile over the past five years. (See **Appendix 3** for the HIN Methodology.) For Metro COG, severe crashes are greatly concentrated in the urbanized area.

Figure 13 All Mode High Injury Network



Highest crash scores are concentrated on:

- 13th Avenue S. from 21st Street S. to 9th Street E.

- 45th Street from Main Avenue to 23rd Avenue S.
- University Drive from 19th Avenue N. to 13th Avenue S.
- Main Avenue from Broadway to 18th Street.

Crash Profiles

In addition to the development of a HIN, this plan also developed crash profiles, which compares typologies of geographically similar roadways along with common crash types. These crash profiles considered various crash attributes, roadway characteristics, and land use context to identify the most prevalent factors of severe crashes to better inform implementation recommendations. Crash profiles represent sub-groupings of roadways that form part of the HIN.

The three identified crash profiles include:

- Confined Residential Arterials
- Downtown Arterials
- Multilane Arterials

Confined Residential Arterials

Typical Characteristics: On-street parking, adjacent land use mostly residential, 3 or fewer lanes, narrower right of way, dense access point spacing, low speed limit (30-35 mph)

Downtown Arterials

Typical Characteristics: On-street parking, mixed land use (retail, dining, offices), 2-4 lanes, narrower right of way, moderate access point spacing, low speed limit (30-35 mph)

Multilane Arterials

Typical Characteristics: No on-street parking, adjacent land use usually large-scale retail, residential, or office space, 3+ lanes (often divided by median), very wide right of way, sparse access point spacing, higher speed limit (30-55 mph)

Table 3 shows typical attributes by crash profile for fatal and severe injury (KA) crashes.

Table 3 Crash Profiles

Crash Profile	# of KA Crashes	% of Crash Profile KA Crashes
Confined Residential Arterials	15	--
Passenger vehicle crashes at intersections	7	47%
Drivers (in passenger vehicles) failing to yield to cyclists and pedestrians at intersections	4	27%
Intoxicated drivers	7	47%
Downtown Arterials	11	--
Drivers (in passenger vehicles) failing to obey signal or yield to other drivers at signalized intersections	5	45%
Drivers (in passenger vehicles) speeding	5	45%
Intoxicated road users	2	18%
Multilane Arterials	73	--
Passenger vehicle crashes at intersections	32	44%
Bicycle and pedestrian crashes at intersections	7	10%
Bicycle crashes on roads with no bicycle facilities	4	5%
Motorcyclists speeding or driving recklessly	6	8%
Drivers (in passenger vehicles) speeding	13	18%

Transportation Equity Review

The Transportation Equity Review examines vulnerable populations in the Fargo-Moorhead Area which includes all of Cass County, North Dakota and Clay County, Minnesota. Vulnerable populations are people more susceptible to impacts caused by the transportation system. In the Fargo-Moorhead area for example, a family with no vehicle or dependent-aged residents who cannot drive may face higher risk walking or biking across an intersection or street, just to go

about their daily lives or meet essential needs. The Transportation Equity Review identifies several key indicators of vulnerability and disadvantage, introduces a preliminary prioritization process based on equity considerations, and summarizes how transportation safety improvement projects will positively impact vulnerable populations.

What does Equity Mean?

According to the U.S. Department of Transportation, equity in transportation seeks fairness in mobility and accessibility to meet the needs of all community members. A central goal of transportation is to facilitate social and economic opportunities by providing equitable levels of access to affordable and reliable transportation options based on the needs of the populations being served, particularly populations that are traditionally disadvantaged.

Does Equity Apply to the Fargo-Moorhead Area?

Yes. In accordance with Metro COG's Title VI Non-Discrimination Plan, the organization provides guidance to consider the participation and mobility of vulnerable and disadvantaged populations during the metropolitan transportation planning and programming process. The organization identifies two critical ways in which to consider said participation and mobility: (1) Public outreach and engagement with vulnerable and disadvantaged populations; and (2) Geospatial socioeconomic analysis of the location of vulnerable and disadvantaged population concentrations relative to regional travel patterns, employment and services, including future employment and services.

Metro COG currently identifies two specific vulnerable population groups, defined by the organization as environmental justice (EJ) areas including:

- Low-Income Population
  - Defined in Census Block Groups with an annual median household income less than $21,624 in 2024 (regionally-adjusted threshold).
- Minority Population
  - Defined in Census Blocks with minority populations equaling or exceeding 25 percent.

The Safety Action Plan aligns closely with the guidance established by: (1) following Metro COG's *Public Participation Plan* to provide inclusive and meaningful engagement; and (2) including a Transportation Equity Review to analyze where various vulnerable and disadvantaged populations are located across the region. The Safety Action Plan's Transportation Equity Review provides a more robust analysis, expanding upon Metro COG's EJ area identification.

Metro COG Equity Analysis

Expanding on the Metro COG's defined EJ Areas, the organization also reviewed the Climate and Economic Justice Screening Tool (CEJST) from the US Council on Environmental Quality, the Equitable Transportation Community (ETC) Explorer from the US Department of

Transportation, and 2018-2022 five-year data from the US Census Bureau's American Community (ACS).

- Climate and Economic Justice Screening Tool (CEJST)
  - The White House published tool provided to screen for Justice40 disadvantaged communities, provides an interactive web application utilizing Census Tract geographies and data to present cumulative disadvantages and vulnerabilities. CEJST designation of disadvantaged areas is considered the official designation of disadvantaged community, when pursuing SS4A implementation grants and/or other Federal discretionary grant programs. There are eight components tracked by the CEJST:
    - Climate Change
    - Energy
    - Health
    - Housing
    - Legacy Pollution
    - Transportation
    - Water and Wastewater
    - Workforce Development

- Equitable Transportation Community (ETC) Explorer
  - The USDOT published tool provides an interactive web application utilizing Census Tract geographies and data to present cumulative disadvantages and vulnerabilities. There are five components tracked by ETC Explorer:
    - Transportation Insecurity
    - Climate and Disaster Risk Burden
    - Environmental Burden
    - Health Vulnerability
    - Social Vulnerability
- American Community Survey (ACS) Data
  - Outside of the federal screening tools such as CEJST and ETC Explorer, Metro COG utilized the US Census Bureau's 2018-2022 five-year ACS datasets. The organization identified key indicators to analyze in the Transportation Equity Review:
    - Zero Vehicle Households
    - Disabled Population
    - Median Household Income
    - Housing Cost Burden
    - Commute Time
    - Single-Parent Households
    - Veteran Population
    - Population Aged Younger Than 18 years
    - Population Aged 65 Years or Older
    - Non-White or Minority Population
    - Limited English Proficiency Population
    - Population Below Poverty Line
    - Areas of Persistent Poverty (APP)
    - Historically Disadvantaged Communities (HDC)

Equity Considerations and Prioritization

Metro COG used the Federal screening tools and ACS data to review and score Census Block Group geographies with an equity prioritization score. There were 18 factors considered when assigning geographies with the prioritization score, the equation of which is shown below:

(ETC components above 65-percentile threshold) [max. of 5 points] +

(ETC designation as 'Disadvantaged Community') [max. of 1 point] +

(APP designation and/or HDC designation) [max. of 2 point] +

(Census indicators higher than highest rate of comparison) [max. of 18 points]

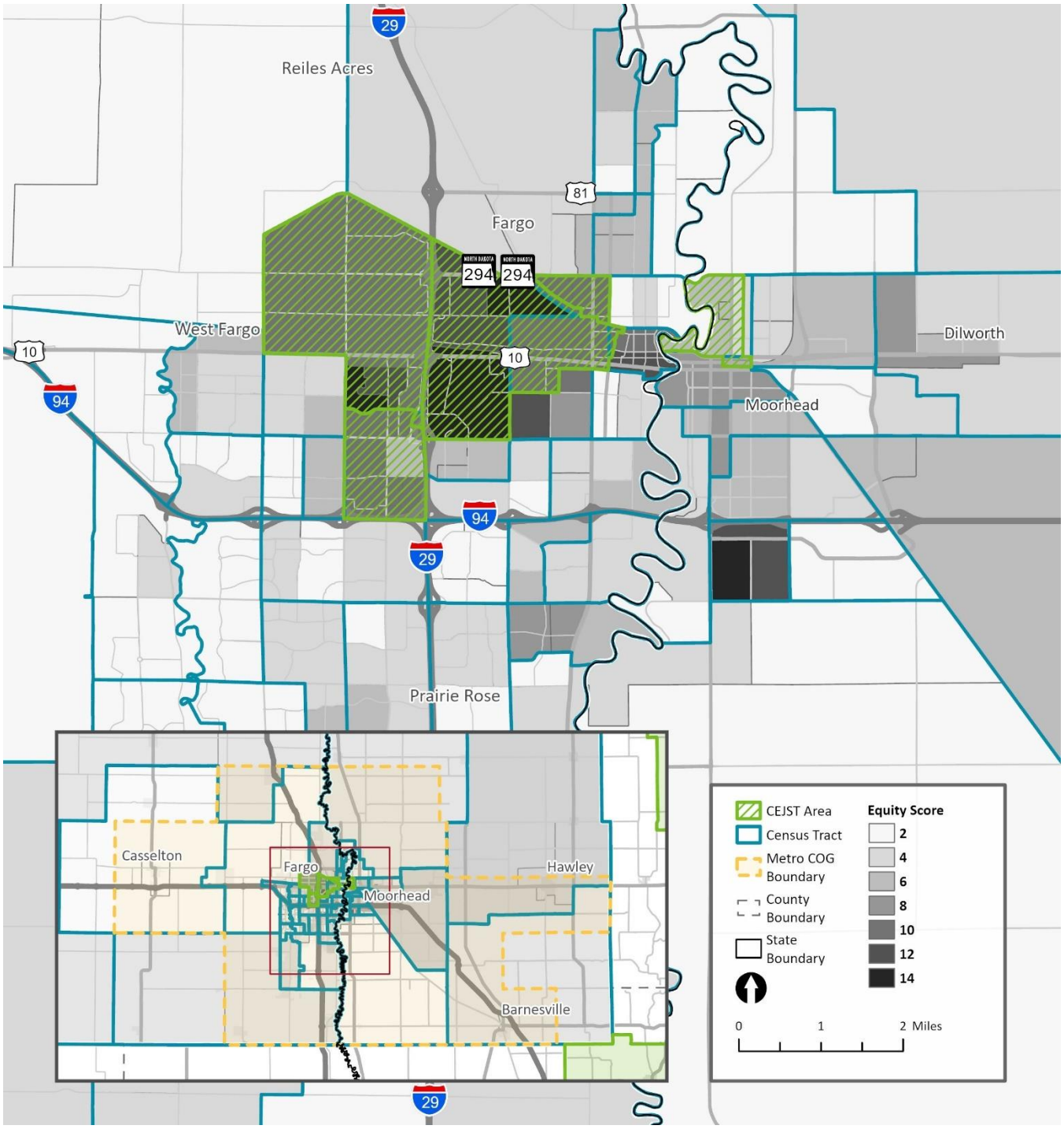
= Equity Score

Figure 14 highlights the equity score of each geography overlayed by the CEJST. Metro COG's equity prioritization methodology will be used to identify potential locations where future multimodal roadway safety investments could be made.

Proposed implementation strategies will positively impact disadvantaged and vulnerable populations within the Fargo-Moorhead Area. Strategic safety countermeasures on roadways and intersections will increase safety for travelers, helping to ensure people can go about their daily lives without being put at a higher risk for going wherever and however they travel. By reducing the risks associated with 'high injury' locations in the region, safety will be improved to ensure equitable accessibility to destinations for vulnerable and disadvantaged people. The multimodal transportation network improvements will enhance the safety of all residents and visitors from all walks of life to meet basic needs, go to work, get an education including higher education, participate in cultural events, receive healthcare, and ultimately sustain a higher quality of life in the Fargo-Moorhead Area.

For more information on the Equity Analysis methodology and results, see **Appendix 4**.

Figure 14 Comparison of USDOT (CEJST) and Metro COG Equity Areas



CHAPTER 5 SAFETY STRATEGIES AND TOOLKIT

Metro COG identified the following countermeasures for consideration to address the region's high-risk themes (See crash profiles for more information). The countermeasures include data-driven and proven safety strategies from Federal Highway Administration (FHWA) Proven Safety Countermeasures, FHWA Step Guide for Improving Pedestrian Safety at Uncontrolled Intersections, and Crash Modification Factor Clearinghouse. The Technical Coordinating Committee and communities within the region also provided input on potential countermeasures they would consider; therefore, consolidating the list to a focused toolkit. Each countermeasure addresses at least one of the high-risk themes identified in the crash profiles. See the following chapter (Chapter 6 Road to Zero) for the systematic implementation of these countermeasures.

Engineering Countermeasures

Metro COG and the communities within the region may consider the following engineering design countermeasures to address high priority locations identified within this plan.

Table 4 Urban Safety Strategies

Urban Safety Strategies								
Intersections	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Segments**	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Pedestrian**	**Estimated Implementation Cost**	**Estimated Effectiveness**
Roundabout / Mini Roundabout	High ($1,800,000 to $2,400,000)	High (78-82% crash reduction)	**Corridor Access Management**	High ($360,000 per mile)	Moderate (25-31% crash reduction)	**Rectangular Rapid Flashing Beacons**	Low ($15,000)	Moderate /High (47-75% crash reduction)
Dedicated Left / Right Turn Lanes	High ($250,000)	Low / Moderate (14-26% crash reduction)	**Road Diet (Lane Reconfiguration)**	Moderate / High (25,000 to $100,000)	Low / Moderate (19-47% crash reduction)	**Curb Extension**	Moderate / High ($50,000 to $100,000)	Moderate (30% crash reduction)
Backplates with Retroreflective Borders	Low ($4,000)	Low (15% crash reduction)	**Bicycle Lanes / Boulevard**	Low ($1,000 to 11,000 per mile)	Moderate (30-49% crash reduction)	**Pedestrian Refuge Islands**	Low / Moderate ($2,140 to $41,170 per mile)	Low (14% crash reduction)

Urban Safety Strategies								
Intersections	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Segments**	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Pedestrian**	**Estimated Implementation Cost**	**Estimated Effectiveness**
Flashing Yellow Arrow	Moderate ($50,000 to $100,000)	Moderate (37% crash reduction)	**Median Barriers**	Moderate ($25,000 to $50,000)	High (44-56% crash reduction)	**Sidewalks**	Moderate ($80,0000 per mile)	Moderate (40% crash reduction)
Lighting	Low	Low	**Variable Speed Limits**	Low	Moderate (34% crash reduction)	**Pedestrian Countdown Timers**	Low ($12,000)	Low (9% crash reduction)
No Right Turn on Red	High ($100,000)	Not available	**Dynamic Speed Feedback Sign**	Moderate ($30,000 per location)	Low (5-7% crash reduction)	**In-Street Pedestrian Crossing Sign**	Low ($240 per sign)	Not available
Removed Sightline Obstructions	Not available	Moderate (38% crash reduction)	**Appropriate Speeds**	Low	Moderate (26% decrease in fatalities)	**Pedestrian Hybrid Beacons**	High ($100,000 to $170,000)	High (69% crash reduction)
Retroreflective Strips on Stop Sign Posts	Low ($2,500)	Not available	**Reduced Lane Widths**	Low ($2,000 to $25,000)	High	**Parking Restriction on Crosswalk Approach**	Low ($15,000)	Low (20% crash reduction)
Advanced "Yield Here" Sign and Stop Bar	Low ($300 per sign)	Moderate (25% crash reduction)				**Leading Pedestrian Interval**	Low	Low

Table 5 Rural Safety Strategies

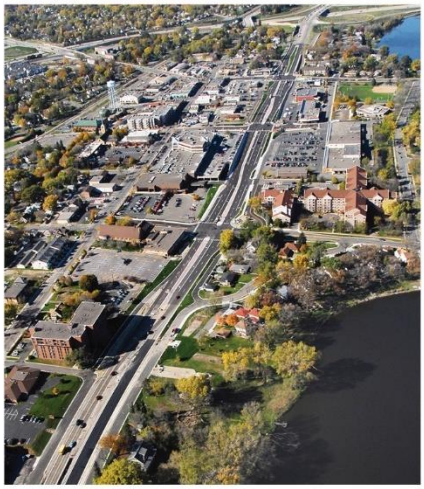
Rural Safety Strategies								
Intersections	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Segments**	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Curves**	**Estimated Implementation Cost**	**Estimated Effectiveness**
Restricted Crossing U-Turn	High ($750,000 per intersection)	Moderate / High (35-71% reduction in crashes)	**Safety Edge**	Low	Moderate (34.5% reduction in crashes)	**Dynamic Curve Signing**	Low / Moderate ($20,000 to $40,000)	Moderate (44% reduction in crashes)
Roundabout	High ($1,800,000 to $2,400,000)	High (78-82% crash reduction)	**Centerline Rumble Strip**	Low	Moderate	**Chevrons**	Low	Low
High Friction Surface Treatment (Hfst)	High	Moderate	**Enhanced Edgeline (6" and 8")**	Low ($9,000)	Low (18% crash reduction)	**High Friction Surface Treatment (Hfst)**	High	Moderate
All-Way Stop / Yield	Low	High	**Clear Zone Maintenance / Enhancements**	Not available	Not available	**Paved Shoulders**	Low ($5,000 per mile)	Moderate (30-49% crash reduction)
Removed Skew / Realigned Intersections	High	Moderate	**Ditch / Embarkments / Side Slope Improvements**	Not available	Not available	**Upgraded Signs / Oversized Regulatory Signs**	Low	Not available

Rural Safety Strategies								
Intersections	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Segments**	**Estimated Implementation Cost**	**Estimated Effectiveness**	**Curves**	**Estimated Implementation Cost**	**Estimated Effectiveness**
Continuous Green T	High	Low	**Shoulder / Edge Line Rumble Strip**	Low	Moderate	**Roadside Barrier / Guardrail**	Not available	Not available
Streetlights	Low ($4,800 per streetlight)	Moderate (42% crash reduction)	**Upgraded Signs / Oversized Regulatory Signs**	Low	Moderate (54% crash reduction)	**6" or 8" Pavement Markings**	Not available	Not available

Priority strategies are described in more detail in Table 6.

Table 6 Priority Strategies

Corridor Access Management



Cost:
Varies depending on a length of roadway and number of driveways.

Purpose:
Access management reduces conflict points by consolidating access points.

Effectiveness:
Reducing driveway density:
5-23% reduction in total crashes along 2 lane rural roads.

25-31% reduction in fatal and injury crashes along urban/suburban arterials.

Road Diet (Lane Reconfiguration)

Cost:
About 25,000 to $100,000 per mile.

Purpose:
Reconfigured roadway to change the total number of lanes. Typically, an existing 4-lane undivided roadway is changed to a 3-lane roadway with a two-way left turn lane.

Effectiveness:
4-lane to 3-lane, Road diet conversions:
19-47% reduction in total crashes

Bicycle Lanes / Boulevard

Cost:
$1,000 to $11,000 per mile of striping.

Purpose:
Dedicated bicycle lane on a vehicular roadway.

Effectiveness:
Bicycle lane additions can reduce crashes up to:

49% for total crashes on urban 4-lane undivided collectors and local roads.

30% for total crashes on urban 2-lane undivided collectors and local roads. Separated bicycle lanes may provide further safety benefits.

Rectangular Rapid Flashing Beacons

Cost:
$15,000 per unit.

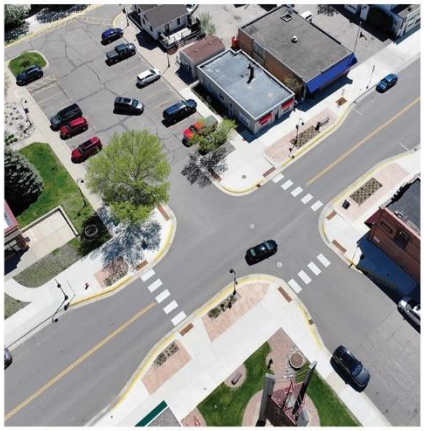
Purpose:
RRFBs can be added to all non-signalized crossings to increase awareness of drivers of crossings traffic by flashing lights when the system is activated either by push button or permissive detection.

Effectiveness:

75% of drivers yield to pedestrians.

47% reduction in pedestrian crashes.

Curb Extension



Cost:
$50,000 to $100,000.

Purpose:
Curb extensions and bump-outs are an extension of the sidewalk in the roadway to decrease the crossing distance and improve pedestrian visibility to drivers.

Effectiveness:

30% reduction in total crashes.

Source: https://www.dot.state.mn.us/complete-streets/case-studies/annandale-hwy24.html

Pedestrian Refuge Islands

Cost:
$2,140 to $41,170 per island depending in the design, site and construction project.

Purpose:
Median space in the roadway where pedestrians have protection from vehicular traffic.

Effectiveness:
14% reduction in total crashes.

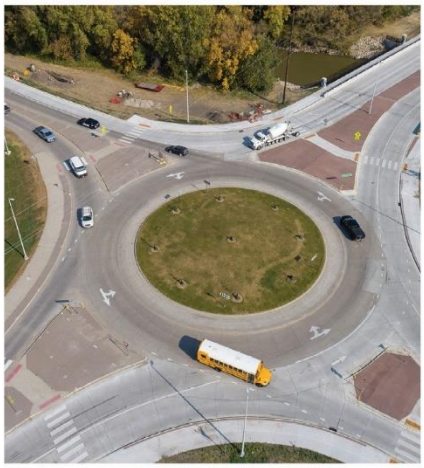
Restricted Crossing U-Turn

Cost:
$750,000 per intersection.

Purpose:
Restricted crossing intersections decrease the amount of conflict points caused by traditional left turns and require drivers to take a right and U-turn rather than a left-turn.

Effectiveness:
35% reduction in fatal and injury crashes.
71% reduction in severe crashes.

Roundabout



Cost:
$1.8 to $2.4 million.

Purpose:
A circular intersection where traffic flow is slowed and severe conflict points are reduced.

Effectiveness:
Two-way stop intersection to a roundabout:
82% reduction in fatal and injury crashes.
Signalized intersection to a roundabout:
78% reduction in fatal and injury crashes.

Safety Edge

Cost:
Less than 1% of total paving cost.

Purpose:
Paving roadway edge with an angle rather than a straight edge that drops off.

Effectiveness:
34.5% reduction in drop-off-related crashes on two-lane rural highways.

Dynamic Curve Signing

Cost:
$20,000 to $40,000.

Purpose:
Dynamic curve signing is blinking chevron signs used along curves to inform drivers of the upcoming curve in the road.

Effectiveness:
44% reduction in total crashes.

Non-Engineering Countermeasures

Not all approaches to improving roadway safety in the Fargo-Moorhead Area include physical improvements or changes to the system. A theme for non-engineering countermeasures to improving roadway safety is ongoing diligence on the part of Metro COG and its partners in having a comprehensive approach to roadway safety. These solutions are vital components of a comprehensive safety strategy. These measures focus on policy, education, enforcement, and community engagement, aiming to foster a culture of safety and awareness among all road users.

Corridor Studies

A corridor study is a planning project that characterizes and evaluates roadway conditions, whether existing or for the future. The goal of the study is to provide recommendations for infrastructure projects that address concerns highlighted by the study. Once the corridor study is adopted, implementation can begin which can lead to funding for the project, additional studies and/or policy updates.

Speed Management

Speed management programs provide a framework on how to create a safe environment for all road users across a specific road network. A speed management program aims to address factors that influence speeding. This includes user behavior, roadway design, land use, traffic behavior and law enforcement. Along with identifying issues, countermeasures are to be identified that are effective in management speeds. The outcome of developing the plan is to evaluate the effectiveness of the solutions and thus reduce speeding-related fatalities and injuries as well as increasing the safety experience for all road users.

Lighting Management

Lighting management programs create a plan to strategically place lighting infrastructure for the benefit of all road users. Lighting management plans particularly emphasize resolving pedestrian safety issues as this vulnerable user group is at significant risk during the night. Once implemented, lighting infrastructure will provide a visual environment that is safe for road users during hours of darkness. Lighting management plans may also consider and investigate using new lighting technology to enhance the safety of the network.

New Education Campaign

A new education campaign helps connect people to their transportation options which leads to the promotion of safety and wellbeing of all users. Key services of a campaign may include social media, graphic design, web development and in person engagement as well as research and innovation to involve stakeholders in the deployment of a new or existing program, policy, or infrastructure improvement.

Road Safety Audit

A Road Safety Audit estimates and reports road safety issues as well as identifying specific improvements for all road users. A team independent from the project conducts the audit. Road safety audits may specifically focus on vehicles, pedestrians, motorcycles or a specific combination of users. Road user capabilities and limitations are essential for a road safety audit. These audits can be utilized at any stage in the project development process.

Road safety audits can be used for projects ranging from minor to major in size.

Pedestrian Education/Visibility

The visibility of pedestrians can be affected by obstructed views, lighting conditions, and parked vehicles. The safety issues that arise from this can be resolved with pedestrian education campaigns that engage the community in the planning process to make the transportation network more visible and safer to all road users. Brochures, news articles, social media announcements and videos, and poster materials can be developed to educate road users about pedestrian safety to improve user experience.

Safe Routes Studies

"Safe Routes to School" has been a longstanding program that uses a variety of education, engineering and enforcement strategies that help make routes safer for children to walk and bicycle to school and encouragement strategies to entice more children to walk and bike. Various Metro COG Safe Routes to School plans have identified improving walking and biking access to schools as a priority.

Based on public input and analysis of crash data, a Safe Routes to School is highlighted as a potential countermeasure to consider in this Plan that will improve walking and biking access near schools. However, additional infrastructure improvements and other strategies may be necessary to improve walking and biking access to schools and parks. Allocating additional funding at the local level to supplement programming and infrastructure development is a possible strategy for Metro COG to pursue.

HIN Corridor Enhanced Enforcement

The high injury network (HIN) developed through this Plan's in-depth analysis of crash data provides an opportunity to focus not only on engineering countermeasures, but also non-engineering countermeasures, such as focused law enforcement and traffic monitoring efforts.

Community-Based Safety Workshops

Community-based safety workshops bring together residents, local businesses, and community organizations to discuss transportation safety concerns and solutions. These workshops include hands-on activities such as bicycle safety checks, pedestrian safety drills, and interactive demonstrations on safe driving practices.

Collaborative Safety Partnerships

Through partnerships with local businesses, schools, non-profits, and healthcare providers, promote a culture of safety across the community. Collaborative efforts include hosting safety awareness days, creating public service announcements, and offering transportation safety training sessions tailored to specific groups such as young drivers and senior citizens.

Motorcycle Awareness Campaigns

A series of motorcycle awareness campaigns are aimed at both motorcyclists and other road users. These campaigns focus on educating motorcyclists about safe riding practices, such as wearing helmets and protective gear,

maintaining a safe speed, and using defensive driving techniques. Additionally, the campaigns educate drivers of other vehicles about the importance of being vigilant for motorcycles, understanding their vulnerability on the road, and providing them with sufficient space.

Improving Traffic Records and Coordination

Capturing accurate and thorough crash data is a constant challenge experienced nationally. Although accuracy can be improved by automating crash data with the use of cameras that capture images of violations or crashes; the use of cameras is controversial. In 2024, Minnesota legalized a pilot program to use traffic cameras for speed management on a limited basis.

The coding and classification of crash data can also be assessed and improved by making training programs available for law enforcement to report on bicycle and pedestrian crashes as well as racial demographics. This can also include the expansion of data attributes to identify more information about the given crash. Near miss incidents are another major gap in our understanding of roadside safety. Near miss reporting can improve the understanding of how the circumstances of a crash can arise. Continued coordination is also necessary with law enforcement, emergency medical services, and hospital records.

Demonstration Projects

Demonstration projects use materials such as plastic bollards and paint to temporarily make a change to a roadway, to show what future changes may look like to public agencies, partners, and the public. They are designed for the short-term, and the cost of a demonstration project is significantly less than a final infrastructure project. Demonstration projects are useful as stakeholders can evaluate the project before making any permanent infrastructure changes. These projects also inspire action, help gather data and increase public engagement. See MnDOT Demonstration Project Implementation Guide, 2019 for more information on best practices for a quick-build approach.

Traffic calming demonstration

Traffic calming demonstration projects may include using temporary materials to create a median island, traffic circle, or a parklet to reduce or slow traffic in the short-term. The goal of the demonstration may also aim to increase the safety of active transportation methods. To evaluate the effectiveness, surveys, interviews, and counts may also be recorded during the process.

Bike lanes/ trail demo

Using temporary materials, bike lanes can be added by creating a buffer to prevent cars from utilizing the given demo project's location. Materials may include paint, tape, bike lane-related signs, or flexible posts for separated bike lanes. Existing lanes for automobiles can also be

reduced to make space for a bike lane demonstration project. Bike lane demos are generally low-cost.

Midblock crosswalk installation demo

Midblock crosswalks can be demonstrated using spray paint. The crosswalk markings may be applied to a project location where pedestrian traffic is anticipated and encouraged. The goal of the project is to see if the crosswalk will reduce potential conflicts between motorists and pedestrians. The effectiveness of a midblock crosswalk demo can be evaluated by driver stop/yield compliance, interviews, and surveys.

CHAPTER 6 ROAD TO ZERO

Growing Safety Culture within Metro COG

Foundational change has already begun within Metro COG. Through the process of creating this plan, Metro COG engaged communities within the region to continue to identify opportunities to address transportation safety and change the safety culture.

Plan Leadership and Structure

Metro COG, in coordination with local jurisdictions, assumes leadership of the Regional Comprehensive Safety Action Plan and its vision Metro COG and members of the Transportation Technical Committee will evaluate the data and review the components of the Regional Comprehensive Safety Action Plan. Metro COG will also continue to collaborate with partners at the local, county, and state levels in support of data-driven safety priorities and implementation.

The cultural actions listed below in Table 7 will support the region's vision to achieve zero traffic deaths and severe injuries on streets within the Fargo-Moorhead Area with a specific goal of 39 or fewer fatalities and serious injuries by 2040. Further, they will serve as the groundwork for the implementation of countermeasures identified through this Safety Action Plan's prioritization process.

Table 7 Cultural Actions

#	Action	Timeline
CA.1	Metro COG Policy Board adopts this Regional Comprehensive Safety Action Plan and its safety goal	Q4 2024
CA.2	Share the Regional Comprehensive Safety Action Plan analysis including GIS data to all local agencies within the region for local analysis and identification of countermeasures to implement.	Q4 2024
CA.3	Continue to engage Metro COG's Transportation Technical Committee to monitor progress on the Regional Comprehensive Safety Action Plan.	Continuous
CA.4	Update High-Injury Network (HIN) map and adjust thresholds annually per guidance and best practices found in Appendix 3.	Continuous
CA.5	Maintain dashboard and other resources so that local agencies and the general public have easy access to data to conduct analysis	Continuous
CA.6	Coordinate joint regional applications to address regional roadway safety priorities to include an application for the Safe Streets and Roads for All Grant program	Q1 2025
CA.7	Identify safety scoring considerations to incorporate the results of this plan into local program and project funding.	Q1 2025
CA.8	Incorporate the HIN and Crash Profiles into long range transportation planning.	Continuous
CA.9	Continue to update datasets and evaluate crash data for future plan updates.	Continuous

Putting the Toolkit into Action

Based on the results of the analysis, the proven engineering and non-engineering countermeasures listed in Table 4 were identified as potential safety improvements to consider when addressing the crash profiles. The potential countermeasures were based on FHWA's Proven Safety Countermeasures and reviewed with Metro COG staff and the SRC.

Table 8 Potential Countermeasures by Crash Profile

Crash Profile	Type	Engineering Countermeasure	Non-Engineering Countermeasure
Confined Residential Arterials			
Located within residential areas and typically have lower speed limits (usually 30-35 mph). Designed to prioritize local access over through traffic.	Intersection	• Mini Roundabout • All-Way Stop / Yield • LED Stop Signs / Flashing Beacon Stop Signs • No Right Turn on Red • Retro Reflective Strips on Stop Sign Posts • Remove Skew / Realign Intersections • Streetlights • Advance "Yield Here" Sign and Stop Bar	• Community-Based Safety Workshops • Pedestrian Education / Visibility • Speed Management • Safe Routes Studies • New Education Campaign • Traffic Calming Demonstration
	Segment	• Reduced Lane Widths • Corridor Access Management • Road Diet (Lane Reconfiguration) • Dynamic Speed Feedback Sign • Safety Edge • Enhanced Edge line (6" and 8") • Clear Zone Maintenance/Enhancements • Upgraded Signs / Oversized Regulatory Signs	
	Pedestrian	• Curb extension • Sidewalks • Parking Restriction on Crosswalk Approach • Rectangular Rapid Flashing Beacons • In-Street Pedestrian Crossing Sign • Pedestrian Countdown Timers • Leading Pedestrian Interval • Upgraded Signs / Oversized Regulatory Signs	

Downtown Arterials			
Found in central business districts, these roads typically have lower speed limits (usually 30-35 mph). Designed to accommodate high pedestrian traffic and mixed-use activities.	Intersection	• Roundabout / Mini Roundabout • Dedicated Left / Right Turn Lanes • Flashing Yellow Arrow • Lighting • No Right Turn on Red • Removed Sightline Obstructions • Retro Reflective Strips on Stop Sign Posts • Advanced "Yield Here" Sign and Stop Bar • All-Way Stop / Yield • Streetlights • High Friction Surface Treatment (HFST)	• Collaborative Safety Partnerships • Pedestrian Education / Visibility • HIN Corridor Enhanced Enforcement • Lighting Management • Bike Lanes / Trail Demo • Midblock Crosswalk Installation Demo
	Segment	• Corridor Access Management • Road Diet (Lane Reconfiguration) • Bicycle Lanes / Boulevard • Variable Speed Limits • Dynamic Speed Feedback Sign • Reduce Lane Widths • Safety Edge • Enhanced Edge line • Centerline Rumble Strip • Shoulder / Edge line Rumble Strip • Upgraded Signs / Oversized Regulatory Signs	
	Pedestrian	• Medians and Pedestrian Refuge Islands • Sidewalks • Rectangular Rapid Pedestrian Countdown Timers • Pedestrian Hybrid Beacons • Parking Restriction on Crosswalk Approach • Leading Pedestrian Interval Lighting • Upgraded Signs / Oversized Regulatory Signs • Paved Shoulders	
Multilane Arterials			
	Intersection	• Roundabout • Dedicated Left/Right Turn Lanes	

Multiple lanes in each direction, with higher speed limits (usually between 30-55 mph) and higher traffic volumes. Designed to accommodate higher speeds and a larger volume of vehicles.		• Backplates with Retroreflective Borders • Flashing Yellow Arrow • Lighting • Removed Sightline Obstructions • Retro Reflective Strips on Stop Sign Posts • Restricted Crossing U-Turn • Advance "Yield Here" Sign and Stop Bar • Removed Skew / Realigned Intersections • High Friction Surface Treatment (HFST) • Streetlights	• Corridor Studies • Road Safety Audit • Speed Management • Improving Traffic Records and Coordination • Motorcycle Awareness Campaigns • Demonstration Projects • Safe Routes Studies • Lighting Management • New Education Campaign
	Segment	• Corridor Access Management • Road Diet (Lane Reconfiguration) • Median Barriers • Variable Speed Limits • Dynamic Speed Feedback Sign • Reduced Lane Widths • Safety Edge • Centerline Rumble Strip • Shoulder / Edge line Rumble Strip • Enhanced Edge line (6" and 8") • Clear Zone • Maintenance / Enhancements • Ditch / Embankments / Side Slope Improvements • Speed Safety Cameras • Upgraded Signs / Oversized Regulatory Signs	
	Pedestrian	• Medians and Pedestrian Refuge Islands • Pedestrian Hybrid Beacons • Rectangular Rapid Flashing Beacons • Sidewalks • Pedestrian Countdown Timers • Parking Restriction on Crosswalk Approach Lighting • High Friction Surface Treatment (HFST) • Upgraded Signs / Oversized Regulatory Signs	

Project Prioritization Criteria

The infrastructure investments needed to address safety issues within the Fargo-Moorhead Area likely exceed annual budgets, so Metro COG will need to prioritize locations and strategies to implement first. Metro COG will use the following project prioritization criteria to determine the highest priority projects. These metrics take into account the severity of crashes, location in relation to the HIN and environmental justice populations, as well public engagement.

Table 9 Project Prioritization Criteria

Metric	Weight
Number of Fatal and Severe Injury (KA) Crashes	30%
On the overall HIN	25%
Equity Score	20%
Total Crashes	15%
Number of Unsafe Location Comments from the Public	10%
Total	**100%**

Measuring and Reporting Progress

Evaluation and Tracking

Metro COG will develop an annual report to evaluate progress toward this plan's vision and safety goal. The yearly reporting will be posted on Metro COG's website and will include the status of project implementation and the most recent crash statistics. The Transportation Technical Committee will convene annually to review the annual report.

Specific performance measures will include:

- Number fatal and serious injury crashes by modes and locations
- Number of safety engineering projects implemented by type of strategy, location, and investment amount
- Number of non-engineering countermeasures implemented by type of strategy, location (if applicable), and investment amount

From the date of adoption, Metro COG will revise the goal, countermeasures, and actions or fully update the Regional Comprehensive Safety Action Plan every five years to ensure the data evaluation is up to date and reflects the evolving policies, programs and projects within the region.

APPENDIX 1 – LITERATURE & POLICY REVIEW

Memorandum

SRF No. 16766

To: Adam Altenburg
Metro COG

From: SRF Consulting Group

Date: November 16, 2023

Subject: Literature & Policy Review - Metro COG Regional Comprehensive Safety Action Plan

Task 4: Literature & Policy Review

Introduction

The Literature & Policy Review examines the current transportation safety planning practices employed by other Metropolitan Planning Organizations (MPOs) and local, county, and regional governments within the Fargo-Moorhead region.

Executive Summary - Key Takeaways

- Transportation safety plans and policy is driven by roust data-driven processes to identify crash trends.
- Safety planning includes robust public engagement and outreach during and after plan development.
- Plans can be policy specific, implementation specific, or a combination of the two and most are updated on an annually or every 5-years.
- Crash trends change over time – trends can look differently from jurisdiction to jurisdiction.
- Emerging incorporation of the people involved, the community, and how traffic safety impacts communities including vulnerable populations.
- Success to forward safety is driven by:
- Explicit crash and community analysis results,
- Focused policy and implementation targets based on results, and explicit policy and project recommendations which are proven/shown to have an impact on traffic safety in communities.

Metro COG Safety Policy

Metro COG's current safety policy comes directly from the organization's adopted Metropolitan Transportation Plan (MTP).

- **Metro Grow: 2045 Fargo-Moorhead Metropolitan Transportation Plan**

Goal
System Safety & Security – Provide a transportation system that is safer for all users and resilient to incidents.

Objectives	Project Prioritization Metrics
Reduce the number and rate of crashes.	Review crash modification factors to determine potential project impact on safety categories.
Reduce the number and rate of serious injury and fatal crashes.	
Reduce the number of bicycle and pedestrian crashes.	
Reduce the number of bus-involved crashes.	Project has potential to reduce bus-involved crashes along an existing bus route.
Identify strategies to make transportation infrastructure more resilient to natural and manmade events.	Project has potential to reduce flooding or other hazard risk.
Policy Objective: collect better bicycle and pedestrian data for future planning efforts.	Policy Objective. Could provide bonus points to projects that include bike and pedestrian counting technology.
Policy Objective: improve transit system security.	Policy Objective. No project scoring.

- **Performance Measure 1 (PM1) - Safety**
    - Metro COG is required to establish quantifiable targets for performance measures, including PM1-Safety. Metro COG sets safety targets annually to track progress and make necessary adjustments to targets. Targets include:
        - Number of fatalities
        - Rate of fatalities
        - Number of serious injuries

  - Rate of serious injuries
  - Number of non-motorized fatalities and serious injuries

- **Complete Streets Policy**
  - Metro COG's complete streets policy was adopted in 2010.
  - Consistent with federal guidance and regulation, Metro COG's complete streets policy incorporates safety of all roadway users as a primary component.
  - Policy Statement: Complete Streets is an on-going and comprehensive planning, design, construction, and operations process, with a long-range perspective, aimed at improving safety, usability, and quality of life. By embracing Complete Streets, Metro COG seeks to plan and program public rights-of-way that fully integrate and balance the needs of all street users, including bicyclists, pedestrians, transit users, commercial vehicles, emergency services vehicles and passenger vehicles. Users of all ages and abilities will be considered. The Complete Streets process will apply to street projects, including construction, reconstruction, and maintenance. Because Complete Streets are context sensitive, a Complete Street in one neighborhood may look very different from a Complete Street in another neighborhood, but both are designed to balance the safety and convenience for everyone using the public right-of-way. Successful achievement of this vision will result in the creation of a complete transportation network for all modes of travel (as opposed to trying to make each street perfect for every traveler), and may result in fewer crashes, lower severity crashes, improved public health, less air, water, and noise pollution, as well as lower overall transportation costs for the public and for their governing bodies.

What are other Agencies doing?

- **2021 Peer Exchange**

Results from peers in 2021 peer exchange from the Denver Regional Council of Governments (DRCOG), San Francisco Bay Area Metropolitan Transportation Commission (MTC), Portland Metro, and Delaware Valley Regional Planning Commission (DVRPC).

  - San Francisco Bay Area Metropolitan Transportation Commission (MTC) (2020)
    - The MTC Planning Committee established a Regional Safety / Vision Zero Policy in June 2020. The policy establishes a region-wide policy

to encourage and support actions towards eliminating traffic fatalities and serious injuries by the year 2030.
        - The policy works with partner agencies, is data-driven, equity-focused, provides evidence-based policy, and includes education and engagement.
        - Includes a Bay Area Vision Zero Working Group that is an MTC-led panel of officials working towards the shared goal of making the streets safer for all users.
    - Portland Metro
        - Recently awarded 2.4 million for its Safe Streets for All Action Plan development.
        - Previously completed a Regional Transportation Safety Strategy Plan in 2018. This included addressing three top findings for the region to make travel safety for all users:
            - Traffic deaths are increasing and disproportionately impacting people of color, low incomes, and over the age of 65.
            - Traffic deaths are disproportionately impacting people walking.
            - The majority of traffic deaths are occurring on a subset of arterial roadways.
        - The plan implements the Safe System approach and focuses on six data-driven strategies to work towards the vision zero goal.
    - Delaware Valley Regional Planning Commission
        - Recently awarded 1.47 million for its Regional Vision Zero 2050 Action Program.
        - Previously completed a 2012 Safety Action Plan.

- **North Dakota Vision Zero Strategic Highway Safety Plan**
    - The North Dakota Vision Zero Strategic Highway Safety Plan (SHSP) is a policy plan within the North Dakota Vision Zero program that aims to provide a framework to guide all statewide traffic safety activity, including but not limited to:
        - Widespread public education/outreach
        - Working with the legislature to ensure state laws represent best practices in traffic safety
        - High visibility enforcement of existing laws

        - Technology advancements
        - Infrastructure/road safety improvements
    - The SHSP is driven by data and collaboration, which includes analyzing recent crash trends, identifying safety emphasis areas, developing and prioritizing comprehensive safety strategies which ultimately lead to project programming, project development, implementation, and progress monitoring and evaluation.
    - The SHSP is updated every five years to reflect crash trends and emerging safety strategies. Stakeholder and public engagement input is vital in informing strategies; stakeholder input is collected through webinars, workshops, and steering committee meetings.
    - The update to North Dakota's Vision Zero SHSP is beginning soon.

- **Minnesota Strategic Highway Safety Plan**
    - The MnDOT Strategic Highway Safety Plan (SHSP) is a policy plan within the Minnesota Toward Zero Deaths (TZD) program that aims to provide a framework for strategies involving enforcement, education, engineering, and emergency medical services and trauma systems. The SHSP also serves as a tool to address safety issues on public roads. The SHSP is driven by data and outreach, which includes analyzing recent crash trends, identifying and prioritizing focus areas into one of four categories (core, strategic, support solutions, and connected), strategies with specific actions identified, and implementation to guide traffic safety partners to using this Plan effectively.
    - The SHSP is updated every five years to reflect crash trends and emerging safety strategies. Stakeholder and public engagement input is vital in informing strategies; stakeholder input is collected through conferences, workshops, and steering committee meetings.
    - The update is beginning soon.

- **Minnesota Highway Safety Plan and North Dakota Highway Safety Plan**
    - Updated annually, both MnDOT Highway Safety Plan (HSP) & NDDOT HSP focus on each agency's respective SHSP to monitor progress and evaluate traffic safety. While the SHSPs focus on strategies and tactics, the HSP provides an update for crash trends and any updates regarding focus areas or policies identified in the SHSP.

- All data analysis, projects, and programs found within each agency's HSP are aligned to the respective SHSP policies, goals, and objectives of each state.
- The HSPs are submitted to the National Highway Traffic Safety Administration (NHTSA).

- **Minnesota Highway Safety Improvement Program (HSIP) & North Dakota HSIP**
  - Each State's Highway Safety Improvement Program (HSIP) acts as the implementation arm of the SHSP and HSP.
  - Each State solicits for HSIP funding, which is a federal-aid program designed to reduce traffic fatalities and serious injuries.
  - HSIP projects are programmed through Metro COG's TIP and each State's respective STIP.

- **Minnesota County Road Safety Plans**
  - The initial County Road Safety Plans were completed between 2008 and 2013. The updates began in 2016 by phase with approximately 15 counties in each phase. Since 2016, two phases were completed including more than 30 counties. Phase 3 will begin in Fall of 2023.
  - The goal is to develop a plan that provides a prioritized list of safety projects for the counties to implement. Key steps included analysis of severe crashes, data collection of existing roadway features and data-driven systemic analysis to prioritize locations. Proven, effective, low-cost safety countermeasures, such as rumble strip/stripes, modified intersection design, enhanced signing/markings, ITS signing applications, and lighting, were assigned to high-priority locations. Each plan resulted in a report that highlighted high-priority intersections, segments, and curves and identified projects for implementation. HSIP forms were created for each project to facilitate applying for funding. For each county, a workshop was held with safety partners (enforcement, education, emergency services, and engineering). Since 2016, SRF has been assisting MnDOT with updating the County Road Safety Plans for multiple counties in the state.

- **North Dakota Local Road Safety Program**
    - The Local Road Safety Program (LRSP) was prepared for all of the regions in North Dakota and prepared as part of North Dakota's statewide highway safety planning process between 2012-2015 Although pre-Vision Zero (current SHSP), the LRSP are the result of a data-driven process, with a goal to reduce severe crashes by documenting at-risk locations, identifying effective low-cost safety improvement strategies, and better positioning each region in North Dakota to compete for available safety funds.
    - The LRSP provides a list of priority safety projects for each region, with each region is made up by local governments including counties and larger cities. At risk locations along the county/local road system were considered candidates for safety investment, including road segments, horizontal curves, and intersection with multiple severe crashes. At risk locations also considered road geometry and traffic characteristics like other locations in North Dakota where similar severe crashes have occurred.
    - Proven, effective, low-cost safety countermeasures, such as rumble strip/stripes, modified intersection design, enhanced signing/markings, ITS signing applications, and lighting, were assigned to high-priority locations. Each plan resulted in a report that highlighted high-priority intersections, segments, and curves and identified projects for implementation. HSIP forms were created for each project to facilitate applying for funding. For each local road agency, a workshop was held with safety partners (enforcement, education, emergency services, and engineering).
    - Local jurisdictions are encouraged to update their LRSP in a timely manner to reflect SHSP policy direction, current crash trends, and changes to traffic including the transportation system.

- **2022 Fargo-Moorhead Metropolitan Bicycle & Pedestrian Plan**
    - Updated every five years, the bike & ped plan provides new and updated details about the people and communities in the FM area and includes information about how regional transportation systems support and/or inhibit people from walking and biking to desired destinations.
    - The plan provides recommendations for Metro COG's member jurisdictions, non-profit organizations, and community members to create better bike and ped transportation systems, policies, and programs. The

recommendations include: a bike network for people of all ages and abilities, improvements to pedestrian crossings, design guidelines, policy and program recommendations, and process improvements.
- Guiding principles and objectives of the bike & ped plan include: health and safety; maintenance; connectivity; equity; collaboration; and sustainability/environment.

- **MnDOT District Road Safety Plans**
  - Between 2009-2016, MnDOT developed the first safety plans for the state highways in seven districts. The objective of the safety planning effort was to identify a list of prioritized candidate projects for each District to submit for funding through the Highway Safety Improvement Program. A two-step analytical process was used to identify projects: a site-specific review of locations with higher-than-average crash rates and a systemic risk assessment process documenting locations that include roadway and traffic characteristics determined to be over-represented at locations with severe crashes. For each District, a safety workshop was hosted to educate staff on safety trends, issues, and strategies, review locations with safety issues and brainstorm solutions. The final deliverable was a plan each District could use to identify projects to submit to MnDOT for safety funding.
  - The District Safety Plans are currently being updated for the first time since they were originally developed. Data collection and internal equity meetings have taken place. The updates will incorporate new practices, crash data and lessons learned with the objective of further reducing fatal and serious injury crashes in Minnesota.

- **Vulnerable Road User Safety Assessment (In Progress)**
  - The Vulnerable Road User Safety Assessment conducted for the Minnesota Department of Transportation (MnDOT) is a comprehensive evaluation set for completion in Fall of 2023. The assessment aims to identify potential risks and develop strategies to improve the safety of people biking, people walking, and other vulnerable road users such as people with disabilities.
  - The evaluation aims to understand the most pressing challenges faced by vulnerable road users and identify areas where improvements can be made across the transportation system. The methods will develop data

tools such as a statewide High Injury Network (HIN) and conduct engagement with stakeholders and community members.

APPENDIX 2 – SAFETY ANALYSIS

Memorandum

SRF No. 16766

To: Adam Altenburg
Metro COG

From: SRF Consulting Group

Date: February 19, 2024

Subject: Metro COG Regional Comprehensive Safety Action Plan

Task 5 Safety Analysis: Crash Data Analysis & Trend Summary

Executive Summary

Between 2018 and 2022, the Fargo-Moorhead Metropolitan Statistical Area (MSA), which includes all of Cass County, North Dakota and Clay County, Minnesota, recorded 18,948 total crashes, 351 of which resulted in fatal or serious (incapacitating) injuries. An analysis of these crashes below identifies crash trends among five transportation modes: (1) passenger vehicles, (2) heavy vehicles, (3) pedestrians, (4) bicyclists, and (5) motorcycles. The safety analysis includes an examination of the crashes by mode by basic crash report variables such as roadway characteristics or roadway ownership/jurisdiction. The correlations identified in the crash trend summary will help Metro COG prioritize multimodal transportation safety investments in the future.

Introduction

A Safe System approach focuses on eliminating severe crashes (fatal and serious injury crashes) using a proactive approach, understanding that humans are vulnerable and make mistakes, and the system needs to be designed to be accommodating. To make a difference and reduce the number of fatal and serious injury crashes within the MSA, Metro COG is developing the Organization's first ever Regional Comprehensive Safety Action Plan (safety action plan).

The crash analysis is divided into two key categories: (1) general crash characteristics and (2) demographic and economic characteristics. The analysis includes available crash data from 2018 through 2022 provided by the Minnesota Department of Transportation (MnDOT) and North Dakota Department of Transportation (NDDOT). Throughout the safety analysis, crash trends are summarized by "**KA**" indicating fatal and serious injury crashes and "**BCO**," which includes non-serious injuries. The KABCO injury scale is used and includes the designations shown on Table 1 below.

Table 1. KABCO Injury Scale

Severe (more injurious)	Non-Severe (less injurious)
K - involves a fatal injury **A** - incapacitating injury (serious injury)	**B** - non-incapacitating injury **C** - possible injury **O** - no injury or a property damage-only (PDO) crash

The data is further processed and grouped by transportation mode (unit/vehicle type): passenger vehicle, heavy vehicle, pedestrian, bicycle, and motorcycle. To categorize the modes, one record is created per mode when the unit and vehicle type are the same (e.g. passenger vehicle/passenger vehicle). This scenario applied to most passenger vehicle crashes. The highest severity type is then recorded. Very few of the pedestrian, bicycle, and motorcycle crashes involved another unit of the same type. Crashes where the unit and vehicle type are different (e.g. passenger vehicle/pedestrian), one record is created in each of the corresponding mode's crash dataset. Some crashes may require further investigation of the descriptions to identify the appropriate mode.

After crashes are categorized by mode, crash factors are summarized and further broken down by segment (midblock/non-intersection) and intersection crash types. Crash factors include crash report variables as identified in the crash datasets provided by MnDOT and NDDOT.

Crash Data Background

Crash data for the safety action plan comes directly from MnDOT and NDDOT crash reports. Both MnDOT and NDDOT collect data from law enforcement through an electronic crash reporting system, which is often entered at the scene of the crash. For transportation safety planning, the national best practice is to utilize the latest five years of complete crash data. For the safety action plan, data from the last five full calendar years, or 2018 through 2022, is utilized. Historical data earlier than 2018 is not utilized because the safety action plan analyzes current trends. Focusing on more recent five-year crash trends helps Metro COG and local jurisdictions implement safety improvements to address crash trends occurring recently, including emerging trends, rather than trends that may have peaked, waned, and/or have already been addressed. Given the significant degree of physical development and change that has occurred in the Fargo-Moorhead Region over the last decade, the transportation system has also continuously changed and grown. Using the last five years of crash trends is especially important for the growing MSA.

The dataset utilized for the safety action plan is tailored specifically to Metro COG's role as a bi-state Metropolitan Planning Organization (MPO). MnDOT data comes directly from the Office of Traffic Safety, as a five-year dataset. Traditionally, North Dakota data is assembled by the Highway Safety Division as a five-year dataset. However, upon comparison of five-year crash datasets from each state, the difference in the structure of the data prohibited merging the datasets. The project team wanted to pursue a comprehensive merged bi-state dataset for the MSA. NDDOT also has one-year crash datasets, which are much more compatible with MnDOT's five-year.

The project team requested five years' worth of NDDOT's one-year crash data tables. One-year data tables are assembled to provide the most comparable dataset from each state, allowing a merged bi-state analysis of both MnDOT and NDDOT crash data. NDDOT's five-year dataset that is more typically utilized by jurisdictions across the state; however, the five-year dataset is filtered and cleaned up by the Highway Safety Division, making a much-simplified version of the one-year dataset. Given the scope of the safety action plan, the project team assembled one-year crash data tables which are raw data files received by NDDOT from the Department's electronic crash reporting system. The one-year tables provide as robust of a crash analysis as possible utilizing North Dakota's available crash data therefore, Metro COG can tailor the crash data to merge well with other datasets such as MnDOT's. The feat of merging two State's crash datasets is an innovation of the safety action plan and is likely the first instance of merging North Dakota and Minnesota crash data in either state.

Crash Characteristics

General Summary

Within the MSA, over 18,900 crashes involving passenger vehicles, heavy vehicles, pedestrians, bicyclists, and motorcycles were recorded over the five-year period. Figure 1 indicates that there was an average of 70 severe crashes annually during this period. 2021 and 2022 severe crashes are eight percent higher than 2018 severe crashes.

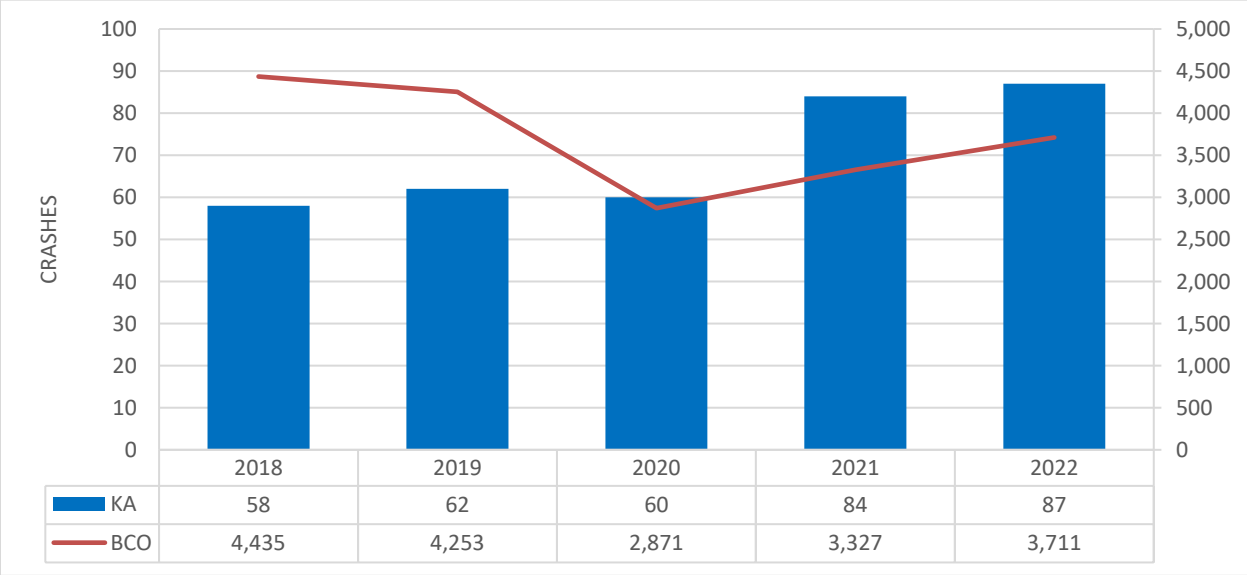
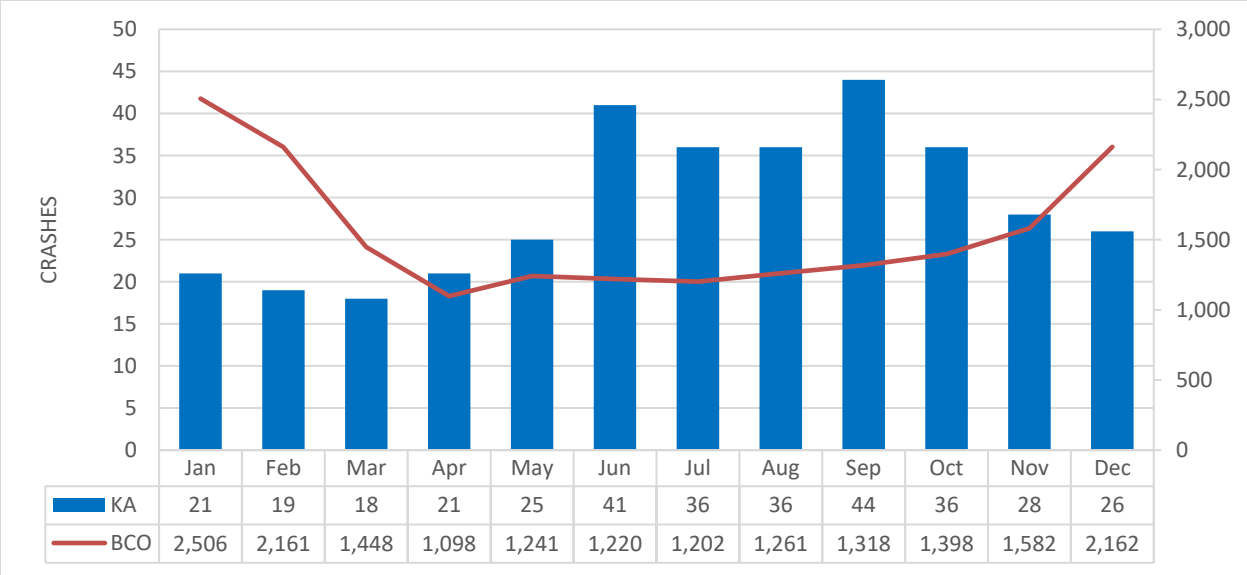


Figure 1 Crash severity by year for all vehicle types

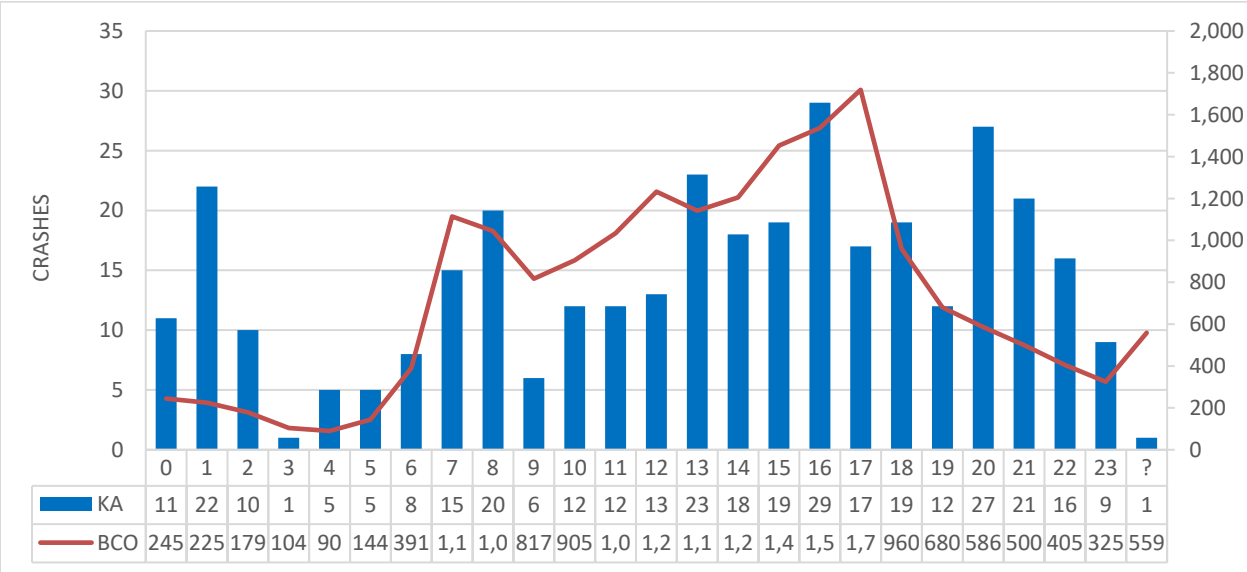
Figure 2 illustrates crashes per month during the five-year period. Severe crashes peak in early summer and then again in the fall, while BCO crashes peak during the winter months; November through March. The four-month timeframe from June through September makes up 45 percent of all severe crashes. The five-month timeframe from November through March accounts for 53 percent of all BCO crashes.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
KA	21	19	18	21	25	41	36	36	44	36	28	26
BCO	2,506	2,161	1,448	1,098	1,241	1,220	1,202	1,261	1,318	1,398	1,582	2,162

Figure 2 Crash severity by month for all vehicle types

Figure 3 illustrates crashes by time of day during the five-year period. Severe crashes peak several times through the day including AM peak, lunch peak, PM peak, late evening (8:00 p.m.), and again at (1:00 a.m.). Crashes with no recorded time of day are found under "?".



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	?
KA	11	22	10	1	5	5	8	15	20	6	12	12	13	23	18	19	29	17	19	12	27	21	16	9	1
BCO	245	225	179	104	90	144	391	1,1	1,0	817	905	1,0	1,2	1,1	1,2	1,4	1,5	1,7	960	680	586	500	405	325	559

Figure 3 Crash severity by hour of day for all vehicle types

Figure 4 indicates crashes by day of the week during the five-year period. Severe crashes peak mid-week on Wednesday and then peak again Friday to Saturday.

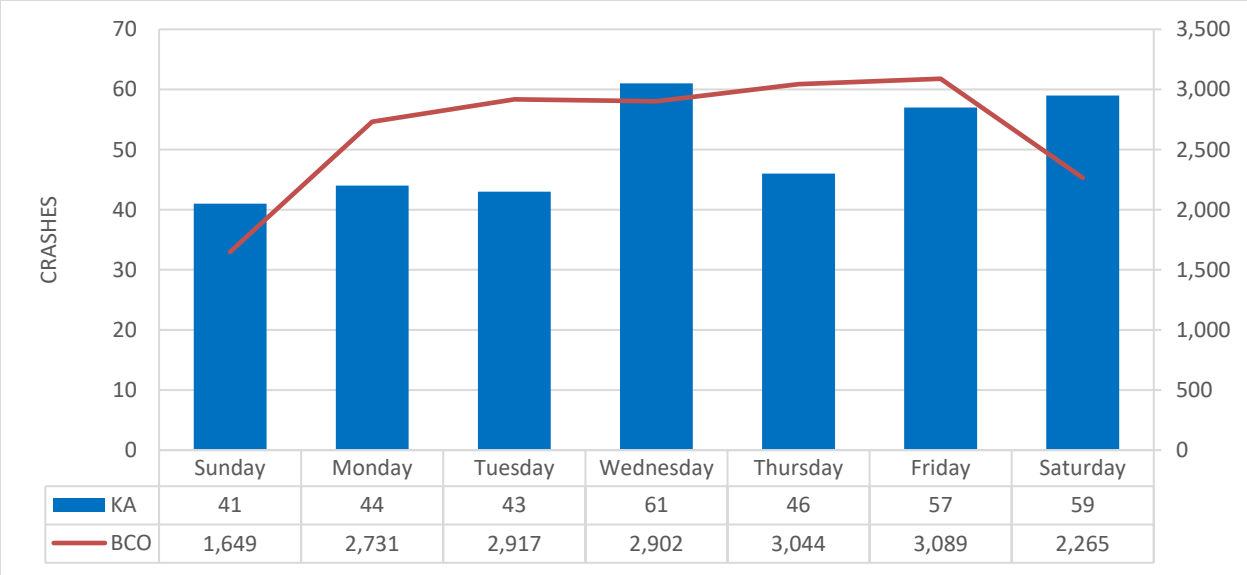


Figure 4 Crash severity by day of the week for all vehicle types

Figure 5 illustrates crashes by number of vehicles involved. A vast majority of severe (78 percent) and BCO (86 percent) crashes involved one to two vehicles.

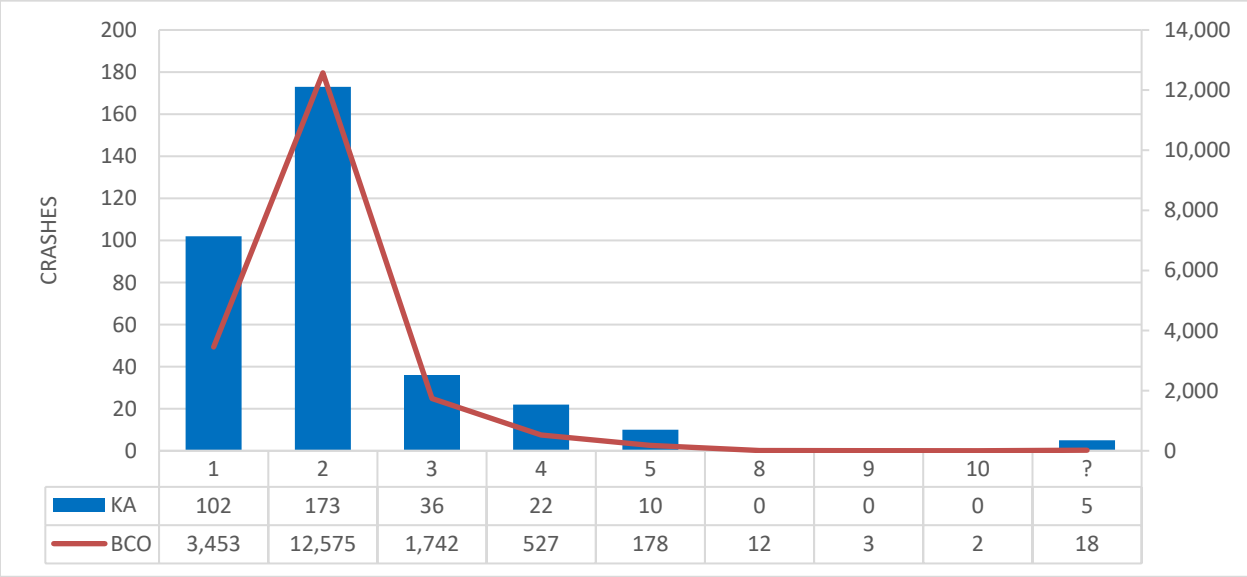


Figure 5 All-Mode Crash Severity by Number of Involved Vehicles/Parties

Figure 6 indicates crashes by mode and the most severe injury suffered by a person traveling by that mode. Severe motorcycle crashes make up 29 percent of all motorcycle-involved crashes, severe pedestrian crashes make up 18 percent of all pedestrian-involved crashes, and severe bicyclist crashes make up 10 percent of all bicyclist-involved crashes; whereas severe passenger vehicle crashes make up one percent of all passenger vehicle-involved crashes and severe heavy vehicle crashes make up 0.5 percent of all heavy vehicle-involved crashes.

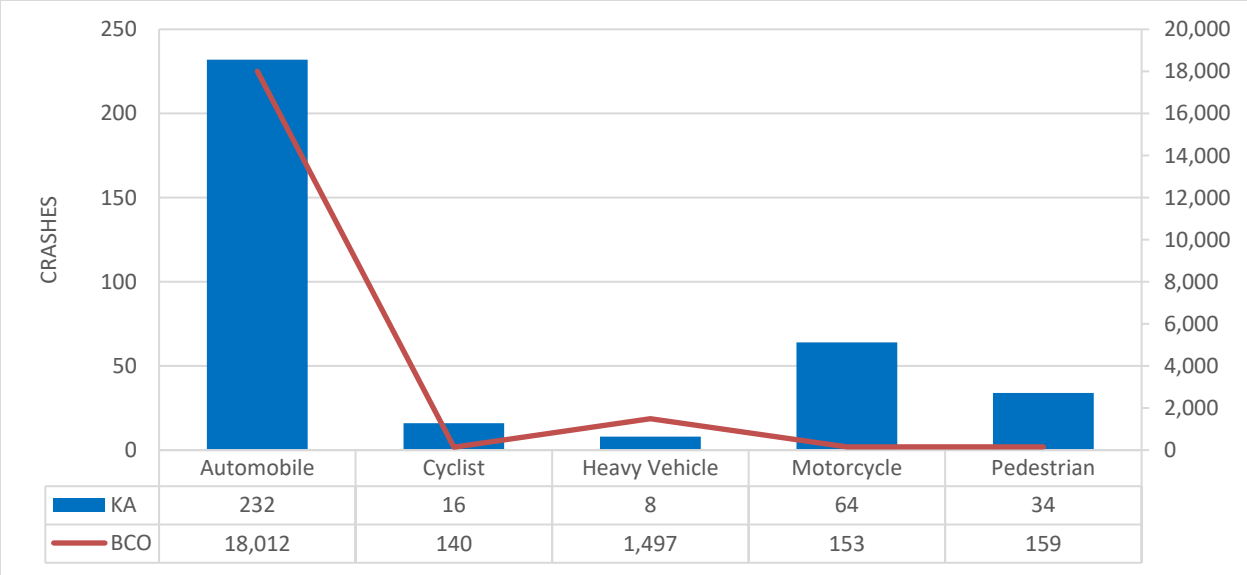


Figure 6 All-Mode Crash Severity by Mode

Figure 7 illustrates the number crashes by the two counties within the MSA. With respect to each county, 86 percent of crashes occurred in Cass County, whereas 14 percent occurred in Clay County. Most of the fatal and severe crashes (83 percent) occurred in Cass County and 17 percent occurred in Clay County.

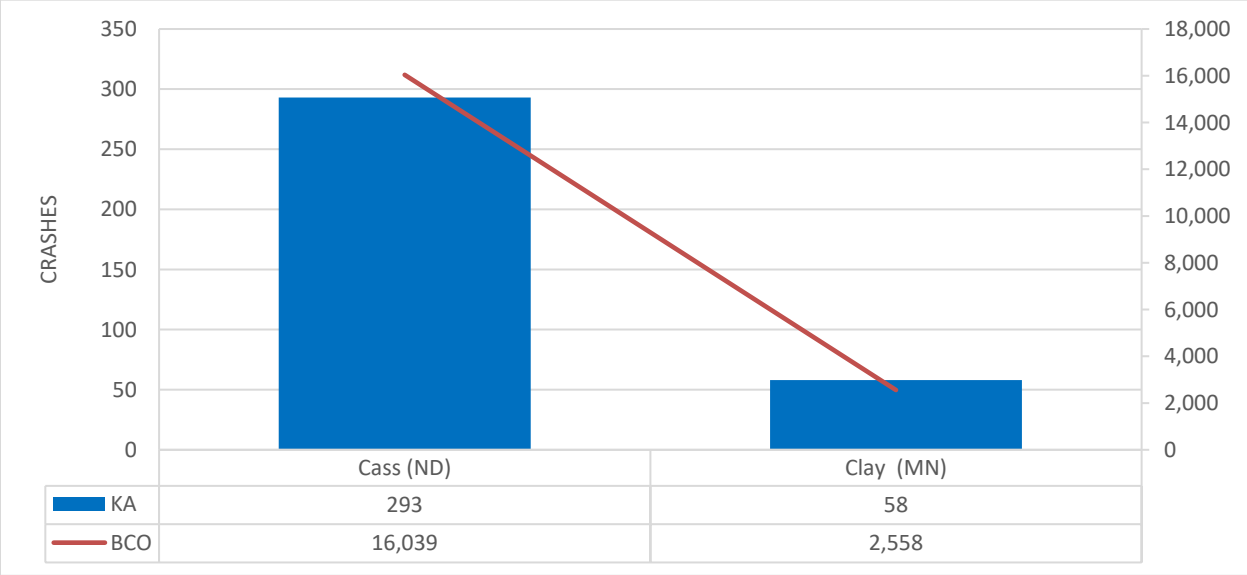
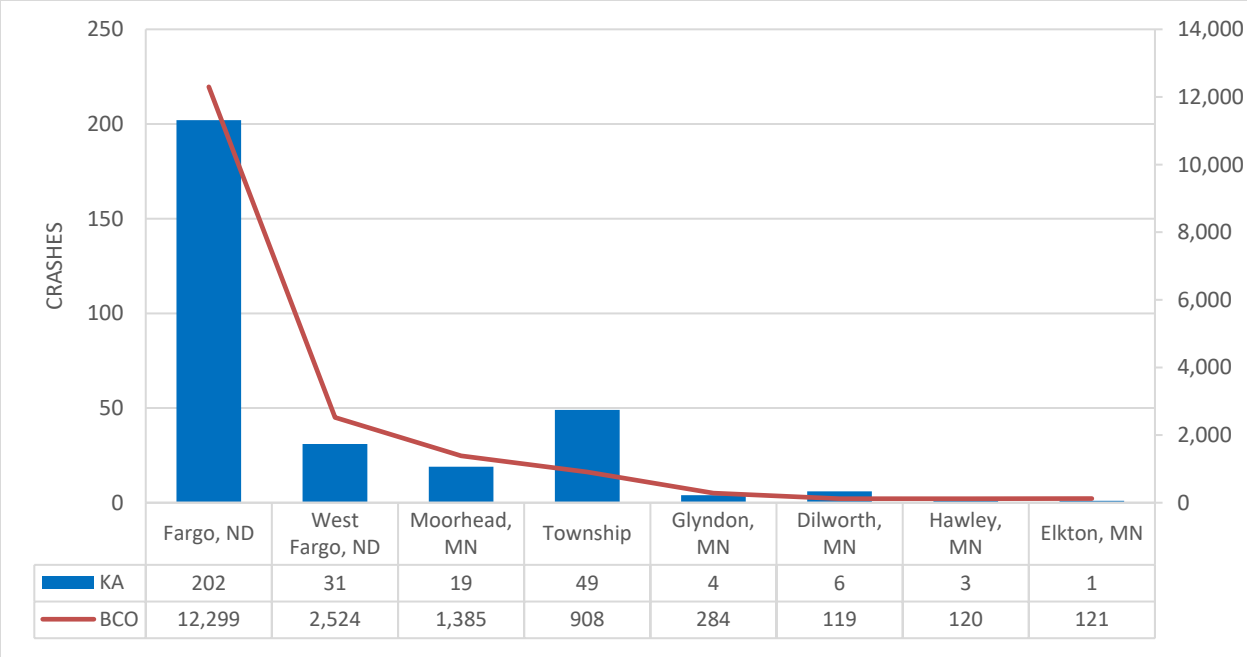


Figure 7 All-Mode Crash Severity by Counties for All Vehicle Types

Figure 8 illustrates the number of crashes amongst the five cities: Fargo, West Fargo, Moorhead, Dilworth, and Horace. Of the five jurisdictions, 66 percent of crashes occurred in Fargo, 13 percent of crashes occurred in West Fargo, seven percent occurred in Moorhead, and less than one percent occurred in either Dilworth or Horace.

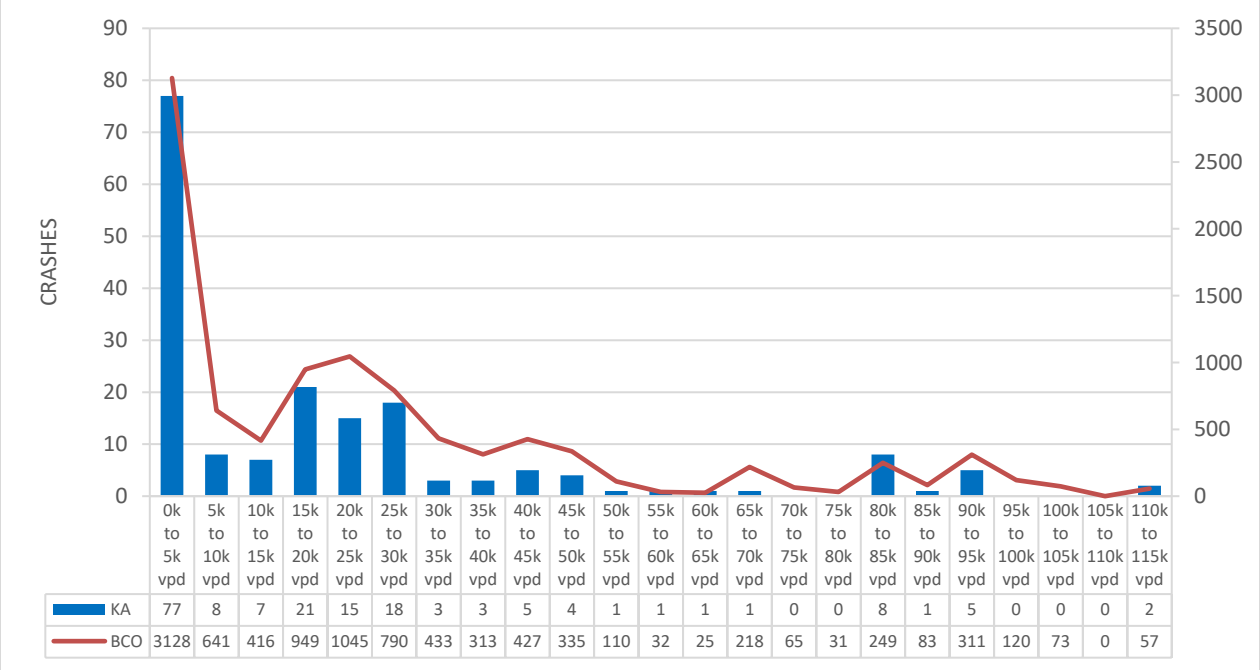


	Fargo, ND	West Fargo, ND	Moorhead, MN	Township	Glyndon, MN	Dilworth, MN	Hawley, MN	Elkton, MN
KA	202	31	19	49	4	6	3	1
BCO	12,299	2,524	1,385	908	284	119	120	121

Figure 8 All-Mode Crash Severity by City Jurisdiction

Segment-Related Crashes

Figure 9 indicates the number of segment crashes by maximum bidirectional approach average annual daily traffic (AADT) for all modes of transportation. Most of the fatal and serious injury crashes (40 percent) occurred on roadways with less than 5,000 vehicles per day (VPD). Additionally, roadways with 15,000 to 29,999 VPD contribute 28 percent fatal crashes. A majority of BCO crashes occurred on segments with less than 5,000 VPD (30 percent). Segments include roadways between intersections.

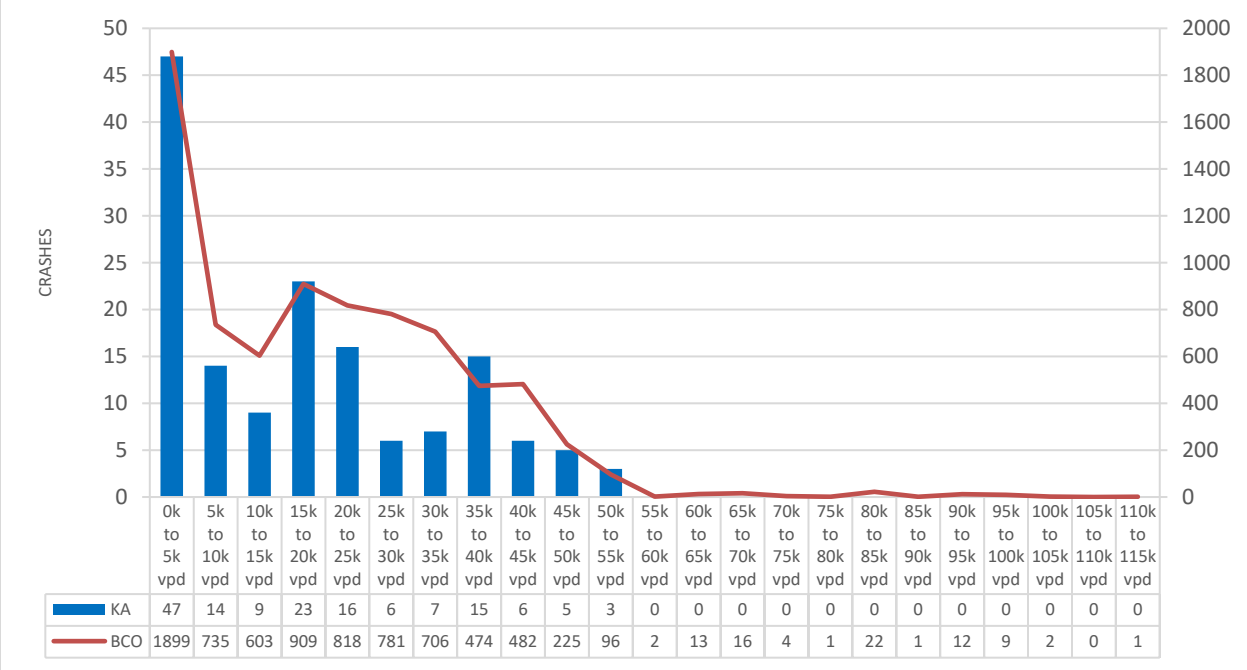


	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	77	8	7	21	15	18	3	3	5	4	1	1	1	1	0	0	8	1	5	0	0	0	2
BCO	3128	641	416	949	1045	790	433	313	427	335	110	32	25	218	65	31	249	83	311	120	73	0	57

Figure 9 All-Mode Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

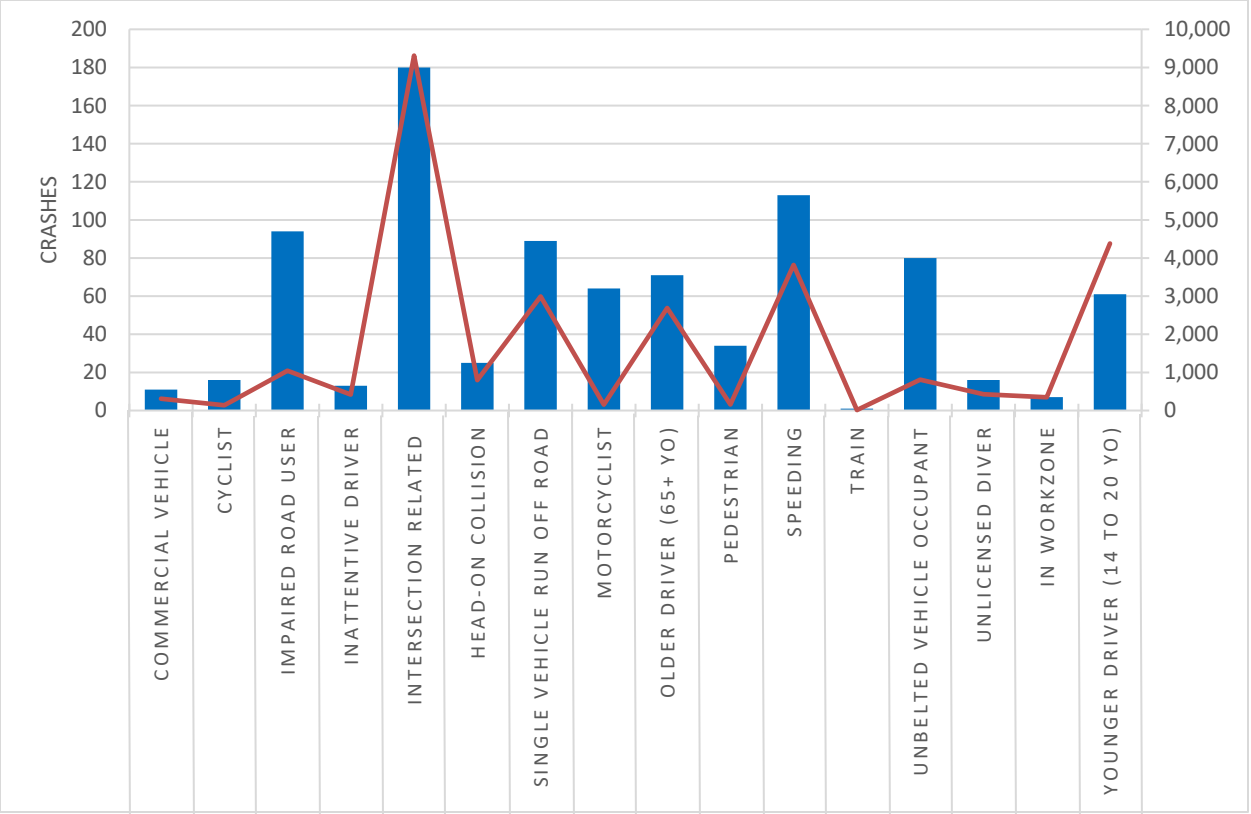
Figure 10 also includes all modes and illustrates the number of intersection crashes by maximum bidirectional approach AADT. Most of the fatal and serious injury crashes (30 percent) occurred at low volume intersections. Additionally, intersections comprise of 5,000 to 24,999 VPD and 35,000 to 39,999 VPD contribute to 40 percent of fatal crashes.



	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	47	14	9	23	16	6	7	15	6	5	3	0	0	0	0	0	0	0	0	0	0	0	0
BCO	1899	735	603	909	818	781	706	474	482	225	96	2	13	16	4	1	22	1	12	9	2	0	1

Figure 10 All-Mode Crash Severity by Maximum Approach AADT (intersection crashes only)

Figure 11 indicates the number of crashes of all modes by emphasis areas. Approximately 20 percent of severe crashes are intersection related, followed by speeding (13 percent), impaired road user (11 percent), and 10 percent for lane departure (single vehicle run off road). A majority of BCO crashes (33 percent) are intersection related.



	COMMERCIAL VEHICLE	CYCLIST	IMPAIRED ROAD USER	INATTENTIVE DRIVER	INTERSECTION RELATED	HEAD-ON COLLISION	SINGLE VEHICLE RUN OFF ROAD	MOTORCYCLIST	OLDER DRIVER (65+ YO)	PEDESTRIAN	SPEEDING	TRAIN	UNBELTED VEHICLE OCCUPANT	UNLICENSED DIVER	IN WORKZONE	YOUNGER DRIVER (14 TO 20 YO)	
KA	11	16	94	13	180	25	89	64	71	34	113	1	80	16	7	61	
BCO	309	140	1045	418	9310	797	2991	153	2689	160	3818	13	811	429	348	4380	

Figure 11 All-Mode Crash Severity by Emphasis Areas

Passenger Vehicles

Figure 12 indicates passenger vehicle-involved crashes by lighting condition. Most (56 percent) severe passenger vehicle crashes occurred during daylight conditions, with another peak (25 percent) during dark (lighted) conditions. A vast majority of BCO crashes (70 percent) occurred during Daylight conditions. The crashes with no record for lighting conditions are classified as unknown.

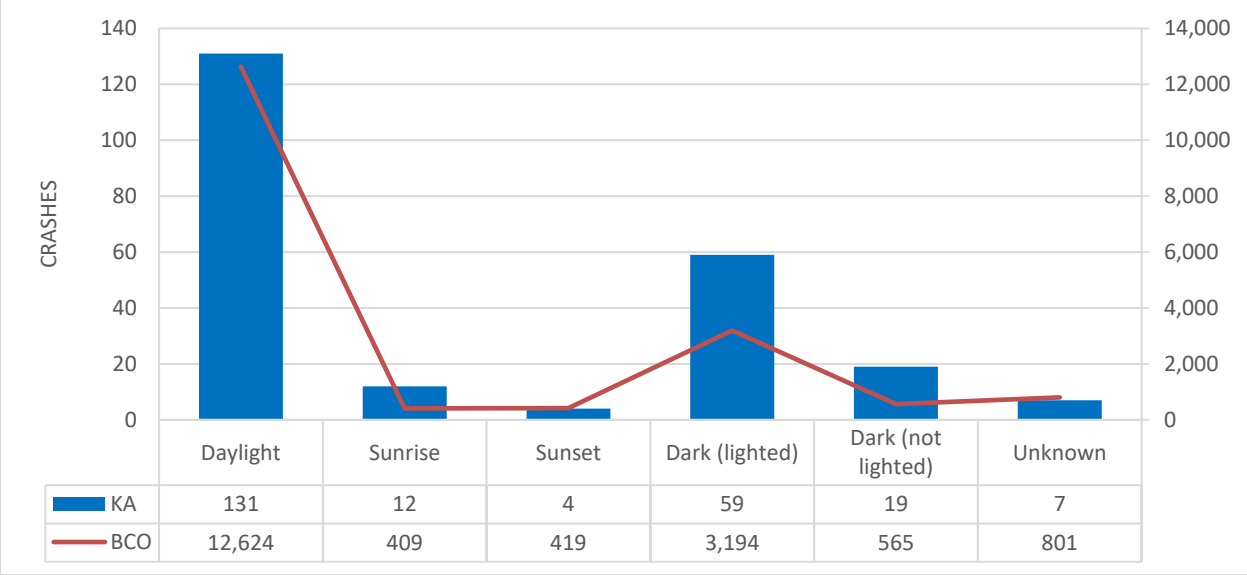


Figure 12 Passenger Vehicle Crash Severity by Lighting Conditions

Figure 13 illustrates passenger vehicle-involved crashes by functional classification. Most (51 percent) severe crashes occurred on Principal Arterials followed by Interstates (19 percent). A large majority of BCO crashes occurred on Principal Arterials (46 percent). Crashes with no record for functional class are classified as unknown.

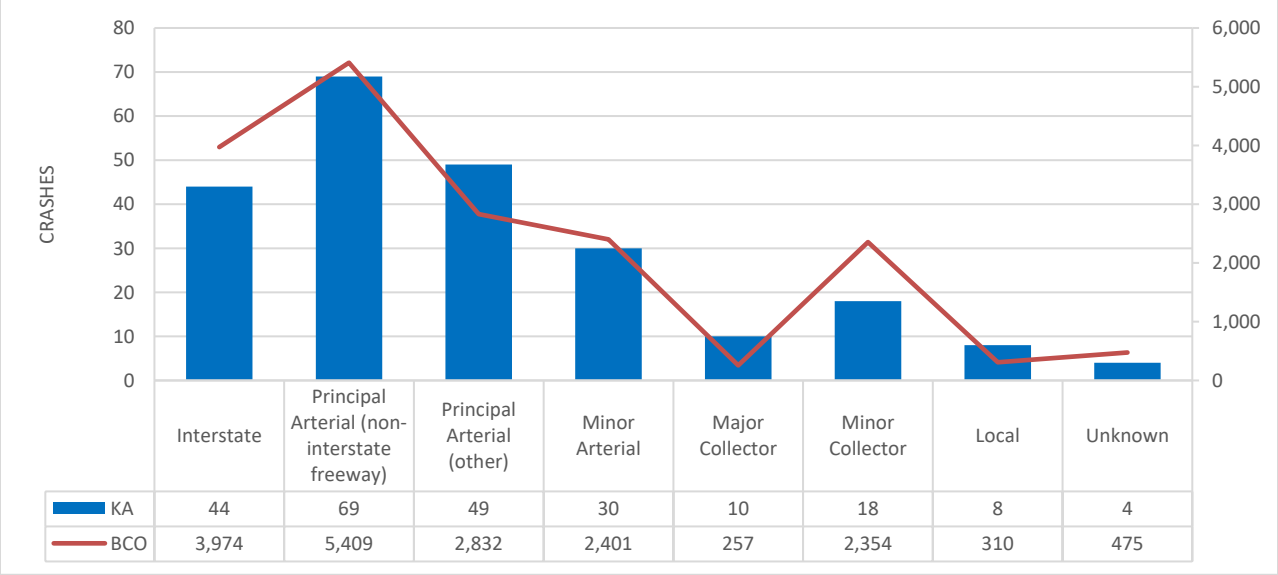
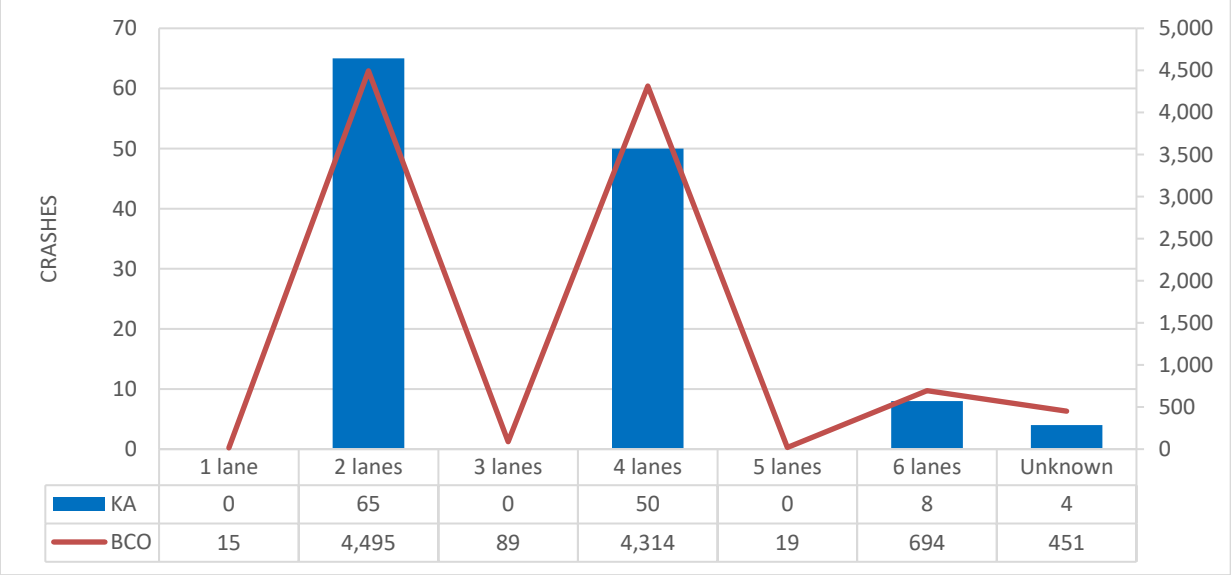


Figure 13 Passenger Vehicle Crash Severity by Functional Classification

Segment-Related Crashes

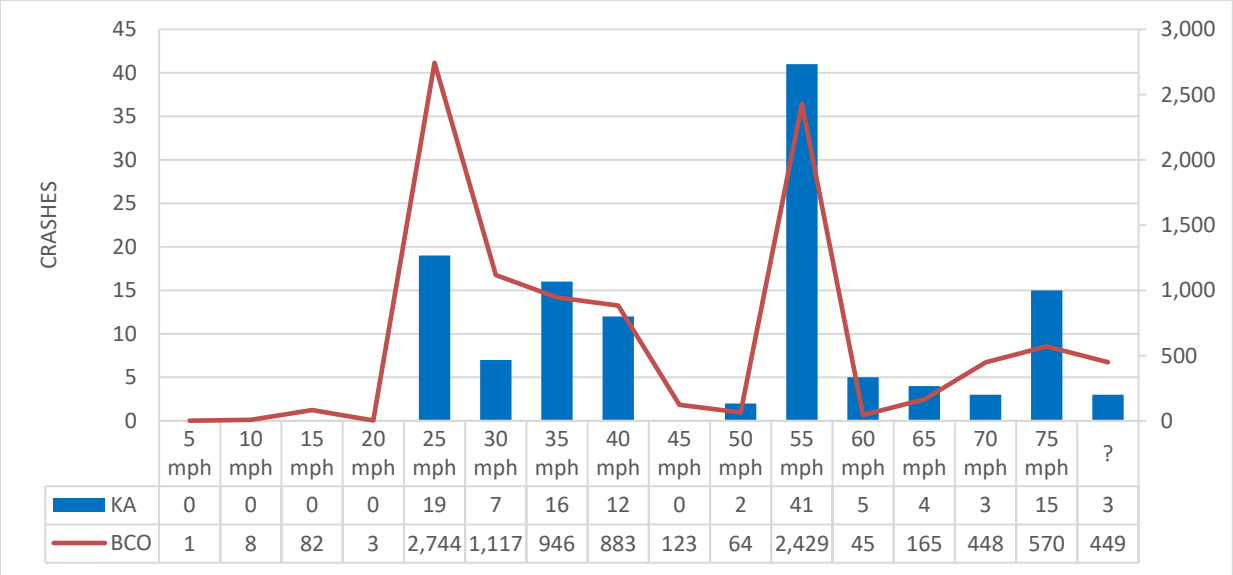
Figure 14 illustrates passenger vehicle-involved segment crashes by number of lanes. Two-lane configurations comprise 51 percent of severe segment crashes and four-lane configurations comprise 39 percent of severe segment crashes. Most BCO crashes occurred on segments with two-lane (45 percent) and four-lane configurations (43 percent). Crashes with record of number of lanes missing are classified as unknown.



	1 lane	2 lanes	3 lanes	4 lanes	5 lanes	6 lanes	Unknown
KA	0	65	0	50	0	8	4
BCO	15	4,495	89	4,314	19	694	451

Figure 14 Passenger Vehicle Crash Severity by Midblock Number of Lanes (segment crashes only)

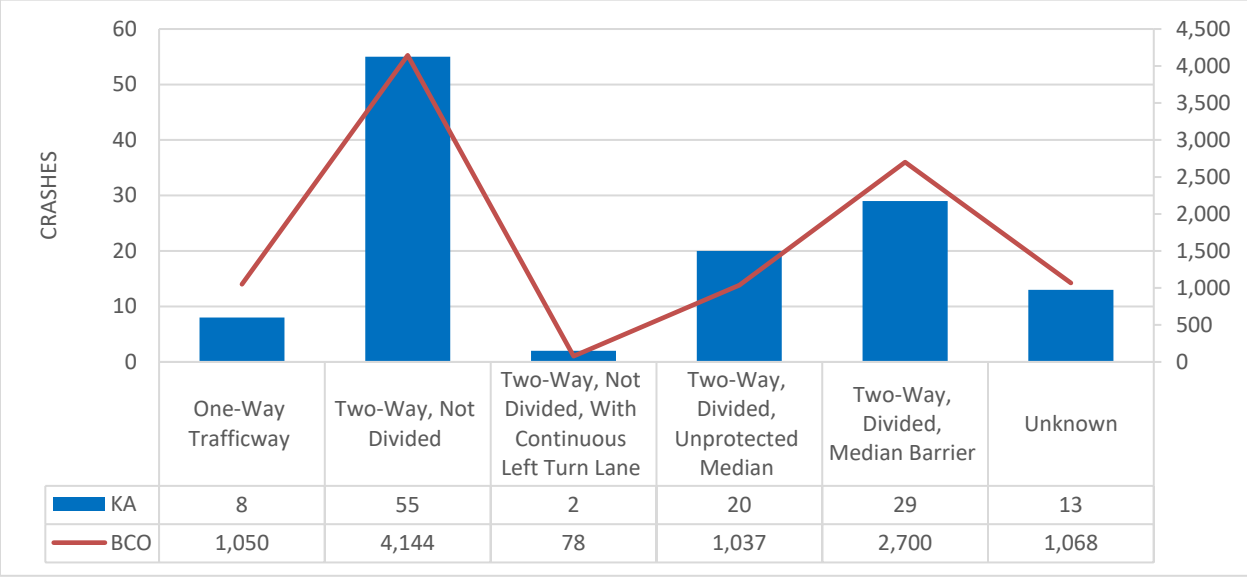
Figure 15 indicates passenger vehicle-involved crashes by speed limit. A majority or 32 percent of severe segment crashes occurred on roadways with a speed limit of 55 mph. Segment speed limits of 25, 35, 40, and 75 mph collectively contributed 49 percent of severe segment crashes. Segments with speed limits of 25 mph and 55 mph account for 51 percent of all BCO accidents. Crashes with no record for speed limit data are reported as "?".



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	0	0	0	0	19	7	16	12	0	2	41	5	4	3	15	3
BCO	1	8	82	3	2,744	1,117	946	883	123	64	2,429	45	165	448	570	449

Figure 15 Passenger Vehicle Crash Severity by Midblock Speed Limit (segment crashes only)

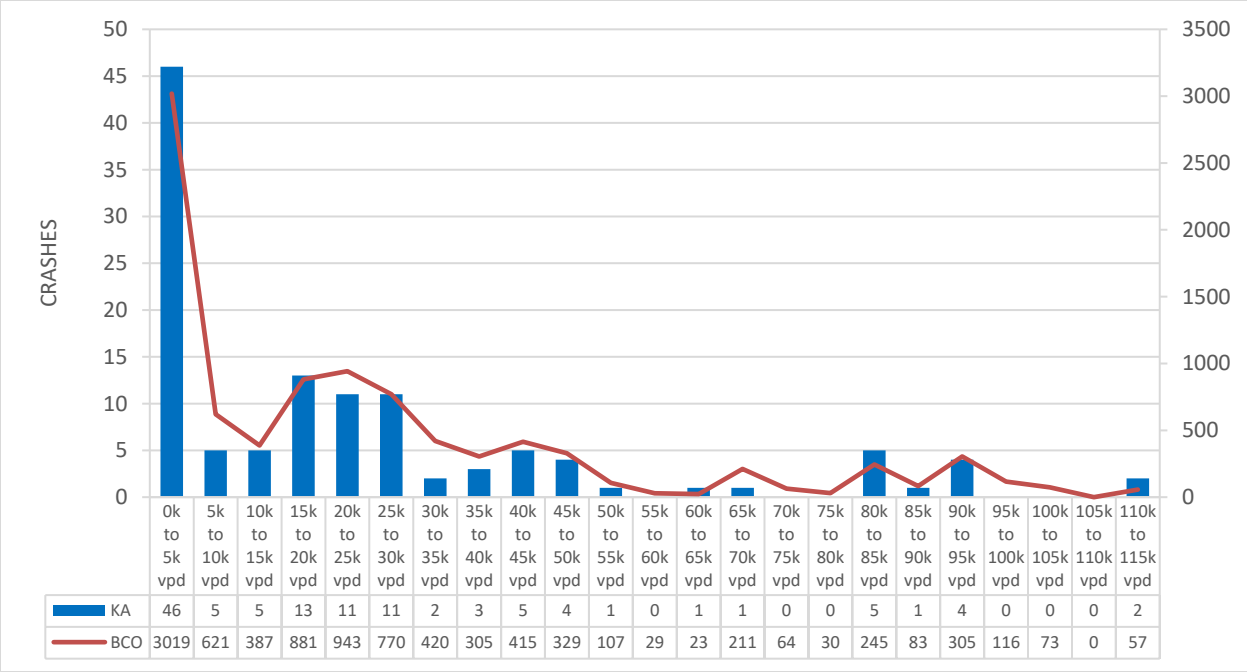
Figure 16 illustrates passenger vehicle-involved segment crashes by midblock roadway configuration. A majority or 45 percent of severe segment crashes occurred on two-way undivided roadways, with two-way divided (both unprotected median and barrier median) comprising 39 percent of severe segment crashes. For BCO crashes, most of the incidents occurred on two-way undivided roadways (42 percent). Crashes where record of roadway configuration is missing are reported as unknown.



	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	8	55	2	20	29	13
BCO	1,050	4,144	78	1,037	2,700	1,068

Figure 16 Passenger Vehicle Crash Severity by Midblock Road Configuration (segment crashes only)

Figure 17 indicates passenger vehicle-involved segment crashes by maximum bidirectional approach AADT. A majority or 36 percent of severe segment crashes occurred on roadways with low VPD. Additionally, roadways comprising of 15,000 to 29,999 VPD contributed 28 percent of severe crashes. Most BCO crashes occurred on segments with less than 5,000 VPD (30 percent).



	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	46	5	5	13	11	11	2	3	5	4	1	0	1	1	0	0	5	1	4	0	0	0	2
BCO	3019	621	387	881	943	770	420	305	415	329	107	29	23	211	64	30	245	83	305	116	73	0	57

Figure 17 Passenger Vehicle Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

Figure 18 illustrates passenger vehicle-involved intersection crashes by intersection configuration. Four-way intersections contributed to 69 percent of fatal and severe crashes. A vast majority, or 83 percent, of BCO crashes occurred at four-way intersections or were intersection related. Intersection related crashes are those near an intersection but not within. Crashes with no record for intersection configuration are recorded as unknown.

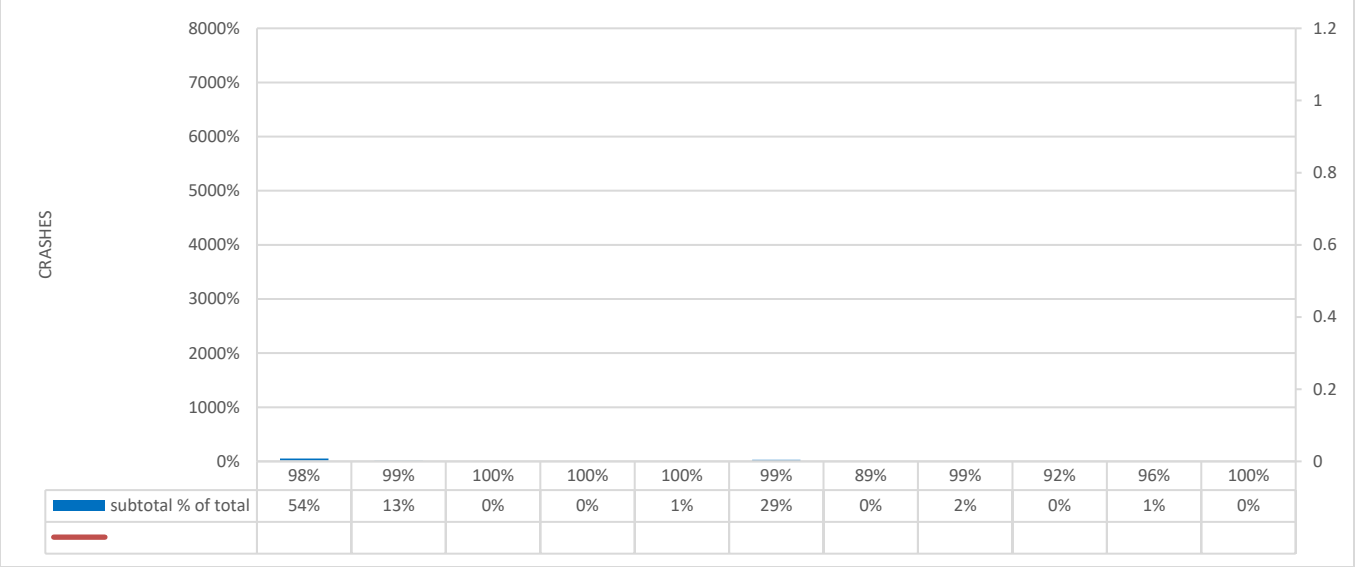
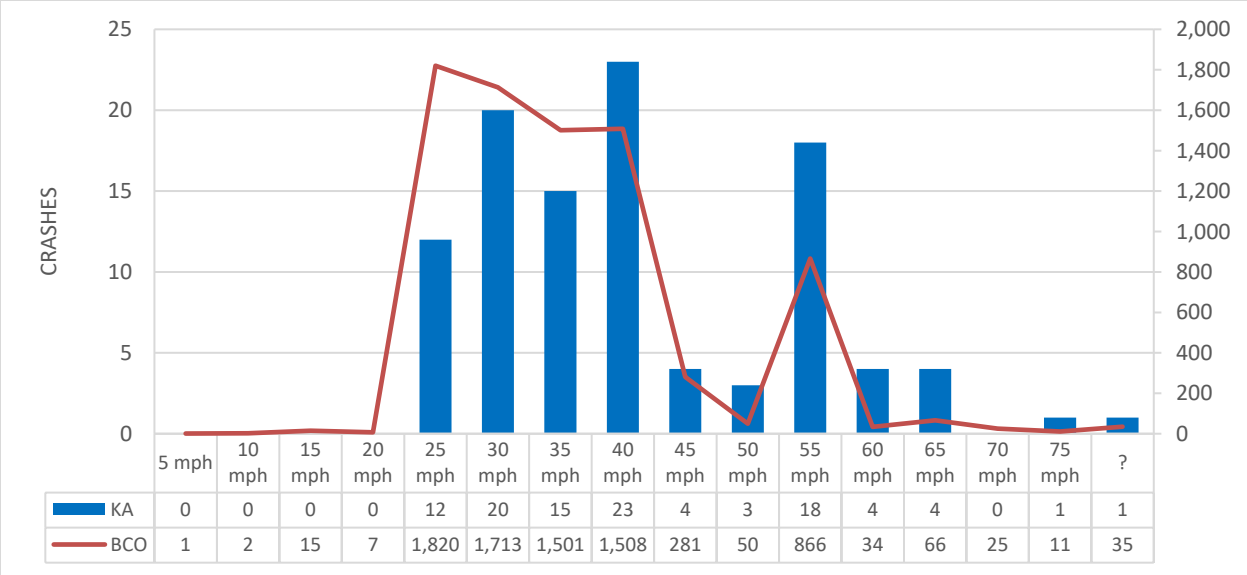


Figure 18 Passenger Vehicle Crash Severity by Intersection Configuration (intersection crashes only)

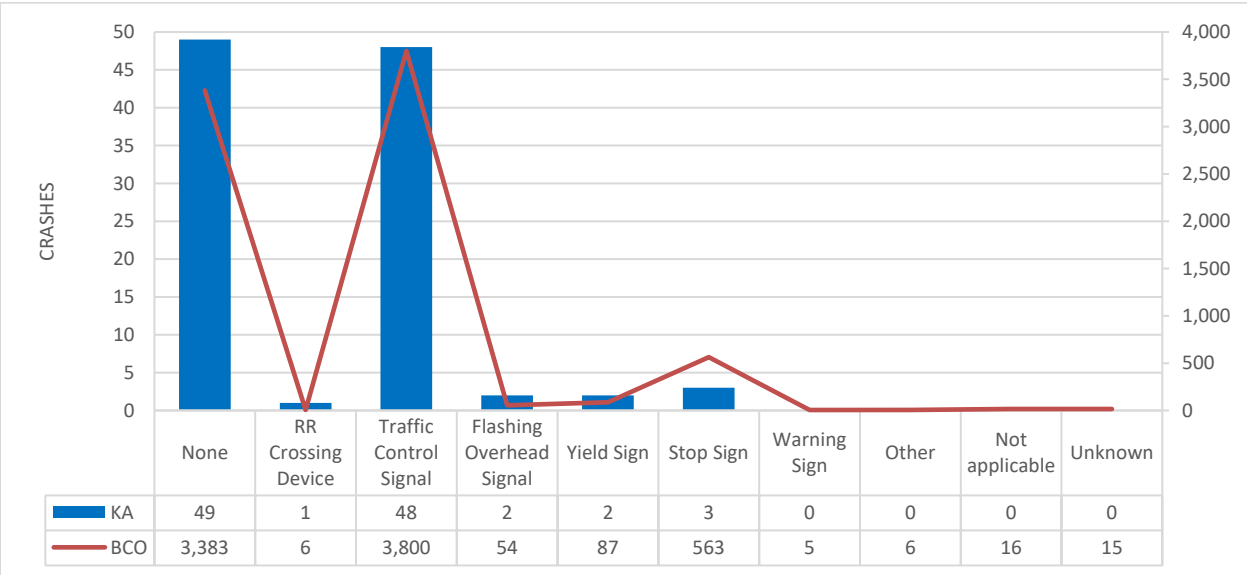
Figure 19 illustrates passenger vehicle-involved intersection crashes by maximum speed limit. The highest prevalence of severe intersection crashes occurred at intersections with max speed limits of 40 mph (22 percent), 30 mph (19 percent), and 55 mph (17 percent). The majority, or 82 percent, of BCO crashes occurred at intersections with speed limits between 25 mph and 40 mph. Crashes with no record for speed limit data are reported as "?".



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	0	0	0	0	12	20	15	23	4	3	18	4	4	0	1	1
BCO	1	2	15	7	1,820	1,713	1,501	1,508	281	50	866	34	66	25	11	35

Figure 19 Passenger Vehicle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

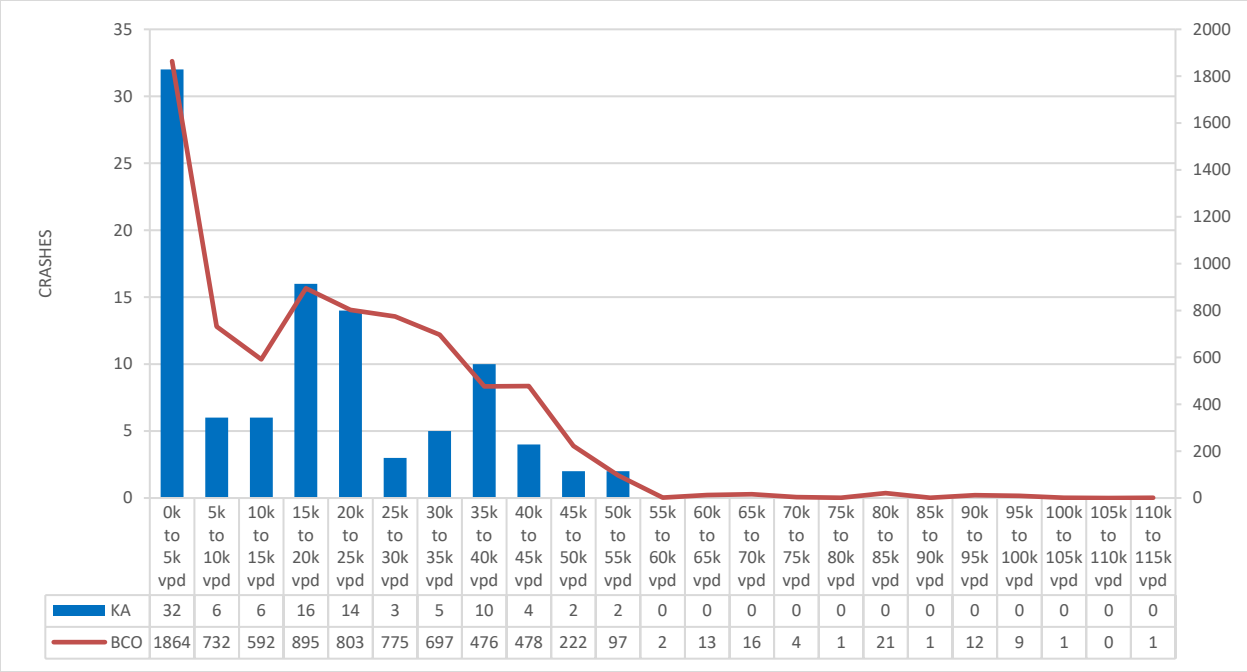
Figure 20 illustrates passenger vehicle-crashes by intersection traffic control device. A vast majority of severe intersection crashes occurred at uncontrolled (47 percent) and signalized intersections (46 percent). Uncontrolled and signalized intersections contribute to 91 percent of BCO crashes. Crashes with no record for intersection control devices are recorded as unknown.



	None	RR Crossing Device	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Warning Sign	Other	Not applicable	Unknown
KA	49	1	48	2	2	3	0	0	0	0
BCO	3,383	6	3,800	54	87	563	5	6	16	15

Figure 20 Passenger Vehicle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 21 illustrates the number of passenger vehicle-involved intersection crashes by maximum bidirectional approach AADT. Most fatal and serious injuries occur at intersections with low VPD (30 percent). Additionally, a high prevalence of severe crashes occurred at intersections with 15,000-19,999 VPD (15 percent), 20,000 to 24,999 VPD (13 percent), and 35,000 to 39,999 VPD (10 percent). Intersections with less than 5,000 VPD contributed to 23 percent of BCO-related crashes.



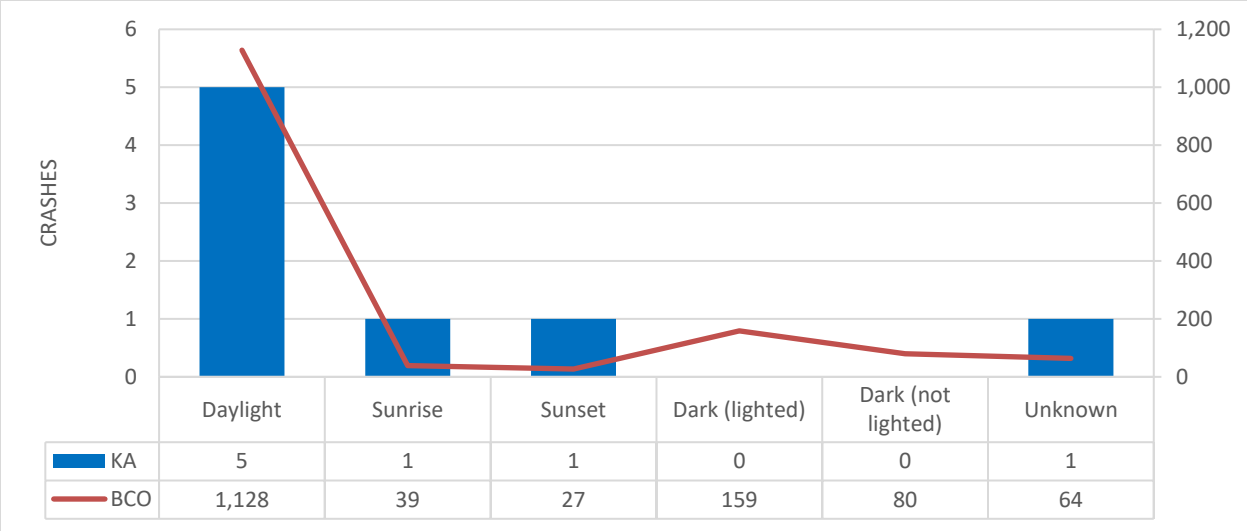
	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	32	6	6	16	14	3	5	10	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0
BCO	1864	732	592	895	803	775	697	476	478	222	97	2	13	16	4	1	21	1	12	9	1	0	1

Figure 21 Passenger Vehicle Crash Severity by Maximum Approach AADT (intersection crashes only)

Heavy Vehicle

Figures 22-31 illustrate different characteristics for crashes involving heavy vehicles. The five-year period evaluated shows six severe crashes for operators of heavy vehicles therefore, the analysis may also highlight characteristics of BCO (less severe) crashes as well.

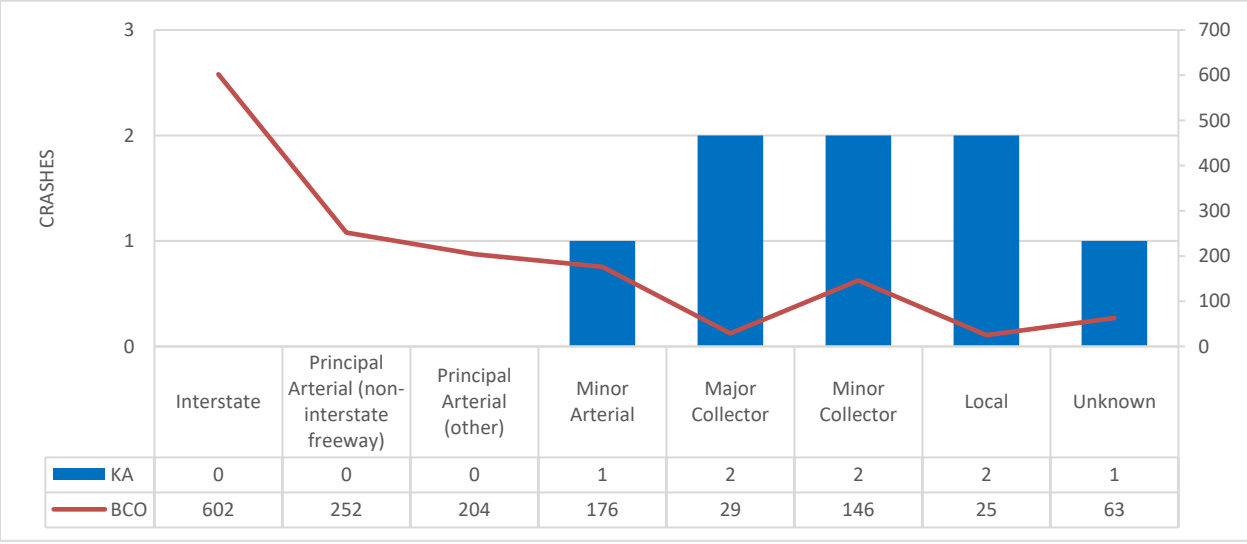
Figure 22 indicates heavy vehicle-involved crashes by lighting conditions. Most fatal and severe crashes (63 percent) occur during daylight hours. The majority of BCO crashes (75 percent) occurred during the daylight hours.



	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	5	1	1	0	0	1
BCO	1,128	39	27	159	80	64

Figure 22 Heavy Vehicle Crash Severity by Lighting Conditions

Figure 23 illustrates the number of heavy vehicle-involved crashes by functional classification. All fatal and severe crashes during the five-year period occurred on minor arterials, collectors, locals, and unknown. Most BCO crashes for operators of heavy vehicles occurred on Interstate (40 percent).

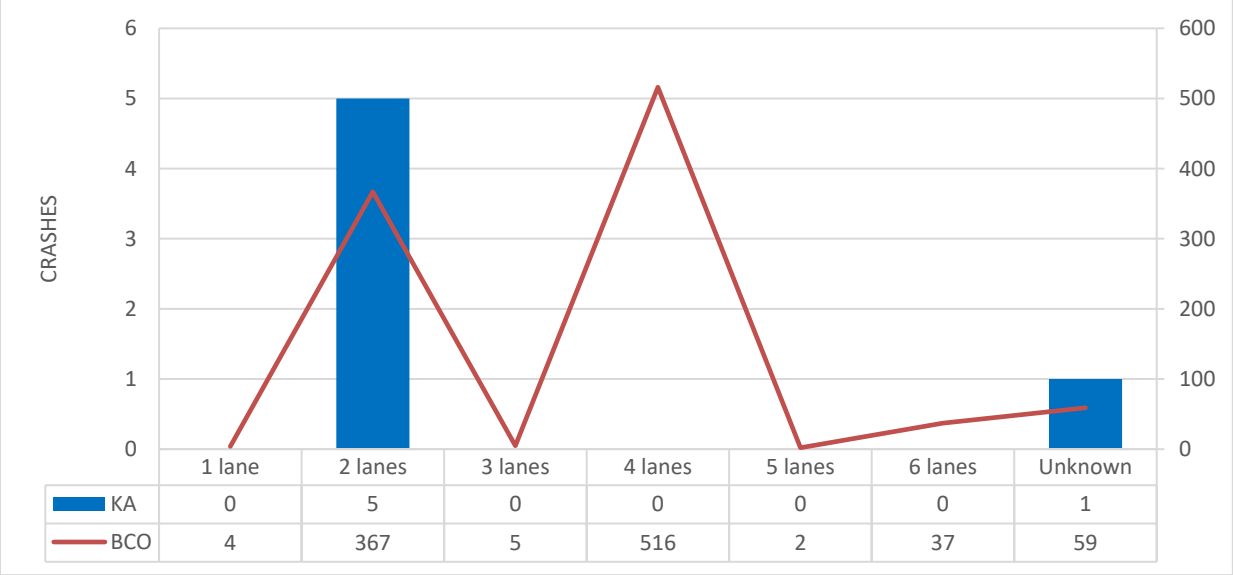


	Interstate	Principal Arterial (non-interstate freeway)	Principal Arterial (other)	Minor Arterial	Major Collector	Minor Collector	Local	Unknown
KA	0	0	0	1	2	2	2	1
BCO	602	252	204	176	29	146	25	63

Figure 23 Heavy Vehicle Crash Severity by Functional Classification

Segment-Related Crashes

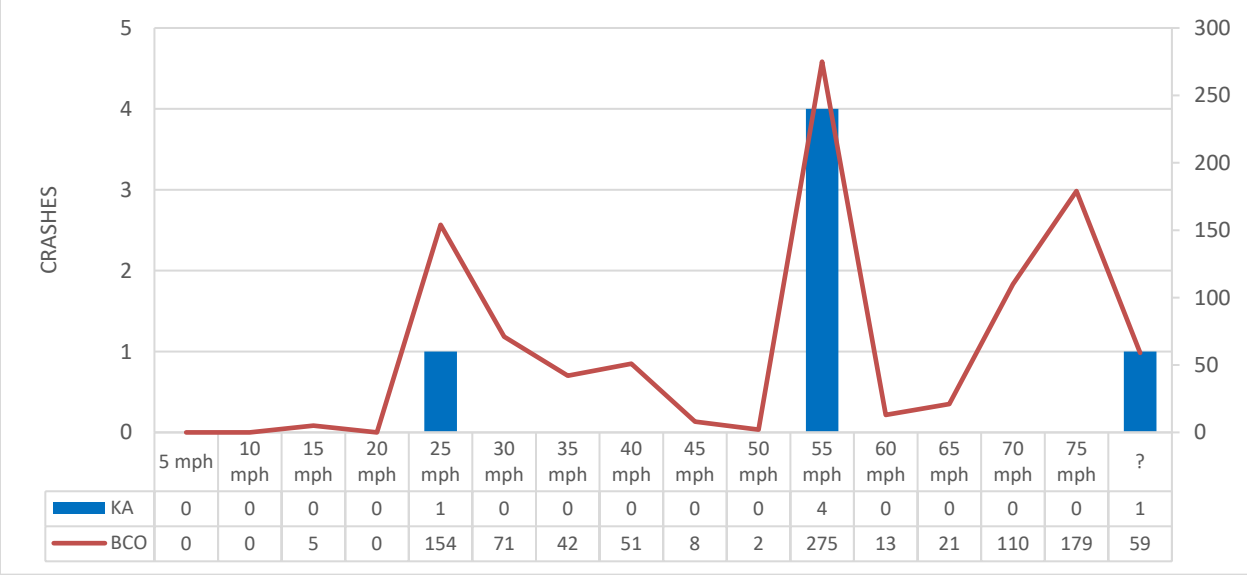
Figure 24 indicates the number of heavy vehicles involved in a segment crash by number of lanes. Most fatal and severe crashes (83 percent) for operators of heavy vehicles during the five-year period occurred on two lane roadways. The majority of BCO crashes (89 percent) occurred on two- and four-lane roadways.



	1 lane	2 lanes	3 lanes	4 lanes	5 lanes	6 lanes	Unknown
KA	0	5	0	0	0	0	1
BCO	4	367	5	516	2	37	59

Figure 24 Heavy Vehicle Crash Severity by Midblock Number of Lanes (segment crashes only)

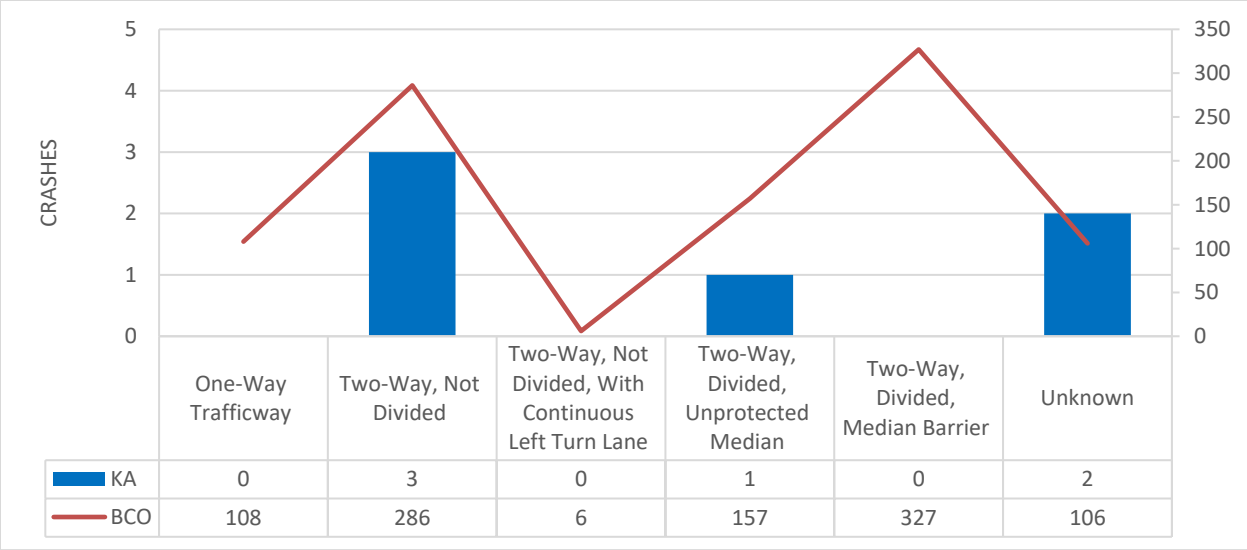
Figure 25 illustrates the number of heavy vehicles-involved segment crashes by speed limit. Most fatal and severe crashes (67 percent) occurred on roadways with a speed limit of 55 mph. A vast majority of BCO crashes (61 percent) occurred on roadways with speed limits of 25 mph, 55 mph, and 75 mph.



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	0	0	0	0	1	0	0	0	0	0	4	0	0	0	0	1
BCO	0	0	5	0	154	71	42	51	8	2	275	13	21	110	179	59

Figure 25 Heavy Vehicle Crash Severity by Midblock Speed Limit (segment crashes only)

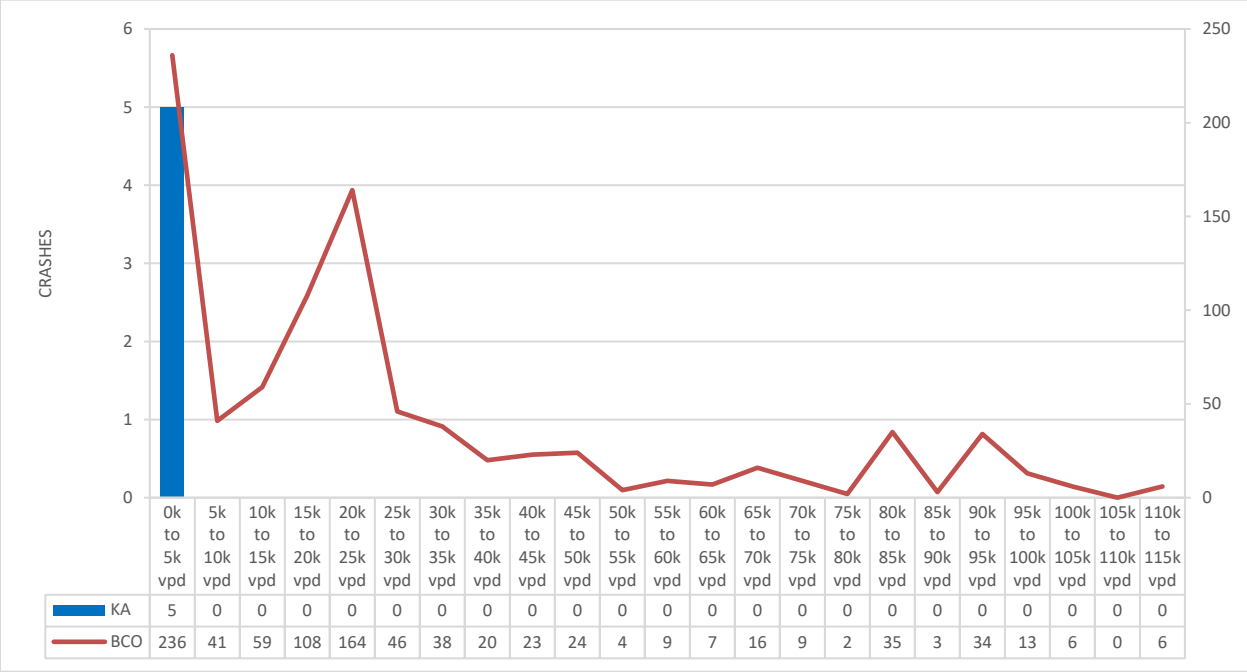
Figure 26 illustrates the number of heavy vehicle-involved segment crashes by midblock roadway configuration. Most fatal and severe crashes for operators of heavy vehicles during the five-year period occurred on two-way undivided roadways (50 percent). The majority, or 63 percent, of BCO crashes occurred on two-way undivided and two-way divided roadways with median barrier.



	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	0	3	0	1	0	2
BCO	108	286	6	157	327	106

Figure 26 Heavy Vehicle Crash Severity by Midblock Road Configuration (segment crashes only)

Figure 27 illustrates the number of heavy vehicle-involved segment crashes by maximum bidirectional approach AADT. Fatal and severe crashes occurred on roadways with low VPD. The majority of BCO crashes (51 percent) occurred on roadways with less than 5,000 VPD and 15,000 to 24,999 VPD.

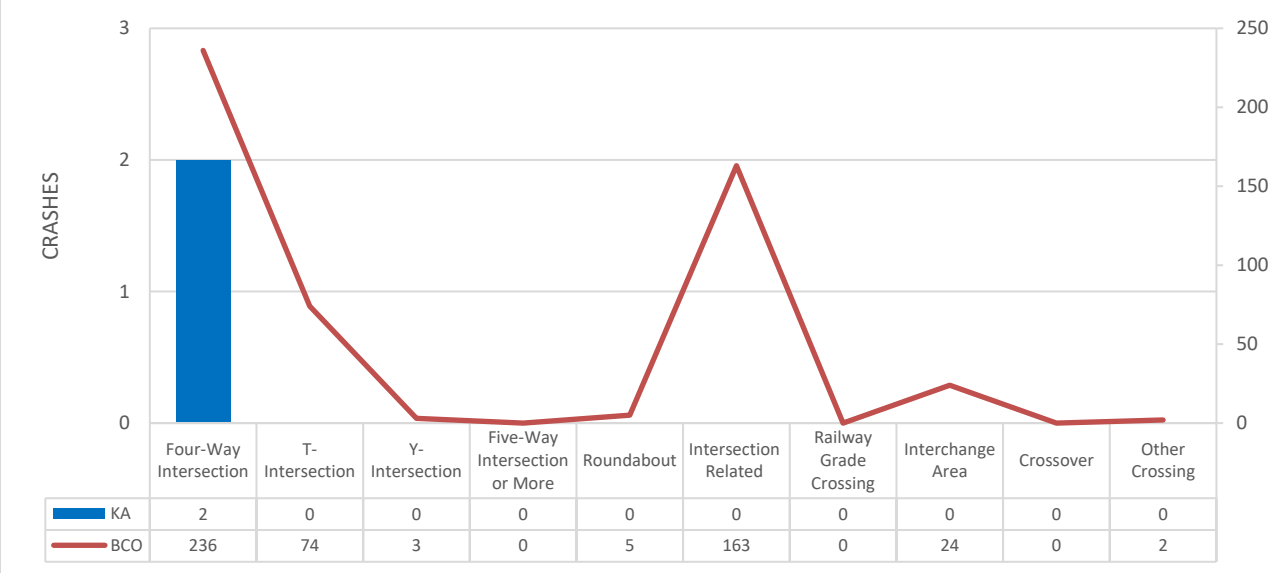


	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	236	41	59	108	164	46	38	20	23	24	4	9	7	16	9	2	35	3	34	13	6	0	6

Figure 27 Heavy Vehicle Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

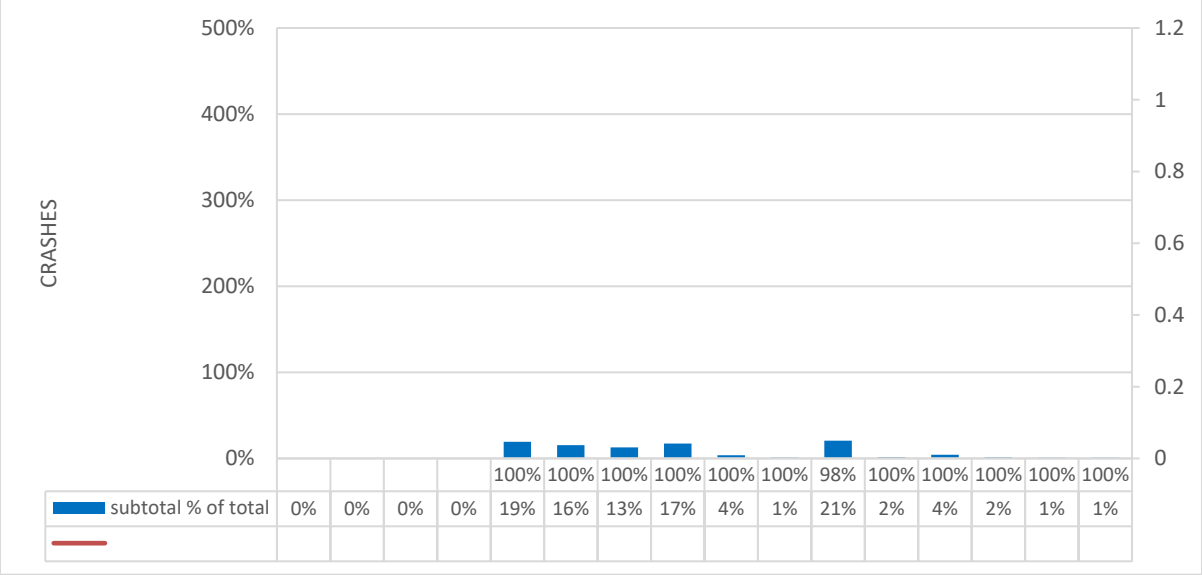
Figure 28 indicates the number of heavy vehicle-involved intersection crashes by intersection configuration. Fatal and severe crashes for operators of heavy vehicles occurred during the five-year period at four-way intersections. Most BCO crashes (79 percent) occurred at four-way intersections or were intersection related.



	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related	Railway Grade Crossing	Interchange Area	Crossover	Other Crossing
KA	2	0	0	0	0	0	0	0	0	0
BCO	236	74	3	0	5	163	0	24	0	2

Figure 28 Heavy Vehicle Crash Severity by Intersection Configuration (intersection crashes only)

Figure 29 illustrates the number of heavy vehicle-involved intersection crashes by maximum speed limit. Fatal and severe crashes for operators of heavy vehicles during the five-year period occurred on 55 mph roadways. Most BCO crashes (57 percent) occurred on roadways with speed limits of 25 mph to 40 mph, and 55 mph.



					100%	100%	100%	100%	100%	100%	98%	100%	100%	100%	100%	100%
subtotal % of total	0%	0%	0%	0%	19%	16%	13%	17%	4%	1%	21%	2%	4%	2%	1%	1%

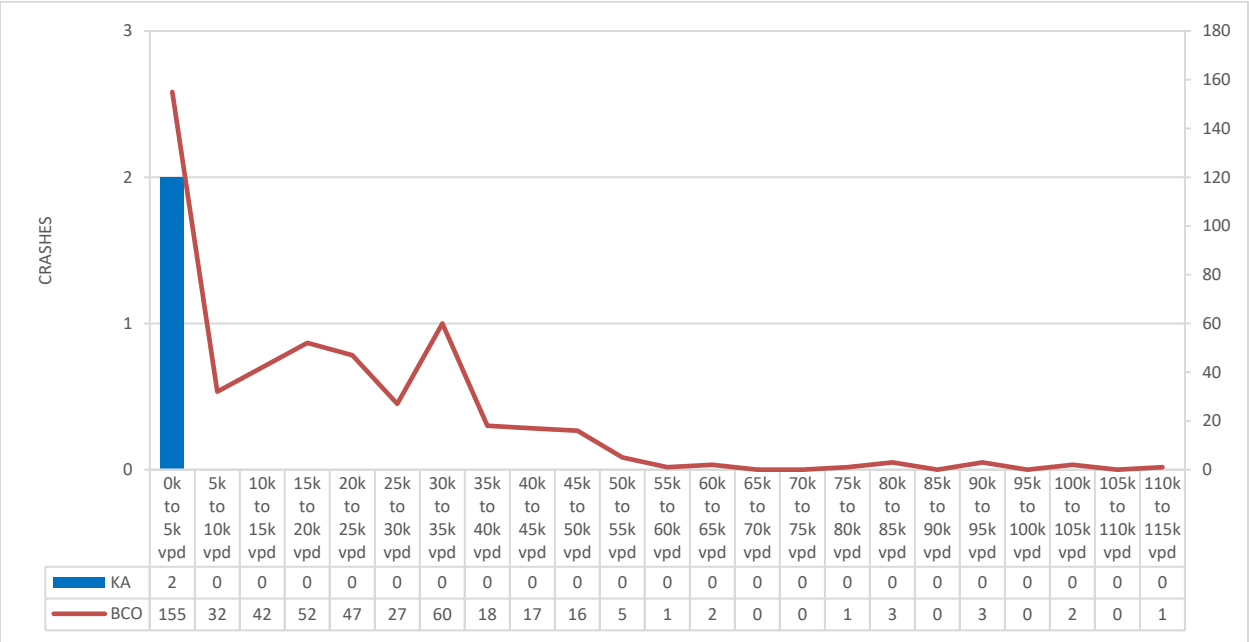
Figure 29 Heavy Vehicle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 30 indicates the number of heavy vehicle-involved intersection crashes by intersection traffic control device. Fatal and severe crashes for operators of heavy vehicles during the five-year period occurred at intersections with no traffic control device or yield sign. Most BCO crashes (89 percent) occur at unsignalized or signalized intersections.

	None	RR Crossing Device	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Warning Sign	Other	Not applicable
KA	1	0	0	0	1	0	0	0	0
BCO	226	0	223	2	3	52	0	1	0

Figure 30 Heavy Vehicle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 31 illustrates the number of heavy vehicle-involved intersection crashes by maximum bidirectional approach AADT. Fatal and severe crashes for operators of heavy vehicles during the five-year period occurred at intersections with a low AADT (less than 5,000 VPD). A small majority, or 31 percent, of BCO crashes occurred at intersections with less than 5,000 VPD.



	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	155	32	42	52	47	27	60	18	17	16	5	1	2	0	0	1	3	0	3	0	2	0	1

Figure 31 Heavy Vehicle Crash Severity by Maximum Approach AADT (intersection crashes only)

Bicycle

Figure 32 illustrates the number of bicyclist-involved crashes by lighting conditions. Most fatal and severe crashes (94 percent) occurred during Daylight conditions. The majority of BCO crashes (87 percent) occurred during Daylight conditions.

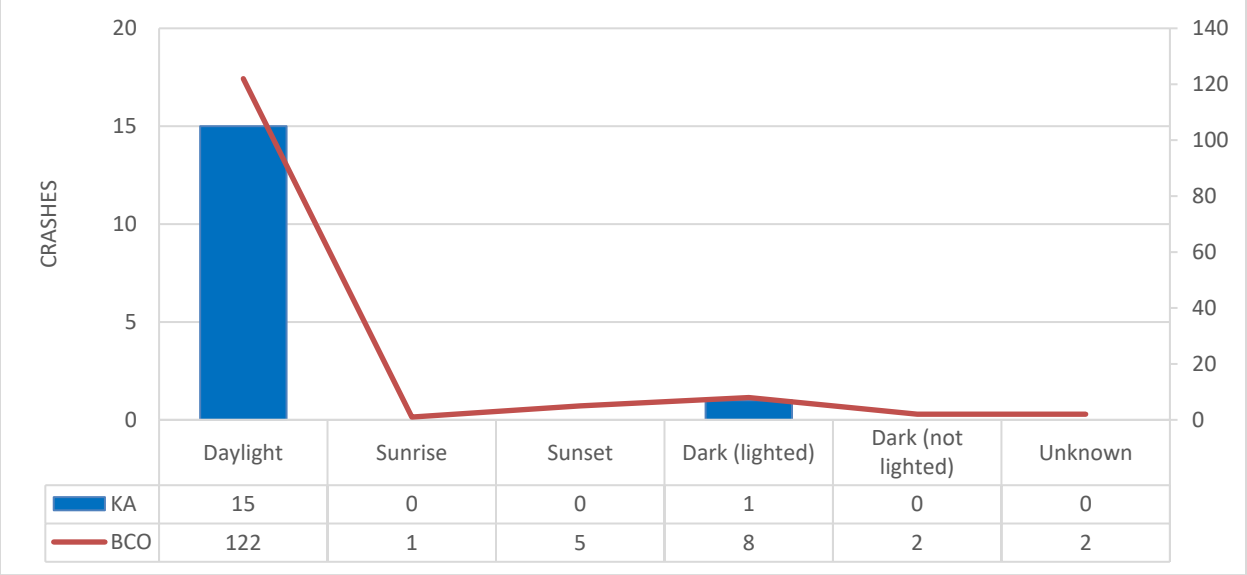


Figure 32 Bicycle Crash Severity by Lighting Conditions

Figure 33 indicates the number of bicyclist-involved crashes by functional classification. Most fatal and severe crashes occurred on Principal Arterial (63 percent) followed by Minor Arterial (25 percent). Most BCO crashes (67 percent) occurred on Principal Arterials.

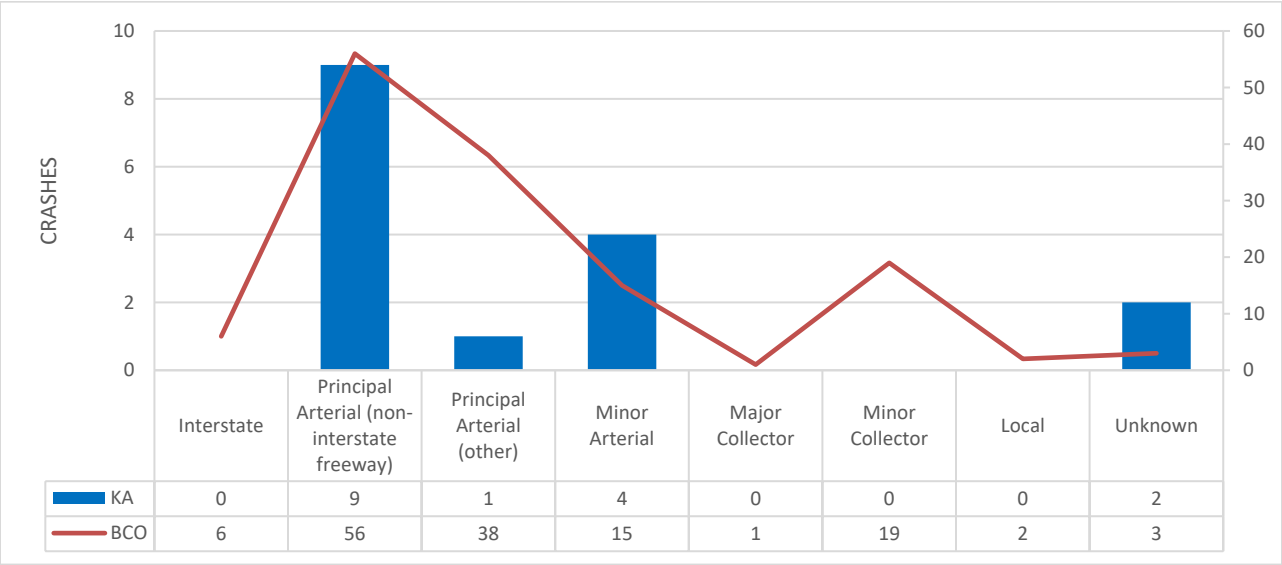


Figure 33 Bicycle Crash Severity by Functional Classification

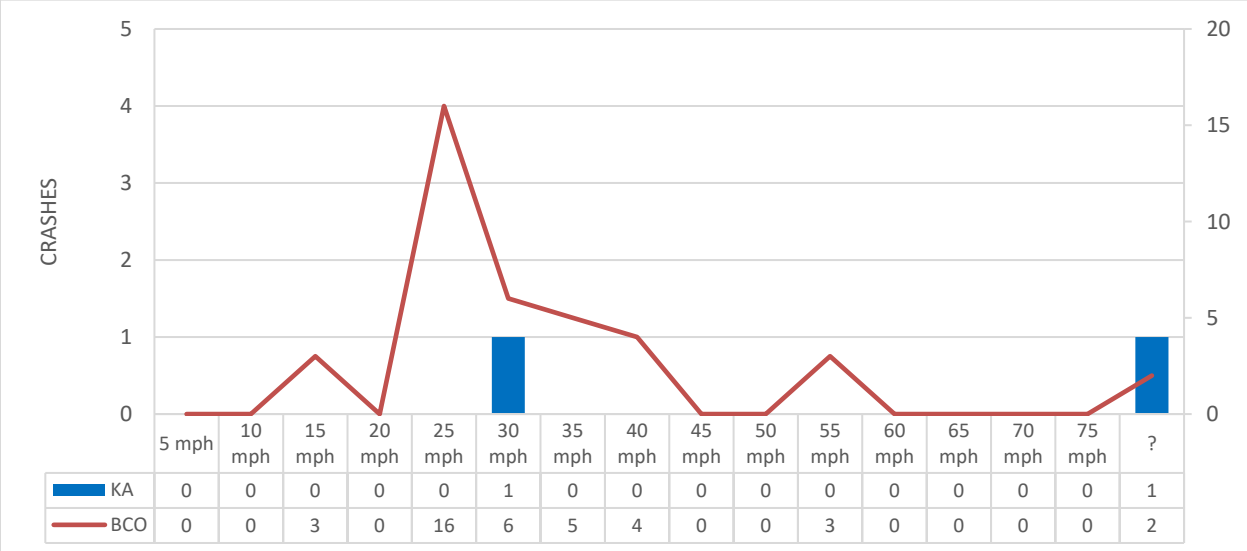
Segment-Related Crashes

Figure 34 indicates the number of bicyclist-involved segment crashes by number of lanes. Fatal and severe segment crashes occurred on roadways with two lanes or an unknown number of lanes. The majority of BCO crashes occurred on roadways with two- and four-lane (85 percent) configurations.

	1 lane	2 lanes	3 lanes	4 lanes	5 lanes	6 lanes	Unknown
KA	0	1	0	0	0	0	1
BCO	0	21	0	12	0	4	2

Figure 34 Bicycle Crash Severity by Midblock Number of Lanes (segment crashes only)

Figure 35 illustrates the number of bicyclist-involved segment crashes by speed limit. Fatal and severe segment crashes on roadways with a speed limit of 30 mph and unknown speed. Most BCO crashes (41 percent) occurred on roadways with a speed limit of 25 mph.



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
BCO	0	0	3	0	16	6	5	4	0	0	3	0	0	0	0	2

Figure 35 Bicycle Crash Severity by Midblock Speed Limit (segment crashes only)

Figure 36 illustrates the number of bicyclist-involved segment crashes by midblock roadway configuration. Fatal and severe segment crashes occurred on two-way undivided and unknown roadways. Most BCO segment crashes (59 percent) occurred on two-way undivided roadways.

Figure 36 Bicycle Crash Severity by Midblock Road Configuration (segment crashes only)

Figure 37 illustrates bicyclist-involved segment crashes by maximum bidirectional approach AADT. Fatal and severe crashes occurred on roadways with VPD between 25,000 to 29,999. The majority of BCO crashes occurred on segments with less than 5,000 VPD (41 percent).

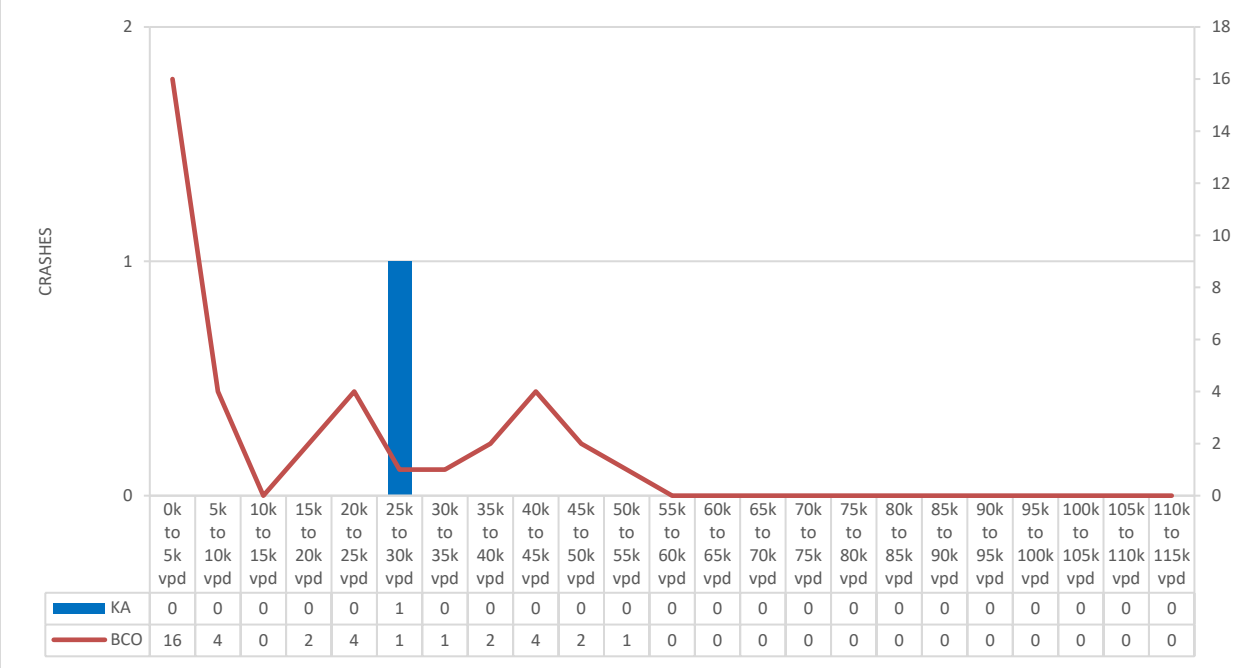
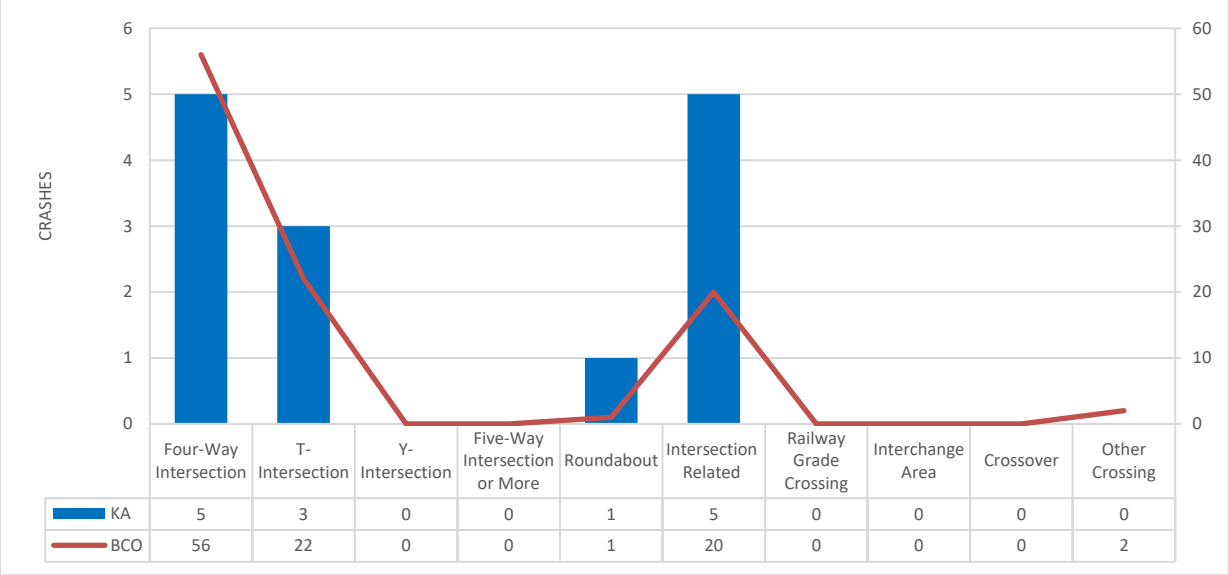


Figure 37 Bicycle Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

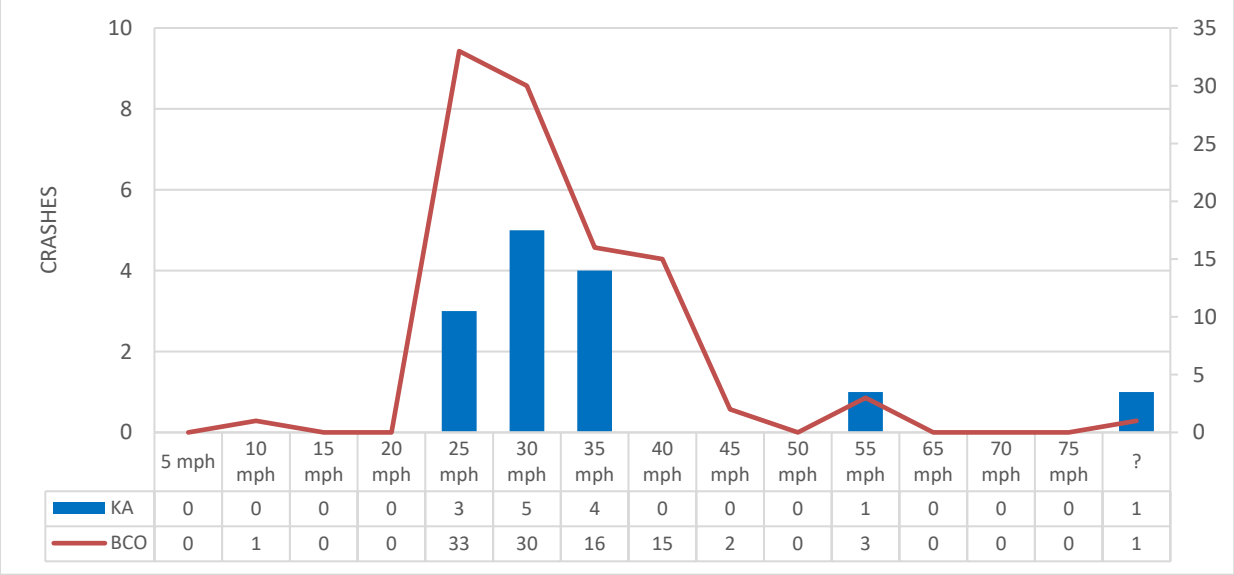
Figure 38 indicates the number of bicyclist-involved intersection crashes by intersection configuration. Most fatal and severe crashes (71 percent) occurred during the five-year period at four-way intersections or were intersection related. A majority, or 55 percent, of BCO crashes occurred at four-way intersections.



	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related	Railway Grade Crossing	Interchange Area	Crossover	Other Crossing
KA	5	3	0	0	1	5	0	0	0	0
BCO	56	22	0	0	1	20	0	0	0	2

Figure 38 Bicycle Crash Severity by Intersection Configuration (intersection crashes only)

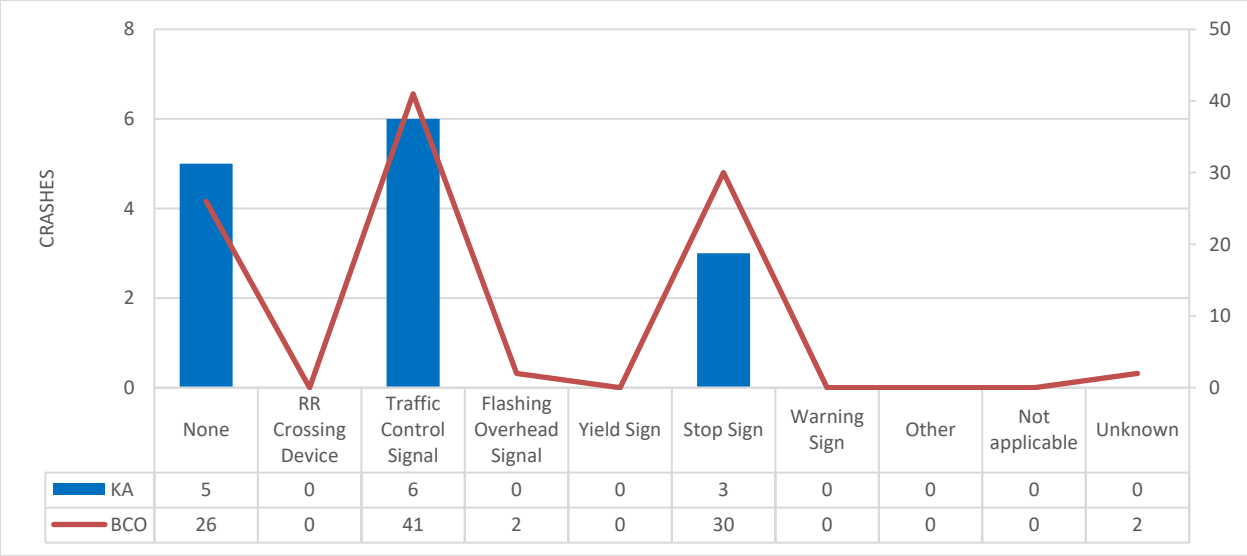
Figure 39 illustrates the number of bicyclist-involved intersection crashes by speed limit. Most fatal and severe crashes (86 percent) occurred during the five-year period at intersections with speed limits between 25 mph and 35 mph. A majority, or 93 percent, of BCO crashes occurred at intersections with speed limits between 25 mph and 40 mph.



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	65 mph	70 mph	75 mph	?
KA	0	0	0	0	3	5	4	0	0	0	1	0	0	0	1
BCO	0	1	0	0	33	30	16	15	2	0	3	0	0	0	1

Figure 39 Bicycle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

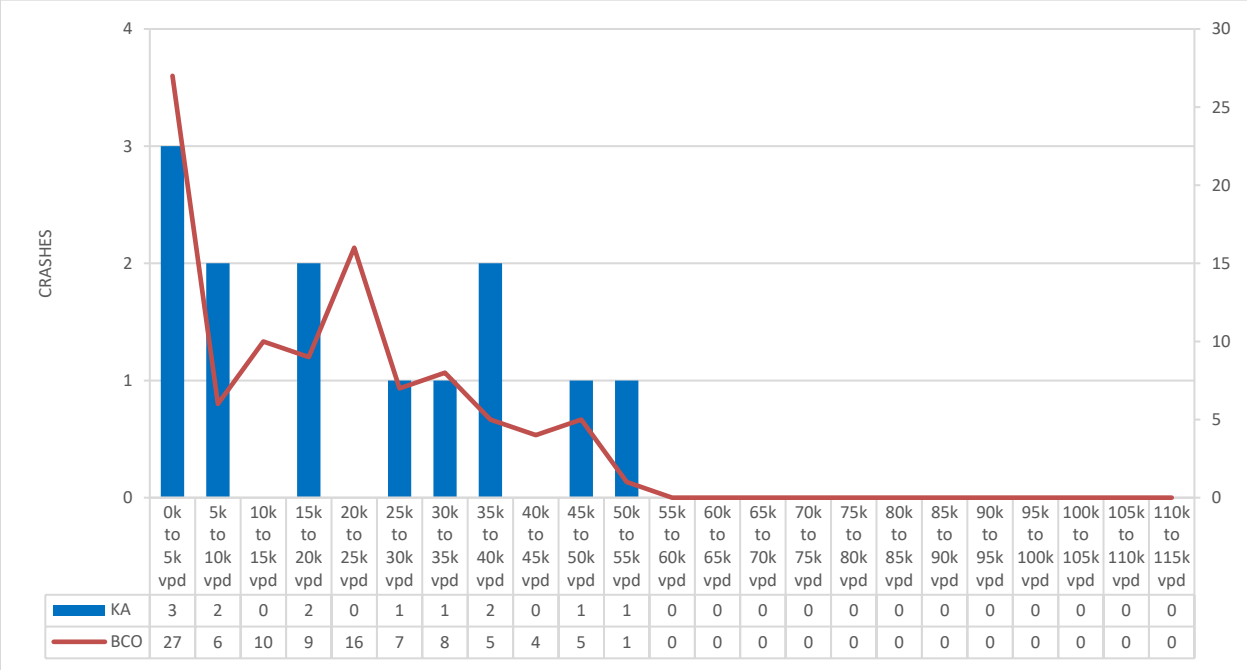
Figure 40 indicates the number of bicyclist-involved intersection crashes by intersection traffic control device. Fatal and severe crashes during the five-year period occurred at uncontrolled, unsignalized, and signalized intersections. A vast majority, or 96 percent, of BCO crashes occurred at the same type of intersections.



	None	RR Crossing Device	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Warning Sign	Other	Not applicable	Unknown
KA	5	0	6	0	0	3	0	0	0	0
BCO	26	0	41	2	0	30	0	0	0	2

Figure 40 Bicycle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 41 illustrates bicyclist-involved intersection crashes by maximum bidirectional approach AADT. Most fatal and severe crashes occurred at intersections with less than 10,000 VPD, 15,000 to 19,999 VPD, and 35,000 to 39,999 VPD (69 percent). A small majority of BCO crashes occurred at intersections with VPD less than 5,000 VPD (27 percent).



	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	3	2	0	2	0	1	1	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
BCO	27	6	10	9	16	7	8	5	4	5	1	0	0	0	0	0	0	0	0	0	0	0	0

Figure 41 Bicycle Crash Severity by Maximum Approach AADT (intersection crashes only)

Pedestrian

Figure 42 indicates the number of pedestrian-involved crashes by lighting condition. Most fatal and severe pedestrian crashes (47 percent) occurred during Daylight conditions; followed by Dark (lighted) with 38 percent. Most BCO crashes (66 percent) occurred during Daylight conditions.

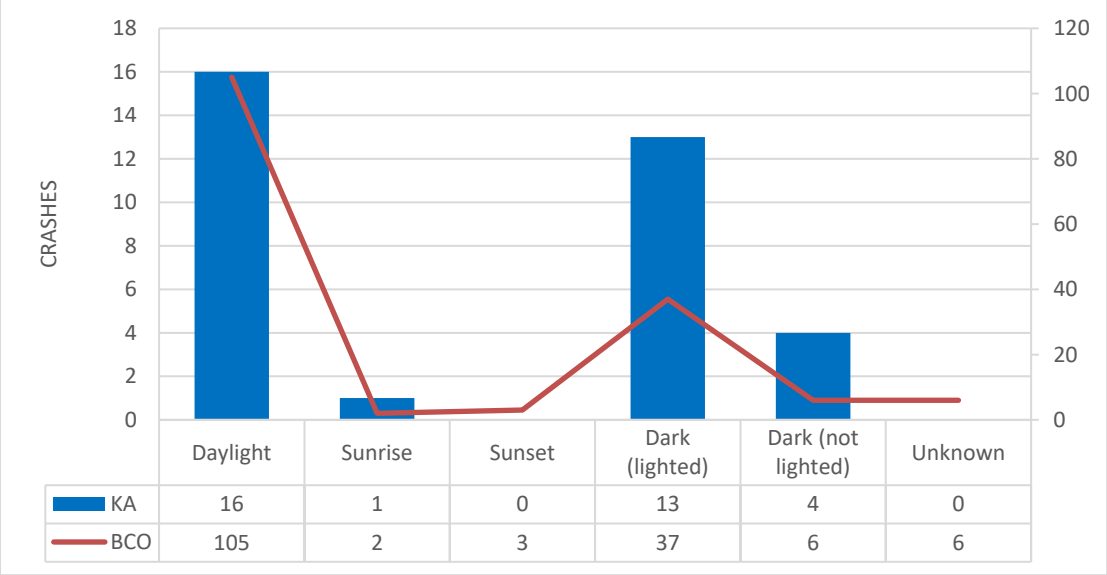


Figure 42 Pedestrian crash severity by Lighting Conditions

Figure 43 illustrates the number of pedestrian-involved crashes by functional classification. Most fatal and severe crashes occurred on Principal Arterials (35 percent), Minor Arterials (24 percent), Interstates and Minor Collectors; each contributed 18 percent, respectively. A majority, or 42 percent, of BCO crashes occurred on Principal Arterials.

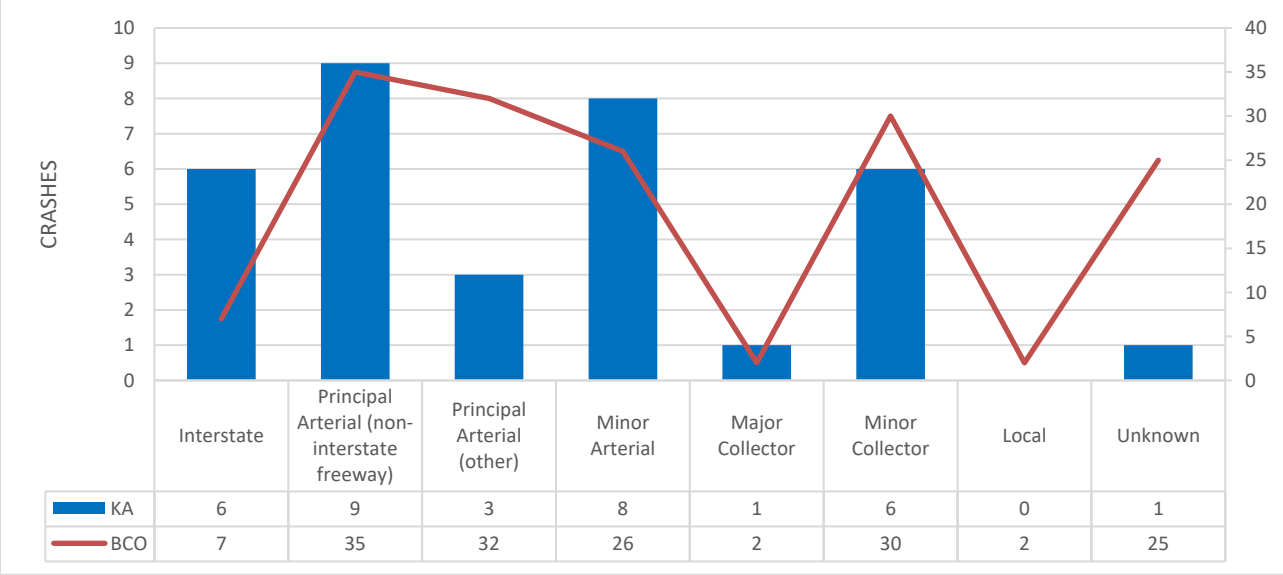
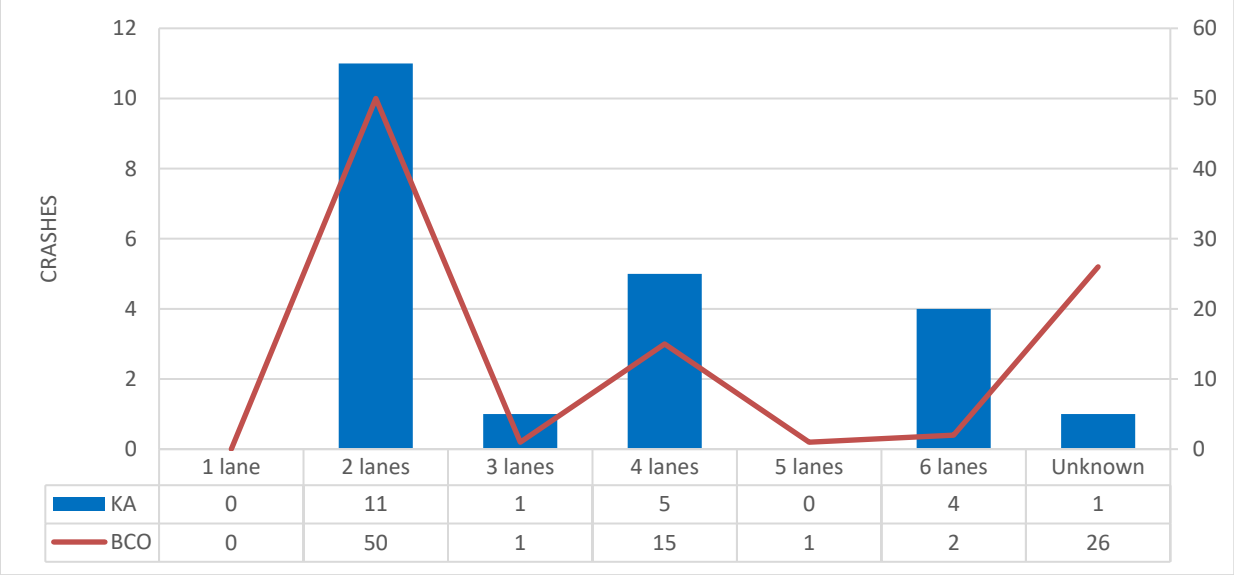


Figure 43 Pedestrian Crash Severity by Functional Classification

Segment-Related Crashes

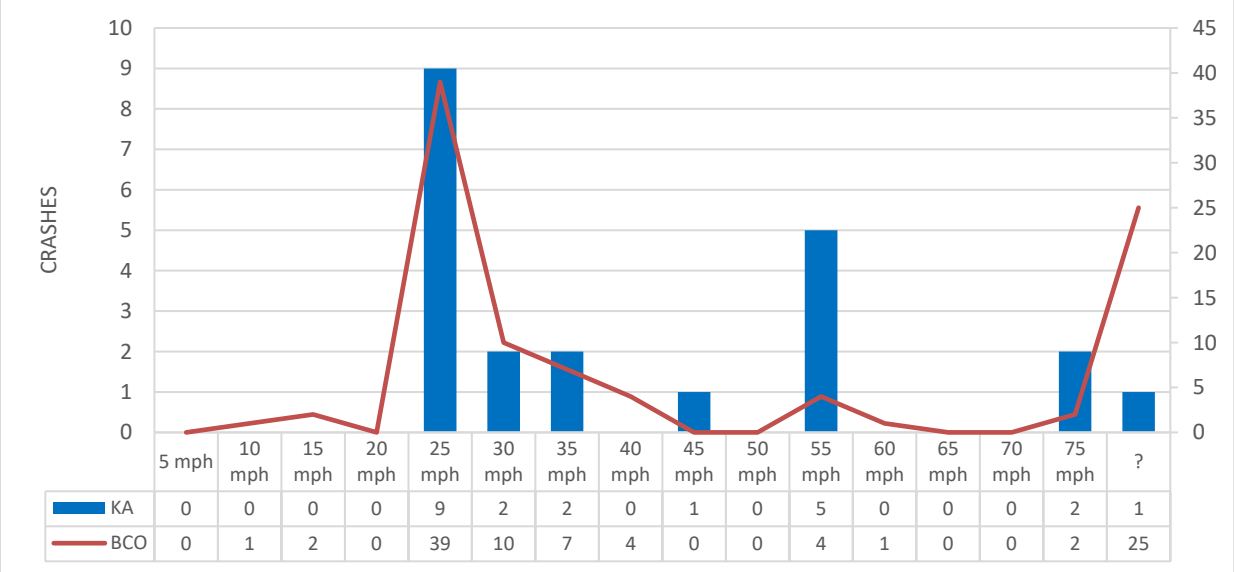
Figure 44 illustrates the number of pedestrian-involved segment crashes by number of lanes. Most fatal and severe segment crashes (50 percent) occurred on two-lane roadways. A majority, or 53 percent, of BCO segment crashes occurred on two-lane roadways.



	1 lane	2 lanes	3 lanes	4 lanes	5 lanes	6 lanes	Unknown
KA	0	11	1	5	0	4	1
BCO	0	50	1	15	1	2	26

Figure 44 Pedestrian Crash Severity by Midblock Number of Lanes (segment crashes only)

Figure 45 indicates the number of bicyclist-involved segment crashes by speed limit. Most fatal and severe segment crashes (64 percent) on roadways with a speed limit of 25 mph and 55 mph. A majority, or 67 percent, of BCO crashes occurred on roadways with a speed limit of 25 mph and those with an unknown speed.



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	0	0	0	0	9	2	2	0	1	0	5	0	0	0	2	1
BCO	0	1	2	0	39	10	7	4	0	0	4	1	0	0	2	25

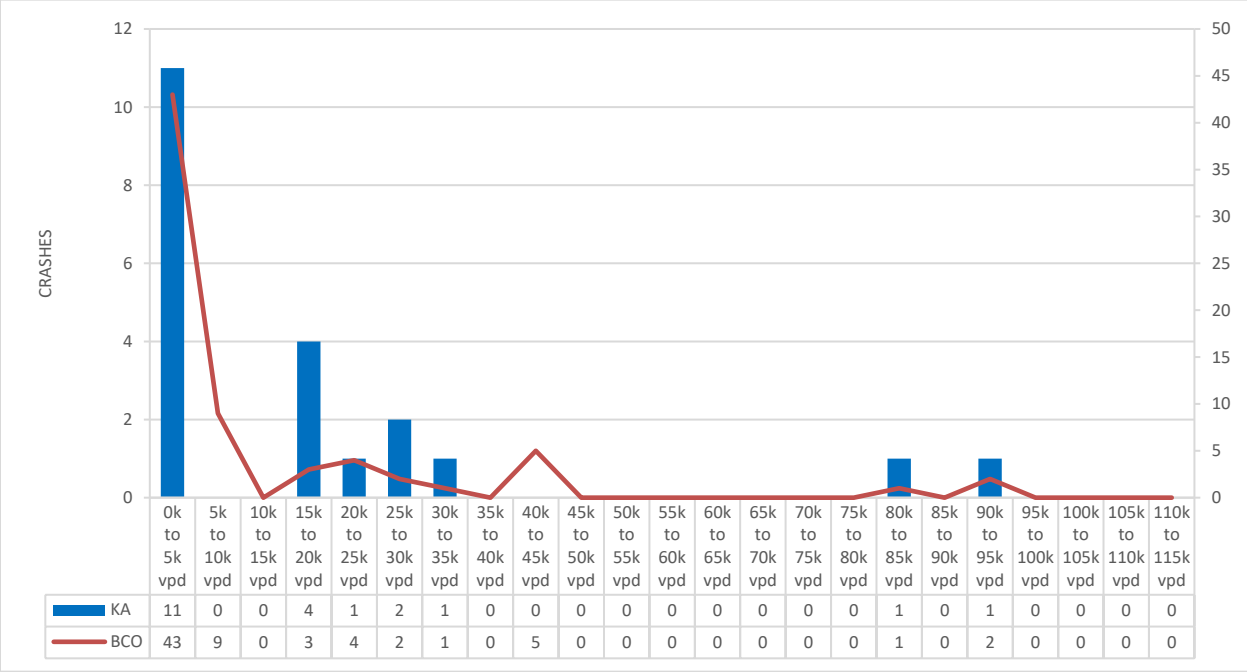
Figure 45 Pedestrian Crash Severity by Midblock Speed Limit (segment crashes only)

Figure 46 illustrates the number of pedestrian-involved segment crashes by midblock roadway configuration. Most fatal and severe segment crashes (46 percent) occurred on two-way undivided. Two-way undivided and roadways with unknown configuration contributed to 87 percent of BCO crashes.

	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	1	10	0	1	4	6
BCO	5	43	2	3	4	38

Figure 46 Pedestrian Crash Severity by Midblock Road Configuration (segment crashes only)

Figure 47 indicates pedestrian-involved segment crashes by maximum bidirectional approach AADT. Most fatal and severe crashes (50 percent) occurred on roadways with low VPD (less than 5,000). BCO crashes occurring on segments with low VPD contributed the most (45 percent).

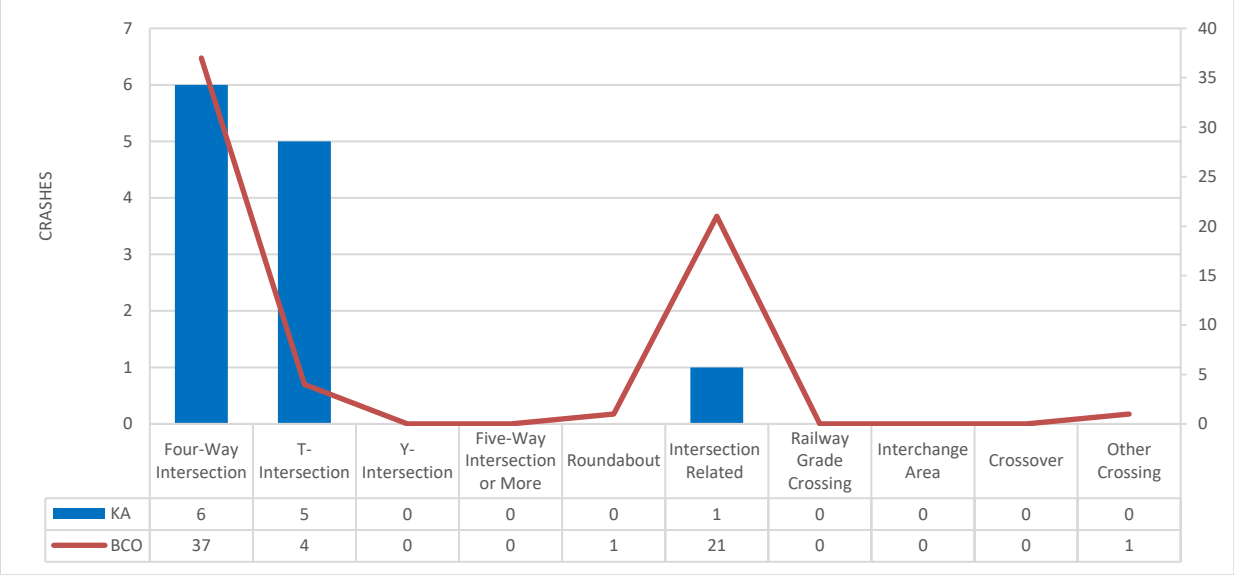


	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	11	0	0	4	1	2	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
BCO	43	9	0	3	4	2	1	0	5	0	0	0	0	0	0	0	1	0	2	0	0	0	0

Figure 47 Pedestrian Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

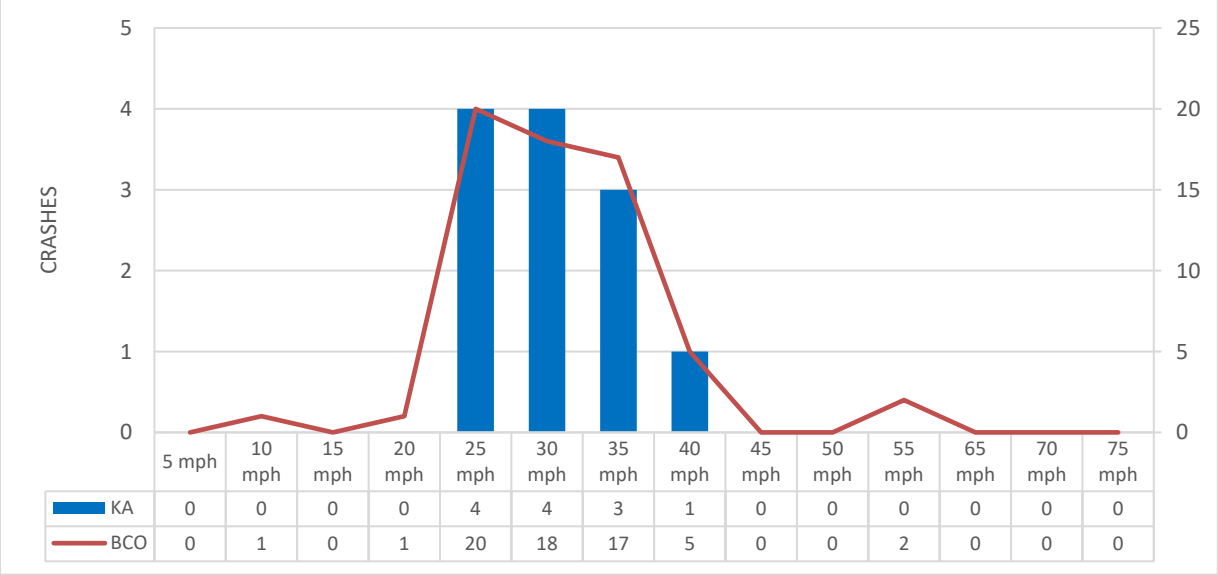
Figure 48 illustrates the number of pedestrian-involved intersection crashes by intersection configuration. Most fatal and severe crashes (92 percent) occurred at four-way and T-intersections. An overwhelming majority, or 91 percent, of BCO crashes occurred at four-way intersections and those that were intersection related.



	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related	Railway Grade Crossing	Interchange Area	Crossover	Other Crossing
KA	6	5	0	0	0	1	0	0	0	0
BCO	37	4	0	0	1	21	0	0	0	1

Figure 48 Pedestrian Crash Severity by Intersection Configuration (intersection crashes only)

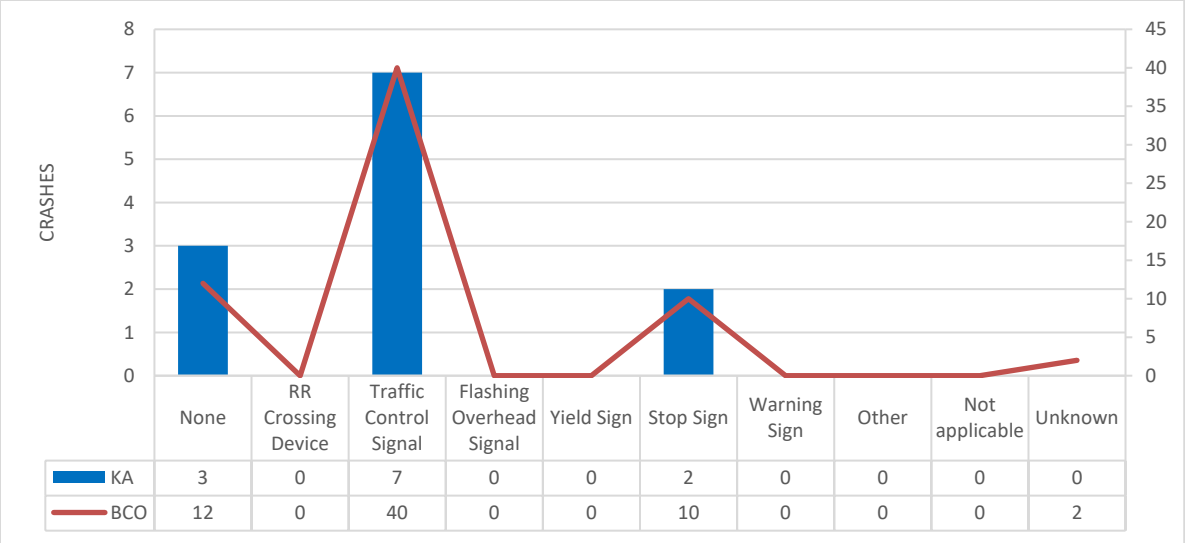
Figure 49 indicates the number of pedestrian-involved intersection crashes by speed limit. Fatal and severe crashes occurred at speed limits between 25 mph and 40 mph. The majority of BCO crashes (86 percent) occurred at speed limits between 25 mph and 35 mph.



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	65 mph	70 mph	75 mph
KA	0	0	0	0	4	4	3	1	0	0	0	0	0	0
BCO	0	1	0	1	20	18	17	5	0	0	2	0	0	0

Figure 49 Pedestrian Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

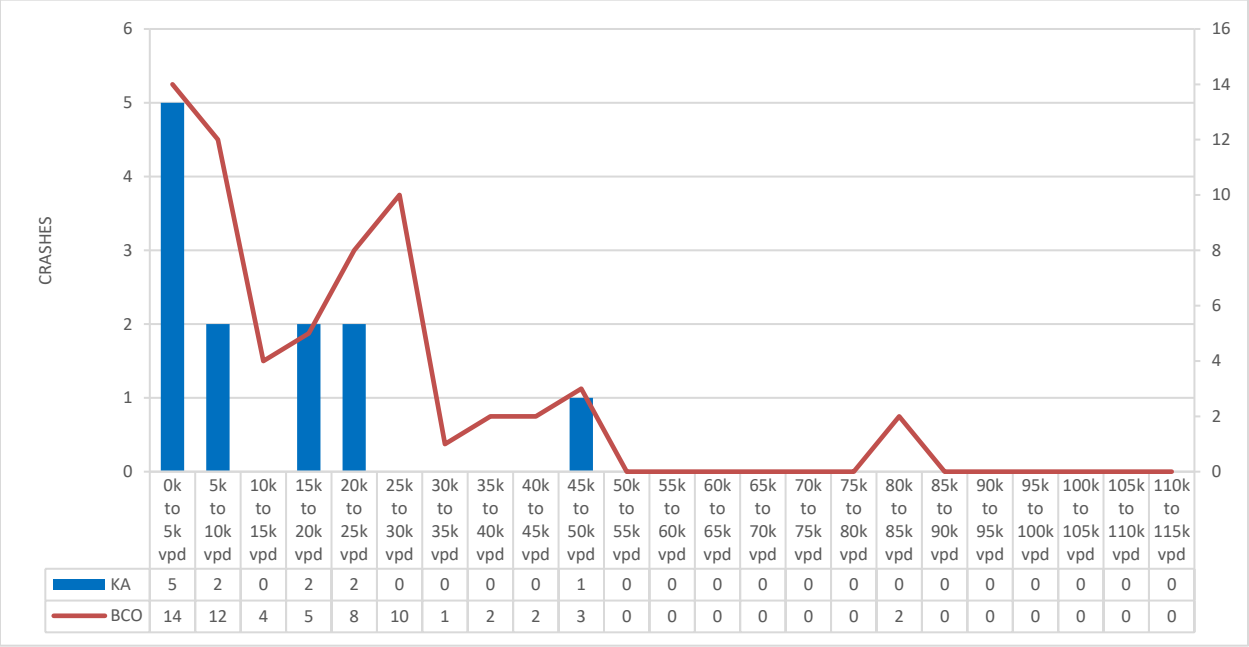
Figure 50 illustrates the number of pedestrian-involved intersection crashes by intersection traffic control device. Most fatal and severe crashes (58 percent) during the five-year period occurred at signalized intersections. A majority, or 63 percent, of BCO crashes occurred at signalized intersections.



	None	RR Crossing Device	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Warning Sign	Other	Not applicable	Unknown
KA	3	0	7	0	0	2	0	0	0	0
BCO	12	0	40	0	0	10	0	0	0	2

Figure 50 Pedestrian Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 51 illustrates pedestrian-involved intersection crashes by maximum bidirectional approach AADT. Most fatal and severe crashes (42 percent) occurred at intersections with less than 5,000 VPD. Additionally, intersections with 5,000 to 9,999 and 15,000 to 24,999 VPD contributed 50 percent to these types of accidents. Most BCO crashes (56 percent) occurred at intersections with less than 9,999 VPD and 25,000 to 29,999 VPD.

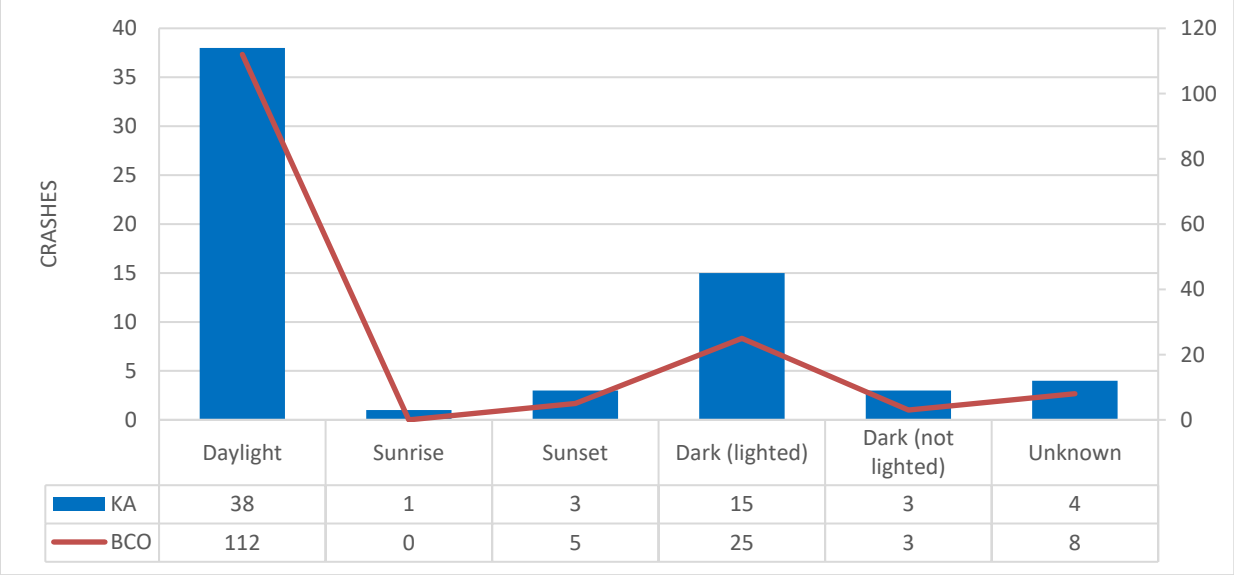


	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	5	2	0	2	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	14	12	4	5	8	10	1	2	2	3	0	0	0	0	0	0	2	0	0	0	0	0	0

Figure 51 Pedestrian Crash Severity by Maximum Approach AADT (intersection crashes only)

Motorcycle

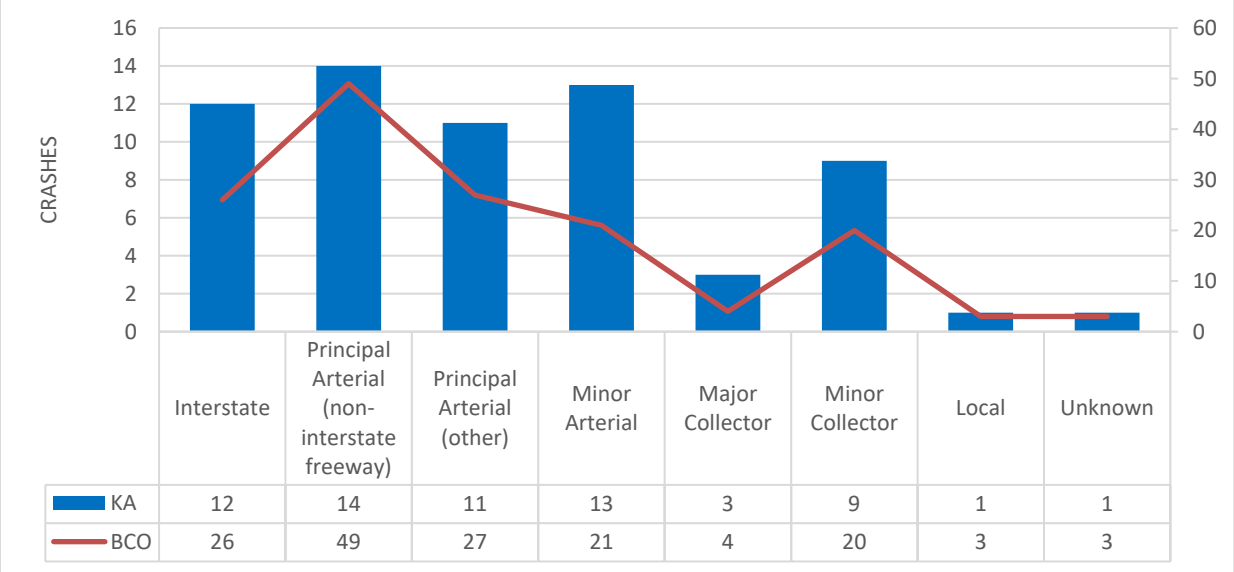
Figure 52 indicates the number of motorcycle-involved crashes by lighting conditions. Most fatal and severe motorcycle crashes (59 percent) occurred during Daylight conditions; followed by Dark (lighted) with 23 percent. A majority, or 73 percent, of BCO crashes occurred during daylight.



	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	38	1	3	15	3	4
BCO	112	0	5	25	3	8

Figure 52 Motorcycle crash severity by Lighting Conditions

Figure 53 illustrates the number of motorcycle-involved crashes by functional classification. Most fatal and severe crashes (39 percent) occurred on Principal Arterials. However, the occurrences of these types of crashes are also high for Interstate (19 percent) and Minor Arterials (20 percent). A majority, or 50 percent, of BCO crashes occurred on Principal Arterials.

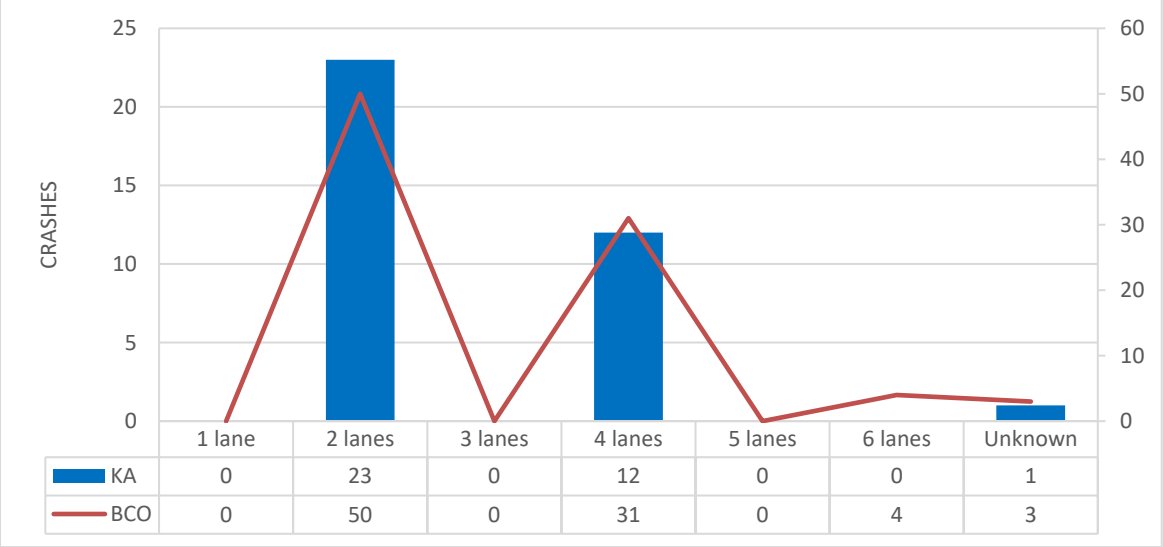


	Interstate	Principal Arterial (non-interstate freeway)	Principal Arterial (other)	Minor Arterial	Major Collector	Minor Collector	Local	Unknown
KA	12	14	11	13	3	9	1	1
BCO	26	49	27	21	4	20	3	3

Figure 53 Motorcycle Crash Severity by Functional Classification

Segment-Related Crashes

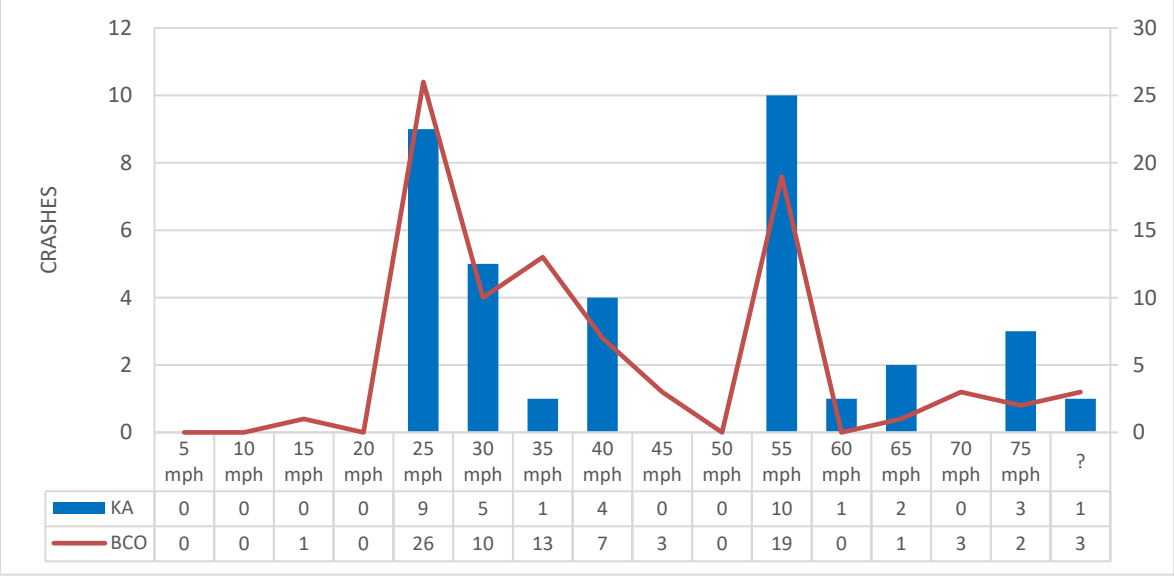
Figure 54 illustrates the number of motorcycle-involved segment crashes by number of lanes. Most fatal and severe segment crashes occurred on two-lane (64 percent) and four-lane (33 percent) roadways. The majority of BCO segment crashes occurred on the same type of roadways; 57 percent and 35 percent, respectively.



	1 lane	2 lanes	3 lanes	4 lanes	5 lanes	6 lanes	Unknown
KA	0	23	0	12	0	0	1
BCO	0	50	0	31	0	4	3

Figure 54 Motorcycle Crash Severity by Midblock Number of Lanes (segment crashes only)

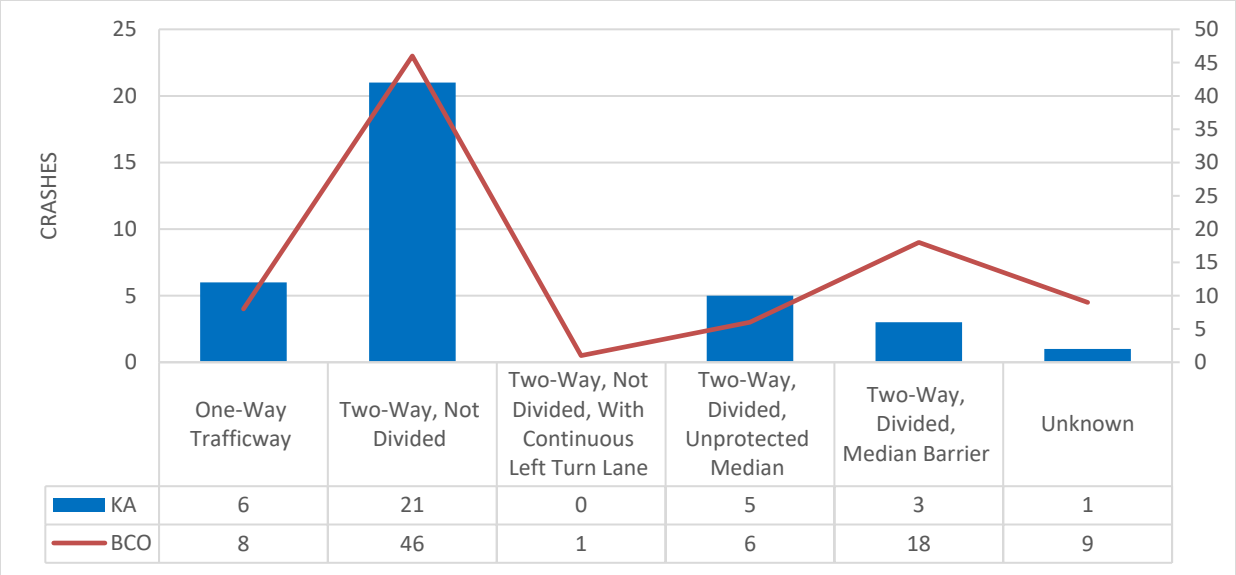
Figure 55 illustrates the number of motorcycle-involved segment crashes by speed limit. Most fatal and severe crashes (53 percent) occurred on segments with speed limits of 25 mph and 55 mph. There is a high prevalence of these crashes occurring on roadways with speed limits of 30 mph, and 40 mph. The majority of BCO crashes, or 66 percent, occurred on segments with speed limits of 25 mph, 35 mph, and 55 mph.



	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	0	0	0	0	9	5	1	4	0	0	10	1	2	0	3	1
BCO	0	0	1	0	26	10	13	7	3	0	19	0	1	3	2	3

Figure 55 Motorcycle Crash Severity by Midblock Speed Limit (segment crashes only)

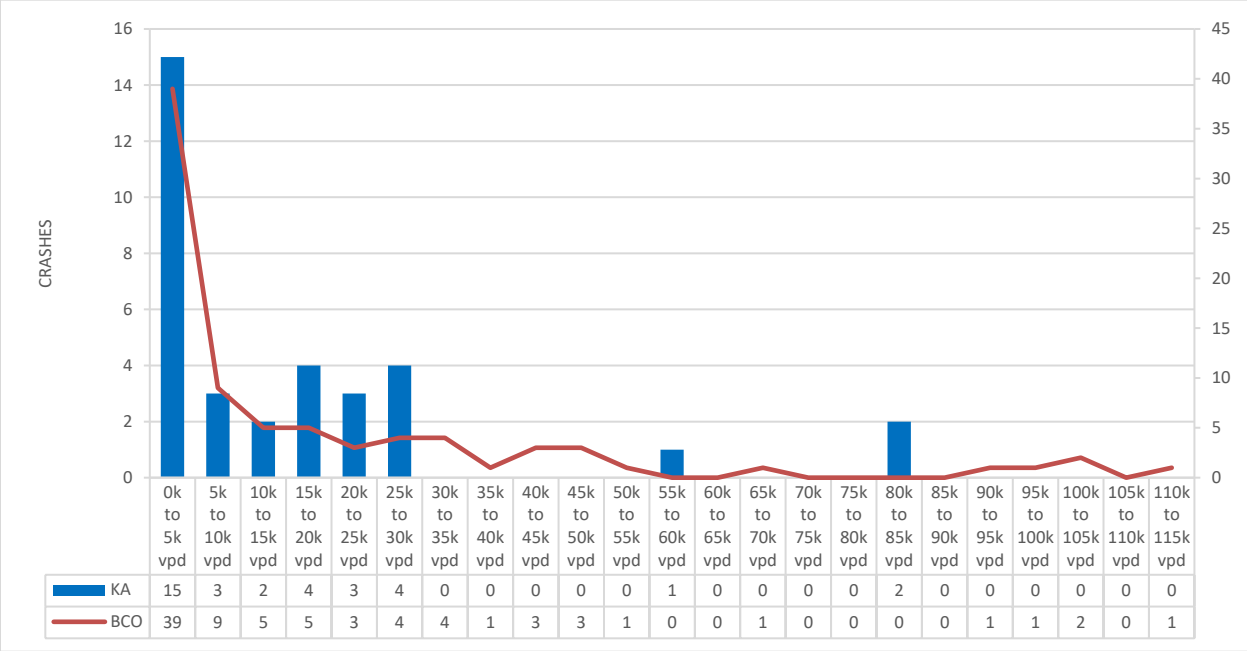
Figure 56 illustrates the number of motorcycle-involved segment crashes by midblock roadway configuration. Most fatal and severe segment crashes (58 percent) occurred on two-way undivided roadways. The majority, or 74 percent, of BCO segment crashes occurred on two-way undivided and two-way divided (median barrier) roadways.



	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	6	21	0	5	3	1
BCO	8	46	1	6	18	9

Figure 56 Motorcycle Crash Severity by Midblock Road Configuration (segment crashes only)

Figure 57 indicates the number of motorcycle-involved segment crashes by maximum bidirectional approach AADT. Most of the fatal and severe crashes (42 percent) occurred on low volume roadways (less than 5,000 VPD). The majority of BCO crashes (44 percent) also occurred on roadways with less than 5,000 VPD.

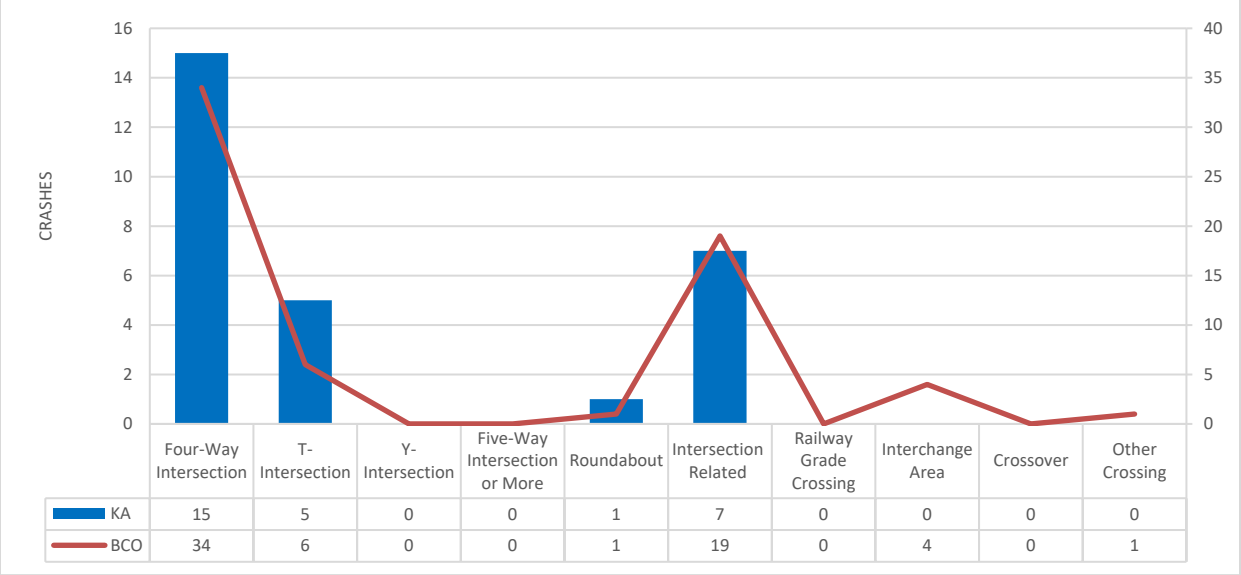


	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	15	3	2	4	3	4	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0
BCO	39	9	5	5	3	4	4	1	3	3	1	0	0	1	0	0	0	0	1	1	2	0	1

Figure 57 Motorcycle Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

Figure 58 indicates the number of motorcycle-involved intersection crashes by intersection configuration. Most fatal and severe intersection crashes (54 percent) occurred at four-way intersections. The majority of BCO crashes (52 percent) occurred at four-way intersections.



	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related	Railway Grade Crossing	Interchange Area	Crossover	Other Crossing
KA	15	5	0	0	1	7	0	0	0	0
BCO	34	6	0	0	1	19	0	4	0	1

Figure 58 Motorcycle Crash Severity by Intersection Configuration (intersection crashes only)

Figure 59 illustrates the number of motorcycle-involved intersection crashes by maximum speed limit. Most of the fatal and severe crashes (79 percent) occurred at intersections with a maximum speed limit of 25 mph, 30 mph and 40 mph. The majority of BCO crashes (71 percent) occurred at intersections with speed limits between 25 mph and 35 mph.

	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph
KA	0	0	0	0	9	6	0	7	1	0	4	0	1	0	0
BCO	0	0	0	0	18	13	15	7	5	0	6	0	1	0	0

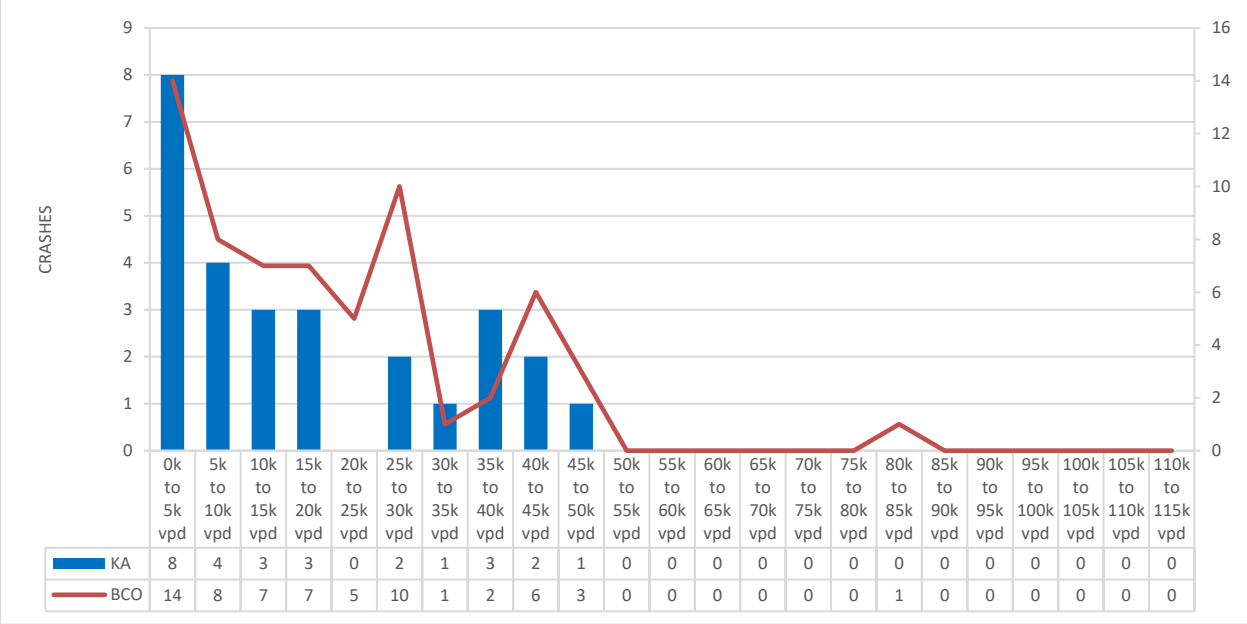
Figure 59 Motorcycle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 60 illustrates the number of motorcycle-involved intersection crashes by intersection traffic control device. An overwhelming majority of fatal and severe intersection crashes (89 percent) occurred at uncontrolled and signalized intersections. For BCO crashes, uncontrolled and signalized intersections contribute to 91 percent of the accidents.

	None	RR Crossing Device	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Warning Sign	Other	Not applicable
KA	15	0	10	0	1	2	0	0	0
BCO	31	0	28	0	3	3	0	0	0

Figure 60 Motorcycle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 61 illustrates the number of motorcycle-involved intersection crashes by maximum bidirectional approach AADT. A small majority of the fatal and severe crashes (29 percent) occurred on low volume roadways (less than 5,000 VPD). Additionally, intersections with 5,000 – 19,999 VPD and 35,000 – 39,999 VPD contributed to 46 percent of the crashes. For BCO crashes, intersections with less than 5,000 VPD and 25,000 – 29,999 VPD contributed to 37 percent of the accidents.



	0k to 5k vpd	5k to 10k vpd	10k to 15k vpd	15k to 20k vpd	20k to 25k vpd	25k to 30k vpd	30k to 35k vpd	35k to 40k vpd	40k to 45k vpd	45k to 50k vpd	50k to 55k vpd	55k to 60k vpd	60k to 65k vpd	65k to 70k vpd	70k to 75k vpd	75k to 80k vpd	80k to 85k vpd	85k to 90k vpd	90k to 95k vpd	95k to 100k vpd	100k to 105k vpd	105k to 110k vpd	110k to 115k vpd
KA	8	4	3	3	0	2	1	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	14	8	7	7	5	10	1	2	6	3	0	0	0	0	0	0	1	0	0	0	0	0	0

Figure 61 Motorcycle Crash Severity by Maximum Approach AADT (intersection crashes only)

APPENDIX 3 – HIGH-INJURY NETWORK METHODOLOGY

Memorandum

SRF No. 16766

To: Adam Altenburg
Metro COG

From: SRF Consulting Group

Date: February 19, 2024

Subject: Metro COG Regional Comprehensive Safety Action Plan

Task 5 Safety Analysis: High-Injury Network Methodology

The Metro COG Regional Comprehensive Safety Action Plan (Safety Action Plan) relies on a thorough understanding of motor vehicle, heavy vehicle, bicycle, motorcycle, and pedestrian crash trends to inform strategic investments in safety improvements aimed at decreasing crashes and eliminating severe crashes (fatal and incapacitating injury crashes) on roadways throughout the Fargo-Moorhead Metropolitan Statistical Area (MSA).

This technical memorandum documents the High-Injury Network (HIN) for the MSA. A HIN consists of the roadway corridors where a majority of severe crashes are occurring. This moves beyond typical historical crash analysis and allows for a better description of the types of roadways and intersections in the MSA where users are the most at risk. The HIN systemic analysis allows Metro COG and partners to proactively work to minimize the occurrence and severity of crashes into the future.

In addition to the development of a HIN, the Safety Action Plan will also rely on crash profiles, which considers crash types, crash attributes, roadway characteristics, land use context, and road user behavior (as applicable) to identify the most prevalent factors of severe crashes in the area to inform implementation recommendations. Crash profiles will be developed after review of the crash analysis and trends, and the systemic analysis, including the HIN as identified herein (Task 5).

Definitions

What is a high injury network (HIN)? The HIN identifies streets or locations where a high number of severe crash concentrations have occurred along a corridor-level segment for the most recent 5-year period (2018-2022). The high injury network street represents a prioritized subset of Metro COG's overall regional transportation network, focusing on streets with the highest prevalence of severe crashes.

What are sliding windows? There are various methodologies to develop a HIN. The sliding window methodology within a 0.5-mile or 1.0-mile window sliding along a corridor in 0.1-mile increments.

What is the KABCO injury scale? The KABCO scale consists of five crash severities that are used as an industry shorthand when discussing crash severity. Table 1 includes descriptions of each of the codes and categorizes them into severe and non-severe groups.

Table 1. KABCO Injury Scale

Severe (more injurious)	Non-Severe (less injurious)
K - involves a fatal injury **A** - incapacitating injury (serious injury)	**B** - non-incapacitating injury **C** - possible injury **O** - no injury or a property damage-only (PDO) crash

The project team utilized crash data provided by the North Dakota Department of Transportation (NDDOT) and the Minnesota Department of Transportation (MnDOT) for 2018-2022. The data on crashes that occurred on the North Dakotan side of the study area was provided in the five-table format (Crash Master, Unit, Pedestrian, Operator, and Occupant) and the data on crashes that occurred on the Minnesotan side of the study area was provided in the three-table format (ACC, VEH, and PER) typical of the Minnesota Department of Public Safety's frozen annual reports. The two states' data sets were combined into a unified dataset which was then used to create mode-specific HINs for each of the following modes:

- Automobile (passenger automobile and/or light vehicle)
- Heavy Vehicle
- Pedestrian
- Bike (pedalcycle)
- Motorcycle

Each unit (a vehicle or a pedestrian) involved in a crash was sorted into a mode based on the Unit Configuration field from the Unit crash table for North Dakota crashes and the Unit Vehicle and Vehicle Type fields from the VEH crash table for Minnesotan crashes. In addition to the five modes listed above, units could be sorted into three additional mode types which were then excluded from analysis: other (people riding on/in ATVs, farm equipment, horses, etc.), parked/unoccupied vehicles, and hit-and-run vehicles.

After classifying each unit by mode and excluding units with atypical characteristics, units without occupants, and units on which there was little to no information, the project team determined the Most Severe Injury (MSI) suffered by a person using each of the five modes. For example, if a passenger car with a driver (operator) and two passengers (occupants) strikes a person walking in a crosswalk (pedestrian) and the pedestrian is killed (K), the driver receives a non-incapacitating injury (B), and the two passengers are suspected of having minor injuries (C), the MSI for someone in an automobile would be a minor injury (B), the MSI for a pedestrian would be a fatality (K), and the MSI for the other modes (heavy vehicle, cyclist, and motorcycle) would be null.

Developing a High Injury Network

The development of an HIN consists of four steps: creating short and long windows from a base road network, assigning crashes to long windows, calculating short and long window scores, and setting a minimum short window crash score threshold for inclusion in the final selection. All four steps are described below.

Creating the Short and Long Windows from the Base Network

The first step in developing the base HIN is to simplify Metro COG's regional roadway centerline shapefile(s) to create contiguous corridors from the street segments. For example, 13th Avenue S. and 13th Avenue E. are converted from separate shorter segments to a single merged contiguous 13th Avenue corridor. In the example shown in Figure 1, the main corridor is shown as a black line at the top of the diagram and measures 0.73 miles long.

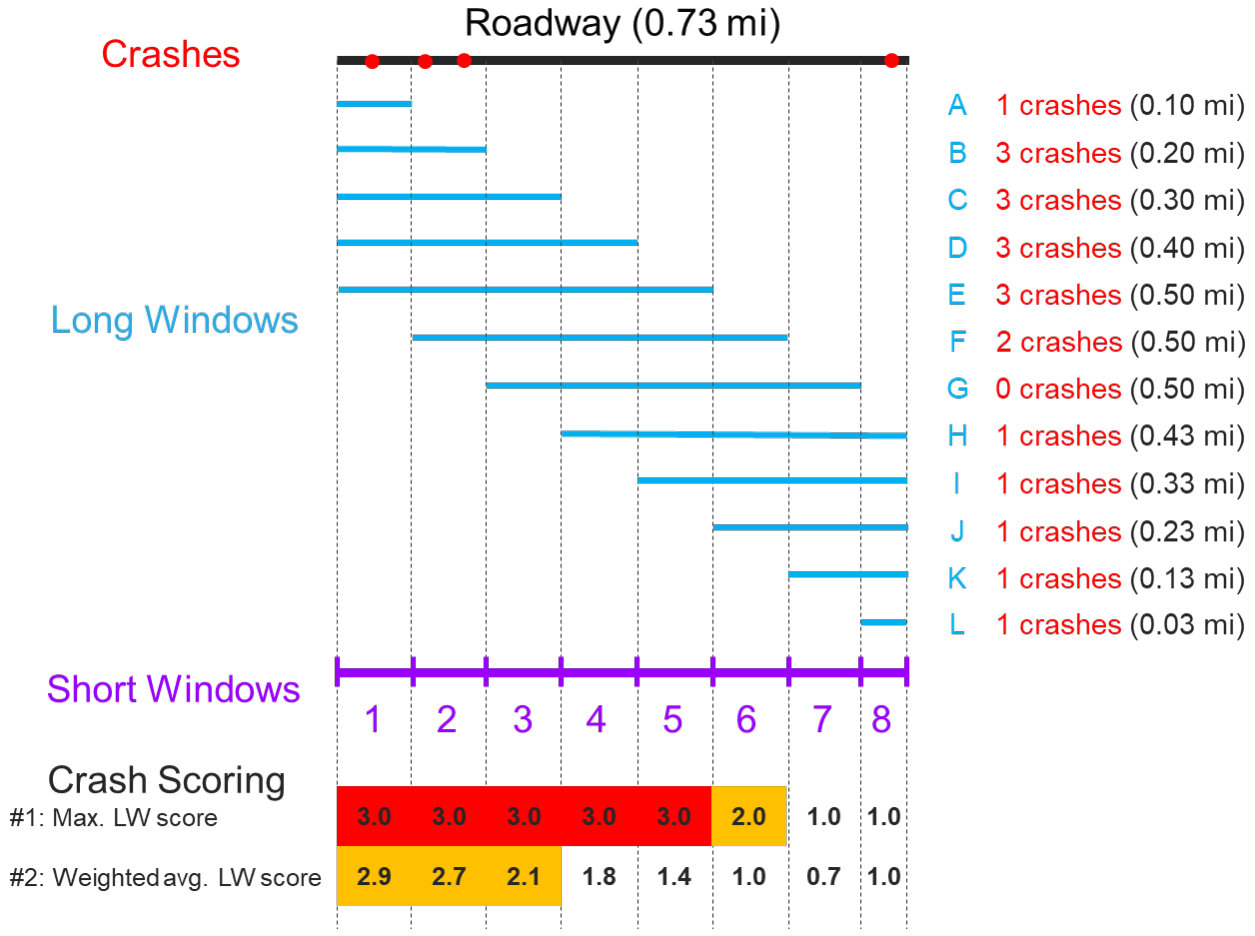


Figure 1. Diagram Illustrating the Sliding Window Analysis

The corridors are then split into 0.1-mile segments called "short windows". These short windows (represented by the purple line segments at the bottom of the diagram in Figure 1) are the same length as the increment by which the sliding window slides. The short windows are split from the corridor starting at one end (in this case, on the left end) which sometimes results in one short

window being shorter than the others as is the case with 0.03-mile-long Short Window 8 in the example above.

The sliding windows, often referred to as "long windows", are created by merging short windows in overlapping groups of five or ten to create 0.5- or 1.0-mile-long windows, respectively. In the diagram shown in Figure 1, the long windows are 0.5-miles in length and therefore consists of up to five short windows. As they get closer to the ends of the corridor, the long windows (represented by the blue line segments in the middle of the diagram in Figure 1) decrease in length. In the example, long windows A, B, C, D, H, I, J, K, and L are shorter than the standard 0.5 miles to ensure that each short window has the same number of long windows overlapping it.

Assigning Crashes to Long Windows

Once the long windows have been created from the short windows, the individual crashes are mapped to the long windows. To account for the width of the road, minor inaccuracies in the coordinates assigned to each crash, and discrepancies in the geometries representing roads in different data sets, a buffer of 50 meters is used when joining the crashes to the long windows. While using a buffer helps reduce the number of crashes that are unintentionally left off of a long window, it does increase the likelihood of crashes being assigned to too many long windows – especially at intersections and in locations where two roads run parallel to each other such as frontage roads along freeways. The effects of this over-assignment of crashes to long windows can be mitigated by manual exclusion of short windows that have been assigned an erroneously high crash score and/or the usage of certain score-calculation methods (as discussed in the next section).

Calculating Crash Scores

Once the crash points have been joined to the long windows, the crash score for each long window is calculated based on the number and severity of crashes that are joined to it. The long window crash scores are, in turn, used to calculate the short window crash scores.

In the example shown in Figure 1, the long window crash score (shown in red on the righthand side of the figure) simply reflects the quantity of crashes (shown as red dots along the black line representing the study corridor) that lie within a given long window. In other words, one crash equates to one point as opposed to the relative weights (discussed later in this section) that are assigned to each severity in the actual analysis. There are two main scoring methods used to calculate short window crash scores when conducting HIN analyses:

- **Maximum Associated Long Window Score Method** - the maximum long window score is just that, the maximum score of crashes of any of the long windows. In Figure 1, short window six has a maximum long window score of 2.0, which comes from long window F. In the example shown in Figure 1, and based on maximum long window score, if the threshold for inclusion in the HIN is set to 2.0, six short windows (1, 2, 3, 4, 5, and 6) have scores above the threshold (3.0, 3.0, 3.0, 3.0, 3.0, and 2.0, respectively), resulting in a total of 0.6 miles included in the HIN.
- **Length-Weighted-Average Long Window Score Method** - the length-weighted-average long window score is calculated by assigning the average score of all long windows

associated with a short window (weighted by the long windows' respective lengths) as the short window score. Weighted-average long window crash scores provide a finer resolution than the maximum long window crash scores as evidenced by the gradual decrease of the short window scores as they get further from a crash. In the example shown in Figure 1, if the threshold for inclusion in the HIN is set to 2.0, three short windows (1, 2, and 3) have scores above the threshold (2.9, 2.7, and 2.1, respectively), resulting in a total of 0.3 miles included in the HIN.

The project team elected to use the maximum associated long window score method to calculate the short window scores instead of the length-weighted-average long window score method because the maximum associated long window score method performs better in larger networks with denser crash distributions like Metro COG's by minimizing the number of discontinuous street segments in the HIN (a common byproduct of using the higher thresholds required in study areas with higher crash densities).

To maintain the focus on the most harmful crashes despite their relative infrequency, only the K, A, and B crashes are considered in the score calculations. To further reduce the likelihood of less severe (and far more prevalent) crash types overshadowing the most harmful crash types, two additional measures are employed: the K and A crashes are given a relative weight of 3 and the B crashes are given a weight of 1; and the B crashes are excluded entirely from the passenger automobiles/light vehicles crash score calculations (as seen in Table 1, Auto B crashes outnumber the Auto K and A crashes by nearly a factor of ten).

Table 2: Most Severe Injury (MSI) by Mode

Mode	K	A	B	C	O	Total
Automobile	48	184	1,900	2,016	14,096	18,244
Motorcycle	14	50	95	24	34	217
Pedestrian	5	29	104	35	20	193
Cyclist	1	15	106	31	3	156
Heavy Vehicle	1	7	50	24	1,423	1,505

Setting a Threshold for Inclusion in the HIN

The HIN is identified using crash score thresholds across the study area. The project team uses the following rough targets to recommend thresholds, which vary by mode:

- **Coverage of severe (KAB) crashes** – are roughly 40-50 percent of severe crashes covered by the HIN?
- **Mileage or extent of HIN streets and intersections** – is the total length of the HIN streets roughly 1-3% of the total length of the entire network?
- **Natural breaks** – does increasing or decreasing the threshold result in a significant change in severe crash density on the network? Are there natural breaks in the data where severe crash density dramatically changes?
- **Minimum threshold** – thresholds that are too low dilute the meaning of HIN. The project team typically advises a minimum threshold to yield tangible visual results on the overall

multimodal network. Given the context of the study area, the team recommends a minimum crash score threshold of 6.0 for all modes, which equates to the equivalent of at least two life-changing crashes (e.g. two K or A crashes, one K or A crash and three B crashes, etc.) per mile over the past five years.

In short: minimum thresholds should be set high enough to imply a spatial pattern of severe crashes – HIN segment status should not be driven by just one severe crash.

The four targets above are sometimes at odds with one another and should be balanced. For example, covering 50 percent or more of KA crashes may result in an unreasonable number of miles being included in the HIN or may require a minimum crash score threshold that is so low that even segments with just one crash end up being included in the HIN. The project team recommends erring on the side of a higher minimum crash score threshold to provide a more targeted HIN.

Crashes that resulted in serious injuries to an occupant of a heavy vehicle are infrequent and sparsely distributed enough that there are no network segments with scores above the minimum meaningful threshold of 6.0. Particularly in cases such as the heavy vehicle HIN where few or no street segments are included in the modal HIN, it is recommended that the HIN results be supplemented with proactive or systemic methods to help identify safety needs in areas with few or no identified HIN streets. Proactive or systemic methods to identify safety needs may include physical roadway attributes, operational configurations, adjacent land use, and/or stakeholder feedback to identify dangerous locations for multimodal transportation users in the Safety Action Plan study area. When a sufficient number of street segments have been identified by the HIN, as is the case for the other three modes (automobile, motorcycle, pedestrian, and cyclist), it is recommended that unique thresholds be identified for each mode.

Table 3 shows the combined length of all segments in the network and the total number of KAB crashes (*note that automobile B crashes are excluded as previously discussed) and compares them to the combined length of the segments selected in each mode's HIN and the number and percentage of the KAB crashes covered by the modal HIN defined by the proposed threshold.

Table 3. Threshold Setting Metrics Comparison

Mode	Total Network Miles	Total KAB* Crashes	Proposed Threshold	Network Miles Selected	KAB* Crashes Selected
Automobile	2687	232	9	59.8 (2.2%)	100 (43.1%)
Motorcycle	2687	159	6	19.9 (0.7%)	35 (22.0%)
Pedestrian	2687	138	6	18.0 (0.7%)	44 (31.9%)
Cyclist	2687	122	6	11.6 (0.4%)	39 (32.0%)
Heavy Vehicle	2687	58	6	0.0 (0.0%)	0 (0.0%)

Overview of Results

For the Metro COG MSA, severe crashes are greatly concentrated in the Urbanized Area (UZA). There are severe crashes in rural areas outside of the UZA however, they do not cluster into significant densities to show up on the HIN. As shown in Figures 2 and 3, some areas of the MSA have high crash densities. Density of crashes does not always show up on HIN, which more specifically relates to density of severe crashes (K & A crashes).

All Modes

The All Modes HIN analysis provides a composite crash score across modes including automobiles, pedestrians, motorcycles, cyclists, and heavy vehicles. The composite score and HIN shown for All Modes does not reflect a one-to-one comparison to the other modal HIN maps and analysis and is a true composite across modes (i.e. there is HIN in the All Modes analysis that does not appear in one of the other modal HIN analysis because different modal severe crashes are contributing to the HIN). Figures 2 and 3 show crash density of all modes K, A, and B crashes. Figures 4 and 5 show the HIN for all modes.

Context Insights

Highest crash scores are concentrated on:

- 13th Avenue S. from 21st Street S. to 9th Street E.
- 45th Street from Main Avenue to 23rd Avenue S.
- University Drive from 19th Avenue N. to 13th Avenue S.
- Main Avenue from Broadway to 18th Street.

Functional classification: Concentrated on Principal and Minor Arterials.

Jurisdictions: The All Modes HIN is mostly concentrated in Fargo, with much less HIN showing up in Moorhead, West Fargo, Dilworth, or rural areas of Cass and Clay Counties.

Land use: The land use along the highest scoring HIN areas of 13th Avenue S. and 45th Street is predominantly auto-oriented retail commercial and to a lesser degree commercial office. Main Avenue includes retail, heavy commercial, light industrial, commercial office, and mixed use commercial/residential. University Drive includes public institutional, single-family residential, multi-family residential retail commercial, commercial office, and mixed-use commercial/residential.

Access management: Within the highest concentrated All Modes HIN, 13th Avenue S. and 45th Street strictly control access management, with virtually zero direct access to private properties along either roadway. Main Avenue and University Drive also strictly control access to adjacent residential uses however, more private access exist at commercial and auto-oriented uses.
The four roadways highlighted above are classic in terms of balancing functional classification and land use. All four examples are Arterial roads with significant traffic volume however, the 13th Avenue S. and 45th Street S. HIN segments are dominated by auto-oriented retail commercial and commercial office. Main Avenue and University Drive are also transitional corridors, running through traditional residential or traditional downtown commercial areas, providing a mix of strict

and lenient access management. The HIN scores along all four corridors are likely reflective of an imbalance between regional mobility and access to adjacent land use.

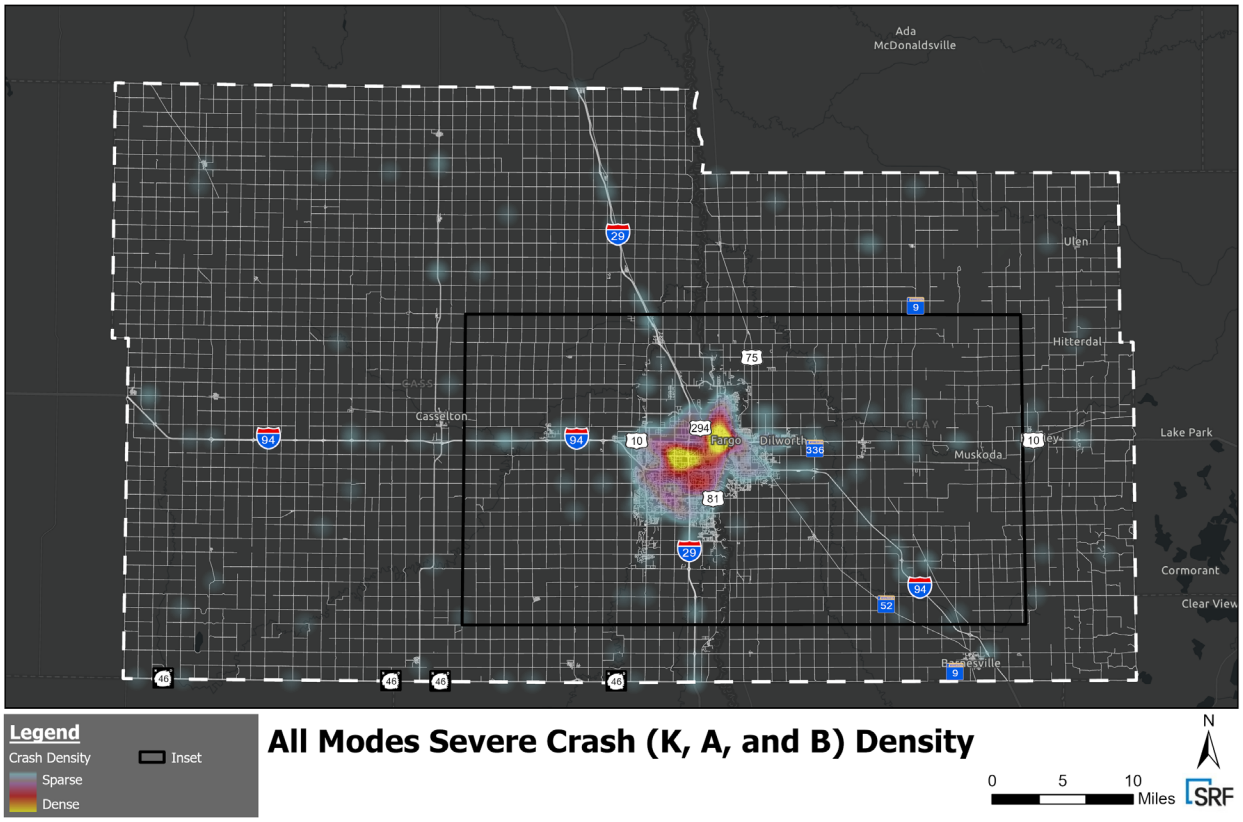


Figure 2

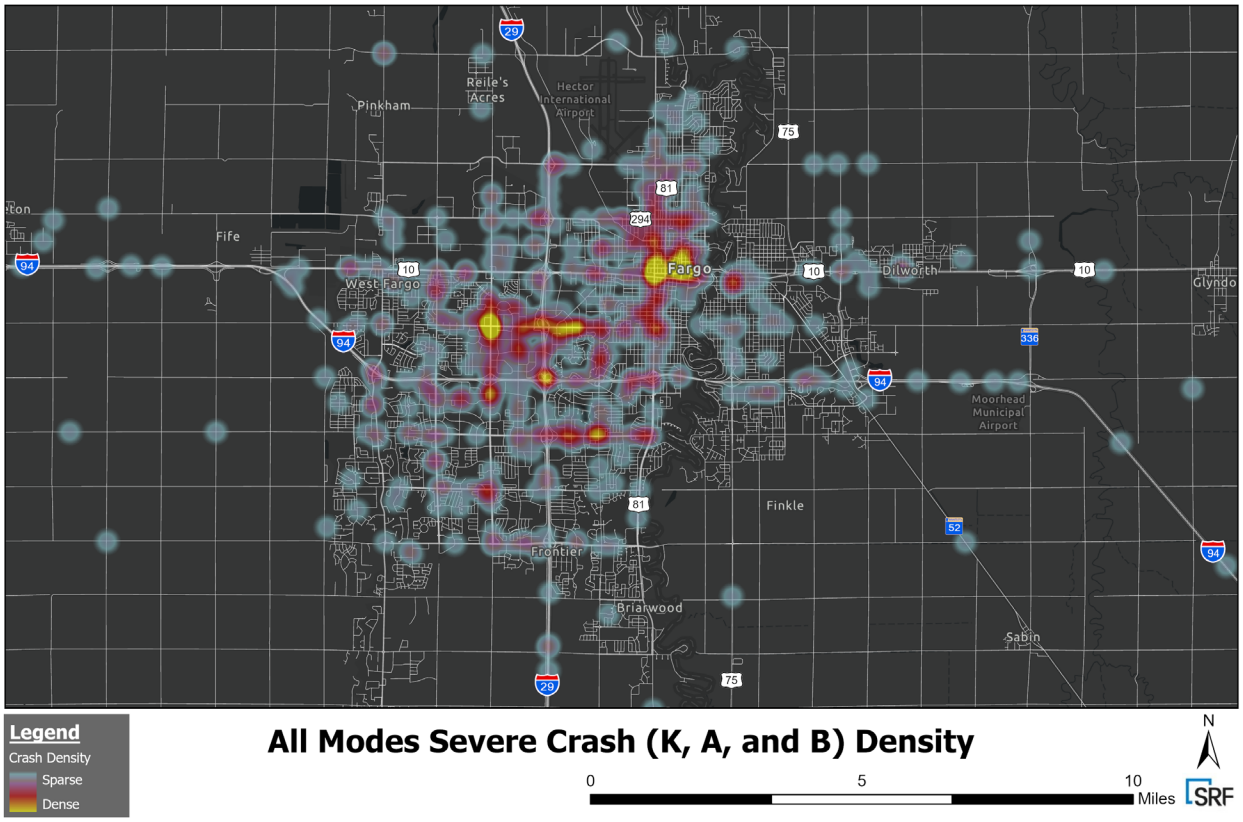


Figure 3

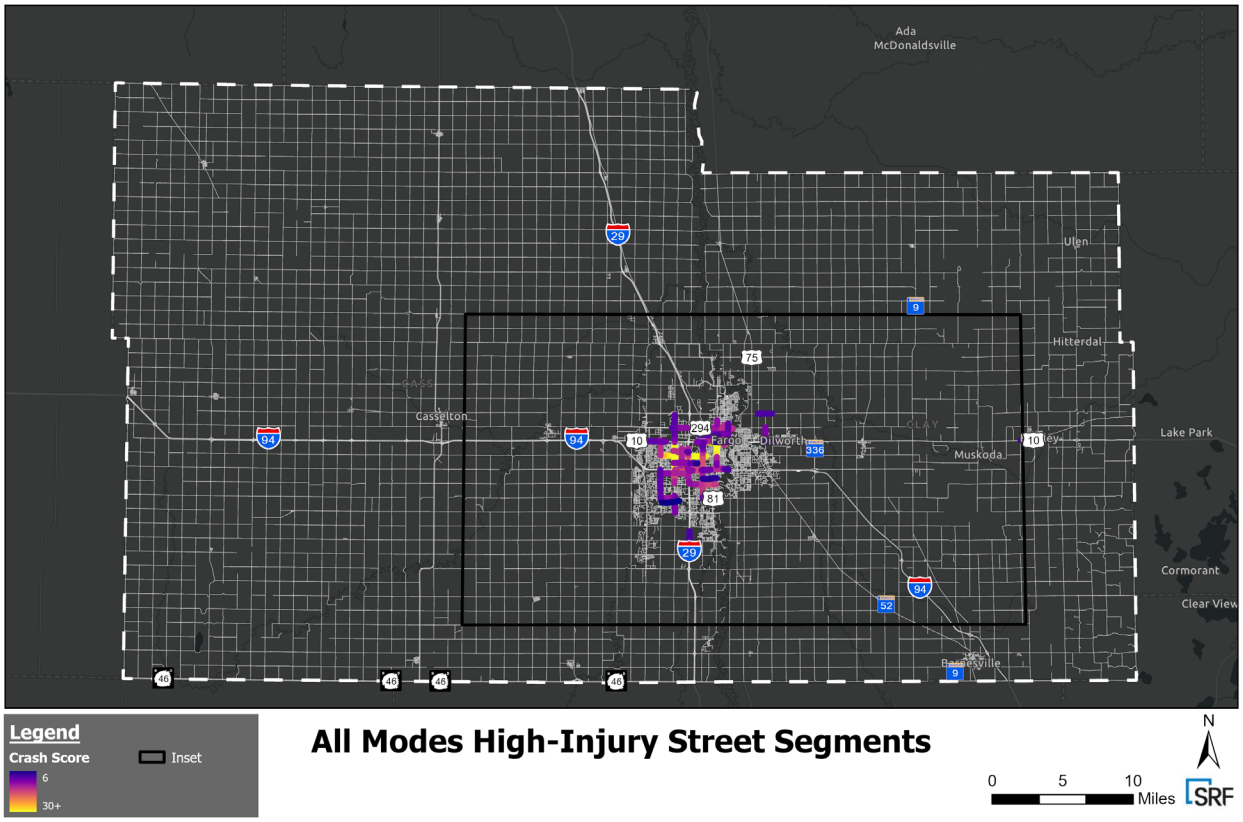


Figure 4

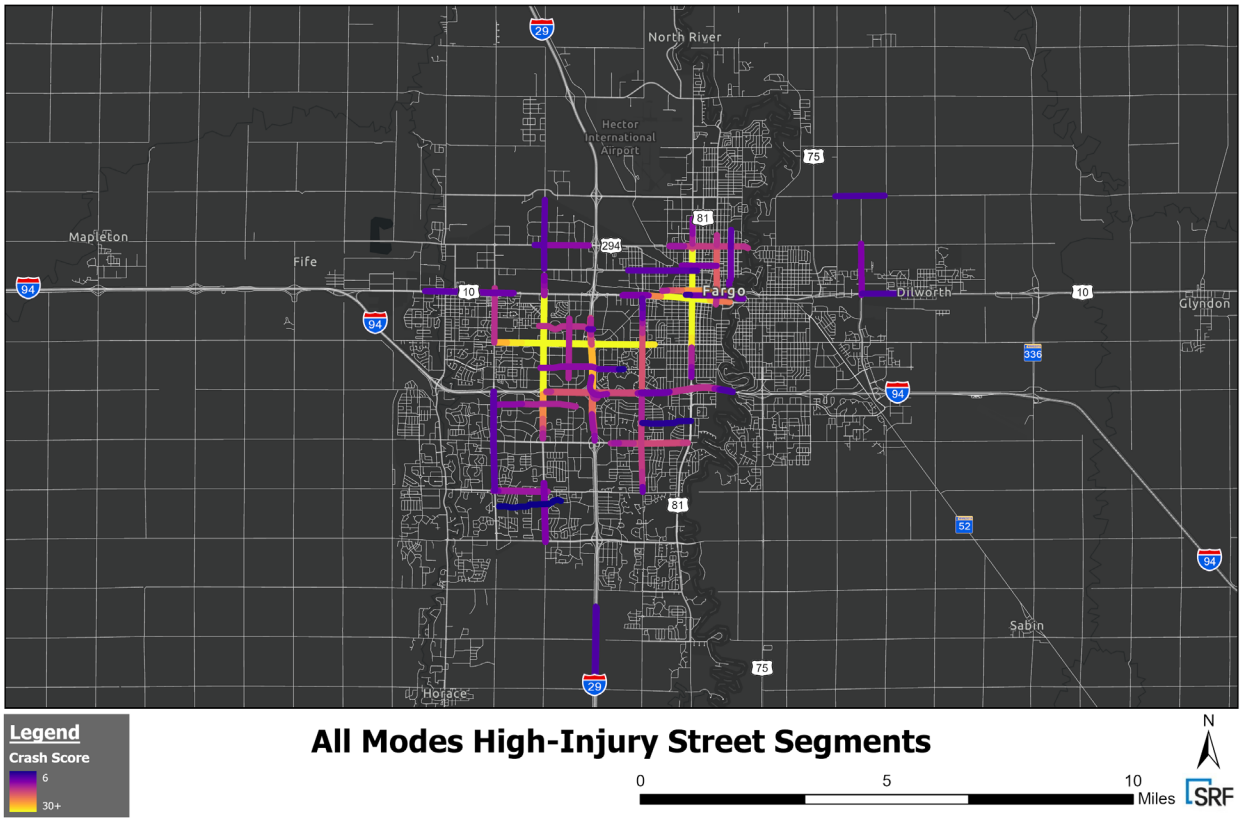


Figure 5

Automobiles

The Automobiles HIN analysis provides a crash score for severe crashes involving automobiles (as the mode experiencing most-severe collision in crash). Figure 6 shows crash density of automobile-involved K, A, and B crashes. Figure 7 shows the HIN for automobile-involved crashes.

Context Insights

Highest crash scores are concentrated on:

- 13th Avenue S. between Page Drive S. and 9th Street E.
- 45th Street from Main Avenue to 32nd Avenue S.
- University Drive from 3rd Avenue N. to 14th Avenue S.
- 32nd Avenue S. from 15th Street S. to 27th Street S.
- I-94 at the interchange with I-29

Functional classification: Concentrated on Principal Arterials, Minor Arterials, and Interstate.

Jurisdictions: The Automobiles HIN is concentrated in Fargo, with much less HIN showing up in Moorhead, West Fargo, Dilworth, or rural areas of Cass and Clay Counties.

Land use: The land use along the highest scoring HIN areas of 13th Avenue S. and 45th Street is predominantly auto-oriented retail commercial and to a lesser degree commercial office. University Drive includes single-family residential, multi-family residential, retail commercial, commercial office, and mixed-use commercial/residential. 32nd Avenue land use includes retail commercial, commercial office, multi-family residential, and single-family residential. Land use is not applicable to the I-94 segment of the Automobiles HIN.

Access management: Within the highest concentrated Automobiles HIN, 13th Avenue S. and 45th Street strictly control access management, with virtually zero direct access to private properties along either roadway. University Drive also strictly controls access to adjacent residential and downtown-oriented uses however, more private access exist at commercial and auto-oriented uses.

Analysis: The first four roadways highlighted above are classic in terms of balancing functional classification and land use. All four examples are Arterial roads with significant traffic volume however, the 13th Avenue S. and 45th Street S. HIN segments are dominated by auto-oriented retail commercial and commercial office. University Drive is also a transitional corridor, running through traditional residential or traditional downtown commercial areas, providing a mix of strict and lenient access management. The HIN scores along all four corridors are likely reflective of an imbalance between regional mobility and access to adjacent land use. The Automobiles HIN score on I-94 at the interchange with I-29 is likely reflective of significant traffic volumes, merging movements, and dangerous traffic operations inefficiencies associated with the current interstate interchange configuration.

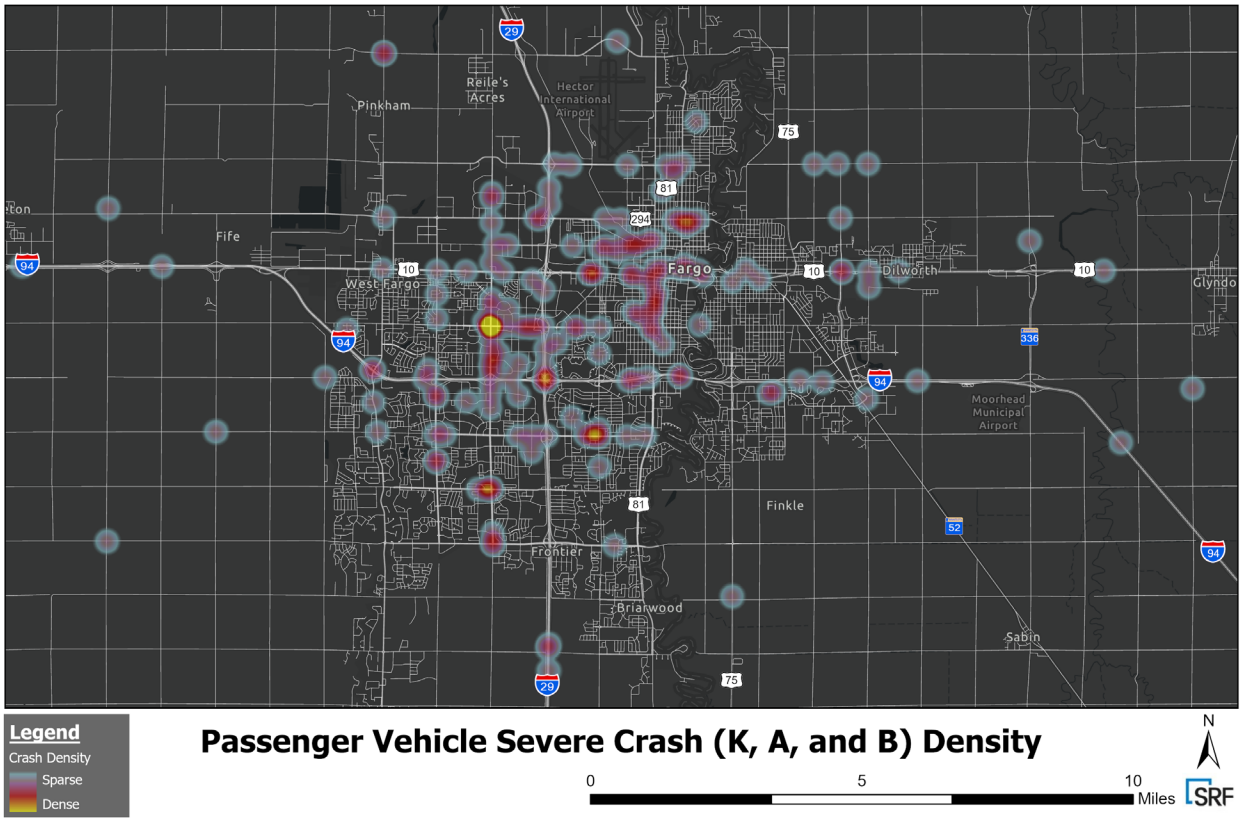


Figure 6

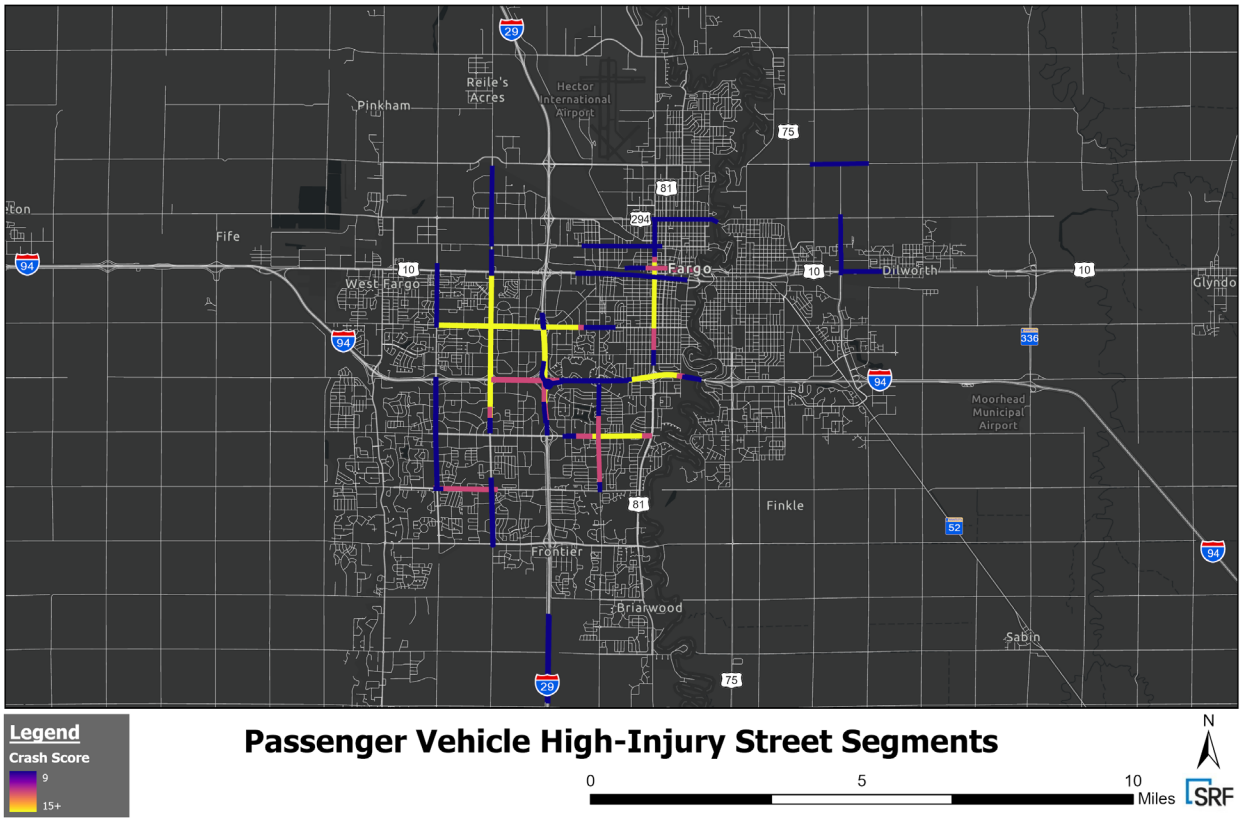


Figure 7

Pedestrians

The Pedestrians HIN analysis provides a crash score for severe crashes involving pedestrians (as the mode experiencing most-severe collision in crash). Figure 8 shows crash density of pedestrian-involved K, A, and B crashes. Figure 9 shows the HIN for pedestrian-involved crashes.

Context Insights

Highest crash scores are concentrated on:

- 13th Avenue S. between 21st Street S. and 40th Street S.
- Broadway from 12th Avenue N. to 1st Avenue S.
- Main Avenue from 2nd Street to 18th Street.
- 17th Avenue S. from 35th Street S. to 45th Street S.

Functional classification: Concentrated on Principal Arterials, Minor Arterials, and Collectors.

Jurisdictions: The Automobiles HIN is concentrated in Fargo, with much less HIN showing up in Moorhead, West Fargo, Dilworth, or rural areas of Cass and Clay Counties.

Land use: The land use along the highest scoring HIN area of 13th Avenue S. is predominantly auto-oriented retail commercial and to a lesser degree commercial office. Broadway is downtown mixed-use including public institutional, commercial, commercial office, and multi-family. Main Avenue includes retail, heavy commercial, light industrial, commercial office, and downtown mixed use. 17th Avenue land use includes multi-family residential, retail commercial, and commercial office.

Access management: Within the highest concentrated Pedestrians HIN, 13th Avenue S. strictly controls access management, with virtually zero direct access to private properties. Broadway strictly controls access with virtually none downtown however, residential uses to the north do have private access. Main Avenue also strictly controls access to adjacent uses however, more private access exists at commercial and auto-oriented uses. 17th Avenue S. controls access most leniently of these corridors, with most adjacent properties having at least one access onto the roadway.

Analysis: Each roadway having the highest Pedestrian HIN crash scores, is likely reflective of pedestrian utility and/or high pedestrian trip generating land uses and their relation to the roadway. In the case of 13th Avenue S., commercial retail land uses and destinations generate significant vehicular and pedestrian traffic resulting in more pedestrian and vehicular interaction and friction along a wide, high-speed road. Broadway is the epicenter of pedestrian trips and activity in the MSA, the downtown mixed-use land use and destinations generate significant pedestrian traffic resulting in pedestrian and vehicular interaction and friction along a narrow, low-speed road. Main Avenue is similar to 13th Avenue S. and Broadway land uses however, the corridor also serves as a funnel for pedestrians in and out of Downtown Fargo on the south side of the BNSF railroad from established residential neighborhoods. Main Avenue has pedestrian utility as a major connection to Downtown Fargo or to an intersecting BNSF-grade-separated facility. 17th Avenue S. serves as a funnel between commercial retail destinations and established residential neighborhoods. 17th Avenue S. runs below I-29 and has pedestrian utility as a major connection to West Acres Shopping Center and surrounding retail commercial areas west of the interstate. In most of the cases, significant pedestrian and vehicular interactions are likely leading to severe crashes and may be pointing to an

imbalance in orientation or accommodation of the roadway to users (Broadway may be the exception).

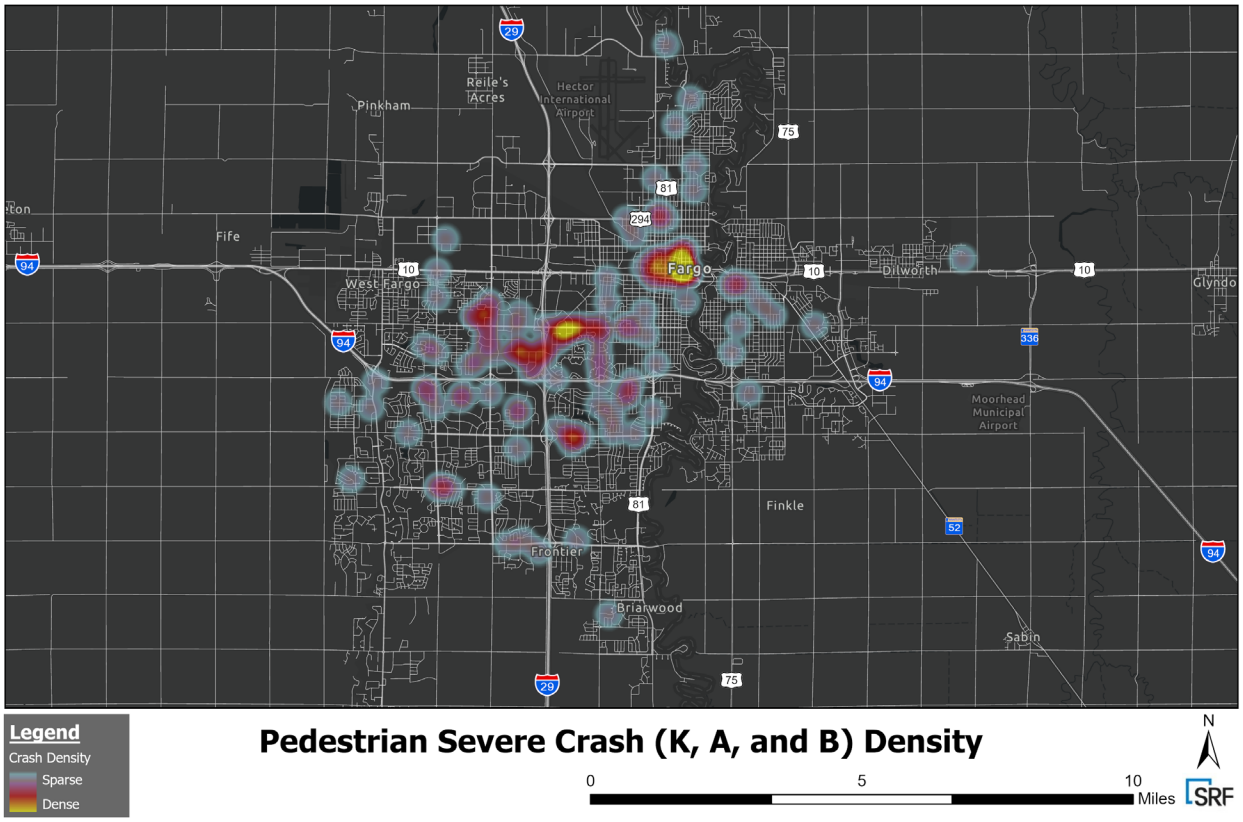


Figure 8

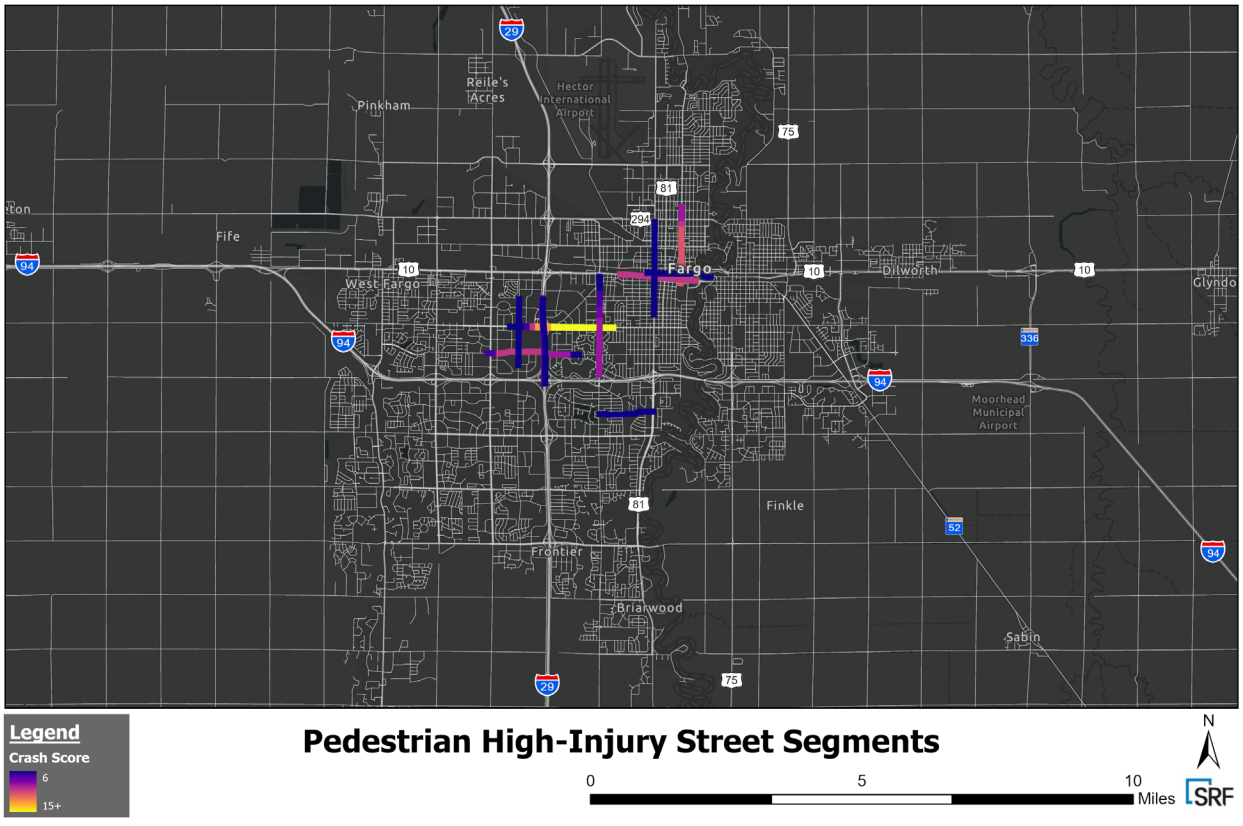


Figure 9

Motorcycles

The Motorcycles HIN analysis provides a crash score for severe crashes involving motorcycles (as the mode experiencing most-severe collision in crash). Figure 10 shows crash density of motorcycle-involved K, A, and B crashes. Figure 11 shows the HIN for motorcycle-involved crashes.

Context Insights

There is quite a bit of overlap between the Automobiles HIN and Motorcycles HIN, the major differences include:

- 12th Avenue N. from Fayland Drive N. to 38th Street N.
- Main Avenue from 12th Street E. to 8th Street W.
- 9th Avenue S. from 36th Street S. to 47th Street S.
- 23rd Avenue S. from 42nd Street S. to 55th Street S.
- 44th Avenue S. from Woodhaven North Park to Osgood Elementary School

Functional classification: Spread across Principal Arterials, Minor Arterials, and Collectors.

Jurisdictions: The Motorcycles HIN is concentrated in Fargo, with much less HIN showing up in West Fargo.

Land use: The land use along the highest scoring HIN area of 12th Avenue N. is predominantly industrial and heavy commercial. Main Avenue is primarily industrial and heavy commercial, with occasional instances of retail commercial and commercial office use. 9th Avenue S. is primarily multi-family residential with few instances of commercial office and retail commercial use. 23rd Avenue S. is a mix of multi-family residential, medical, retail commercial, and public institutional use. 44th Avenue S. is predominantly single-family residential and multi-family residential, with instances of public institutional, commercial office, and retail commercial.

Access management: Within the Motorcycles HIN, 12th Avenue N. leniently controls access management, with frequent direct access to private industrial properties. Main Avenue also leniently controls access to adjacent uses however, in some areas near Downtown West Fargo, access management is provided by frontage road on the south side. 9th Avenue S. controls access leniently, with most adjacent properties having at least one access onto the roadway. 23rd Avenue controls access moderately, with most properties having one access onto the roadway. 44th Avenue S. controls access moderately, with multi-family, commercial office, and public institutional parcels having direct access, while single-family access is not.

Analysis: Each roadway having the highest Motorcyles HIN crash scores, seem to fall into a couple of categories. In the case of 12th Avenue N. and Main Avenue, both corridors are industrial in nature with adjacent uses generating significant freight trafic volumes. In the cases of 9th Avenue S., 23rd Avenue S., and 44th Avenue S., they are all curvy Major Collectors (not straight, some degree of horizontal curve), and connect a mixture of uses primarliy dominated by residential uses (except for 23rd Avenue S.). All portions of the Motorcyels HIN described above appear to have lenient to moderate access management. Motorcycles are prone to visibility issues from other vehicles and

drivers, this may be where the Motorcycles HIN deviates from the Automobiles HIN, as larger freight vehicles, more access, and horizontal curves cause visibility issues for motorcycles.

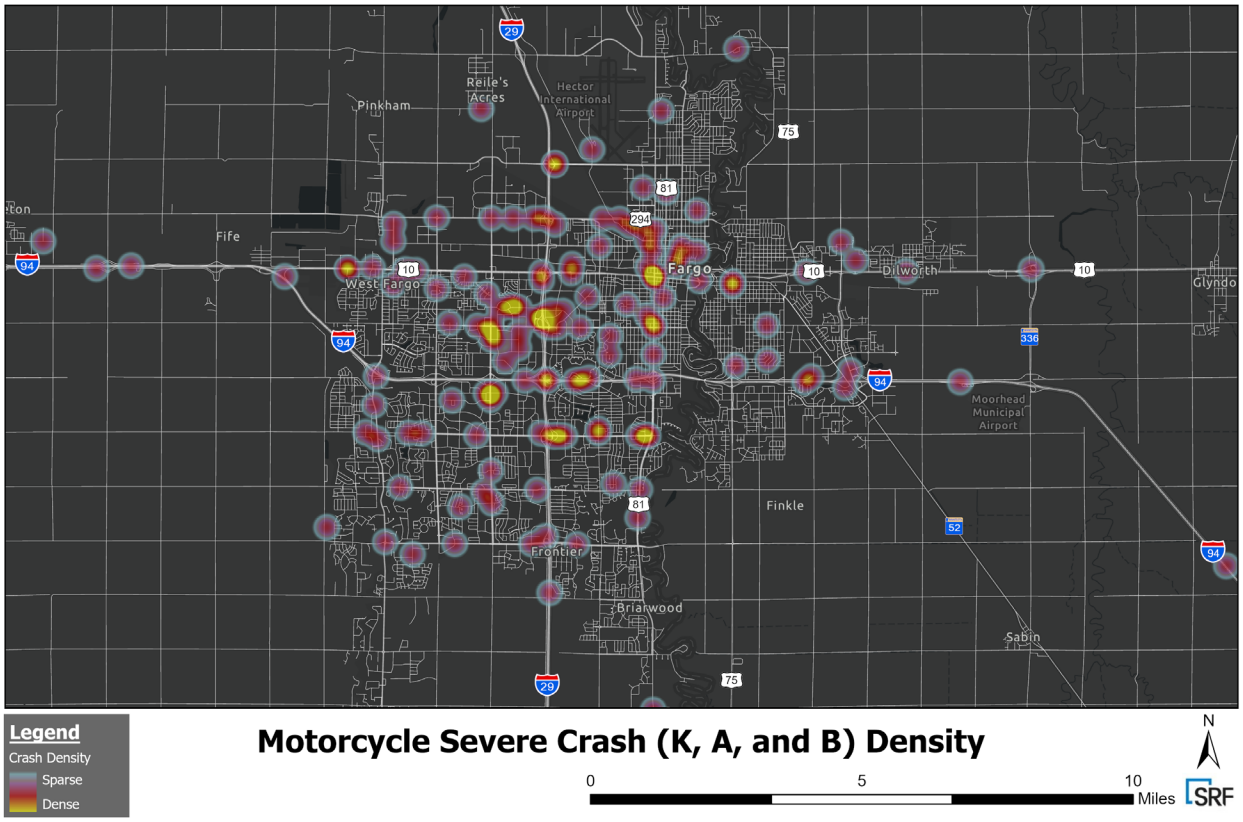


Figure 10

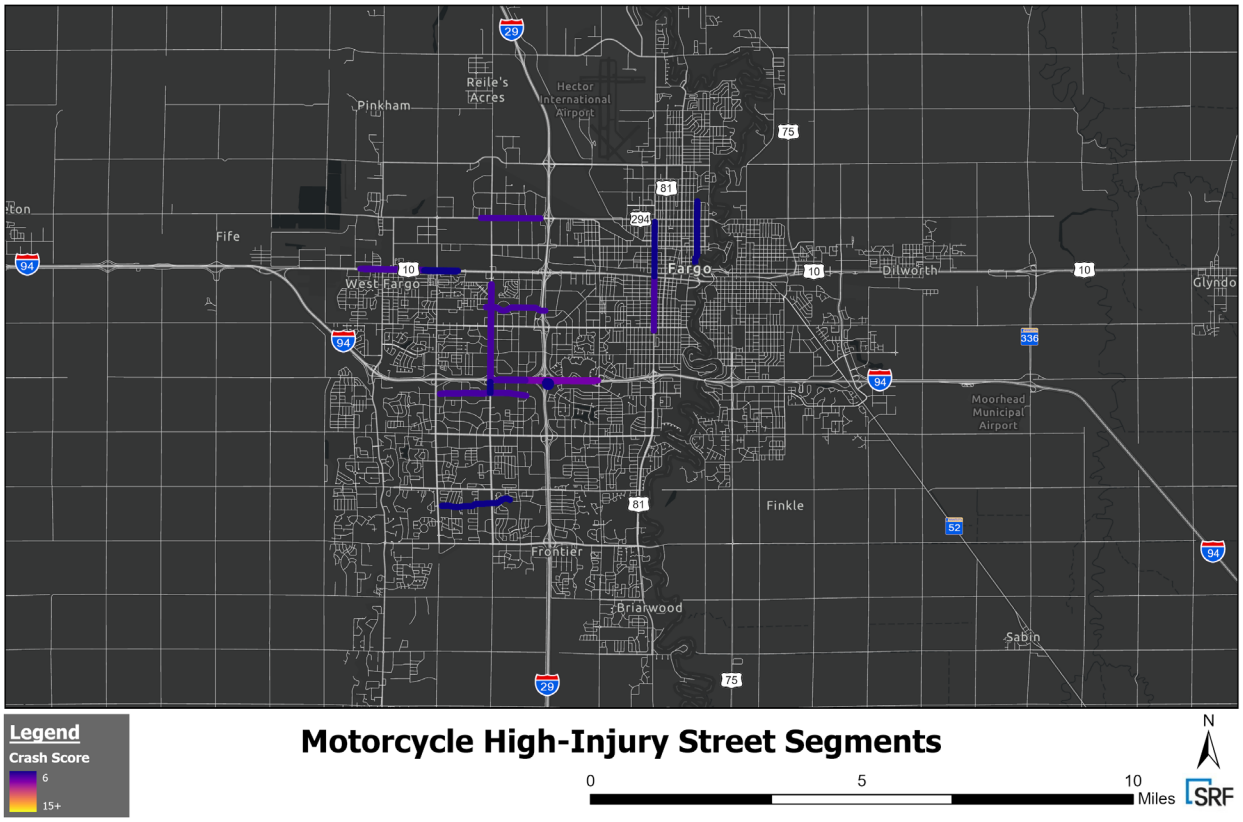


Figure 11

Cyclists

The Cyclists HIN analysis provides a crash score for severe crashes involving bicyclists and/or cyclists (as the mode experiencing most-severe collision in crash). Figure 13 shows crash density of cyclist-involved K, A, and B crashes. Figure 14 shows the HIN for cyclist-involved crashes.

Context Insights

Highest crash scores are concentrated on:

- University Drive from Centennial Boulevard to 8th Avenue S.
- 13th Avenue S. from 28th Street S. to 43rd Street S.

Functional classification: Concentrated on Principal Arterials.

Jurisdictions: The Cyclists HIN is concentrated in Fargo.

Land use: The land use along the highest scoring HIN area of University Drive is public institutional, multi-family residential, single-family residential, and downtown mixed use. 13th Avenue S. is predominantly auto-oriented retail commercial and to a lesser degree commercial office.

Access management: Within the highest concentrated Cyclists HIN, University Drive moderately controls access, with residential uses having fewer direct access points however, access management seems more lenient for commercial properties. 13th Avenue S. strictly controls access management, with virtually zero direct access to private properties.

Analysis: Each roadway having the highest Cyclists HIN crash scores, is likely reflective of high cyclist trip generating land uses and their relation to the roadway. In the case of University Drive, the NDSU campus and downtown mixed-use destinations generate significant cyclist trips resulting in more cyclist and vehicular interaction and friction along the one-way roadway. The on-street bike lane provides a certain degree of cyclist utility along University Drive however, there is an imbalance somewhere as the on-street facility appears not to be making cyclists safer near the NDSU campus. 13th Avenue S., commercial retail land uses and destinations generate significant vehicular and cyclist traffic resulting in more cyclist and vehicular interaction and friction along a wide, high-speed road. Similar to the Pedestrian HIN, significant cyclist and vehicular interactions are likely leading to severe crashes and may be pointing to an imbalance in orientation or accommodation of the roadway to users.

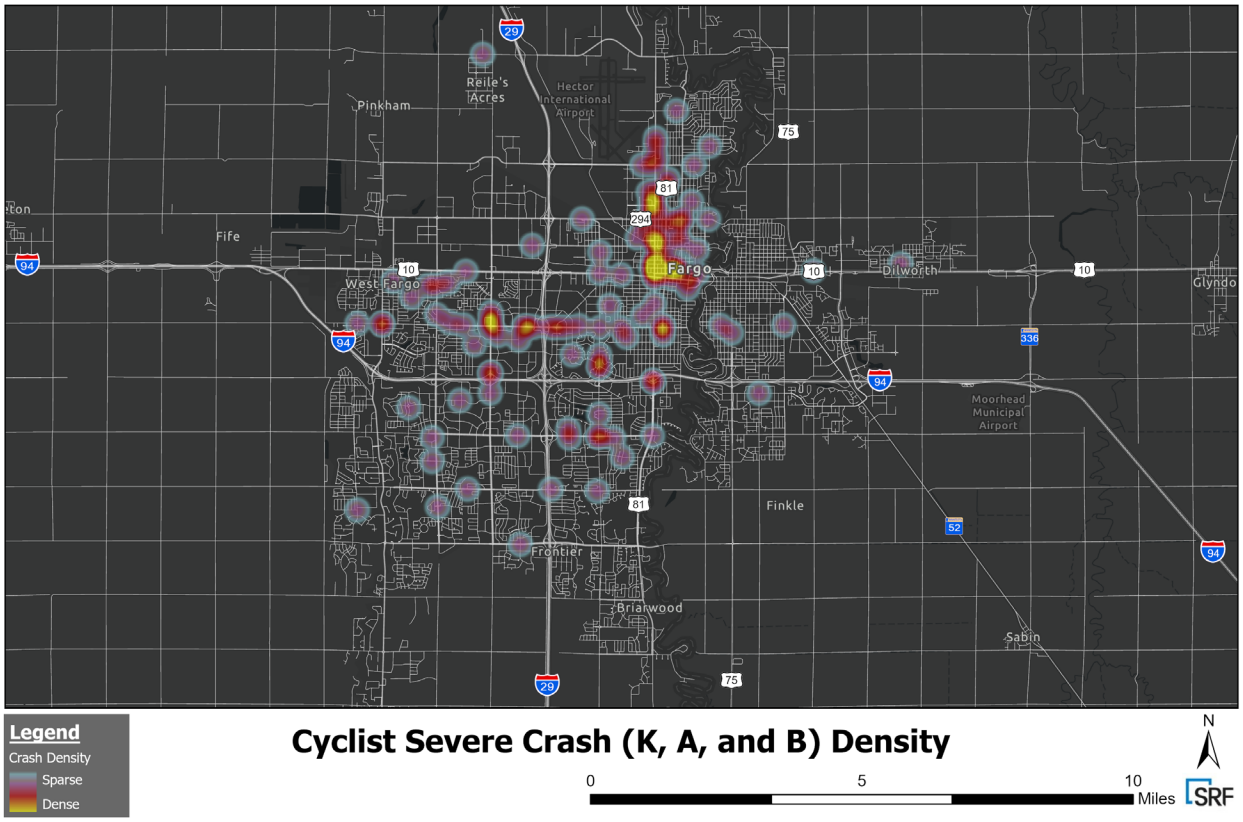


Figure 13

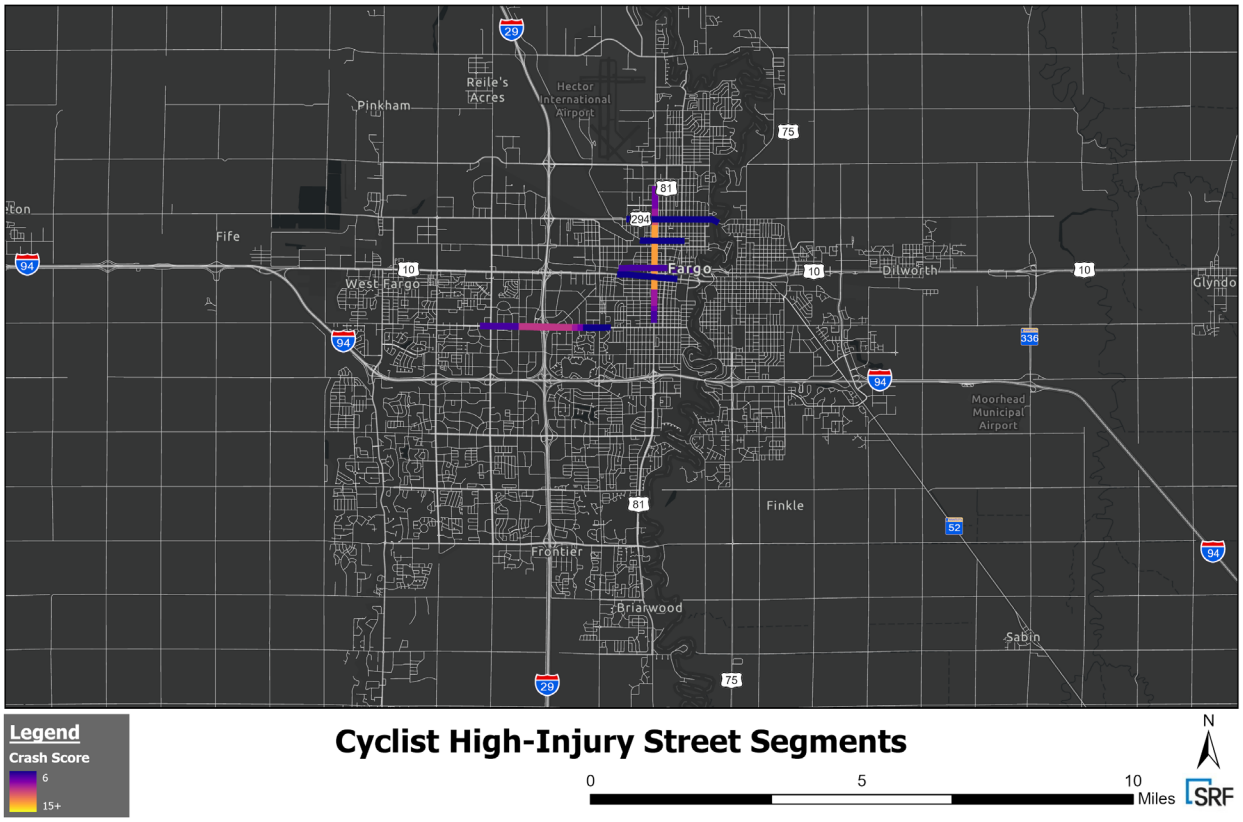


Figure 14

Heavy Vehicles

The Heavy Vehicles HIN analysis provides a crash score for severe crashes involving heavy vehicles (as the mode experiencing most-severe collision in crash). Figure 15 shows crash density of heavy vehicles experiencing K, A, and B crashes. Figure 16 shows the HIN for heavy vehicle-involved crashes. The analysis confirms that drivers and occupants of heavy vehicles are people least likely to experience a severe crash in the Metro COG MSA. This is not to say K and A crashes do not occur, there are a handful of instances across rural Cass and Clay Counties however, the density of severe crashes does not indicate HIN assignment. This is not to say that heavy vehicles are not contributing to another modal HIN or the All Modes HIN.

Context Insights

As shown in Figure 15, the density of K, A, and B crashes is low. Most heavy vehicle crashes are occurring on regional freight corridors and in rural areas of Cass and Clay Counties.

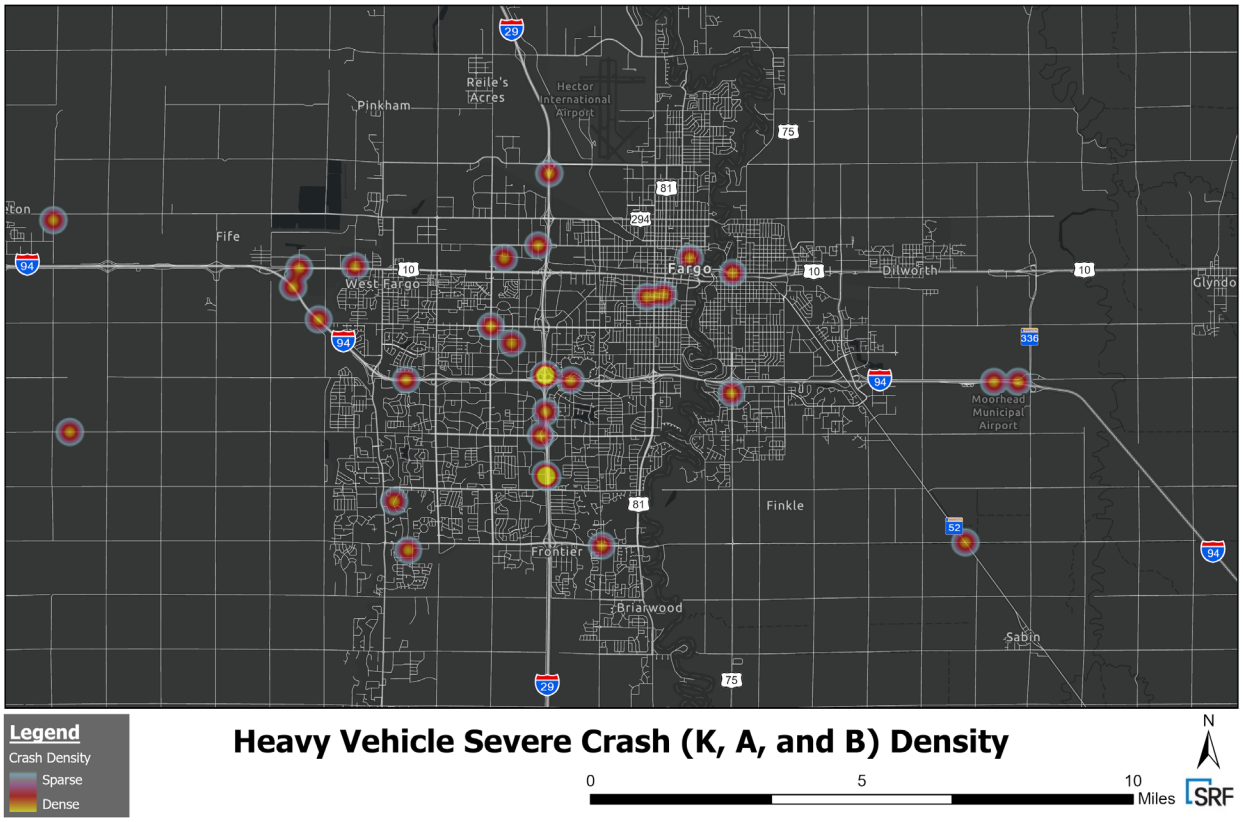


Figure 15

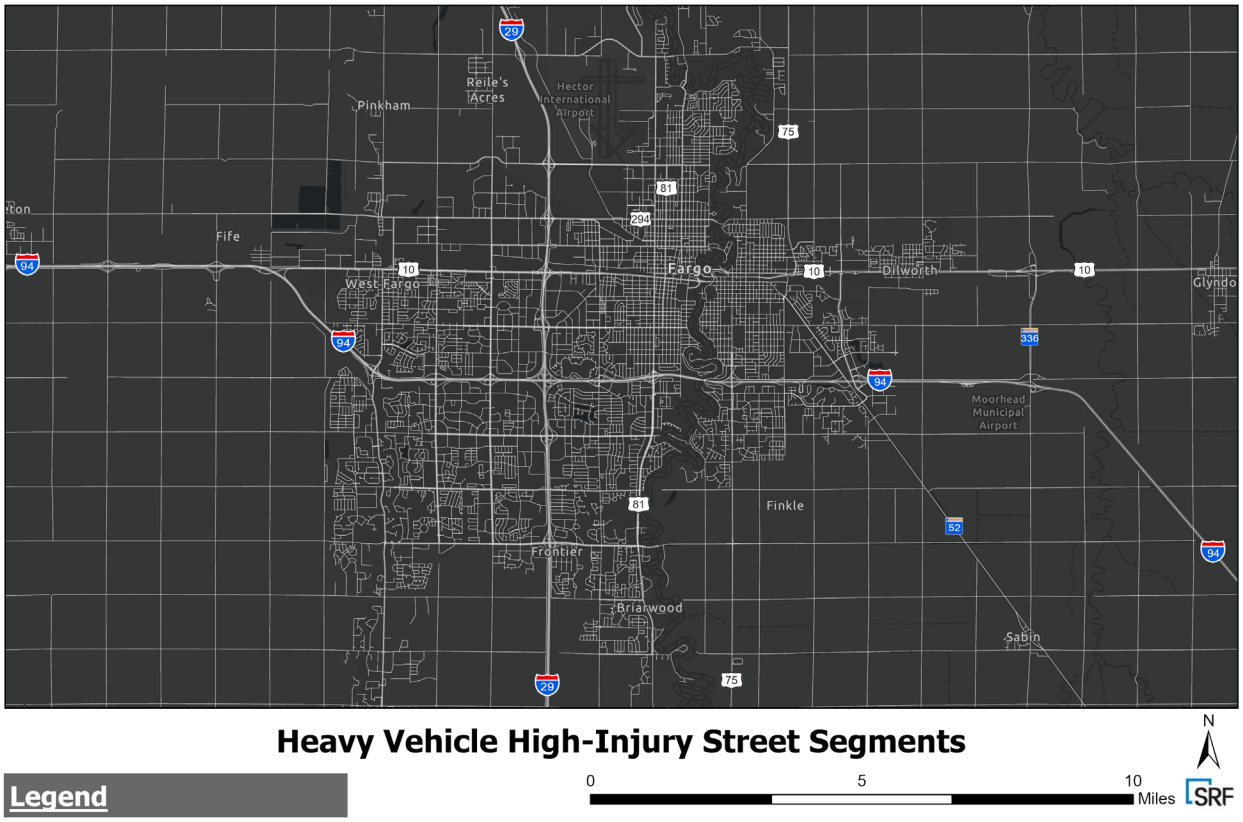

Heavy Vehicle High-Injury Street Segments
Legend
0
5
10
Miles
N
SRF
Pinkham
Reile's Acres
Hector International Airport
Fife
West Fargo
Fargo
Dilworth
Glyndo
Moorhead Municipal Airport
Finkle
Frontier
Briarwood
Sabin
29
94
10
81
294
75
336
52

Figure 16

APPENDIX 4 – TRANSPORTATION EQUITY REVIEW

DRAFT Memorandum

SRF No. 16766

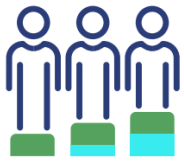
To:	Adam Altenburg Fargo-Moorhead Metropolitan Council of Governments (Metro COG)
From:	SRF Consulting Group
Date:	January 8, 2023
Subject:	Task 6 – Transportation Equity Review
Attachment:	Appendix – Transportation Equity Review Maps

Task 6: Transportation Equity Review

Introduction

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) is developing the Fargo-Moorhead Area's (FM Area) first Comprehensive Safety Action Plan (safety action plan). The safety action plan is funded through a Safe Streets and Roads for All (SS4A) planning grant which Metro COG was awarded by the U.S. Department of Transportation (USDOT). The consideration of equity is a critical component of SS4A guidance for safety action plans, as published[1] by USDOT.

Figure 1. One of the Action Plan Components (source: USDOT)



Equity Considerations

Plan development using inclusive and representative processes. Underserved communities* are identified through data and other analyses in collaboration with appropriate partners. Analysis includes both population characteristics and initial equity impact assessments of the proposed projects and strategies.

Some frequent questions related to the Transportation Equity Review (both internally and by Metro COG staff) include:

- ***What does USDOT mean by 'underserved communities?'***
  - The definition as referenced by the SS4A Grant Program's Notice of Funding Opportunity (NOFO) comes from the Office of Management and Budget's Interim Guidance for the Justice40 Initiative. See the Justice40 Initiative Guidance and Policy section below for more details.
- ***What do underserved or disadvantaged populations look like in the Fargo-Moorhead Area?***
  - It varies. The FM Area has various populations considered disadvantaged, vulnerable, and/or underserved. However, equity looks slightly different in the FM Area than in major coastal cities, or other places in America.

[1] *SS4A Action Plan Components*. USDOT.

- The FM Area is a dichotomous region, with both urban and rural socioeconomic factors that impact communities and populations in different ways. See Table 1.

Table 1. FM Area Urban vs. Rural Population

Type of Place	Jurisdiction	2020 Population[1]
Urbanized Area or FM Metro Area	Fargo, ND	125,990
	Moorhead, MN	44,505
	West Fargo, ND	38,626
	Dilworth, MN	4,612
	Horace, ND	3,085
	TOTAL URBANIZED AREA	**216,818**
Small Cities	Casselton, ND	2,479
	Harwood, ND	794
	Mapleton, ND	1,320
	Barnesville, MN	2,759
	Glyndon, MN	1,306
	Hawley, MN	2,219
Rural*	Cass County, ND	12,231
	Clay County, MN	9,917
	TOTAL SMALL CITIES & RURAL	**33,025**
	TOTAL METROPOLITAN STATISTICAL AREA	**249,843**

*Rural population includes small, incorporated towns not classified as small cities and which are rural in character. Small cities are more rural in character than urban in character and are summed together with rural places.

[1] Source: Metro COG. (2022). 2050 Baseline Demographic Forecast

The Transportation Equity Review examines vulnerable populations in the Fargo-Moorhead Metropolitan Statistical Area (MSA), which includes all of Cass County, North Dakota and Clay County, Minnesota. Vulnerable populations are people more susceptible to impacts caused by the transportation system. In the FM Area for example, a family with no vehicle or dependent-aged residents who cannot drive may face higher risk walking or biking across an intersection or street, just to go about their daily lives or meet essential needs. The Transportation Equity Review identifies several key indicators of vulnerability and disadvantage, introduces a preliminary prioritization process based on equity considerations, and summarizes how transportation safety improvement projects will positively impact vulnerable populations.

Guidance and Policy

The Transportation Equity Review is guided by local and federal policy. Considering equity in Metro COG's safety action plan development builds from existing local policy and follows federal policy framework. Performing a robust equity review and equitable public engagement

to develop Metro COG's safety action plan will result in more competitive SS4A implementation grant applications. One of the goals of the safety action plan is to funnel federal discretionary funding to implementation projects for critical multimodal transportation safety improvements for FM Area residents and visitors from all walks of life.

Local

Metro COG Title VI Nondiscrimination Plan

Metro COG is committed to compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, and all associated regulations and statutes. Metro COG adopted the organization's first Title VI Non-Discrimination Program in 2012 and is required to update the Title VI program every three years.

Title VI/Nondiscrimination and ADA Policy

The latest update was adopted in 2023. Metro COG's Title VI/Nondiscrimination and ADA Policy Statement aligns with federal legislation stating that:

> No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

In addition, there are other nondiscrimination statutes, which include:

- Sex – Section 162(a) of the Federal-Aid Highway Act of 1973 (23 USC 324)
- Age – Age Discrimination Act of 1975
- Disability – Section 504 of the Rehabilitation Act of 1973/American's with Disabilities Act (ADA) of 1990

Metro COG' overall Title VI policy commitment is to:

Ensure that no person or groups of persons shall, on the grounds of race, color, national origin, sex, age, disability, limited English proficiency, or income status, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under and all programs, services, or activities administered by Metro COG, its recipients, sub recipients, and contractors.

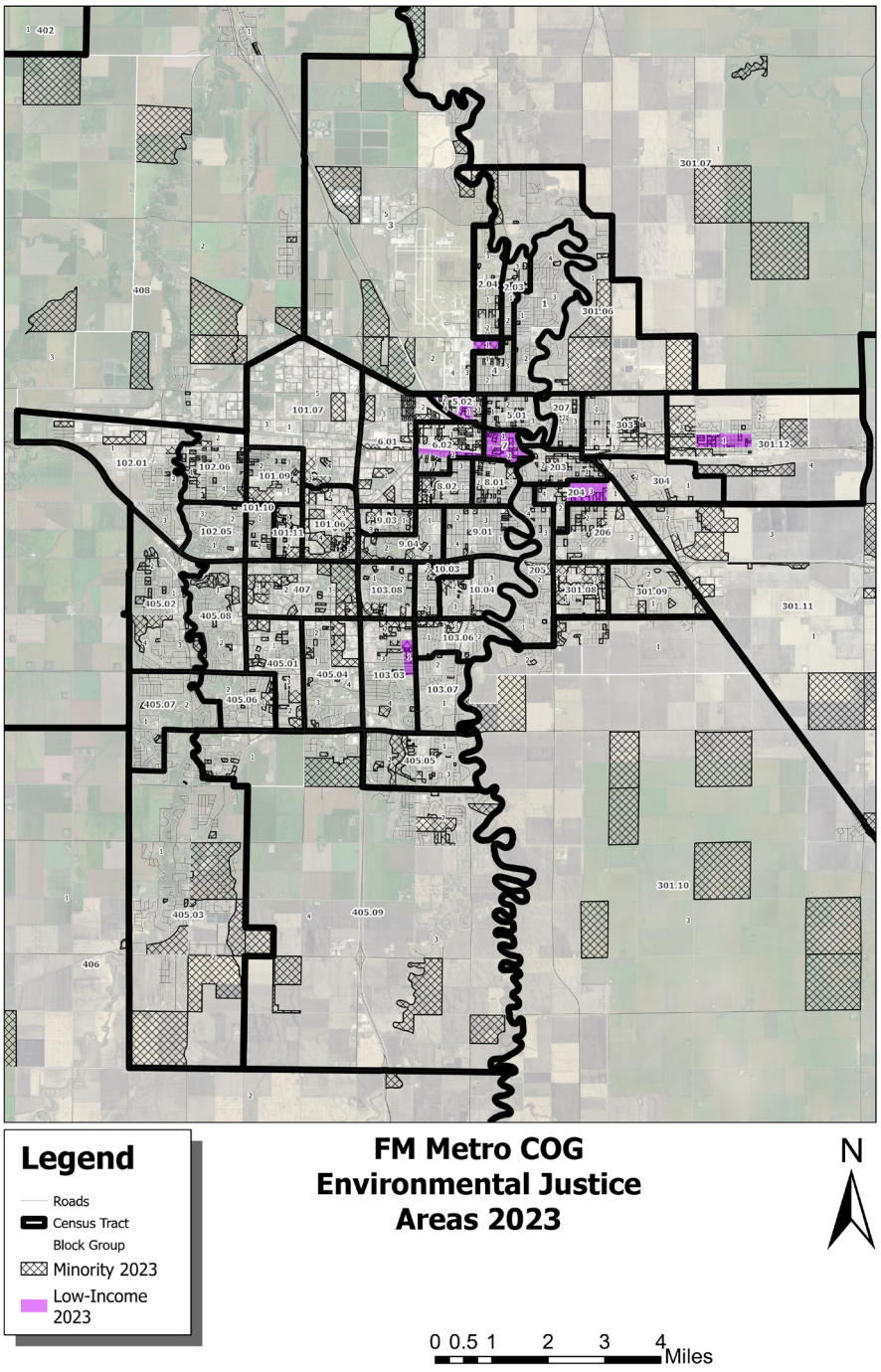
The policy is implemented through guidance provided in the Title VI Nondiscrimination Plan (Title VI Plan).

Title VI and Environmental Justice Considerations in the Planning and Programming Process

Metro COG provides guidance to consider the mobility of vulnerable and disadvantaged populations during the metropolitan transportation planning and programming process. The organization identifies two critical ways in which to consider said mobility: (1) Public outreach and engagement with vulnerable and disadvantaged populations; and (2) Geospatial socioeconomic analysis of the location of vulnerable and disadvantaged population concentrations relative to regional travel patterns, employment and services, including future employment and services.

The Safety Action Plan aligns closely with the guidance established in Metro COG's Title VI plan by: (1) following Metro COG's *Public Participation Plan* to provide inclusive and meaningful engagement; and (2) by including a Transportation Equity Review to analyze where various vulnerable and disadvantaged populations are located across the region.

Figure 2. Metro COG EJ Areas



Demographic Profile

Metro COG tracks socioeconomic data annually in the *Metro Profile* however, the official Environmental Justice (EJ) areas include:

- Low-Income Population
  - Defined in Census Block Groups with an annual median household income less than $23,403 (which is an MSA-adjusted threshold)
- Minority Population
  - Defined in Census Blocks with minority populations equaling or exceeding 25 percent.

EJ areas are calculated in the Metropolitan Planning Area (MPA) by the organization, see Figure 2.

Metro COG Limited English Proficiency (LEP) Plan

Adopted in September 2023, Metro COG's LEP plan addresses the organization's responsibilities as a recipient of federal financial assistance as it relates to individuals with LEP language skills.

Aligning to Executive Order 13166, *Improving Access to Services for Persons with Limited English Proficiency*, the LEP Plan provides guidance for language assistance to persons with limited English proficiency who wish to access services provided by through Metro COG. The Metro COG LEP Plan framework is built by a four-factor analysis including:

1. **Demography.** The number or proportion of LEP persons who may be served by Metro COG.
2. **Frequency.** The frequency with which LEP persons come into contact with Metro COG services.
3. **Importance.** The nature and importance of services provided by Metro COG to LEP populations.
4. **Resources.** The interpretation services available to Metro COG and overall cost to provide LEP assistance.

Federal

Justice40 Initiative

The Justice40 Initiative stems from Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad*, which was signed by the President on January 27, 2021. The Justice40 Initiative is a goal of the federal government to invest 40 percent of certain federal investments in disadvantaged communities that are marginalized, underserved, and overburdened by pollution.

The Office of Management and Budget's Interim Guidance on the Justice40 Initiative defines underserved or disadvantaged communities through a combination of variables including, but not limited to the following:

- Low income, high and/or persistent poverty
- High unemployment and underemployment

- Racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities
- Linguistic isolation
- High housing cost burden and substandard housing
- Distressed neighborhoods
- High transportation cost burden and/or low transportation access
- Disproportionate environmental stressor burden and high cumulative impacts
- Limited water and sanitation access and affordability
- Disproportionate impacts from climate change
- High energy cost burden and low energy access
- Jobs lost through the energy transition
- Access to healthcare
- Tribal jurisdictions

Infrastructure Investment and Jobs Act (IIJA) / Bipartisan Infrastructure Law (BIL)

The IIJA, also known as BIL was signed into law November 15, 2021. BIL is a reauthorization of the surface transportation bill or highway bill, providing five years of federal investment for surface transportation through September 30, 2026. The new legislation provides significantly more funding for surface transportation projects than its predecessor, the Fixing America's Surface Transportation (FAST) Act, the 2015 highway bill. With the additional federal funding appropriation of BIL, nearly every existing surface transportation program area received a boost in funds and over 12 new funding programs were created.

SS4A is one of the new programs and contains appropriations for planning grants (safety action plan) and implementation grants (project construction). Following the heels of the Justice40 Initiative, BIL and subsequently SS4A outline strong considerations of equity and identifying disadvantaged communities to further safety for people most vulnerable to impacts from the transportation system. This has resulted in explicit equity criteria for SS4A implementation grants, and USDOT is asking how agencies have considered and addressed equity in safety action plans and implementation projects.

How does Metro COG Currently Analyze Equity?

Today, Metro COG follows policy guidance directly from the organization's Title VI Plan. Guidance is provided for conducting environmental justice (EJ) analyses or equity analyses which formally apply to two of Metro COG's core plans:

- Metropolitan Transportation Plan (MTP)
- Transportation Improvement Program (TIP)

Metro COG's current framework for EJ or equity analysis includes a qualitative review in which EJ areas highlighting the defined areas with concentrations of minority and low-income populations are overlaid on a map with planned or programmed roadway, transit, and bicycle projects. The qualitative review determines the extent to which EJ populations are negatively or positively impacted by projects. Equity analyses for Metro COG projects occur at the draft stages

of plan development to inform plan development process and address any foreseeable disproportionate impacts, as applicable.

Informally, nearly all the planning work that Metro COG does incorporates an equity analysis to review potential impacts to disadvantaged and vulnerable people. The safety action plan provides a unique opportunity to wholistically review indicators of disadvantage and vulnerability and provide additional perspective about the relationship between equity and the regional multimodal transportation system.

How can Metro COG Analyze Equity?

There are several ways for Metro COG to analyze equity in addition to the organization's current environmental justice analysis process outlined in the Title VI plan. Below is a robust equity analysis framework, which is based on current practices from various regional and state planning agencies around the U.S.[2] The framework is detailed enough to provide guidance for equity considerations on the safety action plan as well as future planning programs or projects in which the organization develops.

Define Key Population Groups and Population Variables

Various population groups and variables are included in the equity analysis for the safety action plan. Information on said groups is pulled from Census data and federal screening resources. Key population groups in the equity analysis may include, but are not limited to:

- Minority or non-white population
- Low-income population
- Dependent aged population (person age 65 and older, and age 17 or younger)
- LEP population
- Disabled population
- Households with zero vehicles
- Veteran status
- Single parent families
- Median household income
- Poverty rate
- Housing cost burden

Spatial or Geographic-Based Variables

Through the safety action plan, Metro COG is considering all users of the transportation system, including those who use alternative modes of transportation such as people walking and people biking. Geographic variables supplement the population-based variables in the equity analysis.

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[2] Caltrans Division of Research, Innovation and System Information. (2021). Transportation-Related Equity Indicators to Improve Mobility and Transportation System Access for Low-Income and Disadvantaged Communities (PI-0290)

The safety action plan project team has identified preliminary geographic-based variables which include proximity to:

- High-Injury Network including road segments and intersections
- Public facilities such as schools, parks, and biking and walking trails
- Other community facilities
- Mobile home communities
- Public housing facilities
- Land uses including commercial, industrial, residential, etc.
- Employment (2050 socioeconomic update)

Establish Numerical Thresholds

A critical step for Metro COG and the project team is to set thresholds that define concentrations of population groups. In some cases, Metro COG may consider high concentrations of population anything over Cass County, Clay County, State of Minnesota, or State of North Dakota percentages for the same groups. Thresholds are not critical to the equity analysis however, as summarized in the Prioritization Consideration section below, thresholds will help prioritize safety projects that may have the largest positive impact on disadvantaged or underserved populations.

Minnesota Threshold Guidance

The Minnesota Department of Transportation (MnDOT) provides specific thresholds for minority and low-income populations in the Agency's published Environmental Justice (EJ) Process. MnDOT guidelines compare study area (Block Groups) minority and low-income population percentages to the percentages of the city or county the study area is located within. If the study area percentage is 10 percentage points higher than the city or county average, or greater than 50 percent in the study area, MnDOT considers there to be a strong indicator of an environmental justice community.

North Dakota Threshold Guidance

The North Dakota Department of Transportation (NDDOT) also provides specific thresholds for minority and low-income populations in the Agency's published Environmental Justice Analysis Guidance. NDDOT advises comparison of the study area (Block Groups) percentages of minority and low-income populations to the percentages of the city or county the study area is located within. If the study area percentage is 10 percentage points higher than the city or county average, or greater than 50 percent in the study area, NDDOT considers there to be a strong indicator of an environmental justice community.

Metro COG Threshold Guidance

Metro COG has established thresholds to determine low-income and minority populations in the MSA. Utilizing Census Buruea's 2013-2017 American Community Survey (ACS) five-year tables for low-income and 2020 decennial Census data for minority populations. The thresholds for said populations are set as follows:

- Low-income population
    - Household income less than $23,403 by Census Block Group

- Minority population
    - Equal or greater than 25 percent of population by Census Block

Metro COG may consider the organization's own, NDDOT's, and MnDOT's EJ guideline thresholds but can set thresholds similarly or differently, there is no mandated requirement for the safety action plan. For the safety action plan transportation equity review, a preliminary threshold for Census indicators has been set as:

- Census data indicators
    - Indicator percent of population by Block Group or Census Tract greater than the highest rate of comparison (Minnesota, North Dakota, Clay County, or Cass County)

Analysis Level

The analysis level is the application of granularity of the equity analysis itself. Analysis levels can include:

- Project
- Program
- Corridor
- Local (City or County)
- Regional
- Statewide

The most granularity of analysis is found at the Project level, and the least granularity at the Statewide level. The safety action plan study area is comprised by the Fargo-Moorhead Metropolitan Statistical Area (MSA) which includes all of Cass County, North Dakota and Clay County, Minnesota. Metro COG's analysis generally level falls under the Regional granularity however, this may vary between urban and rural areas in the MSA. Given the urban versus regional context, the analysis level falls somewhere between Program and Regional; therefore, a very fine granular equity assessment is unnecessary and typical geographic units of analysis can be utilized as described below. Where the Metro COG equity analysis becomes more granular is in urban portions of the MSA, and near the overlay of to-be determined spatial or geographic-based variables.

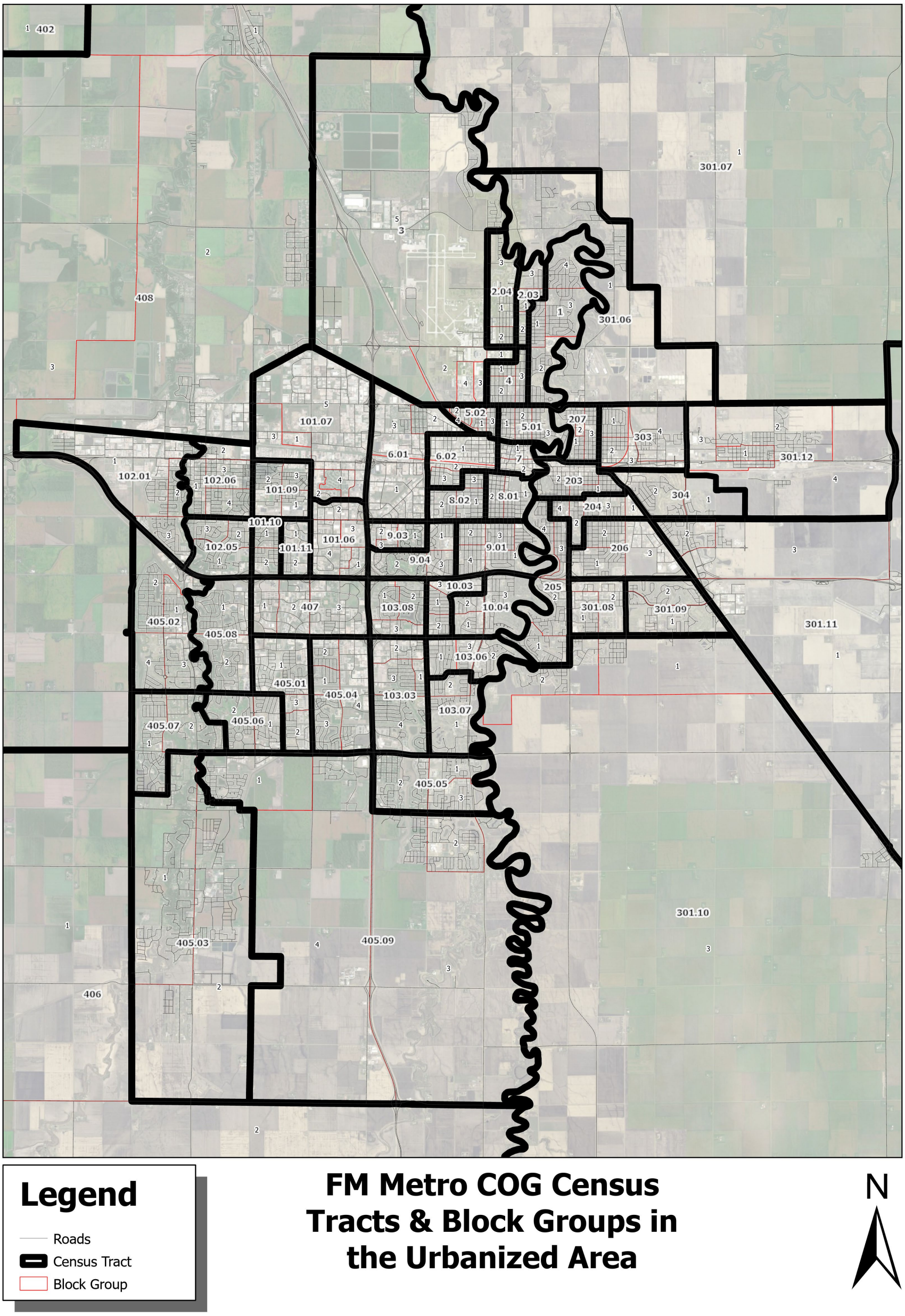
Geographic Unit of Analysis

Equity analyses typically fall into traditional transportation planning-related geographies:

- Census Block Groups
- Census Blocks (rarely)
- Census Tracts
- Transportation Analysis Zones (TAZs)

For the safety action plan, a combination of Census Block Groups and Census Tracts is used. There are 43 Block Groups in Clay County and 132 Block Groups in Cass County (175 MSA total). There are 16 Census Tracts in Clay County and 44 Census Tracts in Cass County (60 MSA total).

Figure 3. Census Tracts & Block Groups in the FM Area (Urban)



Categorical Analysis

Most of the indicators of disadvantaged or underserved communities fall into various categories associated with the transportation equity review. The varying indicators align with different categories of analysis, combining to paint a comprehensive picture of how Metro COG's regional multimodal transportation system impacts disadvantaged or vulnerable populations. Indicators are broken down into categories for the safety action plan and include data available through the U.S. Census Bureau (Census) and federally published indices. Indicators and categories are interrelated, and the following may be affected by the region's multimodal transportation system:

Accessibility

A measure of people's ability to access the locations needed to go about their daily lives. Accessibility equity indicators point to populations that may have accessibility challenges affected by the transportation system. For example, populations who cannot, or may no longer be able to drive a personal vehicle. Indicators may include but are not limited to:

- Proximity to curb ramps and sidewalks compliant with Americans with Disabilities Act (ADA)
- Dependent aged population (person age 65 and older, and age 17 or younger)
- Disabled population
- Households with zero vehicles
- Transportation access (USDOT ETC Explorer. Please see below for further detail)
- Transportation barriers (Climate & Economic Justice Screening Tool. Please see below for further details)
- Traffic proximity and volume (Climate & Economic Justice Screening Tool)

Affordability

A measure of people's ability to afford and sustain their quality of life. Affordability indicators point to populations that may have affordability challenges affected by the transportation system. For example, personal-vehicle operations and maintenance costs may require alternative, lower-cost transportation modes such as walking, biking, and/or transit. Indicators may include but are not limited to:

- Low-income population
- Median household income
- Poverty rate
- Areas of Persistent Poverty (APP)
- Housing cost burden
- 200% poverty line (USDOT ETC Explorer)
- Transportation cost burden (USDOT ETC Explorer)
- Energy cost (Climate & Economic Justice Screening Tool)
- Low median income (Climate & Economic Justice Screening Tool)

Connectivity

A measure of people's ability to connect to their community. Connectivity equity indicators point to populations that may have a more difficult time getting where they need to go through

the transportation system, or the transportation system itself presents a barrier. For example, a multi-lane, arterial roadway may be a barrier to populations needing to connect to essential needs or employment, depending upon how they travel. Indicators may include but are not limited to:

- Transportation access (USDOT ETC Explorer)
- Qualitative analysis

Efficiency

A measure of efficiency. Efficiency equity indicators point to areas of the community or transportation system that may be operating inefficiently. For example, poor traffic operations may cause congestion and backups, leading to inefficient travel across the Fargo-Moorhead area. Indicators may include but are not limited to:

- Transportation access (USDOT ETC Explorer)
- Qualitative analysis

Environment

A measure of the Fargo-Moorhead MSA's environmental quality. Metro COG's regional multimodal transportation system is just one component that can affect people's environment and their community. For example, traffic congestion can contribute to lower air quality. Indicators may include but are not limited to:

- Anticipated changes in extreme weather (USDOT ETC Explorer)
- Annualized disaster losses (USDOT ETC Explorer)
- Impervious surfaces (USDOT ETC Explorer)
- Ozone level (USDOT ETC Explorer)
- PM 2.5 level (USDOT ETC Explorer and Climate & Economic Justice Screening Tool)
- Diesel PM level (USDOT ETC Explorer)
- Air toxics cancer risk (USDOT ETC Explorer)
- Hazardous sites proximity (USDOT ETC Explorer)
- Toxics release sites proximity (USDOT ETC Explorer)
- Treatment & disposal facility proximity (USDOT ETC Explorer)
- Risk management sites proximity (USDOT ETC Explorer)
- Coal mine proximity (USDOT ETC Explorer)
- Lead mine proximity (USDOT ETC Explorer)
- Pre-1980s housing (USDOT ETC Explorer)
- High-volume road proximity (USDOT ETC Explorer)
- Railways proximity (USDOT ETC Explorer)
- Airports proximity (USDOT ETC Explorer)
- Ports proximity (USDOT ETC Explorer)
- Impaired surface water (USDOT ETC Explorer)
- Endemic inequality (USDOT ETC Explorer)
- Expected building loss rate (Climate & Economic Justice Screening Tool)
- Expected population loss rate (Climate & Economic Justice Screening Tool)
- Projected flood risk (Climate & Economic Justice Screening Tool)
- Projected wildfire risk (Climate & Economic Justice Screening Tool)

- Abandoned mine land (Climate & Economic Justice Screening Tool)
- Formerly used defense sites (Climate & Economic Justice Screening Tool)
- Proximity to Superfund sites (Climate & Economic Justice Screening Tool)
- Underground storage tanks and releases (Climate & Economic Justice Screening Tool)
- Wastewater discharge (Climate & Economic Justice Screening Tool)

Health

A measure of people's physical health. Health equity indicators point to populations that may have underlying health diagnoses resulting in more susceptibility to impacts from the transportation system. For example, populations with asthma are more susceptible to air pollution and air quality. Indicators may include but are not limited to:

- Asthma prevalence (USDOT ETC Explorer and Climate & Economic Justice Screening Tool)
- Cancer prevalence (USDOT ETC Explorer)
- High blood pressure prevalence (USDOT ETC Explorer)
- Diabetes prevalence (USDOT ETC Explorer and Climate & Economic Justice Screening Tool)
- Low mental health prevalence (USDOT ETC Explorer)
- Heart disease (Climate & Economic Justice Screening Tool)
- Low life expectancy (Climate & Economic Justice Screening Tool)
- Housing cost burden
- Low-income households
- Transportation cost burden (USDOT ETC Explorer)
- Diesel particulate matter exposure (Climate & Economic Justice Screening Tool)
- Low median income (Climate & Economic Justice Screening Tool)

Housing

A measure of where and how people live. Housing equity indicators point to populations who may not have the ability to chose housing location or typology. For example, low-income households are subject to market affordability or subsidized housing locations and housing types. Indicators may include but are not limited to:

- House tenure (USDOT ETC Explorer)
- Housing cost (Climate & Economic Justice Screening Tool)
- Housing cost burden
- Transportation cost burden (USDOT ETC Explorer)
- Mobile homes (USDOT ETC Explorer)
- Low-income households
- Low median income (Climate & Economic Justice Screening Tool)
- 200% poverty line (USDOT ETC Explorer)
- Areas of Persistent Poverty (APP)
- Lack of green space (Climate & Economic Justice Screening Tool)
- Lack of indoor plumbing (Climate & Economic Justice Screening Tool)
- Lead paint (Climate & Economic Justice Screening Tool)

Jobs

A measure of people's ability to acquire and sustain a job. Jobs equity indicators point to populations who may have more of a challenge accessing and/or connecting to employment. For example, a person with limited English proficiency language skills or no access to a vehicle, may be limited by employment sector and/or employment location. Indicators may include but are not limited to:

- Unemployment (USDOT ETC Explorer and Climate & Economic Justice Screening Tool)
- No high school diploma (USDOT ETC Explorer)
- High school education (Climate & Economic Justice Screening Tool)
- Uninsured
- Lack of internet access
- Dependent-aged population (person age 65 and older, and age 17 or younger)
- Disabled population
- LEP population
- Average commute time
- Transportation access (USDOT ETC Explorer)
- Expected agriculture loss rate (Climate & Economic Justice Screening Tool)
- Linguistic isolation (Climate & Economic Justice Screening Tool)

Mobility

A measure of people's ease of access and connection to their community. Mobility equity indicators point to populations identified through both accessibility and connectivity equity indicators, with an emphasis on ease of travel. For example, transit-dependent riders in the FM area may have a much more challenging time traveling throughout their community. Indicators may include but are not limited to:

- Dependent aged population (person age 65 and older, and age 17 or younger)
- Households with zero vehicles
- Transportation access (USDOT ETC Explorer)
- Transportation barriers (Climate & Economic Justice Screening Tool)
- Traffic proximity and volume (Climate & Economic Justice Screening Tool)

Safety

A measure of people's physical risk and safety. Safety equity indicators point to locations that are unsafe for travelers of different modes. For example, the Crash Analysis and High-Injury Network identifies high crash locations by travel mode, and a person walking or biking may be less safe traveling in certain locations. Indicators may include but are not limited to:

- Transportation safety (USDOT ETC Explorer)
- Crash Analysis & High-Injury Network Analysis
- Proximity to hazardous waste facilities (Climate & Economic Justice Screening Tool)
- Proximity to Risk Management Plan facilities (Climate & Economic Justice Screening Tool)

Travel Time

A measure of the ability to move throughout the MSA within a reasonable amount of time. Travel Time equity indicators point to locations which may experience more congestion and

decreased mobility. For example, lane configuration and/or traffic control at a major intersection may cause delay or congestion during peak hours or school drop-off/pick-up. Indicators may include but are not limited to:

- Commute time
- Transportation access (USDOT ETC Explorer)
- Transportation barriers (Climate & Economic Justice Screening Tool)

Metro COG Disadvantaged Community Indicators and Vulnerable Populations

Federal Datasets

Climate and Economic Justice Screening Tool (CEJST)

The White House published tool provided to screen for Justice40 disadvantaged communities, provides an interactive web application utilizing Census Tract geographies and data to present cumulative disadvantages and vulnerabilities. There are eight components tracked by the Climate and Economic Justice Screening Tool:

- Climate change
- Energy
- Health
- Housing
- Legacy pollution
- Transportation
- Water and wastewater
- Workforce Development

The components listed above are comprised of several indicators and each Census Tract's percentile rank compared to national results. The transportation equity review does not include results from the CEJST.

The Census Tract geographies used to display the indices and data found in the CEJST are 2010 boundaries. Throughout the transportation equity review, 2020 Census geographies are used. With the population growth and demographic changes of the MSA between 2010 and 2020, the CEJST provides interesting results, however, does not overlay very well with other data utilized in the transportation equity review. It is recommended that Metro COG and local partners utilize the CEJST outside of the process established in the transportation equity review, for project-level equity analysis and desktop environmental justice review.

USDOT Equitable Transportation Community (ETC) Explorer

The USDOT ETC Explorer provides an interactive web application utilizing Census Tract geographies and data to present cumulative disadvantages and vulnerabilities. There are five components tracked by USDOT ETC Explorer:

- Transportation Insecurity
- Climate and Disaster Risk Burden
- Environmental Burden
- Health Vulnerability
- Social Vulnerability

ETC Explorer components listed above are comprised of numerous indicators. Components and indicators are percentile ranked against other Census Tracts nationally or in a particular state.

The transportation equity review includes national results from the ETC Explorer. Figure 4 shows the USDOT overall designation of disadvantaged communities based upon the five components.

Figure 4. ETC Explorer Results

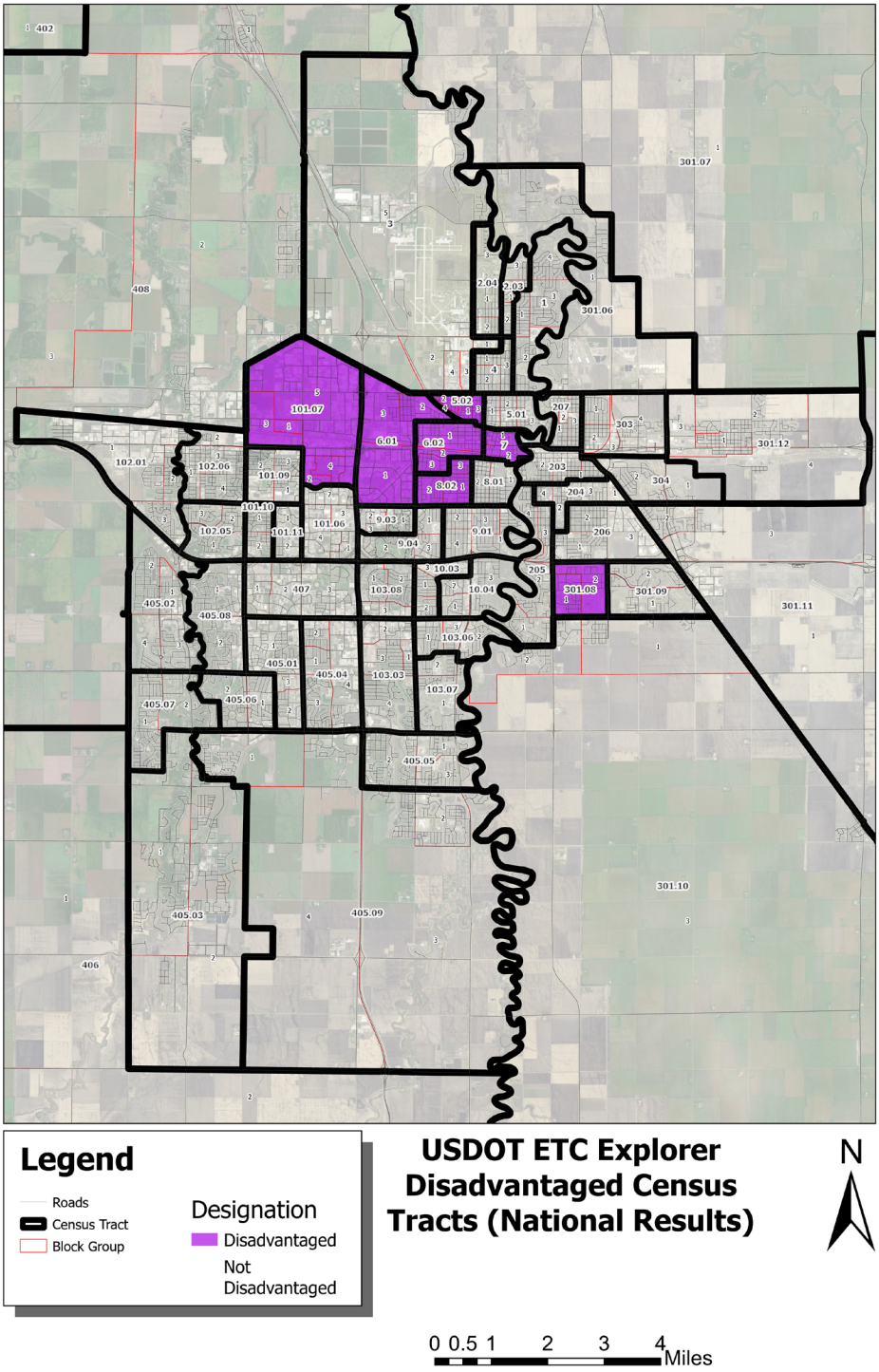


Table 2. Metropolitan Statistical Area ETC Explorer Component Results

County	Census Tract	ETC Explorer Components (National Percentile)					Overall Disadvantaged Community?[1]
		Climate & Disaster Risk Burden	Environmental Burden	Health Vulnerability	Social Vulnerability	Transportation Insecurity	
Clay	203	50%	**84%**	17%	**71%**	42%	No
	204	57%	**71%**	53%	48%	10%	No
	205	43%	57%	**68%**	38%	15%	No
	206	45%	**78%**	32%	48%	38%	No
	207	35%	**72%**	34%	58%	35%	No
	301.06	19%	48%	63%	12%	50%	No
	301.07	13%	10%	63%	11%	**80%**	No
	301.08	52%	**70%**	6%	**82%**	**65%**	**Yes**
	301.09	31%	61%	40%	9%	46%	No
	301.10	8%	11%	43%	21%	57%	No
	301.11	3%	25%	14%	37%	**72%**	No
	301.12	22%	34%	52%	26%	17%	No
	302.01	5%	13%	33%	31%	**87%**	No
	302.02	5%	13%	31%	15%	**88%**	No
	303	35%	**68%**	15%	37%	52%	No
	304	21%	58%	9%	14%	51%	No
Cass	1	27%	57%	29%	1%	43%	No
	2.03	61%	57%	54%	50%	23%	No
	2.04	50%	55%	42%	51%	31%	No
	3	33%	42%	50%	38%	20%	No
	4	63%	**74%**	62%	35%	12%	No
	5.01	63%	**85%**	57%	48%	14%	No
	5.02	59%	**97%**	27%	**93%**	32%	**Yes**
	6.01	**80%**	**92%**	50%	**74%**	19%	**Yes**
	6.02	**70%**	**99%**	13%	90%	45%	**Yes**
	7	**90%**	**93%**	34%	**86%**	26%	**Yes**
	8.01	62%	**96%**	59%	37%	9%	No
	8.02	**69%**	**98%**	42%	**78%**	29%	**Yes**
	9.01	62%	**74%**	64%	17%	10%	No
	9.03	**85%**	58%	60%	**66%**	8%	No
	9.04	**69%**	55%	63%	32%	15%	No
	10.03	**67%**	45%	44%	63%	22%	No
	10.04	48%	55%	47%	51%	23%	No
	101.06	**78%**	54%	27%	**85%**	26%	No
	101.07	**75%**	**79%**	**70%**	**86%**	16%	**Yes**
	101.09	**82%**	**75%**	62%	22%	9%	No
	101.10	55%	47%	8%	7%	50%	No
	101.11	**65%**	39%	4%	**82%**	56%	No
	102.01	58%	54%	51%	7%	19%	No
	102.05	55%	43%	19%	30%	41%	No
	102.06	55%	**83%**	26%	37%	35%	No
	103.03	61%	29%	26%	32%	43%	No
	103.06	**69%**	32%	63%	54%	15%	No
	103.07	37%	24%	26%	1%	53%	No
	103.08	59%	42%	27%	31%	32%	No
	401	-	-	-	-	-	No
	402	11%	14%	64%	5%	**77%**	No
	403	13%	24%	61%	22%	57%	No
	405.01	49%	10%	2%	59%	**75%**	No
	405.02	29%	13%	2%	2%	**82%**	No
	405.03	2%	6%	3%	1%	**85%**	No
	405.04	51%	24%	2%	30%	**75%**	No
	405.05	29%	19%	2%	9%	**77%**	No
	405.06	33%	9%	1%	0%	**78%**	No
	405.07	17%	6%	2%	0%	**80%**	No
	405.08	40%	33%	2%	20%	**74%**	No
	405.09	4%	8%	7%	6%	**74%**	No
	406	15%	15%	59%	8%	63%	No
	407	54%	42%	9%	55%	46%	No
	408	7%	18%	14%	3%	**75%**	No

Bold percentiles indicate component is over the disadvantaged threshold (greater than 65 percent).

[1] Considered disadvantaged when overall index score is greater than 65 percent threshold.

Areas of Persistent Poverty and Historically Disadvantaged Community

Areas of Persistent Poverty (APP) and Historically Disadvantaged Community (HDC) are defined and designated by the federal government.

APPs are defined as:

- Any County with consistently greater than or equal to 20 percent of the population living in poverty during the last 30-year period.
- Any Census Tract with a poverty rate of at least 20 percent (Census ACS 2014-2018 five-year data)
- U.S. Territories

HDCs are defined as:

- Certain qualifying Census Tracts
- Tribal land
- U.S. Territories

There are 10 Census Tracts in the MSA designated as APP and seven designated as HDC. In nearly all USDOT discretionary grant programs, the consideration and identification of APP and HDC is required. Future federal grant submittals may specifically ask if projects or portions thereof are in these designated areas however, there is no eligibility/ineligibility resulting for projects outside of an APP or HDC. See Table 3 for designations within the MSA.

Census Data

Outside of the federal screening tools such as ETC Explorer, the project team utilizes the U.S. Census Bureau's American Community Survey (ACS) 2018-2022 5-year dataset. Table 4 and Table 5 summarize the key indicators analyzed in the transportation equity review by Census Tract and Block Group. Block Group data is provided as ACS dataset granularity allows.

Table 3. Areas of Persistent Poverty and Historically Disadvantaged Community Designation in the Metropolitan Statistical Area

County	Census Tract	APP - County Meets Definition?	APP - Census Tract Meets Definition	HDC - Census Tract Meets Definition
Clay	203	No	**Yes**	No
	204	No	**Yes**	No
	205	No	No	No
	206	No	No	No
	207	No	No	No
	301.06	No	No	No
	301.07	No	No	No
	301.08	No	No	**Yes**
	301.09	No	No	No
	301.10	No	No	No
	301.11	No	No	No
	301.12	No	No	No
	302.01	No	No	No
	302.02	No	No	No
	303	No	No	No
	304	No	No	No
Cass	1	No	No	No
	2.03	No	No	No
	2.04	No	No	No
	3	No	**Yes**	No
	4	No	**Yes**	No
	5.01	No	No	No
	5.02	No	**Yes**	**Yes**
	6.01	No	**Yes**	**Yes**
	6.02	No	**Yes**	**Yes**
	7	No	**Yes**	**Yes**
	8.01	No	No	No
	8.02	No	No	**Yes**
	9.01	No	No	No
	9.03	No	No	No
	9.04	No	No	No
	10.03	No	No	No
	10.04	No	No	No
	101.06	No	**Yes**	No
	101.07	No	**Yes**	**Yes**
	101.09	No	No	No
	101.10	No	No	No
	101.11	No	No	No
	102.01	No	No	No
	102.05	No	No	No
	102.06	No	No	No
	103.03	No	No	No
	103.06	No	No	No
	103.07	No	No	No
	103.08	No	No	No
	401	No	No	No
	402	No	No	No
	403	No	No	No
	405.01	No	No	No
	405.02	No	No	No
	405.03	No	No	No
	405.04	No	No	No
	405.05	No	No	No
	405.06	No	No	No
	405.07	No	No	No
	405.08	No	No	No
	405.09	No	No	No
	406	No	No	No
	407	No	No	No
	408	No	No	No

Table 4. Census Tract Equity Indicators

ACS 2018-2022 5-Year Tables		% Zero Veh. HHs	% Disabled	Median HH Income	% Housing Cost Burden	% with 25+ min. Work Commute	% Single-Parent Households	% Veteran
Table ID		B08201	S1810	B19013	DP04	S0802	DP02	B21001
Minnesota		*6.6%*	*11.2%*	*$ 84,313*	*25.4%*	***38.2%***	*5.3%*	*6.3%*
North Dakota		*5.2%*	*11.4%*	*$ 73,959*	*22.8%*	*19.1%*	*4.9%*	***7.4%***
Clay County		***8.4%***	***11.8%***	*$ 75,006*	***30.0%***	*24.1%*	***5.7%***	*5.4%*
Cass County		*6.0%*	*10.0%*	*$ 73,249*	*25.8%*	*14.4%*	*5.0%*	*5.9%*
County	**Census Tract**							
Clay	203	**13.6%**	**14.5%**	$ 48,583	**39.9%**	11.3%	5.3%	2.0%
	204	**28.6%**	**13.8%**	$ 34,821	**34.0%**	13.6%	5.2%	1.4%
	205	5.7%	7.0%	$ 92,500	18.8%	11.0%	**6.1%**	5.0%
	206	**9.9%**	**13.8%**	$ 71,000	**36.1%**	14.4%	5.1%	6.5%
	207	**18.4%**	**20.6%**	$ 60,417	**31.2%**	17.5%	5.6%	4.8%
	301.06	2.8%	10.7%	$ 96,538	22.5%	18.7%	**7.4%**	5.4%
	301.07	1.7%	9.5%	$ 96,154	18.1%	**48.0%**	2.5%	5.3%
	301.08	**13.7%**	11.4%	$ 40,517	**55.2%**	13.6%	**11.7%**	**7.7%**
	301.09	2.4%	**14.0%**	$ 85,286	26.9%	18.5%	2.2%	6.3%
	301.10	2.8%	7.7%	$ 104,620	**32.6%**	15.3%	4.3%	3.2%
	301.11	**9.0%**	**12.3%**	$ 83,676	**31.4%**	21.1%	3.6%	7.0%
	301.12	7.1%	**13.8%**	$ 84,783	**32.0%**	24.7%	**8.6%**	4.4%
	302.01	4.5%	**12.2%**	$ 85,870	19.0%	**61.4%**	5.2%	**7.5%**
	302.02	4.1%	7.4%	$ 89,145	20.5%	**62.5%**	2.7%	7.1%
	303	**11.5%**	**17.5%**	$ 60,478	26.6%	20.6%	5.2%	6.6%
	304	1.6%	5.5%	$ 96,157	20.6%	3.4%	**9.7%**	6.7%
Cass	1	0.0%	7.4%	$ 115,341	11.7%	8.6%	4.4%	7.1%
	2.03	**12.5%**	**16.9%**	$ 42,569	**34.4%**	11.4%	5.5%	**8.1%**
	2.04	5.3%	**13.9%**	$ 61,272	20.2%	11.4%	5.5%	**7.6%**
	3	**12.7%**	2.9%	$ 78,684	**35.4%**	8.0%	**5.7%**	1.1%
	4	5.9%	6.9%	$ 71,224	**33.0%**	10.0%	2.0%	**9.0%**
	5.01	**10.7%**	9.9%	$ 52,226	29.4%	15.1%	4.5%	4.9%
	5.02	6.8%	6.9%	$ 30,155	**61.3%**	4.4%	**6.8%**	2.0%
	6.01	**13.6%**	**17.4%**	$ 51,292	**39.4%**	6.9%	**19.4%**	4.8%
	6.02	**30.0%**	**29.3%**	-	**47.3%**	11.2%	4.8%	4.1%
	7	**35.4%**	**26.5%**	$ 27,973	**51.8%**	11.2%	0.0%	5.5%
	8.01	5.7%	11.2%	$ 70,313	20.6%	13.6%	4.3%	3.3%
	8.02	**11.7%**	**14.6%**	$ 67,361	26.6%	6.2%	0.0%	**9.7%**
	9.01	2.6%	9.9%	$ 83,630	13.2%	2.2%	**5.9%**	**9.0%**
	9.03	5.8%	**12.8%**	$ 49,219	26.6%	8.6%	**7.0%**	5.6%
	9.04	2.6%	8.4%	$ 62,982	26.7%	7.3%	3.4%	**7.7%**
	10.03	5.1%	**17.2%**	$ 59,265	26.0%	11.4%	**8.0%**	6.9%
	10.04	4.2%	**12.4%**	$ 51,868	24.3%	17.3%	**6.3%**	6.2%
	101.06	**15.0%**	11.4%	$ 36,887	**45.4%**	14.9%	**19.1%**	4.7%
	101.07	8.1%	**20.2%**	$ 48,558	**34.9%**	13.1%	2.2%	**7.7%**
	101.09	3.2%	9.4%	$ 79,500	18.9%	11.2%	**11.0%**	3.8%
	101.10	2.7%	9.5%	$ 104,235	12.3%	7.9%	**9.9%**	4.5%
	101.11	6.7%	11.2%	$ 51,201	27.9%	7.9%	**10.9%**	6.3%
	102.01	4.9%	8.7%	$ 88,167	27.6%	9.1%	1.6%	4.6%
	102.05	7.4%	**14.6%**	$ 102,600	28.8%	24.5%	0.8%	6.8%
	102.06	4.4%	**12.3%**	$ 69,646	25.1%	11.0%	**7.8%**	5.5%
	103.03	3.8%	**12.1%**	$ 79,802	26.3%	19.8%	**7.0%**	3.7%
	103.06	**9.7%**	7.3%	$ 59,828	**32.0%**	15.6%	3.4%	**8.2%**
	103.07	0.5%	7.2%	$ 156,250	17.1%	11.0%	3.9%	**8.5%**
	103.08	4.3%	9.0%	$ 83,922	22.5%	10.3%	4.7%	3.9%
	401	0.8%	**12.2%**	$ 101,917	10.8%	**41.9%**	2.7%	6.3%
	402	1.0%	10.1%	$ 100,139	10.6%	**50.1%**	1.0%	7.3%
	403	2.3%	10.0%	$ 67,022	16.1%	**52.6%**	1.4%	**8.7%**
	405.01	3.5%	**12.2%**	$ 81,365	**30.0%**	18.5%	**5.8%**	**9.6%**
	405.02	4.4%	5.8%	$ 98,088	29.0%	19.1%	1.7%	4.1%
	405.03	0.5%	8.5%	$ 146,184	16.3%	32.0%	**7.3%**	5.8%
	405.04	8.3%	**11.8%**	$ 67,223	16.2%	2.7%	0.6%	2.6%
	405.05	3.4%	10.4%	$ 116,839	20.2%	12.4%	4.8%	**10.5%**
	405.06	0.0%	2.8%	$ 113,615	23.5%	15.7%	0.0%	6.0%
	405.07	0.0%	7.1%	$ 109,112	5.9%	19.8%	0.0%	0.0%
	405.08	2.9%	2.0%	$ 115,534	17.9%	7.5%	1.9%	1.6%
	405.09	1.8%	6.4%	$ 142,232	9.2%	20.2%	0.0%	**9.8%**
	406	0.9%	7.9%	$ 107,625	15.2%	**58.2%**	**7.0%**	5.4%
	407	4.0%	7.7%	$ 61,970	29.8%	1.7%	4.0%	**7.6%**
	408	0.7%	4.5%	$ 131,295	10.9%	19.5%	1.2%	7.0%

Table 5. Block Group Equity Indicators

ACS 2018-2022 5-Year Tables			% Age <18	% Age 65+	% Non-White Pop.	% LEP Pop.	% Pop. Below Poverty Line
		Table ID	B01001	B01001	B02001	B16004	B17021
Minnesota			*23.0%*	***16.5%***	***20.3%***	***1.9%***	*9.3%*
North Dakota			*23.5%*	*15.9%*	*15.5%*	*0.7%*	*10.8%*
Clay County			***24.7%***	*13.5%*	*12.6%*	*0.6%*	***14.7%***
Cass County			*22.2%*	*12.5%*	*15.5%*	*1.0%*	*10.8%*
County	**Census Tract**	**Block Group**					
Clay	203	1	3.9%	13.1%	12.4%	0.0%	**32.7%**
		2	17.0%	9.6%	**21.7%**	0.4%	**25.0%**
	204	1	0.0%	0.0%	0.0%	0.0%	0.0%
		2	14.5%	2.8%	**21.1%**	0.0%	**37.6%**
		3	5.0%	2.7%	13.6%	0.3%	**33.5%**
		4	7.9%	1.2%	18.2%	**5.6%**	8.3%
	205	1	23.7%	14.0%	3.2%	0.0%	2.8%
		2	18.1%	**26.4%**	1.6%	0.0%	6.4%
		3	16.6%	**29.8%**	10.1%	0.0%	**40.1%**
		4	21.6%	**16.5%**	4.2%	0.0%	9.0%
	206	1	19.3%	**20.1%**	11.3%	0.0%	**16.1%**
		2	28.7%	12.0%	19.1%	0.0%	**20.1%**
		3	0.0%	0.0%	0.0%	0.0%	0.0%
	207	1	18.8%	**25.8%**	6.1%	0.0%	**14.3%**
		2	10.1%	10.1%	**84.1%**	0.0%	0.0%
		3	12.4%	10.2%	3.3%	0.0%	5.3%
	301.06	1	24.0%	15.4%	6.7%	0.5%	6.2%
	301.07	1	**25.5%**	**19.8%**	7.7%	0.1%	6.9%
	301.08	1	**43.8%**	5.8%	**29.3%**	**7.7%**	**54.6%**
		2	22.2%	9.8%	**36.3%**	0.0%	**30.7%**
	301.09	1	**28.8%**	16.2%	12.7%	0.2%	10.3%
		2	**27.1%**	11.8%	0.9%	0.0%	1.6%
	301.10	1	**35.5%**	6.1%	6.7%	0.0%	10.2%
		2	**29.3%**	6.3%	8.3%	0.8%	**27.2%**
		3	**29.1%**	15.1%	8.9%	0.0%	1.8%
	301.11	1	**32.4%**	10.9%	11.6%	0.0%	6.4%
		2	**27.2%**	13.2%	16.8%	1.1%	7.2%
		3	**26.0%**	11.4%	19.9%	0.0%	4.8%
	301.12	1	2.4%	**36.4%**	10.9%	0.0%	**15.7%**
		2	**28.4%**	8.0%	8.3%	0.0%	2.8%
		3	**25.7%**	6.8%	**28.6%**	**6.4%**	**30.8%**
		4	3.9%	**49.0%**	0.0%	0.0%	7.8%
	302.01	1	**31.8%**	13.2%	2.6%	0.0%	7.2%
		2	24.6%	**28.3%**	9.0%	0.0%	12.1%
		3	**25.1%**	**24.7%**	2.8%	0.0%	10.6%
	302.02	1	**33.1%**	16.2%	3.4%	0.0%	3.2%
		2	**29.1%**	13.2%	4.4%	0.0%	6.1%
	303	1	23.8%	16.3%	**33.8%**	0.0%	14.6%
		2	17.6%	9.1%	0.0%	0.0%	12.0%
		3	13.0%	0.0%	**53.3%**	0.0%	**100.0%**
		4	**28.0%**	**17.2%**	11.5%	0.0%	3.8%
	304	1	**37.8%**	2.7%	**32.3%**	0.0%	1.3%
		2	20.2%	**16.8%**	4.2%	0.0%	10.7%
	1	1	11.7%	**27.0%**	3.9%	0.4%	7.1%
		2	**27.2%**	14.3%	6.6%	0.0%	0.0%
		3	**37.3%**	10.6%	5.2%	0.0%	0.9%
		4	23.2%	**25.8%**	4.5%	0.0%	0.0%
	2.03	1	21.9%	**18.9%**	18.9%	0.0%	8.5%
		2	16.9%	**19.9%**	1.0%	0.0%	16.1%
		3	**29.2%**	10.9%	5.0%	0.0%	14.3%
	2.04	1	7.2%	**23.2%**	10.5%	0.4%	10.6%
		2	14.9%	7.4%	2.7%	1.0%	3.3%
		3	20.5%	10.5%	**22.0%**	**2.5%**	**19.5%**
	3	1	2.5%	0.0%	**44.4%**	0.0%	**65.3%**
		2	0.0%	0.0%	0.0%	0.0%	0.0%
		3	0.3%	0.0%	16.5%	0.0%	**54.1%**
		4	4.7%	0.0%	14.7%	0.0%	0.0%
		5	**28.3%**	13.5%	0.4%	0.0%	0.1%

ACS 2018-2022 5-Year Tables			% Age <18	% Age 65+	% Non-White Pop.	% LEP Pop.	% Pop. Below Poverty Line
		Table ID	B01001	B01001	B02001	B16004	B17021
Minnesota			*23.0%*	***16.5%***	***20.3%***	***1.9%***	*9.3%*
North Dakota			*23.5%*	*15.9%*	*15.5%*	*0.7%*	*10.8%*
Clay County			***24.7%***	*13.5%*	*12.6%*	*0.6%*	***14.7%***
Cass County			*22.2%*	*12.5%*	*15.5%*	*1.0%*	*10.8%*
County	**Census Tract**	**Block Group**					
Cass	4	1	10.5%	3.6%	3.7%	0.7%	**33.8%**
		2	7.4%	14.2%	4.4%	0.5%	**37.6%**
		3	23.0%	**27.2%**	0.6%	0.2%	5.1%
	5.01	1	12.2%	2.8%	9.4%	0.0%	14.0%
		2	19.2%	**20.9%**	**25.7%**	0.0%	4.0%
		3	22.7%	10.2%	7.5%	0.0%	9.9%
	5.02	1	0.0%	2.8%	13.7%	0.0%	**55.6%**
		2	3.7%	0.2%	15.2%	0.0%	**62.0%**
		3	20.4%	8.9%	**35.4%**	0.0%	**47.4%**
		4	0.0%	1.4%	10.8%	**2.5%**	**50.3%**
	6.01	1	24.5%	0.0%	**37.7%**	0.0%	**60.1%**
		2	21.4%	10.9%	**20.6%**	**6.0%**	**15.4%**
		3	5.3%	11.6%	7.4%	0.0%	5.9%
	6.02	1	15.4%	16.1%	19.2%	0.0%	**37.8%**
		2	0.0%	8.8%	**51.4%**	0.0%	**85.7%**
		3	**27.4%**	7.9%	**38.6%**	1.7%	**40.5%**
	7	1	0.0%	9.3%	14.6%	0.0%	**19.9%**
		2	0.0%	10.9%	**25.7%**	0.0%	**30.9%**
	8.01	1	9.8%	**25.1%**	10.0%	0.0%	**14.9%**
		2	20.6%	10.6%	8.2%	0.0%	6.0%
			17.8%	13.6%	19.3%	**4.7%**	11.3%
	8.02	1	8.1%	6.8%	15.5%	0.0%	6.2%
		2	**27.6%**	8.6%	**22.8%**	**8.7%**	11.5%
		3	1.6%	**38.8%**	14.0%	0.4%	**20.8%**
	9.01	1	**25.5%**	**39.6%**	0.6%	0.9%	0.0%
		2	23.4%	13.6%	**27.1%**	0.6%	13.3%
		3	20.9%	**27.3%**	0.9%	0.0%	2.8%
		4	20.7%	**29.7%**	4.7%	0.0%	4.3%
	9.03	1	10.5%	14.5%	**30.0%**	0.0%	8.5%
		2	**25.6%**	8.2%	**60.7%**	0.0%	4.8%
		3	19.0%	**27.8%**	3.2%	0.0%	0.3%
	9.04	1	23.5%	**18.3%**	13.9%	0.0%	2.2%
		2	12.2%	**26.4%**	5.8%	1.5%	7.2%
		3	23.0%	9.6%	14.0%	0.0%	7.1%
	10.03	1	15.2%	**27.7%**	3.6%	0.0%	0.0%
		2	**34.7%**	4.5%	**21.4%**	1.6%	**20.7%**
		3	20.0%	**32.9%**	**31.5%**	0.0%	**32.4%**
	10.04	1	13.7%	**30.4%**	13.3%	0.0%	6.0%
		2	19.3%	8.1%	**35.5%**	**3.2%**	9.7%
		3	24.3%	**22.4%**	3.3%	0.5%	3.4%
	101.06	1	18.6%	5.4%	**68.6%**	**2.4%**	**21.5%**
		2	**26.0%**	4.3%	**52.3%**	**9.3%**	**19.8%**
		3	0.0%	0.0%	0.0%	0.0%	0.0%
		4	**39.1%**	5.1%	**54.1%**	**10.6%**	**60.0%**
	101.07	1	0.0%	0.0%	0.0%	0.0%	0.0%
		2	18.5%	13.7%	**44.4%**	**6.7%**	**17.9%**
		3	0.0%	0.0%	0.0%	0.0%	0.0%
		4	18.9%	**23.2%**	15.2%	0.0%	3.1%
		5	0.0%	0.0%	0.0%	0.0%	0.0%
	101.09	1	18.1%	**17.0%**	10.1%	0.0%	0.0%
		2	19.9%	10.4%	9.0%	0.0%	4.0%
		3	**34.4%**	10.4%	18.6%	0.0%	8.2%
	101.10	1	**37.9%**	15.6%	3.6%	0.0%	0.0%
		2	17.6%	14.9%	15.6%	0.0%	2.5%
	101.11	1	13.5%	14.1%	**42.4%**	**6.5%**	13.4%
		2	**30.4%**	4.4%	**21.5%**	0.0%	10.9%
	102.01	1	20.0%	6.9%	17.2%	0.0%	8.0%
		2	17.6%	14.0%	0.0%	0.0%	1.5%
		3	17.0%	**17.4%**	7.6%	0.0%	10.5%
	102.05	1	**25.1%**	**23.1%**	12.2%	1.0%	6.7%
		2	22.9%	12.8%	0.0%	0.0%	0.7%
		3	9.9%	**33.9%**	1.6%	0.0%	10.2%

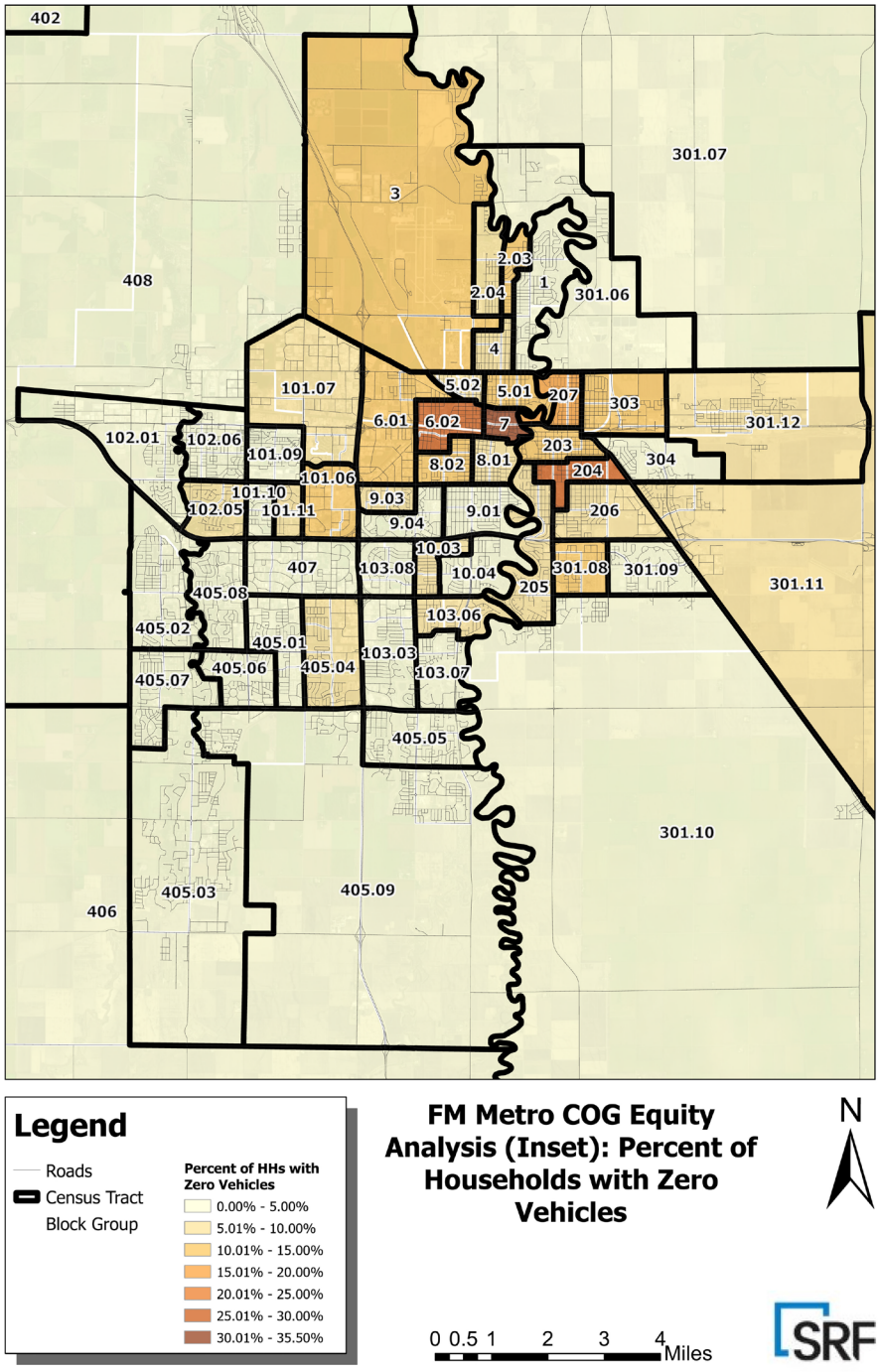
ACS 2018-2022 5-Year Tables			% Age <18	% Age 65+	% Non-White Pop.	% LEP Pop.	% Pop. Below Poverty Line
		Table ID	B01001	B01001	B02001	B16004	B17021
Minnesota			*23.0%*	***16.5%***	***20.3%***	***1.9%***	*9.3%*
North Dakota			*23.5%*	*15.9%*	*15.5%*	*0.7%*	*10.8%*
Clay County			***24.7%***	*13.5%*	*12.6%*	*0.6%*	***14.7%***
Cass County			*22.2%*	*12.5%*	*15.5%*	*1.0%*	*10.8%*
County	**Census Tract**	**Block Group**					
	102.06	2	0.0%	**19.8%**	0.0%	0.0%	**21.0%**
		3	22.6%	8.3%	13.6%	**2.5%**	13.2%
		4	13.7%	**21.6%**	7.4%	0.0%	9.6%
	103.03	1	15.7%	10.8%	**46.7%**	0.0%	**46.3%**
		2	17.5%	10.5%	**34.4%**	0.9%	**19.7%**
		3	24.2%	**19.3%**	14.6%	0.0%	10.7%
		4	20.3%	4.3%	5.9%	0.0%	7.6%
	103.06	1	**31.4%**	**22.3%**	**38.1%**	1.1%	5.6%
		2	19.5%	**38.5%**	8.7%	0.0%	3.2%
		3	17.7%	8.8%	**25.0%**	0.0%	**17.2%**
	103.07	1	**25.5%**	**18.5%**	4.3%	0.2%	4.8%
		2	15.4%	**24.7%**	16.9%	0.8%	0.5%
	103.08	1	22.8%	15.0%	9.7%	0.5%	1.0%
		2	19.9%	**21.3%**	8.6%	0.0%	2.5%
		3	15.7%	3.6%	**37.0%**	**4.4%**	5.0%
	401	1	24.1%	**18.5%**	1.8%	0.0%	5.8%
	402	1	**28.1%**	10.9%	8.2%	0.3%	0.7%
		2	24.5%	**20.5%**	4.2%	0.0%	7.4%
	403	1	23.4%	15.2%	3.0%	0.0%	1.3%
		2	**30.6%**	10.3%	1.7%	0.0%	4.7%
		3	**25.8%**	14.8%	1.1%	0.0%	5.5%
	405.01	1	19.0%	16.1%	6.5%	0.0%	11.7%
		2	**26.6%**	5.1%	5.5%	0.0%	1.9%
		3	11.5%	11.1%	0.0%	0.0%	5.3%
	405.02	1	14.9%	**20.1%**	**20.3%**	0.0%	14.0%
		2	**35.0%**	0.0%	9.4%	0.0%	0.7%
		3	**35.3%**	0.0%	8.5%	0.0%	9.4%
		4	**33.4%**	0.0%	6.2%	0.0%	3.8%
	405.03	1	**35.7%**	6.4%	7.3%	0.0%	5.3%
		2	**24.7%**	6.0%	12.1%	0.0%	5.3%
	405.04	1	16.8%	**33.0%**	4.5%	0.0%	1.7%
		2	20.6%	8.9%	11.3%	0.0%	0.0%
		3	**24.7%**	**18.7%**	6.1%	**4.4%**	0.7%
		4	18.0%	4.9%	**51.5%**	0.0%	4.6%
	405.05	1	21.9%	**33.2%**	4.0%	0.0%	2.1%
		2	21.0%	**17.5%**	4.3%	0.0%	0.6%
		3	**31.2%**	14.1%	0.0%	0.0%	3.9%
	405.06	1	**28.3%**	0.0%	11.0%	1.3%	0.0%
		2	12.9%	9.3%	0.0%	0.0%	1.2%
	405.07	1	**32.7%**	7.9%	13.7%	0.0%	4.1%
		2	**38.4%**	8.1%	0.0%	0.0%	0.0%
	405.08	1	**29.8%**	4.9%	10.5%	0.5%	0.9%
		2	**47.3%**	5.2%	4.2%	0.0%	0.0%
	405.09	1	**32.2%**	0.0%	3.0%	0.0%	0.0%
		2	**39.8%**	1.8%	**36.7%**	**21.0%**	6.1%
		3	**31.4%**	**25.9%**	0.5%	0.0%	0.0%
		4	9.2%	8.4%	3.4%	0.0%	0.0%
	406	1	**26.0%**	10.3%	1.8%	1.1%	1.7%
		2	**36.1%**	11.0%	1.9%	0.0%	5.4%
	407	1	10.0%	4.3%	**30.6%**	0.0%	**36.9%**
		2	13.2%	2.0%	12.8%	0.0%	**16.0%**
		3	9.4%	**23.9%**	**30.0%**	0.0%	5.8%
	408	1	**34.2%**	10.2%	2.2%	0.0%	0.9%
		2	**27.4%**	5.5%	10.9%	0.7%	3.1%
		3	**26.6%**	8.7%	8.3%	0.0%	2.5%

Zero-Vehicle Households - *Accessibility, Mobility*

Clay County has the highest proportion of zero-vehicle households at 8.4 percent, followed by Minnesota (6.6 percent), Cass County (6.0 percent), and North Dakota (5.2 percent). Within the study area, there are 16 Census Tracts with a higher rate of zero-vehicle households than Clay County (highest rate of comparison). Cass County Census Tract 7 has the highest proportion at 35.4 percent.

The transportation system may impact zero-vehicle households' accessibility and mobility, as household members do not have direct access to a personal-vehicle to get around. These populations in the MSA must rely on alternative transportation modes such as walking, biking, and/or taking transit.

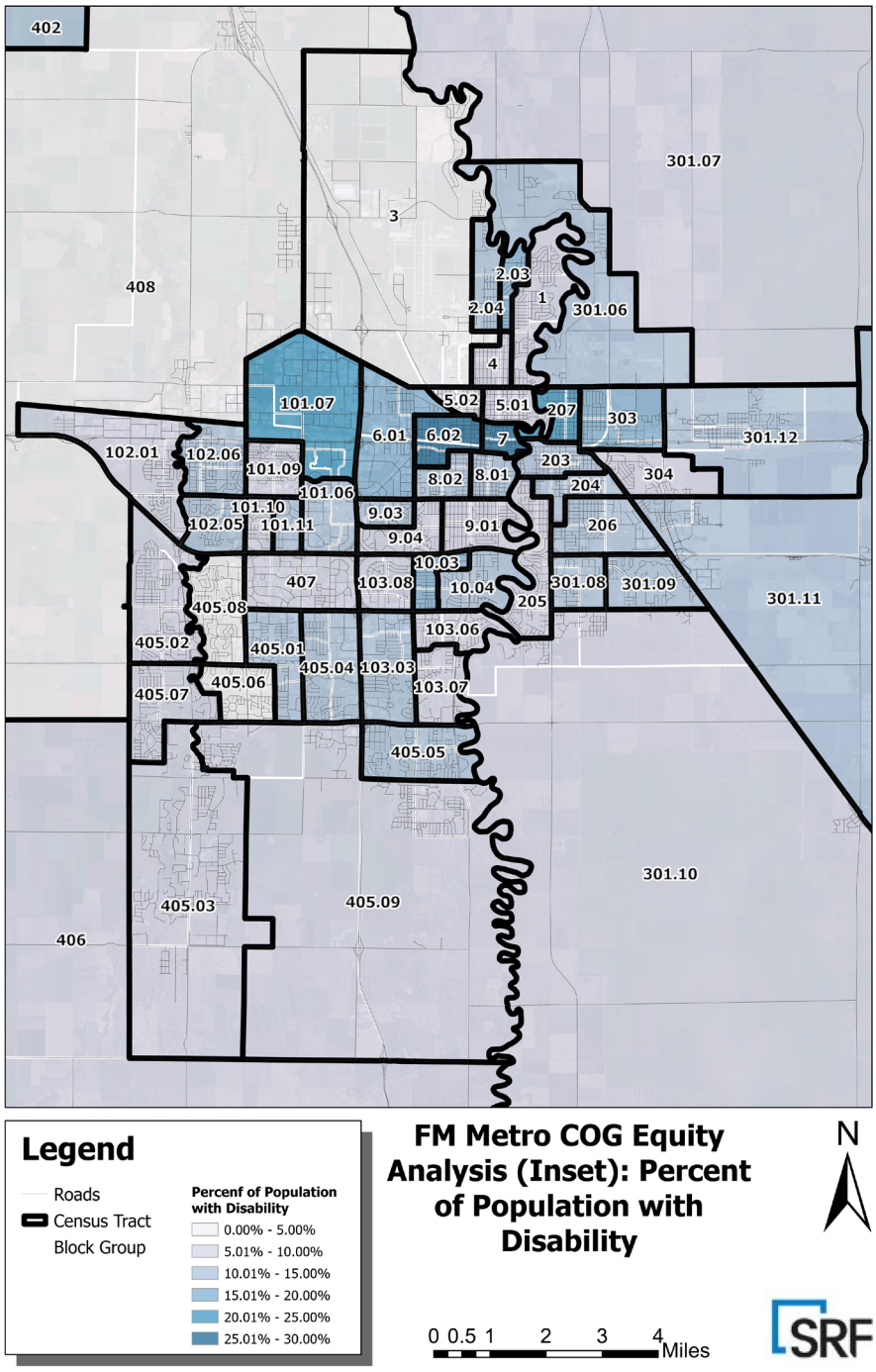
Figure 5. Zero-Vehicle Households



Percent of Population with a Disability - *Accessibility, Mobility, Jobs*

Clay County has the highest proportion of disabled population at 11.8 percent, followed by North Dakota (11.4 percent), Minnesota (11.2 percent), and Cass County (6.0 percent). Within the study area, there are 25 Census Tracts with a higher rate of disabled population than Clay County (highest rate of comparison). Cass County Census Tract 6.02 has the highest proportion at 29.3 percent.

Figure 6. Disabled Population



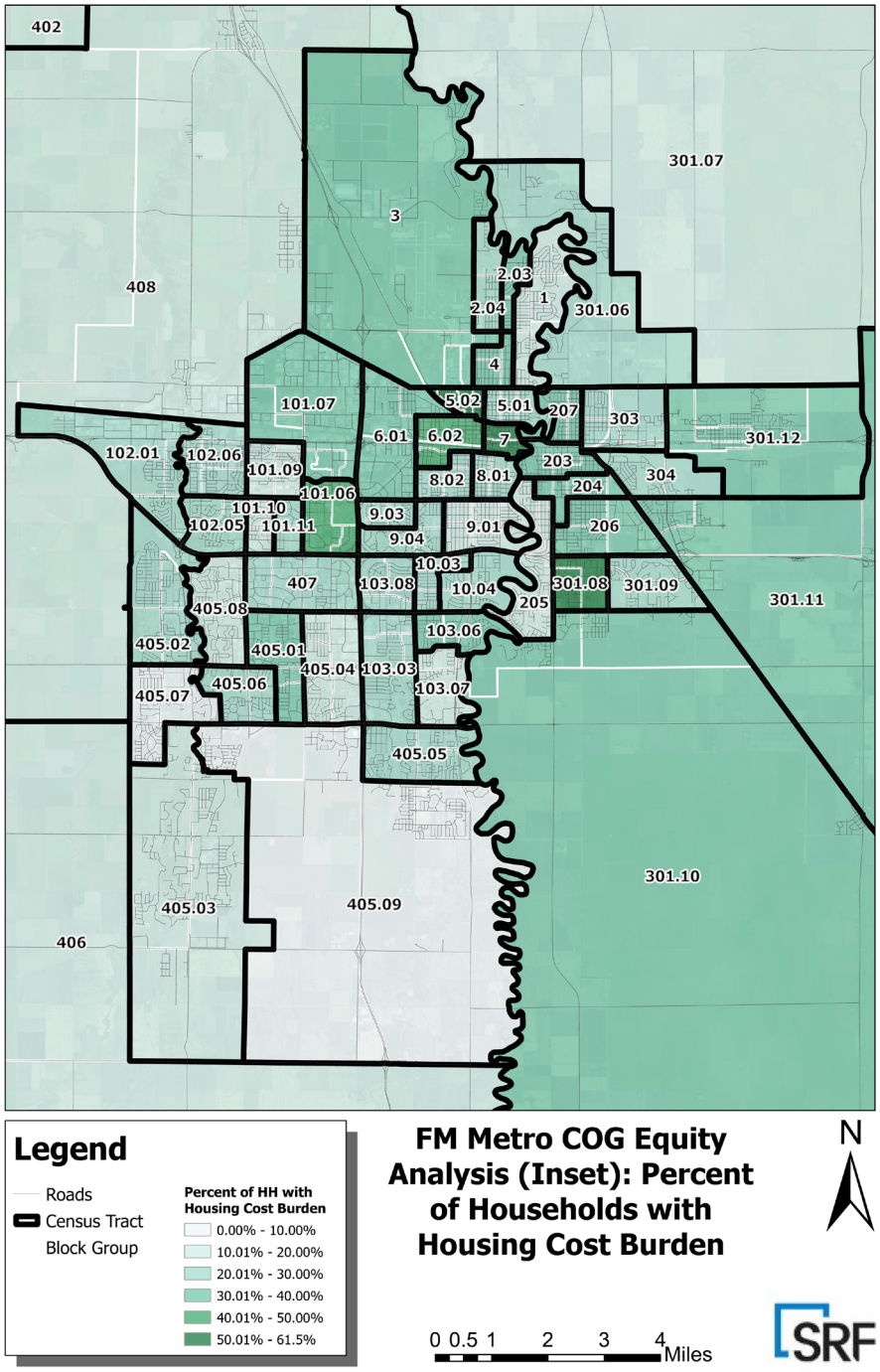
The transportation system may impact the disabled population's accessibility and mobility, as people with disabilities may require alternate means of mobility and often experience the transportation system differently than others. These populations in the MSA may rely on alternative transportation modes such as walking, biking, taking transit, and/or mobility devices.

Housing Cost Burden - *Affordability, Health, Housing*

Clay County has the highest proportion of households experiencing housing cost burden (30 percent or more of household income spent on housing/rent) at 30.0 percent, followed by Cass County (25.8 percent), Minnesota (25.4 percent), and North Dakota (22.8 percent). Within the study area, there are 19 Census Tracts with a higher proportion of households experiencing housing cost burden than Clay County (highest rate of comparison). Cass County Census Tract 5.02 has the highest proportion at 61.3 percent.

The transportation system may impact housing cost burdened households' affordability and health, as people with housing cost burdens make tough budgetary decisions between where they live, if they can receive healthcare, and/or how they get around. These populations in the MSA are more susceptible to cost increases for day-to-day needs and may depend on alternative transportation modes including walking, biking, and taking transit.

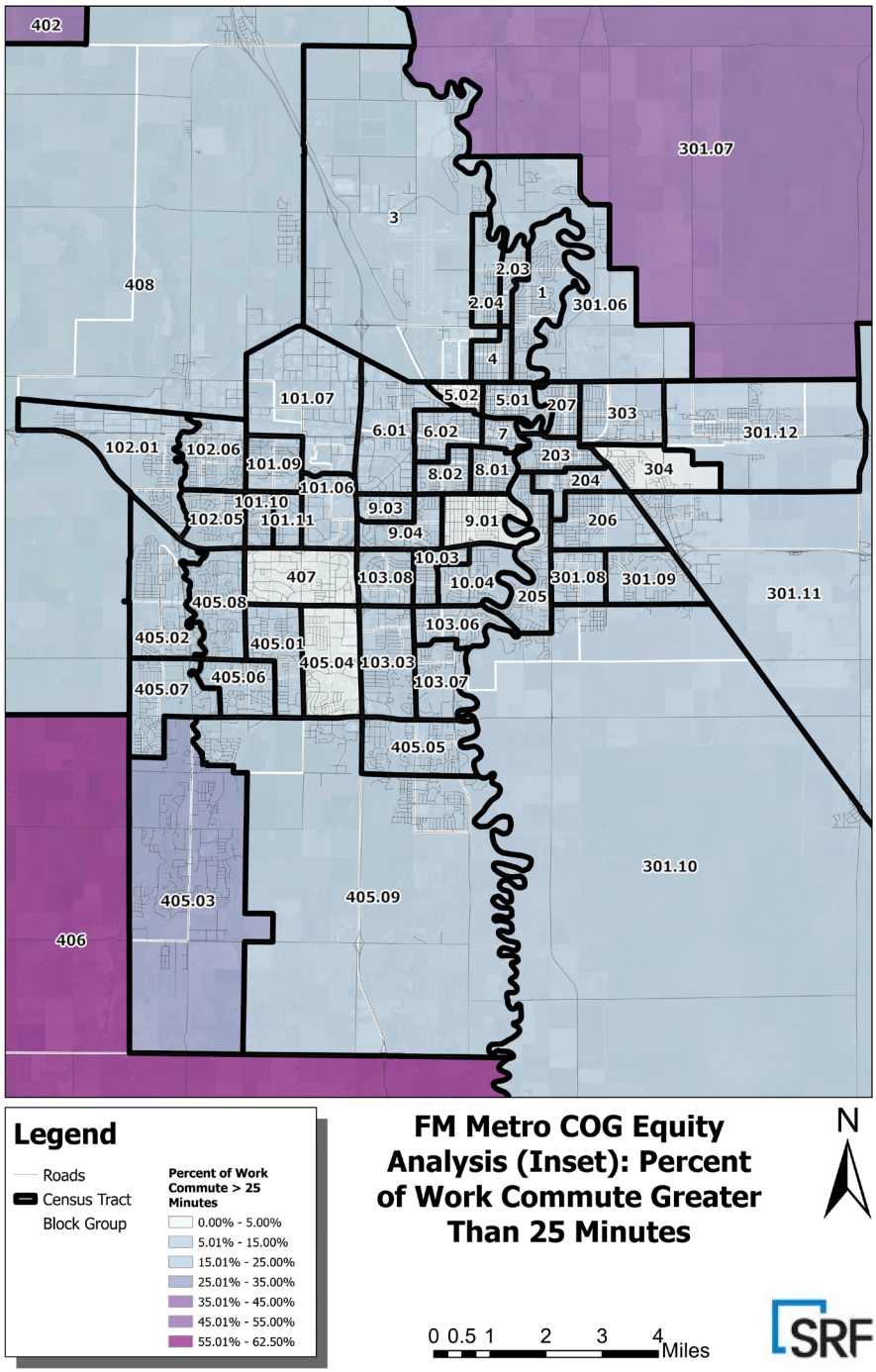
Figure 7. Housing Cost Burden



Commute of 20 Minutes or More – *Jobs, Travel Time*

The average work commute is just over 18 minutes in North Dakota and 23 minutes in Minnesota. Minnesota has the highest rate of population with a 25 minute or greater commute at 38.2 percent, followed by Clay County (24.1 percent), North Dakota (19.1 percent), and Cass County (14.4 percent). Within the MSA, there are seven Census Tracts with a higher proportion of people with a 25 minute or greater commute than Clay County (highest rate of comparison). Clay County Census Tract 302.02 has the highest proportion at 62.5 percent.

Figure 8. Commute Time

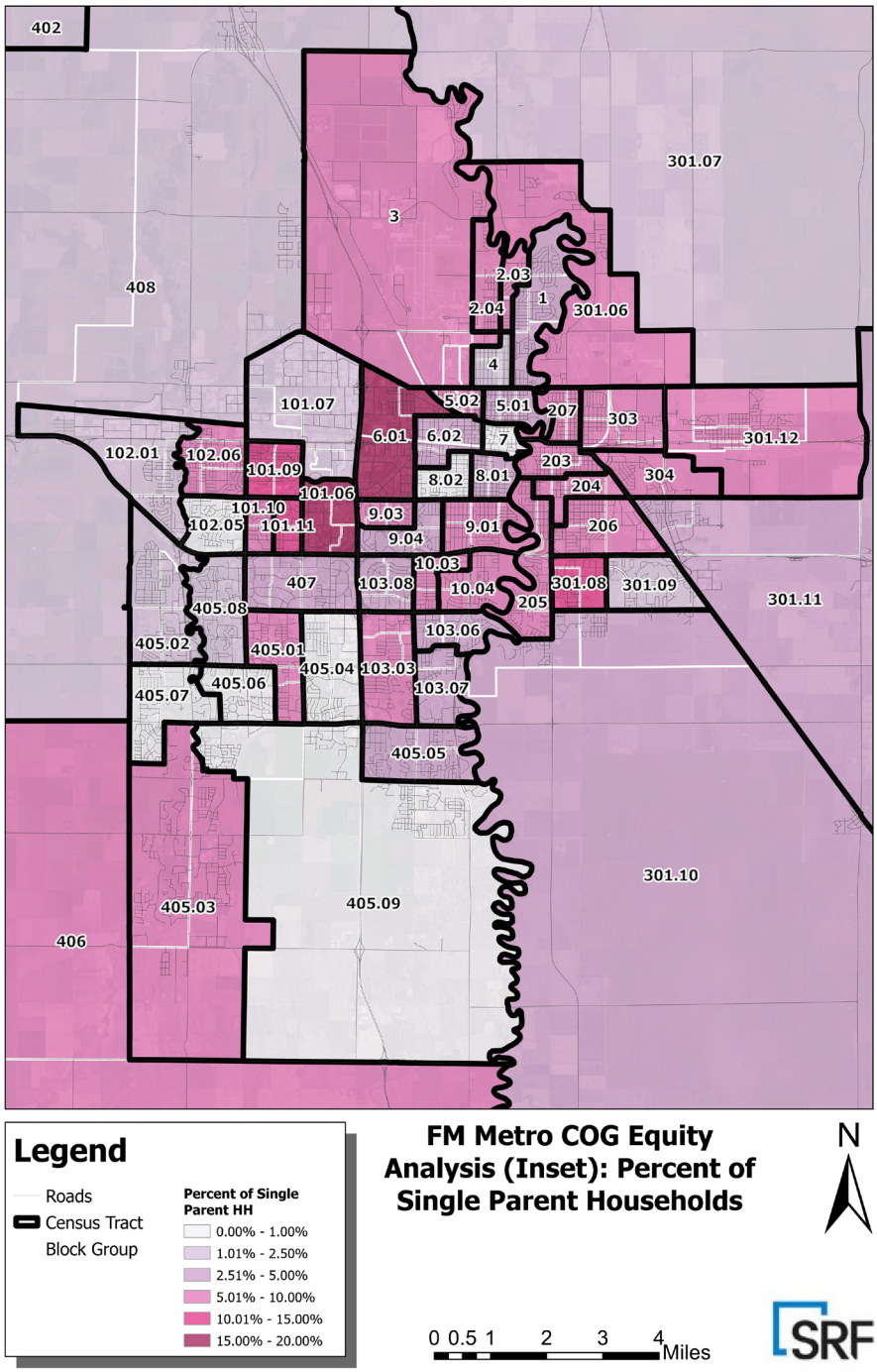


The transportation system may impact commute time as unsafe operations and inefficiencies, connectivity, and traffic congestion may lead to reduced mobility and delay. Commuting times impact accessibility to jobs and increased travel time may lead to decreased quality of life. In the MSA, rural populations and fringe urban growth areas experience the longest commute times.

Single-Parent Households – *Jobs, Affordability, Health, Housing*

Clay County has the highest rate of single-parent households at 5.7 percent, followed by Minnesota (5.3 percent), Cass County (5.0 percent), and North Dakota (4.9 percent). Within the MSA, there are 21 Census Tracts with a higher rate of single-parent households than Clay County (highest rate of comparison). Cass County Census Tract 6.01 has the highest proportion at 19.4 percent.

Figure 9. Commute Time

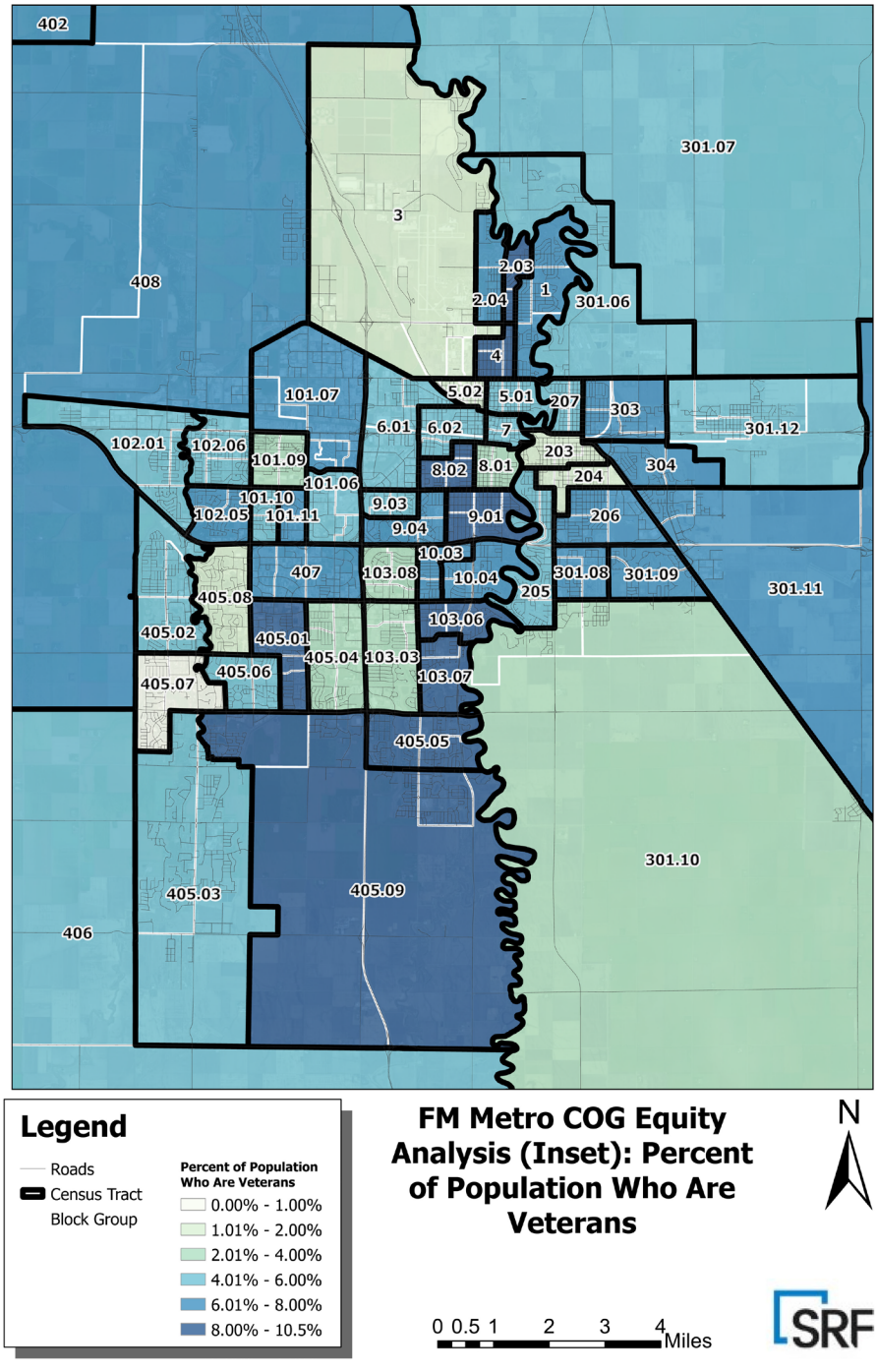


Single-parent households may be vulnerable to transportation and housing costs. The transportation system may impact single-parent households' affordability and health, as people with housing and transportation cost burdens make budgetary decisions between where they live, if they can receive healthcare, and/or how they get around. These populations in the MSA are more susceptible to cost increases for day-to-day needs and may be more reliant on alternative modes of transportation including walking, biking, and taking transit.

Veterans – *Jobs, Affordability, Health, Housing, Accessibility, Mobility*

North Dakota has the highest rate of veteran population at 7.4 percent, followed by Minnesota (6.3 percent), Cass County (5.9 percent), and Clay County (5.4 percent). Within the MSA, there are 15 Census Tracts with a higher rate of veteran population than North Dakota (highest rate of comparison). Cass County Census Tract 405.05 has the highest proportion at 10.5 percent.

Figure 10. Commute Time



The veteran population has a higher rate of disability than the general population, especially for those coming home from recent military conflicts. The transportation system can impact accessibility and mobility for veterans across the MSA to receive critical healthcare, access jobs or re-enter the workforce, and go about their daily lives.

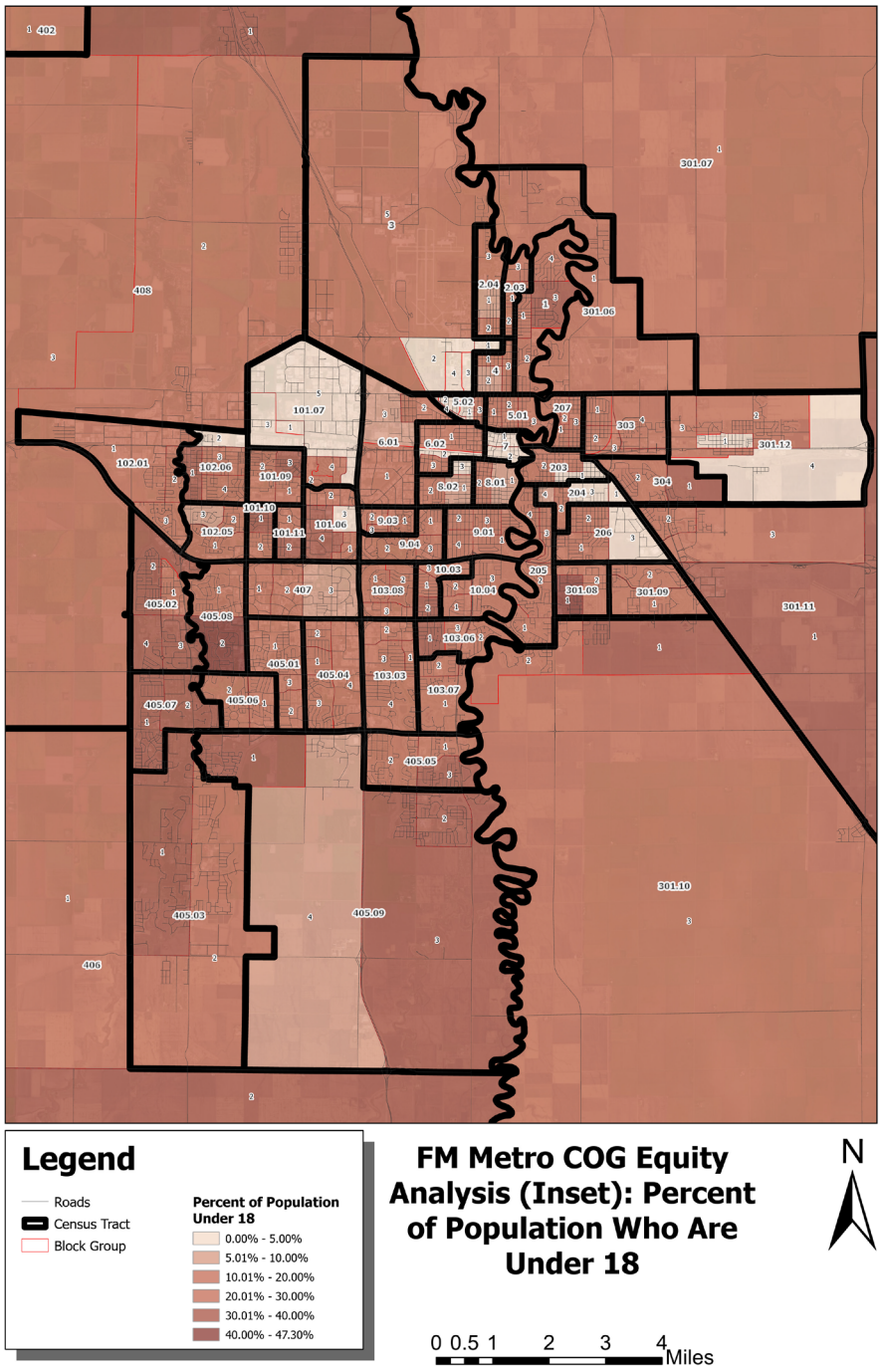
Indicator data varies between Census Tract geographies and Block Groups for two reasons: (1) not all Census data is available at Block Group geographies and (2) Block Group data provides finer granularity and analysis therefore, is supplemented by Centsus Tract analysis for a deeper analysis. The project team uses Block Group indicator data when available, as summarized below.

Age Younger Than 18 – *Accessibility, Mobility, Jobs*

Clay County has the highest rate of youth-dependent aged population at 24.7 percent, followed by North Dakota (23.5 percent), Minnesota (23.0 percent), and Cass County (22.2 percent). Within the MSA, there are 60 Block Groups with a higher rate of youth-dependent aged population than Clay County (highest rate of comparison). Cass County Census Tract 405.08 Block Group 2 has the highest proportion at 47.3 percent.

The transportation system may negatively impact accessibility and mobility for people under 18 years old. Dependent-aged populations in the MSA may rely on alternative transportation modes such as walking, biking, and/or taking transit.

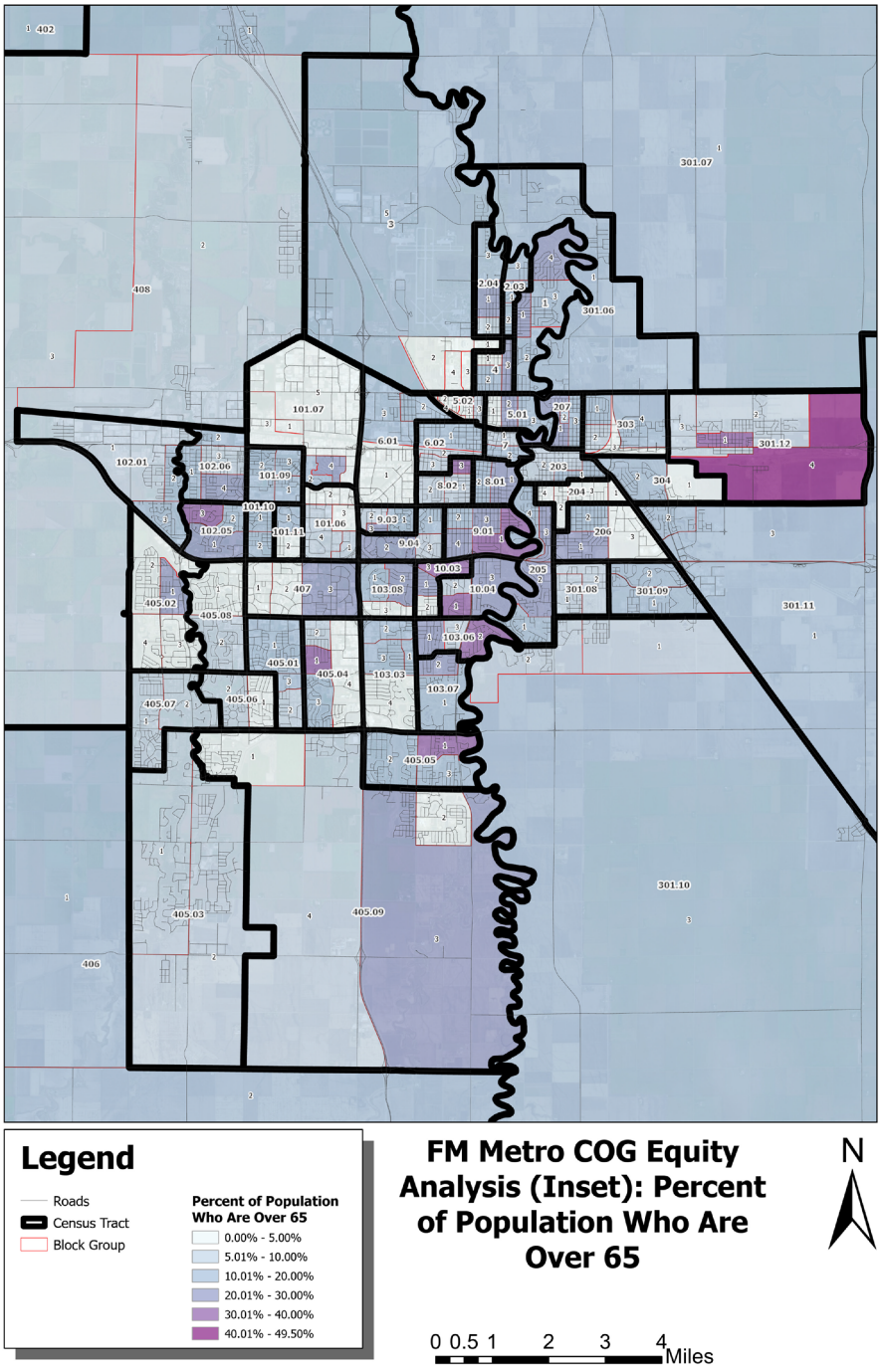
Figure 11. Age Younger than 18



Age 65 or Older – *Accessibility, Mobility, Jobs*

Minnesota has the highest rate of senior-dependent aged population at 16.5 percent, followed by North Dakota (15.9 percent), Clay County (13.5 percent), and Cass County (12.5 percent). Within the MSA, there are 52 Block Groups with a higher rate of senior-dependent aged population than Minnesota (highest rate of comparison). Clay County Census Tract 301.12 Block Group 4 has the highest proportion at 49.0 percent.

Figure 12. Age 65 or Older



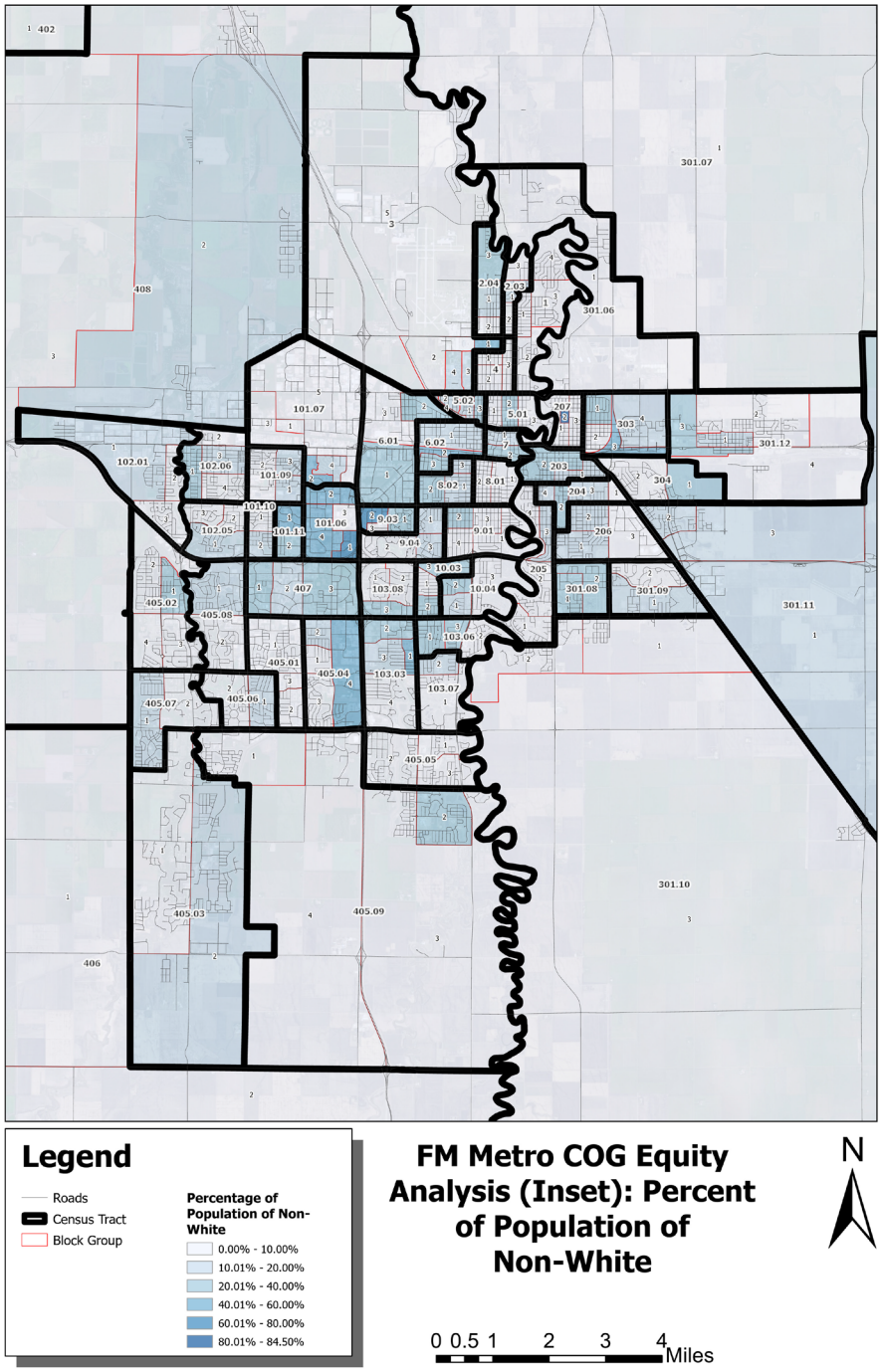
The transportation system may impact accessibility and mobility for people age 65 or older. Dependent-aged populations in the MSA may rely on alternative transportation modes such as walking, biking, and/or taking transit.

Minority (non-white) Population – *Environment*

Minnesota has the highest rate of minority population at 20.3 percent, followed by North Dakota (15.5 percent), Cass County (15.5 percent), and Cass County (12.6 percent). Within the MSA, there are 41 Block Groups with a higher rate of minority population than Minnesota (highest rate of comparison). Clay County Census Tract 207 Block Group 2 has the highest proportion at 84.1 percent.

The transportation system may impact the environment and equality of minority populations. Minority populations in the MSA may face greater differences in size, degree, circumstances, etc., due to historic inequalities at the federal and state levels (USDOT included). Disproportionately high or adverse impacts from the transportation system to minority populations must be considered.

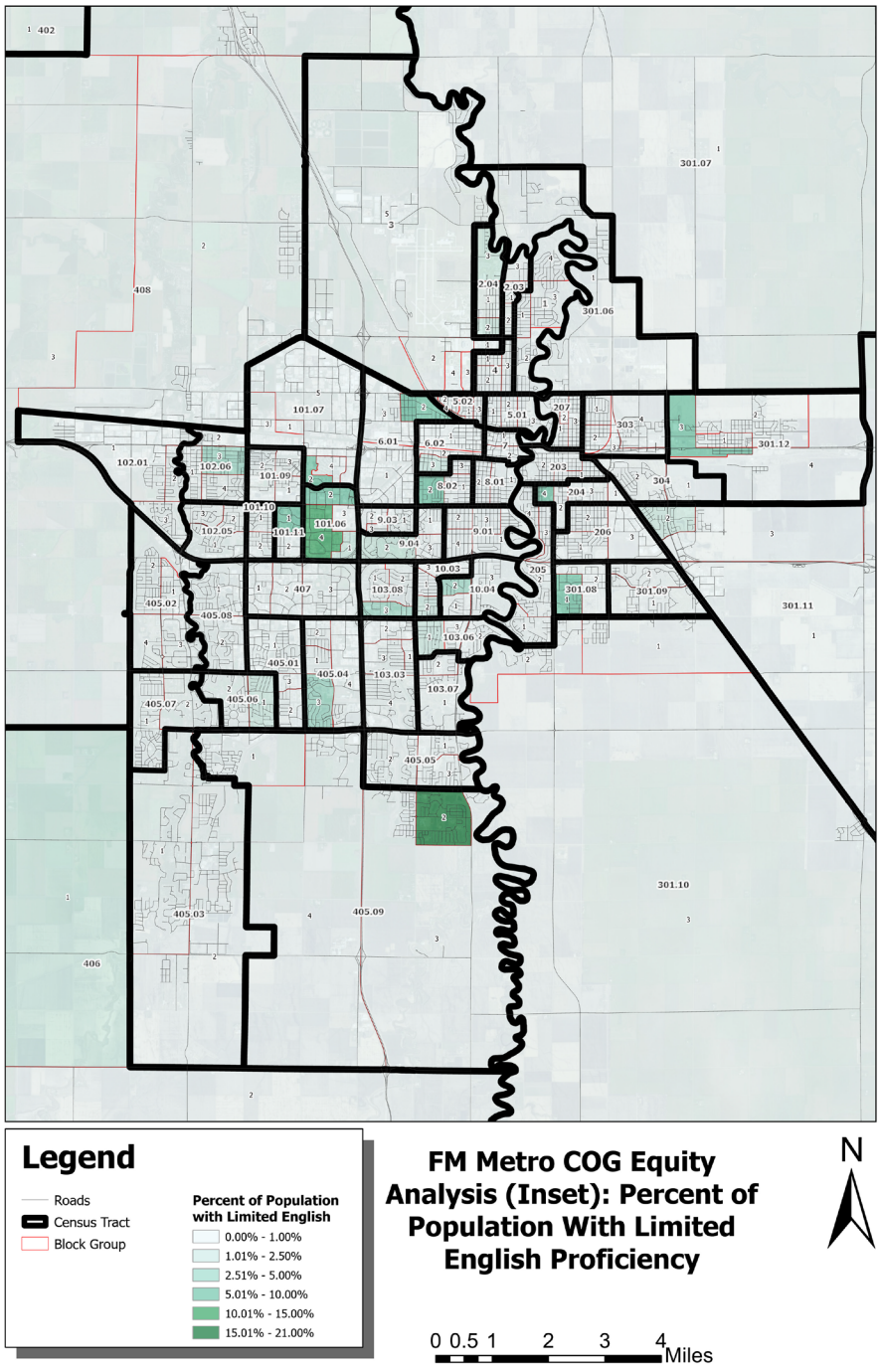
Figure 13. Minority Population



Limited-English Proficiency (LEP) Population – *Jobs*

Minnesota has the highest rate of LEP population at1.9 percent, followed by Cass County (1.0 percent), North Dakota (0.7 percent), and Clay County (0.6 percent). Within the MSA, there are 17 Block Groups with a higher rate of LEP population than Minnesota (highest rate of comparison). Cass County Census Tract 405.09 Block Group 2 has the highest proportion at 21.0 percent.

Figure 14. LEP Population



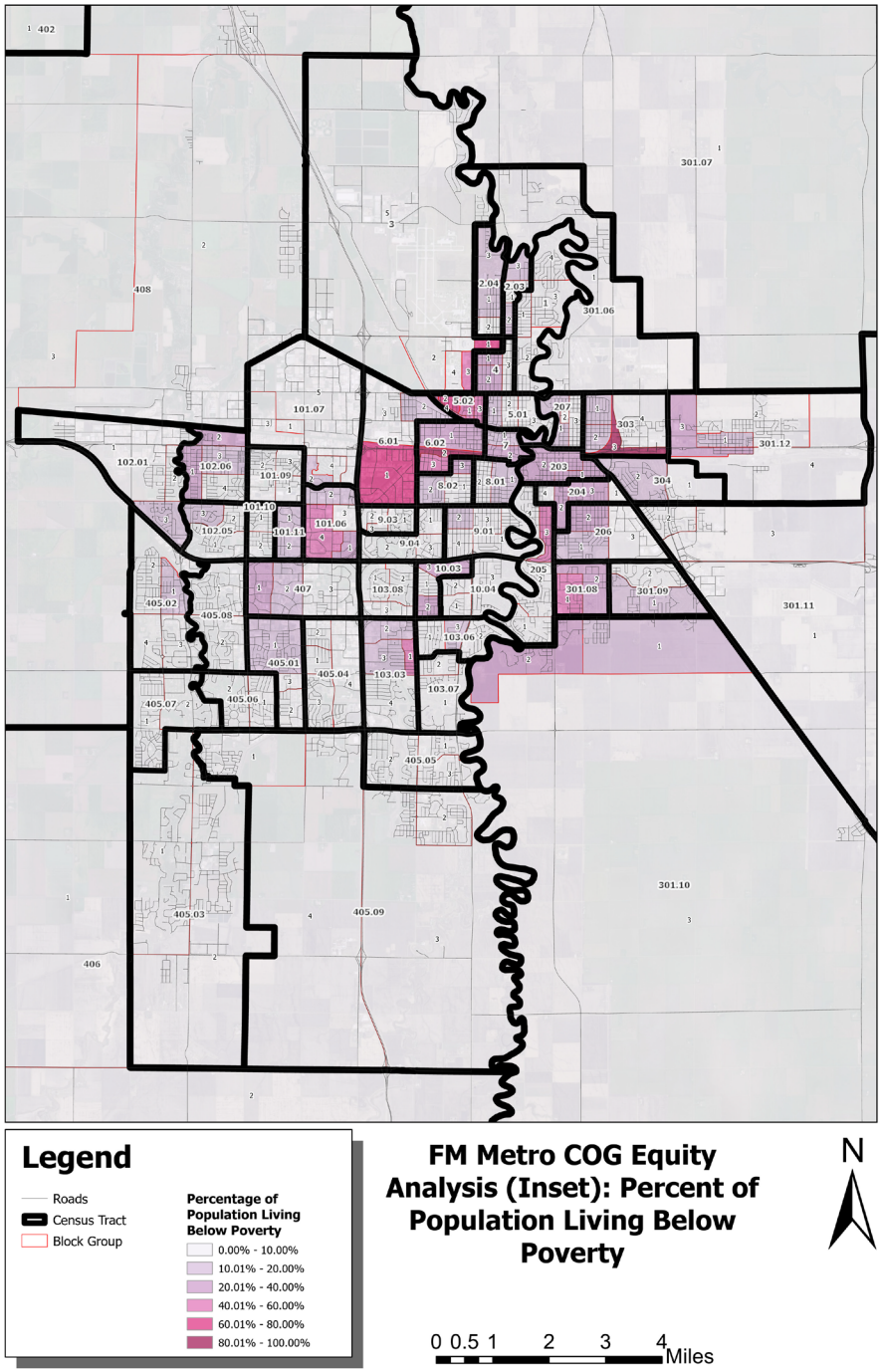
The transportation system may impact the accessibility and mobility of LEP populations. LEP populations may be limited to certain types of jobs that require English language proficiency. Barriers or risks imposed by the transportation system may impact LEP population's ability to access or sustain employment in the MSA.

Population Living in Poverty – *Affordability Equity, Health Equity, Housing Equity*

Clay County has the highest rate of population living in poverty at 14.7 percent, followed by Cass County (10.8 percent), North Dakota (10.8 percent), and Minnesota (9.3 percent). Within the MSA, there are 45 Block Groups with a higher rate of population living in poverty than Clay County (highest rate of comparison). Clay County Census Tract 303 Block Group 3 has the highest proportion at 100.0 percent.

The transportation system may impact the affordability, health, and housing of households living in poverty. Impoverished populations in the MSA face financial hardships that impact where they live, if they can receive healthcare, and/or how they get around. Disproportionately high or adverse impacts from the transportation system to low-income or poverty populations must be considered.

Figure 15. Population Living in Poverty



Equity Considerations and Prioritization

Prioritizing potential safety improvement projects, in part, through equity considerations in the MSA is an important exercise. Metro COG staff and the project team have a strong dedication to understanding the regional community and forward the goals and objectives of local jurisdictions and USDOT surrounding multimodal transportation safety and disadvantaged populations. 18 separate factors have been considered in the comprehensive transportation equity analysis described above:

- USDOT's ETC Explorer Components (five components)
- USDOT's ETC Explorer Disadvantaged Community Designation (Yes or No)
- Area of Persistent Poverty (Yes or No)
- Historically Disadvantaged Community (Yes or No)
- Census Data (11 indicators)
- Proximity to the High-Injury Network and priority community destinations or areas of interest including parks & trails, school facilities, public facilities, jobs, etc.

Metro COG may consider using the transportation equity review to score and prioritize safety projects based on equity. One potential method of prioritizing is to score based on the level of factor or indicators indicating disadvantaged and/or vulnerable populations. Preliminary scoring is based from USDOT ETC Explorer results, APP and HDC designation, and Census data indicators, with a maximum of 18 'points'.

Preliminary Equity Prioritization

Metro COG may tweak the equation below to weight certain equity metrics, increase thresholds, or decrease thresholds allocating points. Preliminary equity scoring is based on the following:

(ETC components above 65-percentile threshold) [max. of 5 points] +

(ETC designation as 'Disadvantaged Community') [max. of 1 point] +

(APP designation and/or HDC designation) [max. of 2 point] +

(Census indicators higher than highest rate of comparison) [max. of 18 points]

= Equity Score

Table 6 below shows an example of a simple prioritization exercise based upon the above equation, however, excludes spatial or geographic-based factors. Spatial or geographic-based factors may include proximity of proposed transportation safety improvement projects and/or Census Block Groups to the following:

- Specified land use(s) (may be applicable to forthcoming crash profiles)
- Public facilities (public school, parks, shared use paths and trails)
- Areas of interest (other public facilities/services)
- Jobs (2050 travel demand model baseline socioeconomic data)

Table 6. Preliminary Equity Prioritization Matrix

Prioritization Score			CENSUS 2018-2022 5-Year Tables										ETC EXPLORER							
County	Census Tract	Block Group	% Zero Veh. HHs	Age Dependent*	% Non-White Pop.	% LEP Pop.	% Disabled	% Pop. Below Poverty Line	% Housing Cost Burden	% with 25+ min. Work Commute	% Single-Parent Households	% Veteran	Climate & Disaster Risk	Environmental	Health Vulnerability	Social Vulnerability	Transportation Insecurity	Overall	APP & HDC^	TOTAL EQUITY SCORE
Clay	203	1	1	0	0	0	1	1	1	0	0	0	0	1	0	1	0	0	1	7
		2	1	0	1	0	1	1	1	0	0	0	0	1	0	1	0	0	1	8
	204	1	1	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	5
		2	1	0	1	0	1	1	1	0	0	0	0	1	0	0	0	0	1	7
		3	1	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	1	6
		4	1	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	1	6
	205	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
		2	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	3
		3	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	4
		4	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	3
	206	1	1	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	6
		2	1	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	5
		3	1	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	4
	207	1	1	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	6
		2	1	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	5
		3	1	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	4
	301.06	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	301.07	1	0	2	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	4
	301.08	1	1	1	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	13
		2	1	0	1	0	0	1	1	0	1	1	0	1	0	1	1	1	1	11
	301.09	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
		2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
	301.10	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
		2	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3
		3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
	301.11	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	5
		2	1	1	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	5
		3	1	1	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	5
	301.12	1	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	5
		2	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	4
		3	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	7
		4	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	5
	302.01	1	0	1	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	5
		2	0	1	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	6
		3	0	2	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	6
	302.02	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	3
		2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	3
	303	1	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	4
		2	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	3
		3	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	5
		4	1	2	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	5
	304	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
		2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2

*Includes age less than 18 and age 65+ for a possible two points.

^Includes Area of Persistent Poverty (APP) and Historically Disadvantaged Community (HDC) designation for a possible 2 points.

Prioritization Score			CENSUS 2018-2022 5-Year Tables										ETC EXPLORER							
County	Census Tract	Block Group	% Zero Veh. HHs	Age Dependent*	% Non-White Pop.	% LEP Pop.	% Disabled	% Pop. Below Poverty Line	% Housing Cost Burden	% with 25+ min. Work Commute	% Single-Parent Households	% Veteran	Climate & Disaster Risk	Environmental	Health Vulnerability	Social Vulnerability	Transportation Insecurity	Overall	APP & HDC^	TOTAL EQUITY SCORE
	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	2.03	1	1	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	5
		2	1	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	5
		3	1	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	5
	2.04	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	3
		2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2
		3	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	5
	3	1	1	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	1	6
		2	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	4
		3	1	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	1	5
		4	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	4
		5	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	4
	4	1	0	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0	1	5
		2	0	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0	1	5
		3	0	1	0	0	0	0	1	0	0	1	0	1	0	0	0	0	1	6
	5.01	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
		2	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4
		3	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
	5.02	1	0	0	0	0	0	1	1	0	1	1	0	1	0	1	0	1	2	9
		2	0	0	0	0	0	1	1	0	1	1	0	1	0	1	0	1	2	9
		3	0	0	1	0	0	1	1	0	1	1	0	1	0	1	0	1	2	10
		4	0	0	0	1	0	1	1	0	1	1	0	1	0	1	0	1	2	10
	6.01	1	1	0	1	0	1	1	1	0	1	1	1	1	0	1	0	1	2	13
		2	1	0	1	1	1	1	1	0	1	1	1	1	0	1	0	1	2	14
		3	1	0	0	0	1	0	1	0	1	1	1	1	0	1	0	1	2	11
	6.02	1	1	0	0	0	1	1	1	0	0	0	1	1	0	0	0	1	2	9
		2	1	0	1	0	1	1	1	0	0	0	1	1	0	0	0	1	2	10
		3		1	1	0	1	1	1	0	0	0	1	1	0	0	0	1	2	10
	7	1	1	0	0	0	1	1	1	0	0	0	1	1	0	1	0	1	2	10
		2	1	0	1	0	1	1	1	0	0	0	1	1	0	1	0	1	2	11
	8.01	1	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	3
		2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	8.02	1	1	0	0	0	1	0	0	0	0	1	1	1	0	1	0	1	1	8
		2	1	1	1	1	1	0	0	0	0	1	1	1	0	1	0	1	1	11
		3	1	1	0	0	1	1	0	0	0	1	1	1	0	1	0	1	1	10
	9.01	1	0	2	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	6
		2	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	4
		3	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	4
		4	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	5
	9.03	1	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	5
		2	0	1	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	6
		3	0	1	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	5
	9.04	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3
		2	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3
		3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
	10.03	1	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	4
		2	0	1	1	0	1	1	0	0	1	0	1	0	0	0	0	0	0	6
		3	0	1	1	0	1	1	0	0	1	0	1	0	0	0	0	0	0	7
	10.04	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	3
		2	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	4
		3	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	3
	101.06	1	1	0	1	1	0	1	1	0	1	0	1	0	0	1	0	0	1	9
		2	1	1	1	1	0	1	1	0	1	0	1	0	0	1	0	0	1	10
		3	1	0	0	0	0	0	1	0	1	0	1	0	0	1	0	0	1	6
		4	1	1	1	1	0	1	1	0	1	0	1	0	0	1	0	0	1	10

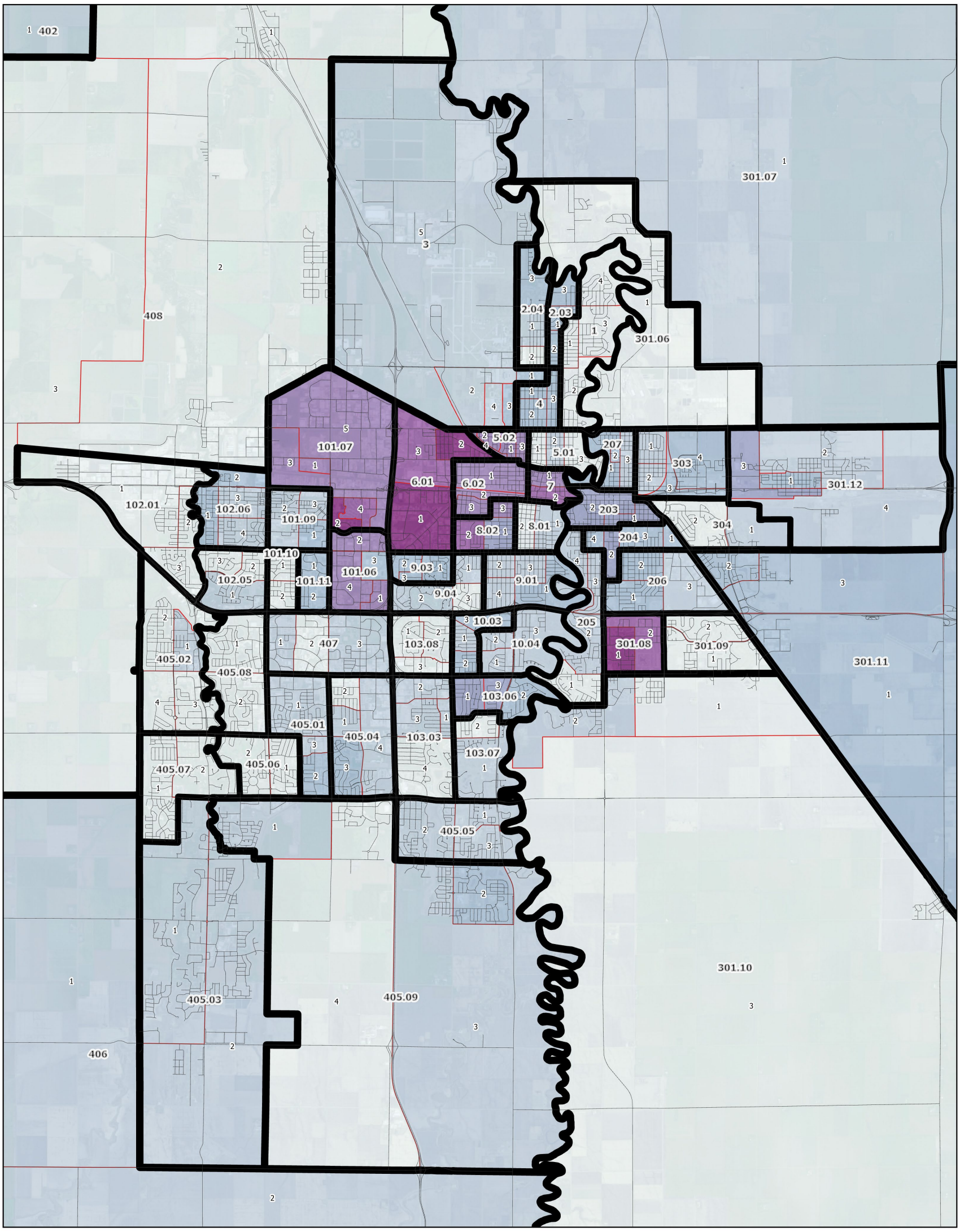
Prioritization Score			CENSUS 2018-2022 5-Year Tables										ETC EXPLORER							
County	Census Tract	Block Group	% Zero Veh. HHs	Age Dependent*	% Non-White Pop.	% LEP Pop.	% Disabled	% Pop. Below Poverty Line	% Housing Cost Burden	% with 25+ min. Work Commute	% Single-Parent Households	% Veteran	Climate & Disaster Risk	Environmental	Health Vulnerability	Social Vulnerability	Transportation Insecurity	Overall	APP & HDC^	TOTAL EQUITY SCORE
Cass	101.07	1	0	0	0	0	1	0	1	0	0	1	1	1	1	1	0	1	2	10
		2	0	0	1	1	1	1	1	0	0	1	1	1	1	1	0	1	2	13
		3	0	0	0	0	1	0	1	0	0	1	1	1	1	1	0	1	2	10
		4	0	1	0	0	1	0	1	0	0	1	1	1	1	1	0	1	2	11
		5	0	0	0	0	1	0	1	0	0	1	1	1	1	1	0	1	2	10
	101.09	1	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	2	6
		2	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	3
		3	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	4
	101.10	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
		2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	101.11	1	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	0	0	5
		2	0	1	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	5
	102.01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	102.05	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3
		2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
		3	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
	102.06	1	0	1	1	0	1	1	0	0	1	0	0	1	0	0	0	0	0	6
		2	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	5
		3	0	0	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	4
		4	0	1	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	4
	103.03	1	0	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	4
		2	0	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	4
		3	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	3
		4	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2
	103.06	1	1	2	1	0	0	0	1	0	0	1	1	0	1	0	0	0	0	9
		2	1	1	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0	7
		3	1	0	1	0	0	1	1	0	0	1	1	0	1	0	0	0	0	7
	103.07	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
		2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
	103.08	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	401	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	3
	402	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	3
		2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	3
	403	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
		2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
		3	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
	405.01	1	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	4
		2	0	1	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	5
		3	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	4
	405.02	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3
		2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
		3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
		4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
	405.03	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	3
		2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	3
	405.04	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	3
		2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
		3	0	2	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	5
		4	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	3
	405.05	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	4
		2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	3
		3	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	3
	405.06	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
	405.07	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
		2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2

Prioritization Score			CENSUS 2018-2022 5-Year Tables										ETC EXPLORER							
County	Census Tract	Block Group	% Zero Veh. HHs	Age Dependent*	% Non-White Pop.	% LEP Pop.	% Disabled	% Pop. Below Poverty Line	% Housing Cost Burden	% with 25+ min. Work Commute	% Single-Parent Households	% Veteran	Climate & Disaster Risk	Environmental	Health Vulnerability	Social Vulnerability	Transportation Insecurity	Overall	APP & HDC^	TOTAL EQUITY SCORE
	405.08	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
		2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3
	405.09	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	3
		2	0	1	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	5
		3	0	2	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	5
		4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2
	406	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	3
		2	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	3
	407	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	3
		2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
		3	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
	408	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
		2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
		3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2

*Includes age less than 18 and age 65+ for a possible two points.

^Includes Area of Persistent Poverty (APP) and Historically Disadvantaged Community (HDC) designation for a possible 2 points.

Figure 16. Preliminary Equity Score



Proximity to High-Injury Network (HIN) & Priority Community Areas of Interest

Vulnerable populations, as indicated by higher preliminary equity scores shown in Table 6 and Figure 16, may face greater safety risk when traveling on the multimodal transportation system throughout the MSA. As shown in Figure 17, the HIN stretches through the most vulnerable communities represented in: Census Tracts 5.02, 6.01, 6.02, 7, 8.02, 101.06, and 101.07. The network dissects these Census Tracts along several corridor with varying directional mobility:

- North-South
  - Fargo
    - 2nd Street North
    - Broadway
    - University Drive
    - 25th Street South
    - I-29
    - 42nd Street South
    - 45th Street
  - Moorhead/Dilworth
    - 34th Street
  - West Fargo
    - 9th Street East
    - Veterans Boulevard
  - Dilworth
    - US 10
  - Clay County
    - 28th Ave N /CSAH 18
- East-West
  - Fargo
    - 12th Avenue North
    - 7th Avenue North
    - 9th Avenue North
    - 1st Avenue North
    - NP Avenue
    - Main Avenue
    - 9th Avenue South
    - 13th Avenue South
    - 17th Avenue South
    - I-94
    - 23rd Avenue South
    - 27th Avenue South
    - 32nd Avenue South
    - 40th Avenue South

        - 44th Avenue South
    - West Fargo
        - Main Avenue

With disadvantaged and vulnerable populations within these specific geographies, people traveling to and from areas of interest, or to go about their daily life or sustain their quality of life, may be at higher safety risk given the proximity of the HIN. Vulnerable populations may be at higher safety risk when traveling by their means of mobility (essential travel mode or mode of choice) to participate in the essential 'building blocks' of society and foundational FM Area destinations such as:

- parks & trails
- educational facilities
- public facilities and governmental services
- cultural events
- social services
- healthcare
- emergency services
- religious institutions
- etc.

Through the transportation equity review, Metro COG is considering vulnerable populations in safety action plan implementation projects by:

- understanding vulnerable populations' proximity to the HIN
- considering accessibility of vulnerable populations to and from foundational places of the FM Area community
- considering mobility of vulnerable populations to and from foundational places of the FM Area community

This understanding and consideration will result in developing contextual implementation strategies sensitive to how future regional transportation safety projects may impact the Fargo-Moorhead area's most vulnerable residents.

Impacting Equity

Proposed implementation strategies at to-be-determined locations will positively impact disadvantaged and vulnerable populations within the FM Area. Strategic safety countermeasures on roadways and intersections will increase safety for travelers, helping to ensure people can go about their daily lives without being put at higher risk going wherever and however (multimodal) they need to go about their daily lives. By reducing the risks associated with 'high-injury' roadways in the MSA, safety will be improved to ensure equitable accessibility to destinations for vulnerable and disadvantaged people. The to-be-determined multimodal transportation network improvements will improve safety for all residents and visitors from all walks of life to meet basic needs, go to work, get an education including higher education, participate in cultural events, receive healthcare, and ultimately sustain a higher quality of life in the FM Area region.

Figure 17. Disadvantaged Populations' Proximity to All Modes High-Injury Network (HIN)