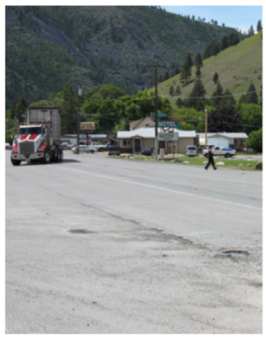
East Missoula (MT 200) Road Safety Audit

Easy Street to Speedway Avenue



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Prepared for:

Montana Department of Transportation

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Acronyms / Abbreviations

AADT ..... Average Annual Daily Traffic

LOS ..... Level of Service

I-90 ..... Interstate 90

ITS ..... Intelligent Transportation System

MDT ..... Montana Department of Transportation

mph ..... miles per hour

MPO ..... Metropolitan Planning Organization

MT 200 ..... Montana Highway 200

NMW ..... New Mobility West

PDO ..... Property Damage Only

RP ..... Reference Post

RSA ..... Road Safety Audit

TWLTL ..... Two Way Left-Turn Lane

vpd ..... vehicles per day

Executive Summary

ES.1. PURPOSE

The *East Missoula (MT 200) Road Safety Audit* (RSA) was conducted to assess the safe operation of the roadway and to ensure a high level of safety for all road users. The study area for this RSA focused on the 1.5 mile corridor of the East Missoula Highway, known locally as Highway 200 (MT 200), between Easy Street and Speedway Avenue.

The purpose of an RSA is to address safety concerns through an intensive and collaborative forum. Crash trends identified through the RSA process are analyzed and improvement recommendations are developed to address the safety concerns.

In September 2014, the Missoula County Board of Commissioners requested that an RSA be conducted for the corridor. The Montana Department of Transportation (MDT) committed to performing an RSA to identify and address transportation safety issues on the highway.

Crash data used in the Road Safety Audit process is part of the Highway Safety Improvement Program and is covered by Section 409, USC 23, which states:

"Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data."

ES.2. PROCESS

An RSA is a formal safety performance review of a corridor by a multi-disciplinary team. An RSA involves data collection, field review, and the development of short-, mid-, and long-term improvement options to address identified issues. Because the RSA process considers local needs and conditions, recommendations can be implemented incrementally as time and resources permit. Crash trends identified through the RSA process are analyzed and improvement recommendations are developed to address the safety concerns.

The RSA process revolves around a single event known as the "audit workshop". For the *East Missoula (MT 200) RSA*, the audit workshop was held on June 3, 2015. The purpose of the workshop was to gather input from local, state, and federal officials and to conduct an on-site field review of the corridor.

A multi-disciplinary approach to transportation safety was taken for the audit workshop. An audit team was assembled with representatives from the "Four E's" of transportation safety: Education, Enforcement, Engineering, and Emergency Services. The audit team consisted of representatives from the following agencies / departments (others were invited but unable to attend):

- Montana Department of Transportation
- East Missoula Community Council
- Missoula County Commission
- Missoula County
- City of Missoula
- Montana Highway Patrol

ES.3. IDENTIFIED SAFETY CONCERNS

The MDT Traffic and Safety Bureau provided crash data for the 11-year period between January 1st, 2004 and December 31st, 2014. The crash data was evaluated for the MT 200 corridor between Easy Street and Speedway Avenue. The crash data was obtained from the MDT Safety Information Management System and only include those crashes which were reported by, or to, the Montana Highway Patrol.

According to the MDT crash database, there were 85 crashes reported within the study area during the 11-year analysis time period. Reportable crashes are defined as those with a fatality, an injury, or property damage only. Trends and contributing factors for the crashes, along with characteristics of the drivers and vehicles involved, were analyzed from information provided in the crash reports.

A number of crash trends and areas of concern were identified within the study area. These crash trends and areas of concern were a result of the review of vehicle crash data, the corridor audit, field review, and discussions with local officials. The following crash trends and areas of concern were identified:

- Corridor Wide
    - Intersection related crashes
    - Increased summertime traffic
- Railroad Underpass
    - Narrow width
    - No multi-modal accommodations
- I-90 Eastbound Off-ramp
    - Limited sight distances
    - Skewed approach angle
    - Increased special event use
- Urban Area (I-90 Interchange to Sommers Street)
    - No access control
    - Poor roadway and intersection delineation and definition
    - No multi-modal accommodations
    - Skewed intersection approaches
- Northeast of Staple Street
    - Speed zone ends at the top of Brickyard Hill
- Brickyard Hill
    - Two fatal head on crashes
    - Icy road conditions
- Speedway Avenue Intersection
    - Poor intersection visibility
    - Recreational use

ES.4. RECOMMENDED SAFETY ENHANCEMENTS

Corridor safety improvement recommendations were identified based on the MT 200 corridor safety review and crash analysis. The recommendations are intended to mitigate identified safety concerns along the study corridor. Both behavioral and engineering recommendations were made to help address the identified trends and areas of concern.

A number of engineering based recommendations were made to address safety concerns throughout the corridor. What defines an engineering recommendation is quite broad and can consist of anything from engineering studies to reconstruction projects.

Small scale recommendations for improved signing, striping, delineation, and lighting are made for spot specific locations. Larger, more costly recommendations are also made which include access control, full roadway reconstruction, intersection reconstruction, and a new railroad underpass.

Educational and enforcement tools are also relevant when discussing ways to mitigate safety concerns. Although the majority of the recommendations in this report revolve around engineering or infrastructure improvements, there is an opportunity to enhance current educational strategies to encourage safe driving behaviors. These enhancements would primarily be for education related to seatbelt use, impaired driving, distracted driving, and young drivers.

Some of the recommendations will require considerable advanced planning, while others can likely be implemented through normal maintenance operations. Implementation and funding responsibility for recommendations identified in the RSA can fall to local governments, law enforcement agencies, MDT, and/or community organizations among others.

Chapter 1
Introduction

1.1. PURPOSE

The purpose of a Road Safety Audit (RSA) is to address safety concerns through an intensive and collaborative forum utilizing a nontraditional approach. An RSA is a formal safety performance examination of a corridor by a multi-disciplinary team. RSA's can be used on any size corridor, from a rural low traffic volume environment to an urban high traffic volume environment. The process is conducted to evaluate the safety of the corridor and to generate recommendations and countermeasures for roadway segments or specific locations which demonstrate a history of crashes or an identifiable crash pattern. An RSA involves data collection and analysis, field review, and the development of short-, mid-, and long-term improvement options to address identified issues. Because the RSA process considers local needs and conditions, recommendations can be implemented incrementally as time and resources permit. Crash trends identified through the RSA process are analyzed and improvement recommendations are developed to address the safety concerns.

Through a letter dated September 29, 2014, the Missoula County Board of Commissioners requested that a safety audit be conducted for the East Missoula Highway, known locally as Highway 200 (MT 200). The Montana Department of Transportation (MDT) committed to performing an RSA to identify and address transportation safety issues on the highway.

1.1.1. OBJECTIVES

The main objective of an RSA is to promote the safe operation of the roadway and to ensure a high level of safety for all road users. This objective must be balanced with maintaining traffic mobility while providing a reasonable amount of access to adjacent land. RSA's have the following characteristics:

- Proactive measure and are not solely dependent on crash data;
- Planning tool to identify safety issues to be considered as improvement projects;
- Considers the safety of all users;
- Adaptable to local needs and conditions; and
- Recommendations can be implemented as time and resources permit.

1.2. PROCESS

The RSA process primarily revolves around a single event known as the "audit workshop." For the *East Missoula (MT 200) RSA*, the audit workshop was held on June 3, 2015. In order to fully understand the safety issues within this corridor, and to identify appropriate countermeasures, the audit workshop was conducted with a multi-disciplinary team of state, federal, and local authorities who have knowledge of safety and transportation issues specific to the corridor. **Figure 1.1** provides a graphical representation of the RSA process.

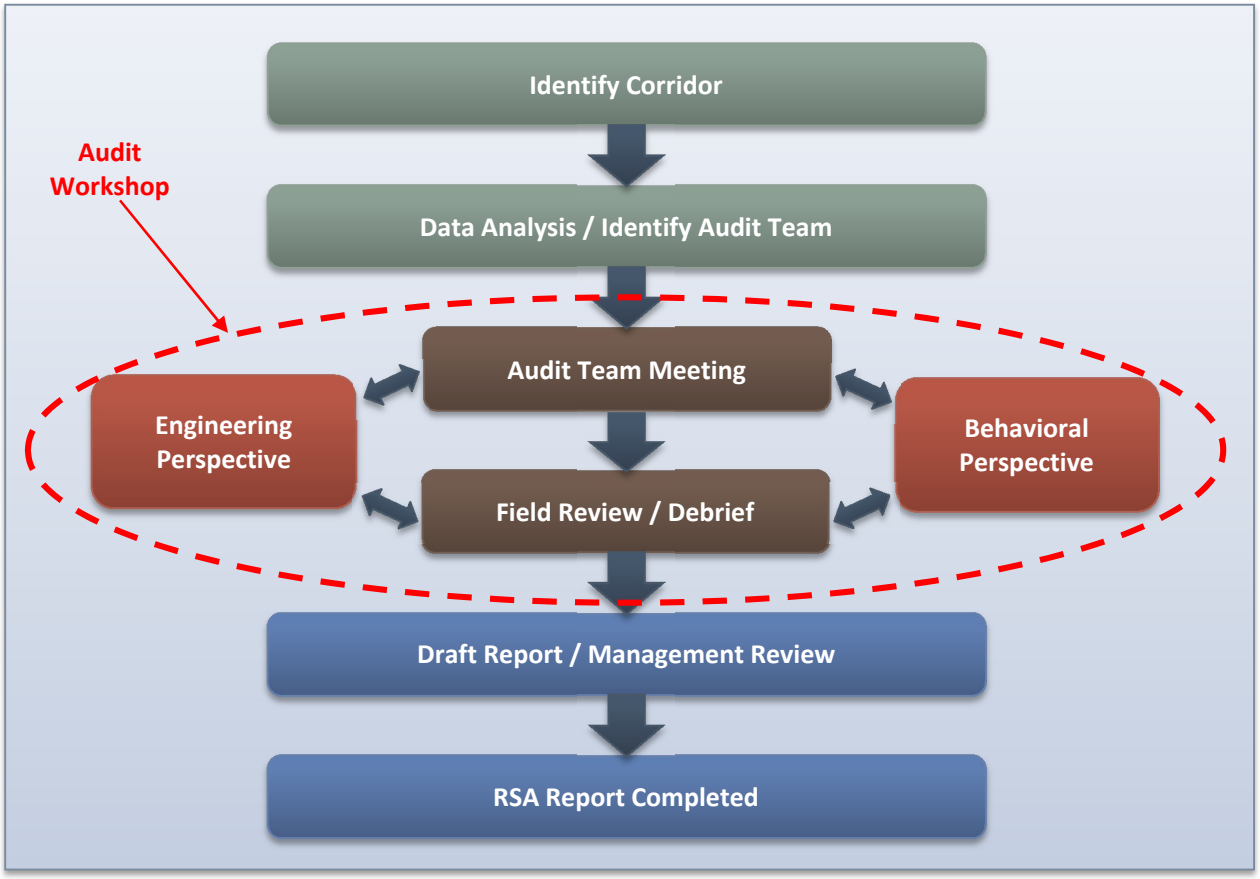

Figure 1.1: Road Safety Audit Flow Chart

Prior to the audit workshop, MDT and consultant staff reviewed and analyzed the available crash data to identify crash trends specific to the MT 200 corridor. The following events were held as part of the audit workshop:

- **Office Review:** On June 3, the audit team met at the Walla Walla College (formerly Mount Jumbo School) in East Missoula. Between 10:00 AM and 12:00 PM, the study location characteristics and crash analysis were reviewed with the audit team. This included an evaluation of both behavioral and engineering crash trends that were relevant to the corridor.
- **Field Review:** The audit team participated in a field review of the corridor between 12:30 PM and 2:00 PM on June 3. During that time, the audit team travelled the full length of the corridor in each direction. Prior to the field review, a number of locations of interest were identified. Accordingly, the audit team stopped at these locations to examine the roadway and behavioral characteristics. A second field review was conducted with a smaller planning team between 9:30 PM and 10:30 PM on June 2, to observe nighttime conditions.
- **Audit Debrief:** The audit team reconvened at Walla Walla College following the field review on June 3rd. A discussion and debrief was held on the findings of the field review, and the perceived problems and potential strategies for improvements.

1.2.1. Audit Team

The audit team was assembled based on input from MDT, Missoula County, and Missoula Metropolitan Planning Organization (MPO) staff. Identified team members were invited to participate in the audit workshop by letter from MDT dated May 3, 2015. **Table 1.1** lists the audit attendees as well as those who were invited but were unable to attend.

Table 1.1: Audit Team Members

NAME	ORGANIZATION	DEPARTMENT/TITLE
AUDIT ATTENDEES		
Dick Ainsworth	East Missoula Community Council	Chair
Lee Bridges	East Missoula Community Council	Member
Glen Cameron	MDT Missoula District	District Traffic Engineer
Bill Carey	Missoula County Commission	Chair
Vicki Crnich	MDT Helena	Statewide and Urban Planning
Erik Dickson	Missoula County	County Engineer
Shane Forsythe	Robert Peccia and Associates	Traffic Engineering Specialist
Rebecca Franke	MDT Helena	Traffic - Safety Engineering
Karen Hughes	Missoula County	Community and Planning Services
Gene Kaufman	Federal Highway Administration	Operations Engineer
Mark Keeffe	MDT Helena	State Highway Traffic Safety
Jeff Key	Robert Peccia and Associates	Transportation Manager
Kraig McLeod	MDT Helena	Traffic - Safety Engineering
Ben Nunnallee	MDT Missoula District	District Engineering
Scott Randall	Robert Peccia and Associates	Project Manager
Kevin Slovarp	City of Missoula	City Engineer
Shawn Smalley	Montana Highway Patrol	Sergeant
Shane Stack	MDT Missoula District	District Preconstruction Engineer
Rick Stephens	East Missoula Community Council	Member
Carol Strizich	MDT Helena	Statewide and Urban Planning
Garrick Swanson	Missoula County	Community and Planning Services
Ben Weiss	City of Missoula	Bicycle/Pedestrian Program Manager
Lewis YellowRobe	Missoula County	Community and Planning Services
INVITED BUT DID NOT ATTEND		
Marcee Allen	Federal Highway Administration	Safety / Traffic / Design Engineer
Adriane Beck	Missoula County Office of Emergency Management	Director
Jean Curtiss	Missoula County Commission	Commissioner
John Engen	City of Missoula	Mayor
Steve Felix	MDT Missoula District	District Maintenance
Ken Jenkins	East Missoula Community Council	Vice Chair
Captain Jim Kitchin	Montana Highway Patrol	District One (Missoula)
TJ McDermott	Missoula County Sheriff	Sheriff
Keri McWilliams	East Missoula Community Council	Treasurer
Jessica Morriss	City of Missoula	Transportation Planning Manager
Patrick O'Herren	Missoula County	Community and Planning Services Director
Gregory Robertson	Missoula County	Public Works Director
Nicole Rowley	Missoula County Commission	Commissioner
Justin Shaffer	East Missoula Rural Fire Department	Chief
Ed Toavs	MDT Missoula District	District Administrator

1.3. CORRIDOR DESCRIPTION

The study area for this RSA includes the MT 200 corridor within East Missoula between Easy Street (Reference Post [RP] 1.5) and Speedway Avenue (RP 3.0). The study corridor is part of the East Missoula Highway Urban Route and is classified as a Minor Arterial roadway. The study area for the RSA is shown in **Figure 1.2**.

The roadway was originally constructed in 1934, with various improvement projects occurring since construction. The corridor consists of one travel lane in each direction with shoulders of varying width. Within the commercially developed East Missoula area, the corridor has wide, undefined shoulders. The northern end of the corridor is more rural with two-foot shoulders.

The Interstate 90 (I-90) East Missoula Interchange (Exit 107) connects to the study corridor just northeast of Easy Street. The speed limit is 35-mph beginning just west of Easy Street and 45-mph northeast of Staple Street.

1.3.1. Roadway Users and Traffic Volumes

The MT 200 corridor provides for a variety of travel uses. As a minor arterial roadway, the corridor provides for intra-community connection between East Missoula and Missoula. The East Missoula core consists of a variety of residential and mixed commercial use accessed by MT 200. In addition, the corridor provides connection to federal and state recreation areas such as the US Forest Service in the Marshall Canyon and Deep Creek areas, the Sha-Ron Fishing Access Site on Speedway Avenue, and the developing Milltown State Park in the Bonner/Milltown/West Riverside area.

Year 2014 average annual daily traffic (AADT) for the study corridor ranges from approximately 5,000 vehicles per day (vpd) on the eastern and western ends, to approximately 7,400 vpd within East Missoula. On average, traffic volumes have increased at a rate of approximately 0.35 percent per year between 2002 and 2014. More recently, however, average volumes have decreased by approximately 1.86 percent per year over the past five years (2010 to 2014). For comparison purposes, I-90 near the East Missoula Interchange has experienced a yearly reduction in traffic volumes of approximately 0.15 percent per year since 2002, and a reduction of 0.11 percent per year over the past five years. **Table 1.2** shows the most recent five years of traffic volumes along the study corridor.

Table 1.2: Average Annual Daily Traffic Volumes

LOCATION		2010	2011	2012	2013	2014
West of Easy Street	RP 1.49	5,970	6,280	5,640	5,440	5,130
Northeast of I-90 Interchange	RP 1.83	8,410	8,810	8,120	7,890	7,390
East of Staple Street	RP 2.59	4,000	4,080	3,910	3,850	4,880

Source: MDT Traffic Data Collection and Analysis

Figure 1.2: Study Area

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Chapter 2
Data Analysis

2.1. CRASH DATA ANALYSIS

The MDT Traffic and Safety Bureau provided crash data for the 11-year period between January 1st, 2004 and December 31st, 2014. The crash data was evaluated for the MT 200 corridor between Easy Street and Speedway Avenue, as shown previously in **Figure 1.2**.

The crash data was obtained from the MDT Crash Database. The crash reports are a summation of information collected at the scene of the crash provided by responding officers. Some of the information contained in the crash reports may be subjective. Any crash records from other law enforcement agencies that were not reported to or by the Montana Highway Patrol were not contained in the database and are not included in this analysis.

According to the MDT crash database, there were 85 crashes reported within the study area during the 11-year analysis time period. The crash records were reviewed to identify trends, contributing factors, and characteristics. An analysis of the crash data is provided in the following sections.

2.1.1. CRASH LOCATION

The reports from the crash database contain the latitude and longitude for the crashes. These locations were plotted using a geographic information system (GIS). The crash locations were further refined based on the associated crash narratives. The relation to a junction – non-junction related or junction related – for each crash was determined and the crashes were grouped accordingly.

Crash types tend to be intrinsically associated with their relation to a junction. For example, multiple vehicle accidents are more common in locations with junctions. As such, analysis of relation to junction information can help to identify systemic issues within the study area. Of the 85 total crashes, 45 percent (38) of crashes were non-junction related. The remaining 55 percent (47) of crashes were junction related. **Figure 2.1** presents relation to junction data. **Figure 2.2** presents the location of crashes within the study area.

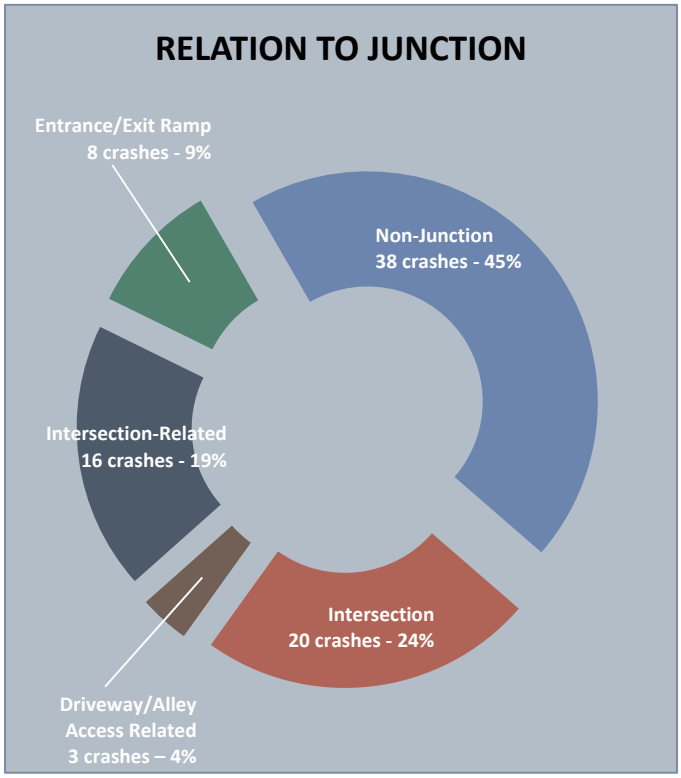

Figure 2.1: Crash Relation to Junction

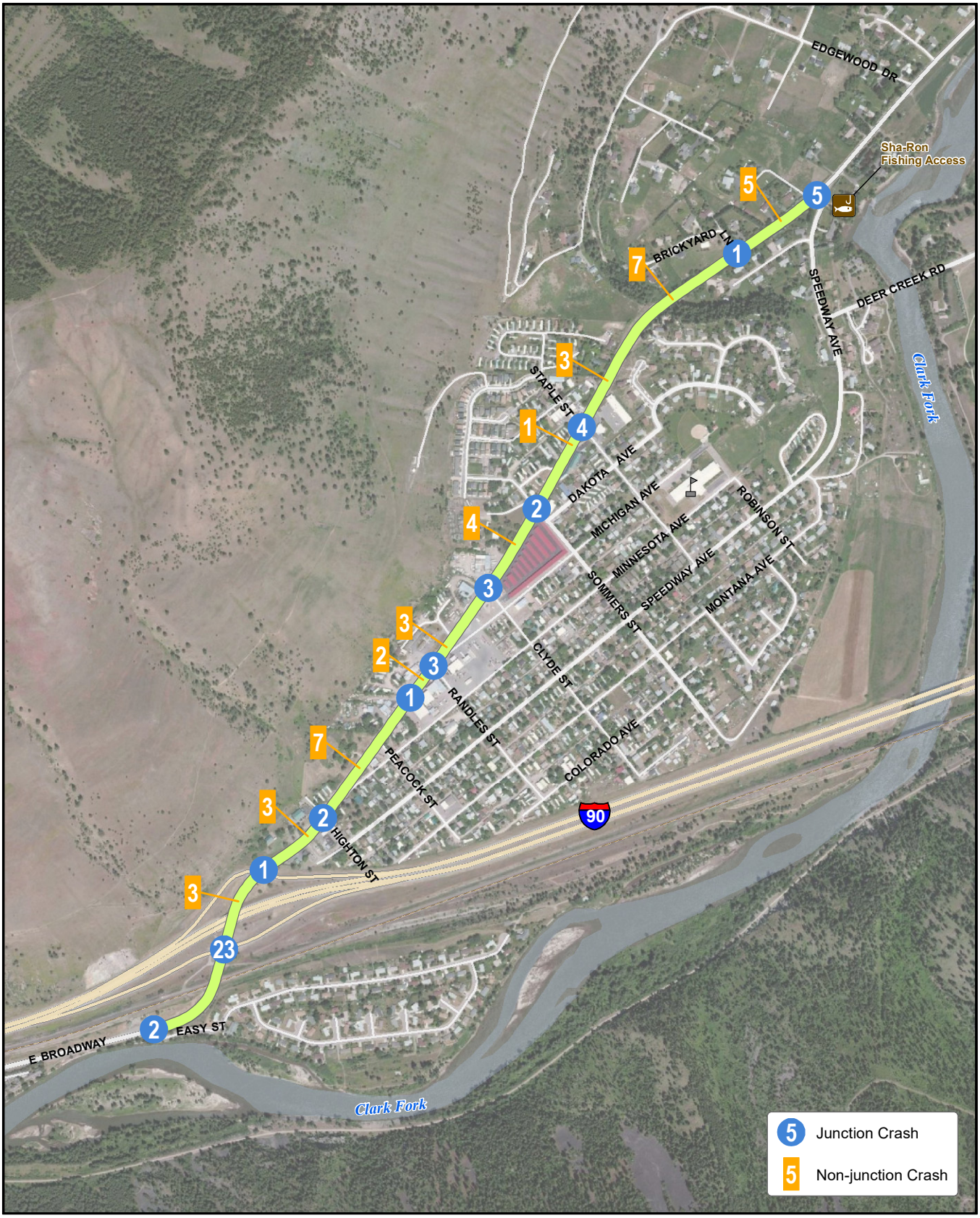

Figure 2.2: Crash Locations

2.1.2. Crash Type

Crash types were grouped into two categories, single and multiple vehicle crashes. Single vehicle crashes are those types that involve only one vehicle. Single vehicle crashes accounted for 32 percent (27) of all reported crashes. Of the single vehicle crashes, fixed object crashes were the most common crash type (44 percent), followed by wild animal (22 percent) and roll over crashes (22 percent).

Multiple vehicle crashes involve two or more vehicles. Multiple vehicle crashes accounted for 68 percent (58) of all crashes. The most common multiple vehicle crash types were right angle (41 percent) and rear-end crashes (38 percent). **Figure 2.3** presents the distribution of crash types.

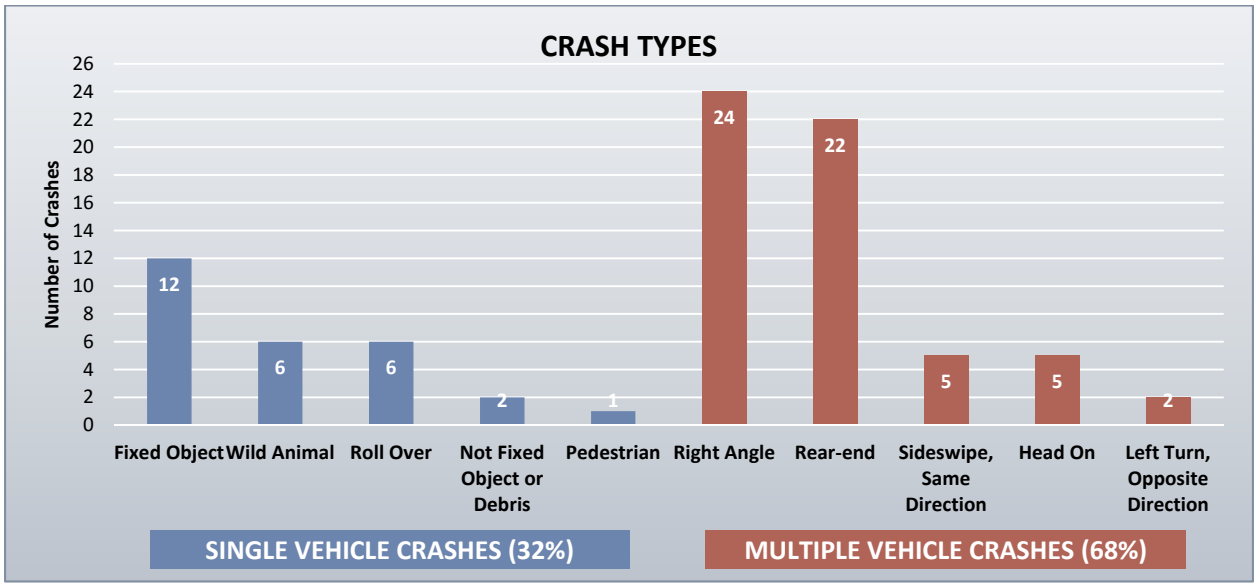

Figure 2.3: Crash Type

2.1.3. Crash Severity

Reported crashes are categorized by crash severity. The most severe injury defines the severity of the crash. For example, if a crash results in a fatality and an injury, the crash would be defined as a fatal crash. Crashes are categorized as property damage only (PDO), possible injury, non-incapacitating evident injury, incapacitating injury, and fatal injury.

Figure 2.4 presents the distribution of crash severity. Of the five possible injury levels, incapacitating and fatal injuries are considered severe. Incapacitating injury crashes accounted for 7 percent (6) of the recorded crashes and resulted in a total of nine injured individuals. Fatal injury crashes accounted for 4 percent (3) of the recorded crashes and resulted in a total of three fatalities. **Figure 2.5** presents a map depicting the location of severe crashes within the analysis period.

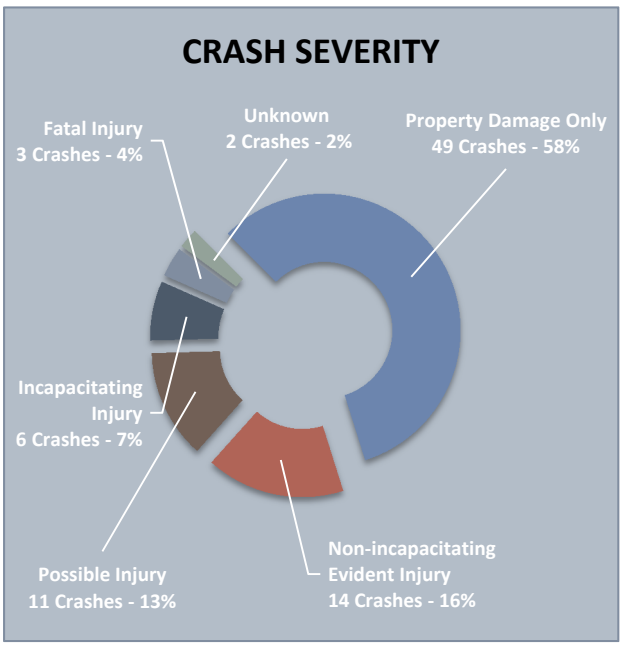

Figure 2.4: Crash Severity

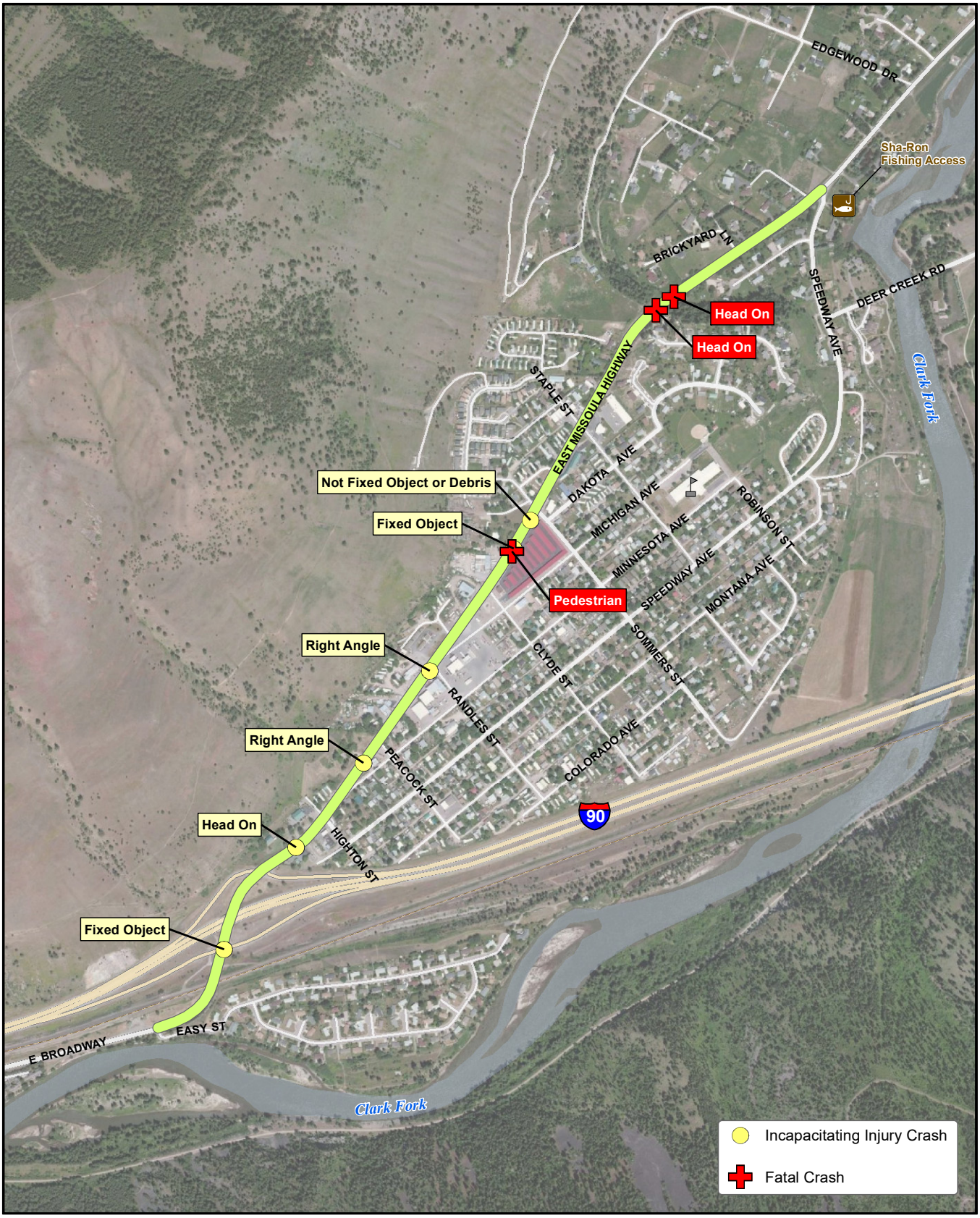

Figure 2.5: Severe Crash Locations

2.1.4. Seatbelt Usage

The supplied data included the seatbelt usage for each occupant of the vehicles involved in the reported crashes. Analysis of the seatbelt usage data found that 66 percent of occupants involved in crashes were wearing their seatbelts while 11 percent of occupants were not wearing their seatbelts. Seatbelt usage for the remaining 23 percent of occupants were listed as unknown (9 percent), or not applicable (14 percent). Vehicles with no seatbelts, such as motorcycles and busses, along with pedestrians involved in a motor vehicle crash were listed as not applicable. There were 31 individuals listed as not applicable in large part due to a school bus with 24 children on board. **Figure 2.6** presents seatbelt usage data for both drivers and passengers.

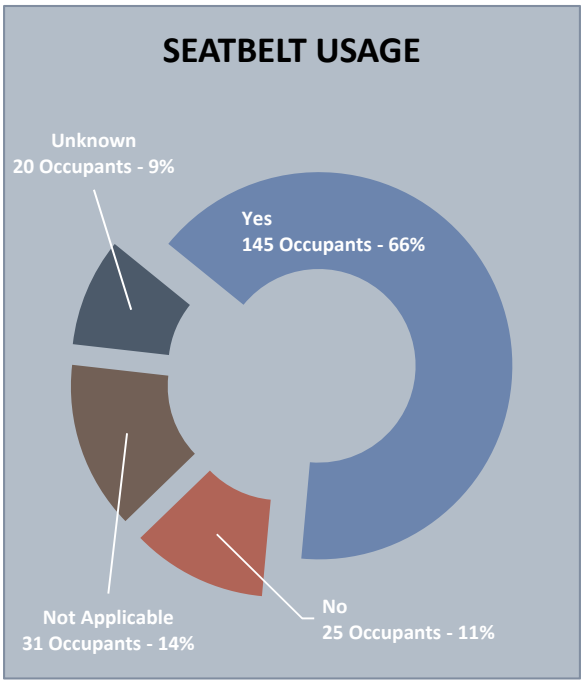

Figure 2.6: Occupant Seatbelt Usage

Seatbelt usage was also cross referenced with severe crashes. It was found that in two out of the three fatal crashes, the fatally injured individuals were not wearing a seatbelt. The remaining fatally injured individual was a pedestrian and therefore seatbelt usage was not applicable. Of the nine individuals that sustained incapacitating injuries, 22 percent (2) were using a seatbelt, 44 percent (4) were not wearing a seatbelt, 22 percent (2) seatbelt usage was unknown, and 11 percent (1) seatbelt usage was not applicable.

2.1.5. Crash Period

Crash data for the corridor was evaluated based on the period of time when the crash occurred. Approximately 15 percent of crashes occurred between 12:00 PM and 2:00 PM while 19 percent of crashes occurred between 5:00 PM and 7:00 PM.

The highest occurrence of crashes within the study area occurred on Fridays and Saturdays, accounting for a combined 39 percent of all crashes. The fewest number of crashes were reported on Thursdays. With respect to the month of the year, the most crashes occurred during February and July with 17 percent and 12 percent of crashes, respectively. As a general trend, winter months – November through February – had higher numbers of crashes as compared to the remaining seasons. There is also a noted peak in crashes during the summer months when traffic volumes are highest. Crash period statistics are presented in **Figure 2.7**.

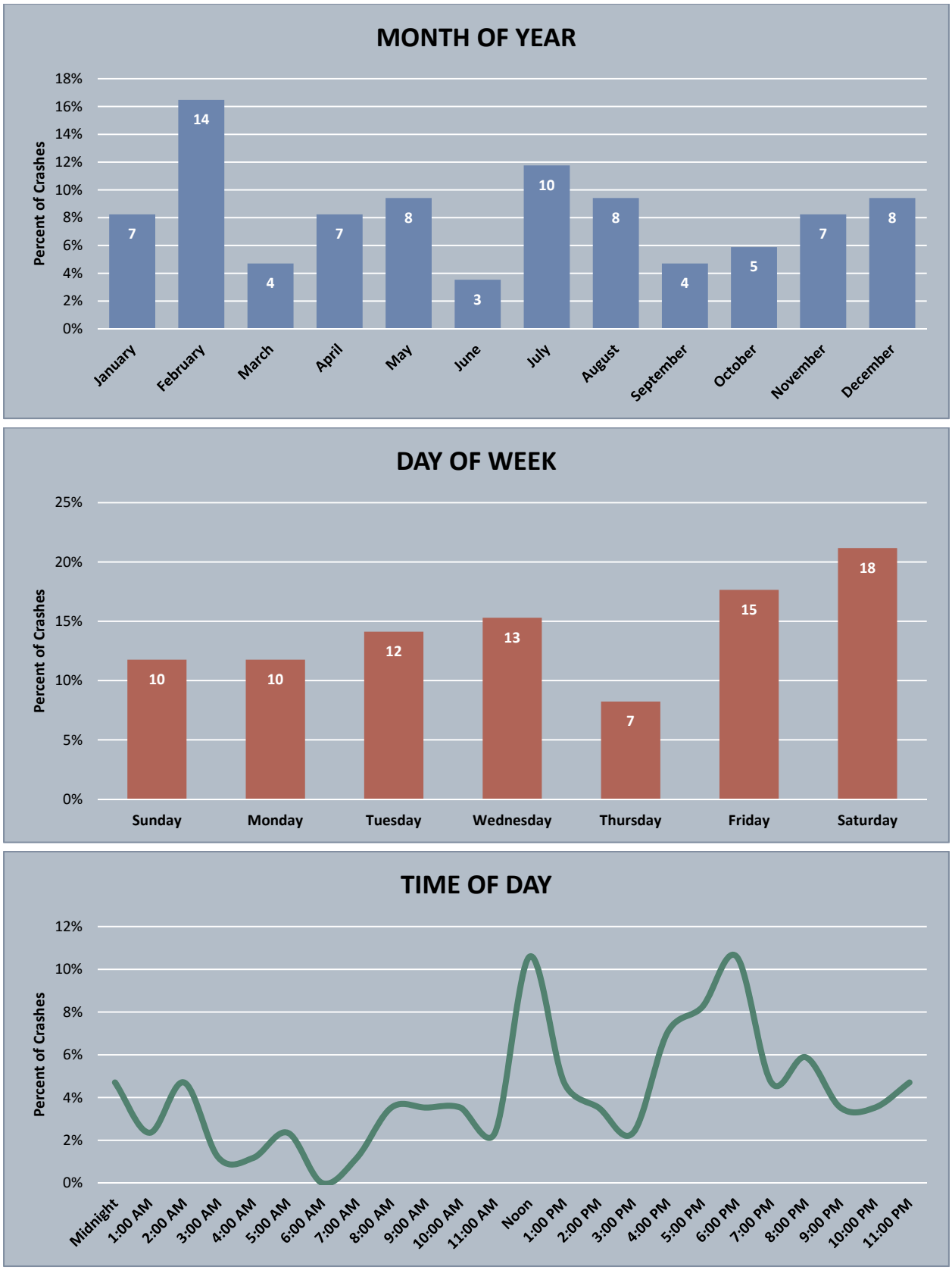

Figure 2.7: Crash Period Data

2.1.6. Environmental Factors

Each crash record includes information relating to environmental factors such as roadway surface, weather, and light conditions. This information was analyzed to determine if any trends exist. The road condition was reported as dry for 68 percent (58) of crashes. Daylight conditions were reported for 58 percent (49) of the reported crashes. The weather conditions were reported as clear for 47 percent (40) of the crashes, 18 percent (15) of the crashes were reported to have occurred during either rain, snow, sleet/hail/freezing rain/drizzle, or severe crosswinds. **Figure 2.8** presents the environmental condition data.

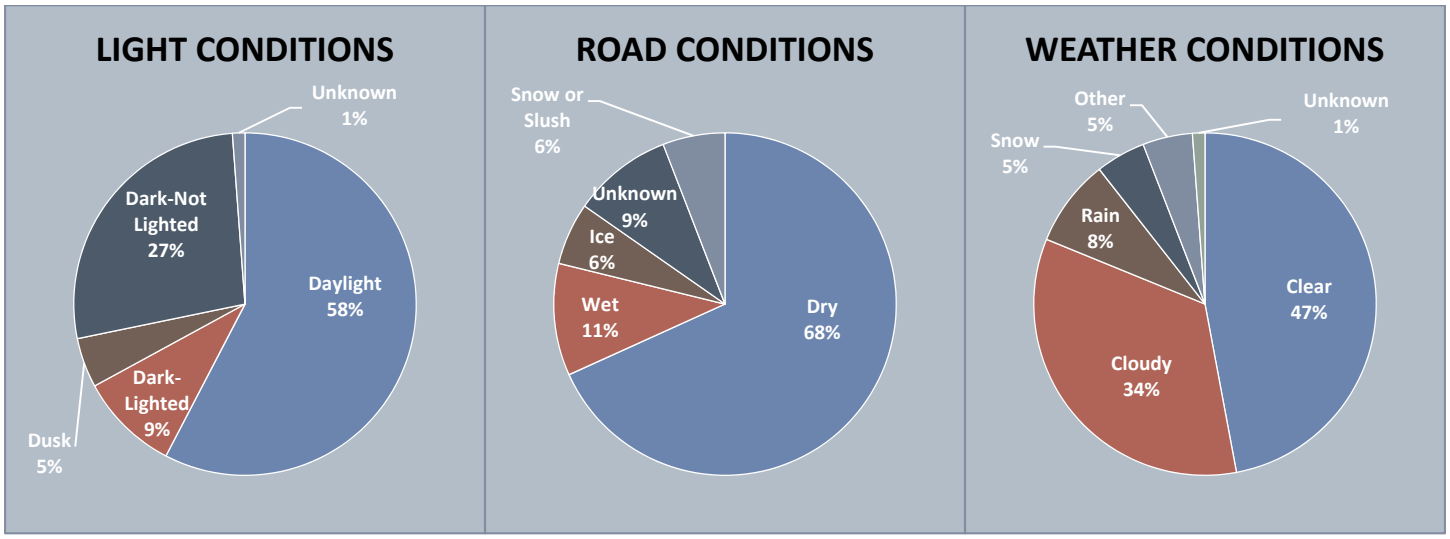

Figure 2.8: Environmental Conditions

2.1.7. Driver and Vehicle Details

Driver gender was analyzed to determine if any trends exist in the data set. Note that multiple drivers were present in multiple vehicle collisions, therefore the total number of drivers exceeds the total number of crashes. It was determined that of the 142 drivers involved in a crash, 59 percent (84) of the drivers were reported as male and 38 percent (54) were reported as female. Driver gender information is presented in **Figure 2.9**.

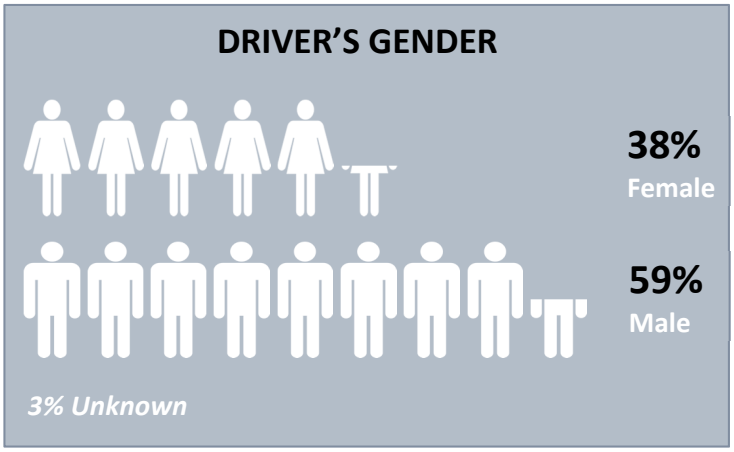

Figure 2.9: Driver's Gender

When a driver's age is known, the drivers with the highest percent involvement in crashes in the study area were between 16 and 20 years of age. This age group accounted for 15 percent (21) of the reported driver's ages. The average driver's age was found to be 38.6 years of age. **Figure 2.10** gives the distribution of reported driver's age.

Passenger vehicles accounted for 92 percent (136) of vehicles involved in reported crashes, large trucks accounted for 3 percent (4) of vehicles involved in reported crashes. The remaining 5 percent (8) of vehicles were listed as other.

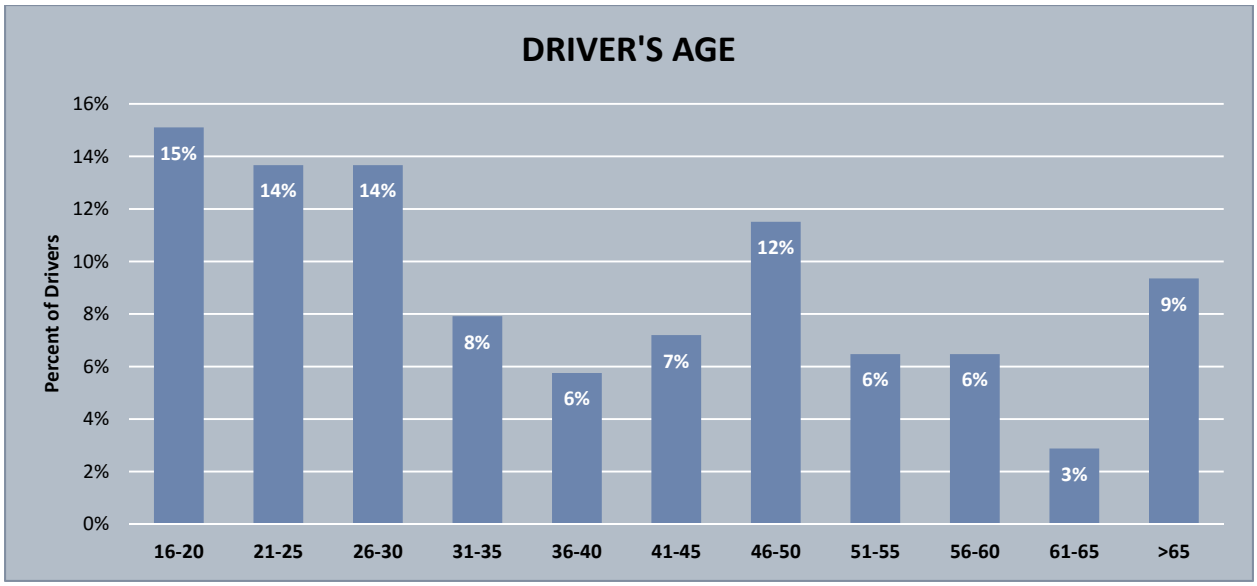

Figure 2.10: Driver's Age

2.2. ADDITIONAL DATA

To further understand the character of the study area, additional data and past studies conducted within the study area were evaluated. These additional data included citation data, as-built engineering drawings, field reviews, speed studies, and local planning documents. The following sections summarize the information from the data sources.

2.2.1. CITATION DATA

Citation data were supplied by MDT for the time period of October 24th, 2008 to December 12th, 2014. The citation data includes only the citations issued by Montana Highway Patrol within the study area. A total of 464 citations were reported in the data set. Analysis of the location where citations were issued did not yield an identifiable trend. Of the 464 citations issued, 152 (33 percent) were issued for seatbelt violations. A total of 35 (9 percent) citations were issued for alcohol/drug violations, while 24 (5 percent) speeding citations were issued.

2.2.2. PAST STUDIES

A review of past studies and reports was conducted to help define the needs and issues along the MT 200 corridor. The following documents were reviewed.

East Missoula Corridor Vision and Redevelopment (2015)

New Mobility West (NMW) developed the *East Missoula Corridor Vision and Redevelopment* study in June 2015. The report was a collaborative effort between NMW, Missoula County, East Missoula Community Council, City of Missoula, and MDT. The intent of the study was to develop a vision for MT 200 multimodal improvements and to identify development potential along the corridor. The study includes multiple recommendations grouped by implementation time frame. In the short-term (0-1 years), recommendations are made to repaint roadway striping, striped bike lanes and intersection delineation, striped left-turn lanes and marked pedestrian crossings at select locations, and treatments to improve visibility of the railroad

overpass. Over the long-term (5+ years), the study recommends that the corridor be reconstructed to include access management treatments, improved drainage, and widening the railroad bridge abutments.

Speed Limit Investigation – East Missoula (2012)

A speed study was conducted by MDT on April 23, 2012. The study recommended that the 35 mph speed zone through East Missoula be extended on both the east and west ends. On the west end of the corridor, it was recommended that the speed zone be extended to encompass the I-90 interchange and associated activity generated by it. On the east end, it was recommended that the speed zone encompass all adjacent development and also provide an improved signing sequence by including the advance pedestrian warning sign within the speed zone. The speed zones were approved by the Transportation Commission and were expanded in October 2012.

Interstate 90 Missoula East-West Corridor Study (Phase 1) - 2004

The *Interstate 90 Missoula East-West Corridor Study (Phase 1)* was conducted by CH2MHILL on April 16, 2004. The study consisted of an assessment of existing physical and traffic operational conditions along the I-90 corridor through Missoula. The study included the analysis of the East Missoula (Exit 107) Interchange. The results of the study indicate substandard acceleration distance for the westbound and eastbound on-ramps. In addition, the intersection of the eastbound ramps were projected to operate at a Level of Service (LOS) F in the PM peak hour based on future year projections.

2.3. DATA ANALYSIS SUMMARY

Crash data supplied by the MDT Traffic and Safety Bureau encompassed an 11 year period from January 1st, 2004 to December 31st, 2014. A total of 85 crashes were reported along the corridor during the analysis period. There were six incapacitating injury crashes and three fatal crashes.

To identify any trends present in the data, the data was analyzed based on location, date and time, environmental factors, crash severity, crash type, and driver details. It was found that the eastbound off-ramp terminus of the I-90 interchange had the greatest concentration of crashes (27 percent of all crashes). The data also showed that the most common crash types were right angle and rear-end crashes accounting for 28 and 26 percent of all crashes, respectively. The majority of crashes (68 percent) involved multiple vehicles.

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Chapter 3
Problem Identification

3.1. AUDIT WORKSHOP

An audit workshop was held June 3rd, 2015 for the MT 200 corridor through East Missoula. The purpose of the audit was to gather input from local, state and federal officials and to conduct an onsite field review of the corridor. Input from officials with local familiarity provides detailed knowledge of local conditions and issues related to corridor safety. The onsite field review provides an opportunity to look at physical conditions along the corridor.

3.1.1. PROCESS

A multi-disciplinary approach to transportation safety was taken for the audit workshop. An audit team was assembled with representatives from the "Four E's" of transportation safety: Education, Enforcement, Engineering, and Emergency Services. The audit team consisted of representatives from the following agencies/departments:

- Montana Department of Transportation
  - Planning
  - Traffic and Safety
  - Engineering
- East Missoula Community Council
- Missoula County Commission
- Missoula County
- City of Missoula
- Montana Highway Patrol

An office meeting was held from 10:00 to 12:00 AM on June 3rd. The purpose of the meeting was to discuss the corridor crash data and solicit input from the audit team. An onsite field audit was conducted with the team following the meeting. An additional field audit was conducted between 9:30 and 10:30 PM on June 2nd with a smaller planning team in order to observe nighttime traffic and roadway conditions.

After the onsite field audit, a debrief meeting was performed. Results and observations from the field audit were discussed during this debrief meeting. All meetings were held at the Walla Walla College in East Missoula.

3.2. OBSERVATIONS / DISCUSSION SUMMARY

This section provides a brief summary of the observations and discussions of the Audit Team. During the audit, several suggestions were made regarding potential mitigation measures for the corridor. These suggestions made by the audit team are considered part of the discussion process only and are not necessarily recommended as improvement options going forward.

Railroad Underpass

The railroad underpass on the southwest end of the corridor is narrow and restricts sight distances. It was noted that this area receives additional traffic congestion related to special events on campus. No crashes were reported at this location, however, the following concerns were noted during both the field review and the audit meeting.

Photo 3.1: Railroad Underpass Looking North

- **Narrow Width:** The narrow width of the underpass limits sight distance for vehicles traveling both east and westbound on MT 200. It was commented that it is easier to see vehicles traveling in the opposite direction at night due to the projection of the oncoming car's headlights on the underpass abutments.
- **Multi-modal Use:** Narrow shoulders inhibit pedestrian and bicycle traffic. Well-worn "desire lines" can be seen on the southeast side of MT 200. Next to the desire line is a concrete barrier rail that terminates at the underpass abutment. Non-motorized users are required to climb over the barrier rail and pass under the railroad along the edge of roadway. Both pedestrian and bicycle traffic were observed multiple times during the field review and audit session.

Eastbound off-ramp

A total of 23 crashes were reported at the intersection of MT 200 and the I-90 eastbound off-ramp. There were also three non-intersection crashes reported between the I-90 eastbound off-ramp and the westbound on-ramp. One incapacitating injury crash was reported at the eastbound off-ramp terminus.

Photo 3.2: Looking South from Eastbound Off-ramp

- **Sight Distance:** It was noted during the field review that sight distance to the south of the eastbound off-ramp terminus is limited by signage and by the railroad underpass. The combination of the horizontal curve in MT 200 to the south and the narrow width of the underpass restrict sight distances. It was suggested that an intelligent transportation system (ITS) solution may help warn motorist of eastbound vehicles on MT 200. After the audit was conducted, the cell phone use sign attached to the City guide sign was relocated to help reduce sight obstructions.
- **Intersection Approach:** The eastbound off-ramp intersects with MT 200 at a skewed angle. During the field review, it was noted that motorists commonly pull past the stop bar and partially into the intersection to improve sight lines. Additionally, it was noted that the width and striping of the intersection allows for two vehicles to stop next to each other, effectively creating an unintended additional lane.

Urban Area (I-90 Interchange to Sommers Street)

A total of 31 crashes occurred between the westbound legs of the I-90 interchange and Sommers Street. Twelve of the crashes were reported as intersection related, while the remaining 19 crashes were non-intersection related. Six incapacitating injury crashes and one fatal injury crash were reported for this section of MT 200. The fatal injury crash involved a pedestrian.

Photo 3.3: MT 200 Looking Northwest

- **Access Control:** Little to no access control is present on this section of the corridor. It was noted that parking occurs within the road right-of-way in some locations. Concerns were raised that increased access control could create access problems for trucks and delivery vehicles attempting to access businesses. A desire for a two-way left-turn lane (TWLTL) was expressed.
- **Angle of Intersections:** The intersection angle of many of the local streets is skewed. For vehicles attempting to access MT 200, it may require the driver to look behind themselves to see conflicting traffic. Additionally, vehicles leaving MT 200 may have to make tight turns or re-route altogether. At some intersections, it is also possible to maintain high speed while merging onto the local streets.
- **Non-motorized Facilities:** No pedestrian or bicycle facilities are present on this section of the study area. MT 200 has wide shoulders through this section, however, no bike lanes or sidewalks are present. There are also no marked crosswalks in this section of the corridor. It was noted that there is commonly pedestrian activity across the roadway between the Reno Café and Ole's. Overhead street lighting was suggested as a way to improve pedestrian safety through town. Bicycle and pedestrian activity was noted during the field reviews.

Northeast of Staple Street

Eight crashes were reported in the vicinity of Staple Street, four of which were intersection related. One of the non-intersection related crashes was reported as occurring to the southwest of Staple Street, while the remaining three crashes occurred northeast of Staple Street.

Photo 3.4: Northeast of Staple Street Looking Northeast

- **Crosswalk:** A marked crosswalk is located at the intersection with Staple Street. A Mountain Line bus stop is located just off of MT 200 on Staple Street. The crosswalk connects the neighborhood to the west with the bus stop on the east side of MT 200. It was commented that pedestrians use a trail behind the business development and church to the northeast to access a park on Dakota Avenue.
- **Vehicle Speeds:** A speed study was performed by MDT in 2012 which recommended the 35 mph speed zone be extended to the bottom of the Brickyard Hill. Previously, the speed zone ended just southwest of the intersection with Staple Street. The existing speed limit signs are located

approximately 400 feet southwest of the recommendations made in the speed study due to site constraints and visibility concerns. The speed zone currently ends at the top of Brickyard Hill.

Brickyard Hill

Brickyard Hill consists of a six percent grade between Staple Street and Brickyard Lane. A total of seven crashes were reported to have occurred on Brickyard Hill. Of these seven crashes, two were head on crashes, both of which resulted in a fatality.

Photo 3.5: Brickyard Hill Looking Southwest

- **Road Conditions:** It was noted that Brickyard Hill tends to remain icy longer than other portions of the corridor due to the hillside blocking sunshine during the winter months. It was also commented that there have been times when school busses were unable to travel up the hill due to the icy conditions. One of the fatal head on crashes occurred during icy road conditions. The existing posted speed limit on Brickyard Hill is 45 mph.

Speedway Avenue Intersection

Five crashes were reported to have occurred at the intersection of Speedway Avenue with MT 200. The intersection was reconstructed in 2012 to improve geometrics. Of the five crashes, three occurred prior to the reconstruction and the remaining two occurred after.

Photo 3.6: Speedway Avenue Intersection Looking South

- **Intersection Layout:** The intersection of Speedway Avenue and MT 200 has a mountable raised median on Speedway Avenue. The intersection is stop controlled on Speedway Avenue. Concerns were expressed that the median is hard to see and may cause confusion. When traveling southbound, it is difficult to see the entrance. After the audit, the median perimeter was painted, flexible delineation was installed, the centerline along MT 200 was repainted, and the "keep right" sign was repositioned to better face the approaching traffic.
- **Recreational Users:** The Sha-Ron Fishing Access is a popular summer time location for recreational users. It was stated that during peak usage times, the fishing access reaches parking capacity and users park on the shoulders of Speedway Avenue and MT 200. No crashes were reported to have resulted from this activity.

Chapter 4
Recommendations

4.1. IMPROVEMENT STRATEGIES

Corridor safety improvement recommendations were identified based on the MT 200 corridor safety review and crash analysis. The recommendations are intended to mitigate safety concerns identified along the study corridor. Both behavioral and engineering recommendations were made to help address the identified trends and areas of concern.

A suggested implementation timeframe was developed for each recommendation. Short-term (0 - 2 years), mid-term (2 - 5 years), and long term (>5 years) implementation timeframes were considered. Given fiscal and other constraints, improvements may be developed individually or in small groups. Proposed implementation responsibility for recommended improvement options are listed for each option. Coordination and collaboration may be required among MDT, Missoula MPO, Missoula County, and other affected stakeholders. For some of the recommendations, a "Benefit-to-Cost Analysis" may be required before implementation to ensure that the benefits of the improvements outweigh the project costs.

4.1.1. ENGINEERING RECOMMENDATIONS

A number of engineering based recommendations were made to address safety concerns throughout the corridor. What defines an engineering recommendation is quite broad and can consist of anything from engineering studies to reconstruction projects. Some of the engineering recommendations will require considerable advanced planning, while others can likely be implemented through normal maintenance operations. Implementation responsibility varies with each improvement option. In any case, those recommendations that are identified to occur immediately or in the short-term should be considered the highest priorities when selecting mitigation strategies for implementation. **Table 4.1** provides a list of the engineering recommendations developed for the corridor.

Table 4.1: Engineering Recommendations

ID	Recommendation	Description	Follow-up	Timeframe
		RAILROAD UNDERPASS / I-90 EASTBOUND OFF-RAMP		
E.1	Reduce sight obstructions	Motorists traveling down the eastbound off-ramp suffer from limited sight distances due to the railroad and I-90 structures. In addition, there are multiple signs south of the intersection which may be distracting and restrict sight lines. It is recommended that the placement and need for the signs be evaluated to determine if sight lines may be improved. *Following the audit, the cell phone use sign was relocated to help reduce sign clutter and improve sight lines.*	MDT, Missoula MPO	Short-term *Partially Completed*

ID	Recommendation	Description	Follow-up	Timeframe
E.2	Intersection Evaluation	There is a trend of crashes at the I-90 eastbound off-ramp intersection attributed to drivers not seeing conflicting traffic, particularly coming from the railroad underpass. It is recommended an intersection evaluation be completed to determine if a modification to the intersection is warranted. Options to be evaluated would include, but not be limited to: • Intersection conflict warning system (ITS solution) to warn motorists on the eastbound off-ramp of conflicting traffic along MT 200 to the south; • Roundabout or Mini-Roundabout; and • Traffic Signal.	MDT, Missoula MPO	Short-term
E.3	Railroad underpass reconstruction	The existing railroad underpass is narrow and restricts sight distances. It is recommended that the underpass be reconstructed to increase sight distances and provide additional width to accommodate multi-modal use.	MDT, Missoula MPO, Missoula County	Long-term
		URBAN AREA (I-90 INTERCHANGE TO SOMMERS STREET)		
E.4	Striping and delineation	The MT 200 corridor through East Missoula has an undefined wide shoulder and unmarked access points. It is recommended that the corridor be striped and delineated to better define the shoulders and access points.	MDT	Short-term
E.5	Access control plan	A trend of access-related crashes was identified through the urban area of East Missoula. The corridor currently lacks definition for accesses. It is recommended that an Access Control Plan be developed to define where access points should exist.	MDT, Missoula MPO	Mid-term
E.6	Street lighting	MT 200 through East Missoula is unlit and difficult to see at night. It is recommended that street lighting be evaluated along the corridor to improve nighttime visibility for motorists and pedestrians.	MDT, Missoula MPO	Mid-term
E.7	Reconstruction	The MT 200 corridor is wide, lacks defined access points, has poor drainage, and has deteriorating surfacing. It is recommended that the MT 200 corridor through East Missoula be reconstructed to incorporate recommendations made in the proposed Access Control Plan and to provide for a TWLTL, turn bays at major intersections, multi-modal accommodations, and improved drainage.	MDT, Missoula MPO	Long-term
		BRICKYARD HILL		
E.8	Speed limit sign	The existing 35 mph speed zone ends at the top of Brickyard Hill. The Transportation Commission approved the speed zone to extend to the bottom of Brickyard Hill. It is recommended that the 35 mph speed zone be extended to incorporate Brickyard Hill.	MDT	Short-term
E.9	Warning sign	Brickyard Hill receives little sunlight during the winter months. The lack of sunlight and steep grade make inclement weather conditions particularly hazardous at this location. It is recommended that the installation of additional warning signs (ITS or static) advising of potential poor road conditions be evaluated at this location.	MDT	Short-term (static) Mid-term (ITS)
		SPEEDWAY AVENUE		
E.10	Delineation	The intersection lacks definition and has a mountable median which is difficult to see. It is recommended that the median be painted and delineation be added to improve visibility and definition of the intersection. *Following the audit, the median perimeter was painted, flexible delineation was installed, the centerline was repainted, and the signing was improved.*	MDT	Short-term *Already completed*

4.1.2. Behavioral Recommendations

Educational and enforcement tools are relevant when discussing ways to mitigate safety concerns. Although the majority of the recommendations in this report revolve around engineering or infrastructure improvements, there is an opportunity to enhance current educational strategies. These enhancements would primarily be targeted to younger drivers, as well as those drivers susceptible to driving while impaired.

Educational opportunities targeted at younger drivers could be delivered through school based health programs and/or new driver education programs. The targeted messaging to younger drivers should be geared towards distracted driving, speeding, and making informed decisions on the pitfalls of impaired driving. Additional resources are also available to assist in traffic safety education. One resource for gathering informational materials to assist in the educational outreach for traffic safety can be found on MDT's website at the following location: http://mdt.mt.gov/safety/. **Table 4.2** provides a list of behavioral recommendations specific to the MT 200 corridor.

Table 4.2: Behavioral Recommendations

ID	Recommendation	Description	Follow-up	Timeframe
B.1	Increase impaired driving education	Alcohol and/or drugs were listed as factors for 21 percent of crashes along the corridor. Expanding public outreach efforts to target impaired drivers is desirable and can consist of public service announcements, billboards targeting high risk groups, print advertising, promoting designated driving programs, and expanding free ride home and taxi services.	MDT, Missoula MPO, City of Missoula, Missoula County, and other stakeholders	Short-term
B.2	Inattentive/distracted driving education	Conduct an educational campaign to encourage driving without distractions. Campaign can be conducted using radio, online videos, advertisements, TV ads, billboards, displays, and community events.	Missoula MPO, City of Missoula, Missoula County	Short-term
B.3	Seatbelt education	Of the occupants involved in crashes, approximately 11 percent were not wearing seatbelts. Utilizing public service announcements and public events to promote the importance of seatbelt use and proper child safety seat installation may help to improve seatbelt compliance rates.	MDT, Missoula MPO, City of Missoula, Missoula County	Short-term
B.4	Young driver programs and strategies	Approximately 15 percent of drivers involved in crashes along the corridor were 20 years of age or younger. School based education and incentive programs could be enhanced via existing driver's education and/or school based health curriculum. Additional instruction to new, young drivers pertaining to various transportation safety topics such as impaired driving, texting/cell phone use, seatbelt use, etc. could be beneficial to help curb the observed trends of younger driver collisions.	Missoula MPO, City of Missoula, Missoula County	Short-term
B.5	Intersection safety education	Approximately 55 percent of crashes were junction related. Providing information and education on how to better navigate intersections and information on training opportunities to improve driving skills, particularly at intersections, may help to improve the driving competency of transportation system users.	Missoula MPO, City of Missoula, Missoula County	Short-term

4.2. IMPLEMENTATION AND NEXT STEPS

This RSA was developed to generate potential improvement recommendations and counter measures for the areas along the MT 200 corridor through East Missoula that demonstrate a history of, or potential for, motor vehicle crashes. The safety recommendations identified during the audit and documented in this report are aimed at improving the safety of the study area.

Many of the strategies identified can be implemented through routine maintenance, while others would require more substantial project development. The full impact of the improvement strategies will be realized when they are combined. Time and budget constraints will ultimately dictate the implementation schedule.

Engineering strategies alone will not eliminate the traffic safety issues identified along the study corridor. Education, with support from a targeted enforcement campaign, is an effective approach for addressing the driver behaviors that lead to crashes.

Implementation and funding responsibility for recommendations identified in the RSA can fall to local governments, law enforcement agencies, MDT, and/or community organizations among others.

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