



El Paso County ROAD SAFETY AUDITS



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EL PASO  COUNTY
COLORADO



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INTRODUCTION

ROAD SAFETY AUDIT SUMMARY

The El Paso County process to develop a Road Safety Plan is to make driving, bicycling, and walking safer in the County with a focus on reducing the number of deaths and serious injuries on El Paso County roads. The Plan includes a detailed data analysis of current trends. These trends helped to identify a set of prioritized locations for safety evaluations to identify potential improvements. The improvement recommendations include well-established and innovative countermeasures and program-related recommendations for the County. This Road Safety Audit (RSA) document documents the review and development of recommendations for sites with safety concerns to assist with prioritizing road safety priority improvements.

The El Paso County Road Safety Plan reflects the perspectives offered by representatives from local towns and municipalities, law enforcement, emergency service providers, regional councils of government, and others involved in this RSA process. The broad participation in the safety review is important so to have input from a broad level of 4-E (engineering, emergency services, education, and enforcement) participation. During this study, much of the State of Colorado and El Paso County was under COVID restrictions, greatly reducing the ability to facilitate face-to-face interactions. To counteract this, the project stakeholders played a critical role using a virtual engagement process to determine the prioritized locations for safety reviews and which programs and projects should be applied throughout El Paso County on recommended safety projects.

While many projects conduct RSAs for locations with the highest number or most severe crashes, in reviewing the data it was determined that most of the highest crash locations already underwent improvements or were in design or construction for improvements. This is a testament to DPW's staff and their knowledge of the road system, safety issues and addressing them proactively. Therefore, the Team looked to locations that were diverse and could be representative of safety improvements that could be made on other locations with similar characteristics. For example, suggestions for an urban intersection with two lanes crossing a four-lane road could be used on other similar intersections. The following criteria were used to identify the locations to investigate in this evaluation:

- Stakeholder input
- Local knowledge
- Planned projects

- Crash data
- Variety of types of segments and intersections (rural versus urban conditions)
- Treatment options, and
- Diversity of safety issues.

This Plan is built upon a data-driven process. The process included a safety data analysis that assisted in identifying candidate locations on which to focus. The project participants then helped prioritize the candidate locations that resulted in identifying the priority locations where road safety audits should be conducted. The Plan will serve as a blueprint to guide El Paso County and partner agencies to improve safety for all – whether walking, biking, or traveling in a vehicle. With the support of the Safety Team, the new Plan will support the County by outlining various improvement strategies in different conditions that outline potential programs and projects that help to reduce fatal and serious injury crashes using County, State, and Federal funding.

Crash Data Observations

The State maintains crash data for state-managed roads in the County. Local road data is also kept by the state; however, the data is not geolocated in the same way as the state-managed roads due to the differences in equipment available between State Patrol and County Sheriff officers. The project team geolocated the crashes on County local roads and combined the two datasets, resulting in one comprehensive crash dataset. The project team then conducted a network screening evaluation of the crash data to understand if there were common crash locations in unincorporated El Paso County. This network screening process resulted in a list of the top-25 intersections and segments with the most frequent and severe crashes in the County. This information was shared with the project stakeholders to narrow down the detailed roadway safety investigations to ten sites, five segments and five intersections.

The following observations were also provided to the stakeholders and assisted in determining the RSA intersection locations. The intersection crash data highlighted the following:

- The most common type of intersection fatality crashes was broadside.
- 50% of intersection fatalities involved speeding and 82% were reported as unrestrained.
- 78% of intersection serious injuries were reported as unrestrained.
- 14% of intersection fatalities and of intersection serious injuries were also reported as impaired.
- 63% of intersection fatalities and 55% of serious injuries are by drivers under age 40 where only 46% of population are between 15 and 40 years old.
- Almost 30% of intersection fatalities occur at “Minor Arterials” – Minor Arterials make up 3% of roadways.
- 17% of intersection fatalities and 14% of intersection serious injuries occur at Dark-Unlighted intersections.
- 79% of intersection fatalities occur at “STOP Controlled” intersections.
- 27% of intersection fatalities occur on vertical or horizontal curves, and
- 26% of intersection fatalities occur in October, 29% on Sundays, and 31% between 2 pm and 6 pm.

PROJECT AREA DESCRIPTION

El Paso County, Colorado

El Paso County is the most populous county in Colorado. It is situated on the east side of the front range region in central Colorado. The County’s seat and largest city is Colorado Springs. There are seven other incorporated cities and towns in El Paso County, the largest of which are neighboring communities of Colorado Springs, with a few smaller incorporated towns along U.S. Highway 24 to the east and west of Colorado Springs. Unincorporated El Paso County is home to the U.S. Army’s Fort Carson which occupies about 28 square miles. A portion of Fort Carson’s northern and western boundaries are contiguous with the City of Colorado Springs’ border, while a

portion of the eastern boundary abuts the Town of Fountain. The project area and data collection included the entire county, but the project outcomes, analysis, and network screening are focused on unincorporated El Paso County roads.

ROAD SAFETY AUDIT PROCESS

The RSA process is a formal examination of the safety performance of a roadway by an independent audit team that seeks to qualitatively report on road safety issues and suggest potential safety improvements for all road users. This process typically involves reviewing crash data and reports, conducting a pre-assessment meeting to review project information, conducting a field review to observe both daytime and nighttime roadway conditions and traffic operations, performing a safety-focused assessment, report preparation documenting the analysis and findings, and developing a formal response and action plan. It should be noted that the crash summary does not analyze potential causes of these crashes. The RSA should not be interpreted as determining the cause of any particular crash.

ROAD SAFETY AUDIT LOCATIONS

The following ten locations (five intersections and five segments) were identified and agreed upon by the project Stakeholders to be evaluated in this RSA, including:

- Intersection – Baptist Road / Jackson Creek Pkwy/ Struthers Road
- Intersection – Burgess Road / Vollmer Road
- Intersection – Meridian Road / Woodman Hills
- Intersection – Ellicott Highway / Judge Orr Road
- Intersection – Bradley Road / Wageman Drive
- Segment – Londonderry Drive
- Segment – Judge Orr Road
- Segment – Palmer Park Boulevard
- Segment – B Street
- Segment – Academy Boulevard

These ten RSA review locations are illustrated in **Figure 1**.

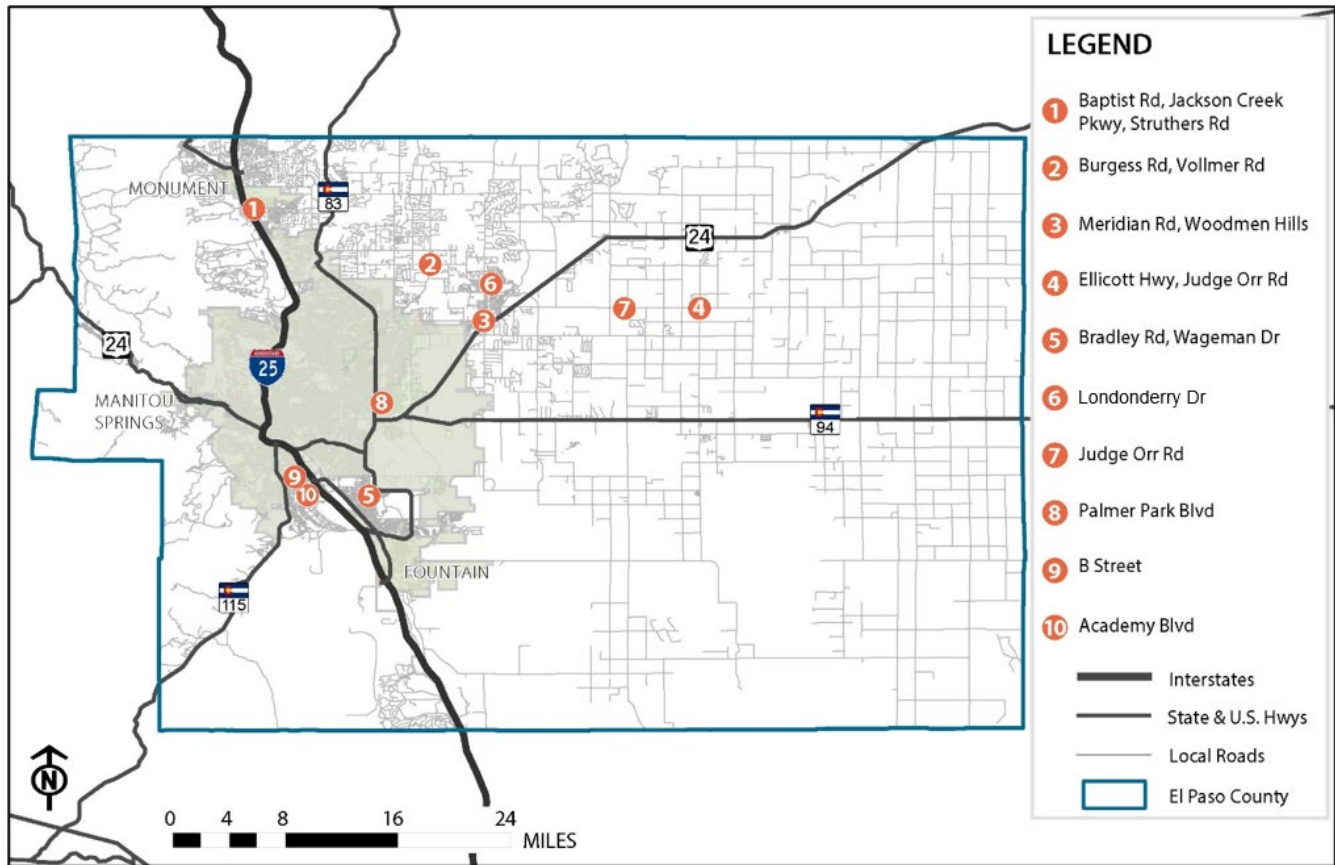


Figure 1 - Project Overview Map

IMPROVEMENT PRIORITIZATION AND MAGNITUDE OF COST

Improvement Prioritization

Each intersection and segment location includes prioritization of recommended countermeasures and is ranked low, medium, and high as defined below.

- **Low Priority** – Indicates an improvement that should be considered but will likely not reduce existing crash patterns. These improvements could prevent or minimize the potential of other types of crashes from occurring. Low Priority can also be a recommendation that identifies known improvements that can assist drivers in safer use of a roadway, both behavior-based and infrastructure-based treatments.
- **Medium Priority** – Indicates an improvement that will help reduce specific crash types but may not reduce the potential crash severity. Medium Priority include pedestrian and bicyclist recommendations that should be implemented as preventative that may not exhibit a current locational crash pattern. Typically, pedestrian and bicyclist conflicts with vehicles occur as near misses and are not recorded or reported as a crash.
- **High Priority** – Indicates an improvement that are predicted to assist in reducing fatal and serious injury crashes and specific crash types. High Priority also includes recommended countermeasures that reflect an identified issue due to higher-than-expected crashes with a crash pattern at the analysis location.

Improvement Strategies

Both standard and targeted improvement strategies are included among recommended location-specific countermeasures. In each case, the intent is to provide either a method or a recommendation. In some cases, such as striping and pavement marking maintenance, it is recommended that the County investigate how a targeted approach could be used for specific intersections and roadway segments based on propensity to experience a higher level of wear. This recommendation embraces a location-specific approach to applying and maintaining pavement marking using variations in maintenance schedules, application techniques and types of materials used. It is recognized that it is difficult to keep striping in good condition in some locations due to wear from snow plowing and/or exceptionally high volumes. At these locations, the County could increase paint thickness by using “high build” techniques to get thicker stripes. Alternatively, the County could contract out putting down epoxy pavement markings in high-volume and/or unusually high wear locations. Another programmatic approach might be used for compliance improvements such as for sidewalks or Americans with Disabilities Act (ADA) paths. These types of remedies could be incrementally implemented as part of an ADA Transition Plan, with improvements programmed to address location-specific issues as identified in this report.

Magnitude of Cost

Each intersection and segment location includes an order-of-magnitude of cost associated with the recommended countermeasures and is ranked \$, \$\$, and \$\$\$, based on a relative scale and not representing an exact dollar figure, \$ = Low; \$\$ = Medium; \$\$\$ = High.

TARGETED COUNTERMEASURE STRATEGIES

The RSA countermeasure recommendations for most locations are standard, and include median repair/reconstruction, re-striping, use of larger signs, signal and signal timing upgrades, sidewalk and ADA ramp

construction, drainage improvements, and spot repaving/pavement reconstruction. Broader, programmatic approaches are recommended for pavement marking application and maintenance as well as for implementation of ADA compliance improvements. The following paragraphs detail are new technologies that can increase safety and could be considered as standard options for any intersection or roadway improvements moving forward.

Enhanced Intersection Detection

Thermal Imaging cameras can be used to increase awareness of vehicles, bicycles, and pedestrians in and around signalized intersections. For signalized intersections with recent-technology controllers, integrating thermal imaging cameras into intersection detection can be used to enhance intersection safety. Thermal imaging cameras can be used to provide enhanced detection of vehicle, pedestrians, and bicyclists. Pedestrian detection can be used to detect pedestrians within a crosswalk to extend the pedestrian crossing time, and detection of no pedestrians (or the pedestrian has cleared the roadway) to eliminate unnecessary pedestrian calls or vehicle wait times. In terms of cyclist detection, common methods are to include detection within a “bike box” so there is a targeted area for detection. Thermal imaging sensors can detect pedestrians and cyclists regardless of outside temperature or lighting condition. These sensors can also be used at unsignalized intersections such as mid-block **High-Intensity Activated crossWalk (HAWK)** crossings or associated with a Rectangular Rapid Flashing Beacon (RRFB). This application should be considered when signalized intersections are upgraded at these subject locations, and throughout the managed signal system as opportunities to do so are presented.

Advanced Warning System with Advance Detection

An Advanced Warning System (AWS/AD) is an actuated system that provides advance warning of a condition that may not always be present that may require a vehicle to stop. These systems consist of an actuation system, signs, and beacons. Intersections with limited visibility, high speeds (55 mph and greater), temporary or newly installed intersections, or grade issues often need an advanced warning system (AWS). The AWS information prepares motorists for unexpected traffic conditions and is especially effective during the first several encounters. Because drivers may tune out this information over time, adding intelligence through advance detection is used to provide the motorists with more information about the intersection they are approaching, and to make the signal dynamic to increase its effectiveness over time. This strategy would be applicable for locations with sight-distance or hazard conditions where lack of driver expectancy may otherwise adversely impact driver response times.

Digital Radar Speed Signs

Digital radar speed signs are designed to slow cars down to help make your streets safer for everyone who uses them. The signs display driver speed data, making drivers aware that they are traveling above the speed limit. Research shows that they are effective in slowing speed violators, particularly with today’s highly visual, often distracted drivers. Radar speed signs are usually installed in areas where speeding is a concern or where vehicles come in close proximity to pedestrians. Examples include school zones, construction zones, and residential areas. In some instances, these signs are used to gather information to see if additional traffic control measures are needed. This strategy would be applicable for locations in which speeding is linked to crash experience.

INTERSECTION LOCATIONS

Baptist Road / Jackson Creek Pkwy / Struthers Road

RSA Investigation

The Baptist Rd, Jackson Creek Pkwy/Struthers Road intersection is in the unincorporated area known as Gleneagle, near the Town of Monument. This intersection is located adjacent to existing residential and commercial uses. Commercial uses include a King Soopers grocery store with a gas station. The Academy View residential neighborhood is just north of the subject intersection. The speed limit on Baptist Road is 45 miles per hour (MPH) and carries approximately 19,000 vehicles per day (vpd). The speed limit on both Jackson Creek Pkwy (north leg) and Struthers Road (south leg) is 35 MPH. Baptist Road runs east to west with commercial developments in the northeast and southeast intersection quadrants as shown in **Figure 2**. The intersection is signalized with spanwire signals, providing for two through-lanes, opposing protected dual left-turns and right-turn lanes in each direction. The north and south legs have designated multiuse shoulders.



Figure 2 - Baptist Road / Jackson Creek Pkwy / Struthers Road Study Area

This is an example of shared ownership of an intersection. The County owns and maintains Struthers and Baptist Roads. Jackson Creek Parkway is owned by the Town of Monument. TriView Metropolitan District maintains Jackson Creek Parkway from Baptist Road to Higby Road. The Town of Monument maintains Jackson Creek Parkway from Higby Road to Highway 105. Therefore, recommendations need to be coordinated among jurisdictions.

The crash data identifies that rear-end crashes are the predominant crash types at this location. There were 26 crashes between 2015 through 2019, including zero fatality, eight injury and 18 property damage only (PDO) crashes. Five of the eight injury crashes were broadside crashes. Two of the crashes occurred with non-ideal road conditions (wet/muddy/snow), and six occurred during nighttime hours. No pedestrian or bicycle crashes were reported. **Table 1** summarizes the five-years of crash data reported at this intersection.

Table 1 - Baptist Road / Jackson Creek Pkwy / Struthers Road Crash Data

Severity		Road Conditions			Time of Day			Type of Crash				Total Number of Crashes
Injury	PDO	Dry	Muddy	Wet	Dark - Lighted	Dawn or Dusk	Daylight	Approach Turn	Broadside	Rear-End	Sideswipe (SD)	
8	18	24	1	1	6	1	19	2	10	12	2	26

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 3** and **Table 2** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the intersection of Baptist Road/ Jackson Creek Pkwy/ Struthers Road.

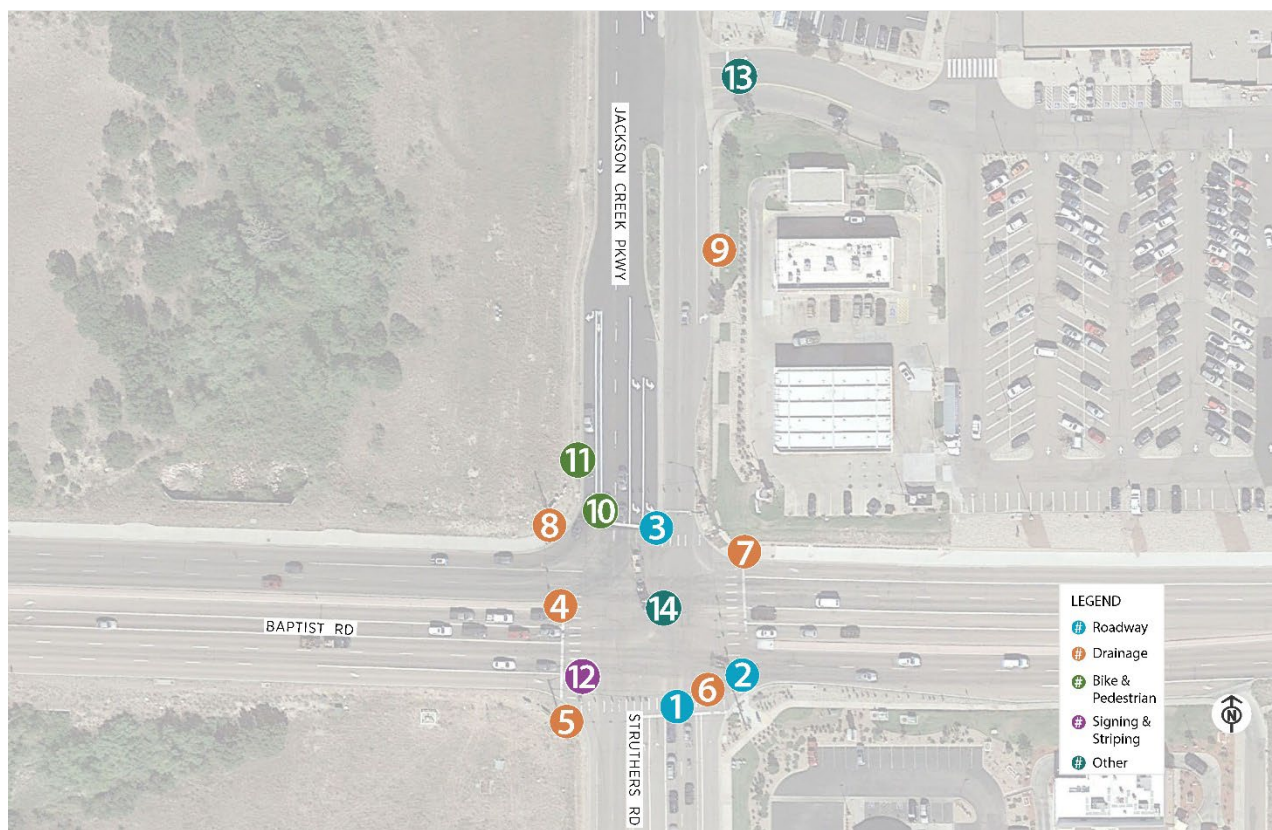


Figure 3 - Baptist Road / Jackson Creek Pkwy / Struthers Road Safety Issues Map

Audit findings include:

- Heavy traffic was observed in the morning and afternoon peak commuter periods. It was observed that during sunrise and sunset times of day, the signal heads were difficult to view along Baptist Road. This condition makes it challenging to see what signal phase (green, yellow, or red) was occurring when approaching the intersection.

- The King Sooper's driveway north of the intersection on Jackson Creek Pkwy has sight distance issues with traffic exiting the development to the west. This sight distance issue was observed and is related to obstructions to the north due to the height of the center median vegetation.
- Bicycle conflicts with vehicular traffic were observed, seemingly due to the termination of the Jackson Creek multiuse shoulder north of the intersection.

Speeding was observed along Baptist Road, potentially due to the intersection being located at the sag of two hills.

Debris such as gravel and sand were observed in the left-turn and right-turn vehicle paths. This could be an indication of potential drainage issues. The intersection is located at a low point, so debris and silt/sand likely flow to the intersection from the adjacent roads and developments.

- Traffic observations could not determine the reasons for broadside crashes. Signal timings did serve observed traffic appropriately, including yellow and red times. Broadside crashes could be associated with signal head viewing angles during sunrise and sunset times-of-day, windy conditions causing spanwire sway, or not obeying traffic signs, signals, or laws.
- The nighttime visit indicated that all the signal heads were visible, the street signs had appropriate reflectivity; however, striping is difficult to see and lacks reflectivity.
- The spanwire traffic signals at this intersection may need to be upgraded to a permanent mast arm signal system. During windy days, spanwire signals sway resulting in potential signal head visibility issues. The signals at the I-25 ramps immediately to the west are permanent mast arm signals.
- Location 14: Signal heads without backplates can impact signal head visibility.
- Location 1: Pavement failure at the stop bar on the south leg. Pavement irregularities can impact cyclist path/ride and can be a tripping hazard for pedestrians.
- Location 2: Scuff marks and curb damage on the southeast corner. No field observations identified issues for passenger cars; however, most likely due to larger vehicles making U-turns. Marks represent vehicles not staying within the travelway.
- Location 3: Sign within the median is missing due to vehicles hitting it and median curb is damaged on the north leg. The signage damage indicates fixed object type crash, these types of crashes are not always reported but can produce unsafe driving conditions. Verify that the median is at least 4-feet wide for vehicle clearance needs.
- Location 7, 13: Weeds growing in the sidewalk could relate to drainage or concrete seam issues making sidewalk use challenging. Weeds in the median on Jackson Creek Pkwy can limit sight distance depending on time of year.
- Location 11: Sidewalk is missing for approximately 745' on the southbound side of Jackson Creek Pkwy. The worn path demonstrates a need for a sidewalk.







The recommended countermeasures are:



- **High Priority** – Review the striping plan and maintenance schedule for the Baptist Road/ Jackson Creek Pkwy/ Struthers Road intersection. Location 12: In high-volume areas or where road sand may rub the paint off quickly. If paint is wearing prematurely, consider an alternative product or process. Reflective striping reduces nighttime crashes and sideswipe (same direction) crashes. (\$/\$\$\$)
- **High Priority** – Review and change the signal timings based on flow conditions. Updating signal timings can reduce rear-end, same direction sideswipe, broadside, and approach turn crashes. (\$)

- **High Priority** – Location 14: Install signal heads with backplates to increase intersection signal visibility to drivers or upgrade signal system **(\$/\$\$/\$\$\$)** Cost varies if the signal heads can be retro fitted with backplates or if new cables or poles would also be needed for the additional weight.
- **Medium Priority** – Upgrade the signal from spanwire to permanent mast arms to potentially improve visibility angles at this large intersection. **(\$\$\$)**
- **Medium Priority** – Implement leading pedestrian intervals (LPI) into the signal timings to improve pedestrian safety at this location. **(\$)**
- **Medium Priority** – Consider pedestrian refuge islands as part of the medians to protect crossing pedestrians. **(\$)**
- **Medium Priority** – Location 10: Coordinate with Monument to consider ending the multiuse shoulder north of the intersection with striping and signage. Future improvements should evaluate if the multiuse shoulders can continue through the intersection on Struthers Road. If bicycle facilities are developed, an examination of including a bike box at the intersection so cyclist can safely enter the intersection before vehicles. **(\$)**
- **Medium Priority** – Location 11: Coordinate with Monument to construct an ADA compliant paved sidewalk to complete connectivity. **(\$\$\$)**
- **Medium Priority** – Consider installing Dilemma Zone (Smart Sensor Advance Radar) to reduce rear-end and sideswipe (same direction) crashes. Dilemma Zone Radar should be considered after monitoring the intersection following an update to signal timings and a reduction of rear-end crashes or sideswipe (same direction) does not occur. **(\$)**
- **Low Priority** – Consider Dynamic Speed Feedback signs along Baptist Road. These types of signs are recommended to reduce speeding. Speeding can cause rear-end crashes when vehicles do not have sufficient time to stop at the intersection. **(\$)**
- **Low Priority** – Location 1: Ensure the intersection is on a regular paving schedule, monitor quality of roadway and, when conditions worsen then a maintenance solution should be provided. **(\$-\$\$\$)**
- **Low Priority** – Location 2: Evaluate if U-turn restrictions are needed, if not, monitor the curb for maintenance. **(\$)**
- **Low Priority** – Location 3: Coordinate with Monument to examine potential to widen the median to provide proper offsets for median signage. Consider different median layout to prevent vehicles from driving over it, such as, pulling it back to the stop bar and not making it traversable. **(\$\$)**
- **Low Priority** – Location 4-6, 8: Coordinate with Monument to evaluate drainage at the intersection; consider street cleaning maintenance at the intersection **(\$/\$\$\$)** Cost depends on drainage issue and level of effort is needed to repair.
- **Low Priority** – Location 7, 13: Coordinate with Monument to consider a vegetation maintenance schedule for the intersection. **(\$)**

Table 2 - Baptist Road / Jackson Creek Pkwy / Struthers Road Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	
3		4	
5		6	

Location Number	Photo	Location Number	Photo
7		8	
9		10	
11		12	

Location Number	Photo	Location Number	Photo
13		14	

Burgess Road / Vollmer Road

RSA Investigation

The Burgess Road/Vollmer Road intersection is in the unincorporated area known as Black Forest, northeast of Colorado Springs. This is a rural intersection with Vollmer Road running north to south, and Burgess Road running east to west. Burgess Road is stop-controlled while Vollmer Road is uncontrolled. There are overhead warning flashers for each approach above the intersection. Signs along both roads indicate a speed limit of 45 MPH. The shoulders are unpaved on each leg; however, the northwest corner has a wider paved apron as shown in **Figure 4**.



Figure 4 - Burgess Road / Vollmer Road Study Area

The crash data identifies that broadside crashes are the predominant crash type at this location. There were 18 crashes between 2015 through 2019, including zero fatality, 12 injury, and six PDO crashes. Seven of the 12 injury crashes were attributed to broadside crashes. One of the crashes occurred with non-ideal road conditions (wet roadway), and none occurred during nighttime hours. No pedestrian or bicycle crashes were reported. **Table 3** summarizes the 5-years of crash data reported at this intersection.

Table 3 - Burgess Road / Vollmer Road Crash Data

Severity		Road Conditions		Time of Day			Type of Crash		Total Number of Crashes
Injury	PDO	Dry	Wet	Dark - Unlighted	Dawn or Dusk	Daylight	Broadside	Rear-End	
12	6	17	1	2	1	15	15	3	18

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off-peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 5** and **Table 4** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the intersection of Burgess Road / Vollmer Road.

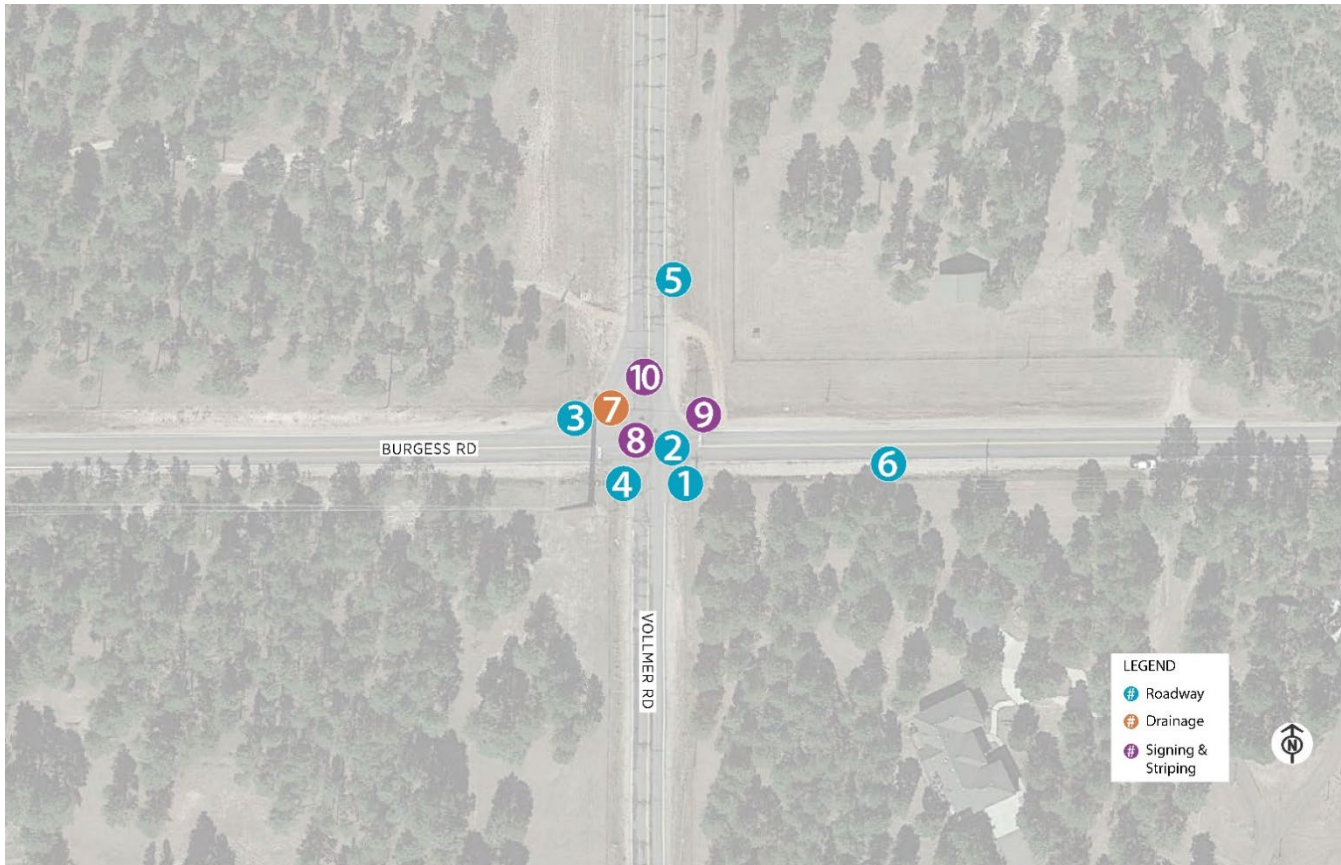


Figure 5 - Burgess Road / Vollmer Road Safety Issues Map

The audit finding include:

- Heavy traffic was observed in the morning and afternoon. Burgess Road drivers had difficulty finding gaps crossing Vollmer Road and accepted smaller gaps to cross. There were observed near misses due to this.
- Backups along Burgess Road, especially eastbound was observed during both morning and evening commuter peak periods. At multiple times, over 20 vehicles were observed to be queued.
- During the morning commuter peak period during sunrise, eastbound visibility is severely compromised and makes it difficult to navigate the roadway and the intersection.
- It was also observed that heavy traffic was present outside of peak commuter periods.
- The corners of the intersection had rutting, which indicates the paved portions of turning radiuses are not sufficient.

- The nighttime visit indicated that the intersection is very dark, and striping is difficult to see even when driving through the intersection. At the time of the observation, it was difficult to distinguish where the edge of pavement was located.
- The nighttime visit indicated that the street signs had appropriate reflectivity; however, striping is difficult to see and lacks reflectivity. There are newer paved areas near the intersection, but not at the intersection, that includes new striping with good reflectivity outside of the intersection.
- Location 1: Deterioration of pavement, soft shoulder and potential vehicle or trailer pathing are apparent in the southwest intersection corner/shoulder. Soft shoulders with significant drop off from the pavement can cause vehicles to lose control, have a difficult time correcting loss of control, and can cause overturning crashes or be a contributing factor to other types of crashes.
- Location 2: Worn pavement observed at the intersection can impact cyclists' control to safely traverse intersection.
- Location 3: Transverse crack in pavement on the west leg can lead to further pavement damage if not repaired.
- Location 4: Deterioration of pavement, soft shoulder and potential vehicle or trailer pathing are apparent. Soft shoulders with significant drop off from the pavement can cause vehicles to lose control, have a difficult time correcting loss of control, can cause overturning crashes or be a contributing factor to other types of crashes.
- Location 5: Steep shoulder is a concern because vehicles can have a difficult time correcting if veering off the shoulder. This is a very dark area, and the roadway edge is difficult to see during nighttime conditions.
- Location 6: Soft shoulders with significant drop off from the pavement can cause vehicles to lose control, have a difficult time correcting loss of control, and can cause overturning crashes and be accompanying causes to other types of crashes.
- Location 7: Sand accumulation in the intersection can indicate potential drainage issues that can impact driver and cyclist path.
- Location 8: Intersection paths and stop locations are not well defined. This can impact vehicle path, potential stop location(s) and edge-of-roadway awareness. This can lead to broadside, approach turn, sideswipe (opposite direction), or overturn type crashes.
- Location 9: This intersection is not well illuminated in dark conditions and more awareness could reinforce the intersection STOP control. Increased STOP sign awareness can increase intersection awareness and potentially reduce broadside crashes.
- Location 10: Worn striping on the north leg of the intersection can impact vehicle channelization.

The recommended countermeasures are:

- **High Priority** – Review the striping plan and maintenance schedule for the Burgess Road / Vollmer Road intersection. (\$) Location 8: In high-volume areas or where road sand may rub the paint off quickly, consider a double layer of paint or epoxy application to provide more material and vertical paint height to add durability and treatment duration.
- **High Priority** – This intersection was observed to be very busy throughout the day. A review of the average daily traffic (ADT) for both roadways indicates similar traffic volumes. It is recommended to complete a signal warrant study for this location. The signal warrant study would evaluate the need for a signal or other intersection traffic control such as an all-way stop. (\$)
 - If a signal is warranted, the cost of installation of a signal is a high cost. (\$\$\$)

- **High Priority** – Location 8: If signal warrants are not met, or an all-way stop is not appropriate, it is recommended to install an Intersection Conflict Warning System (ICWS). **(\$)**
- **High Priority** – Location 10: Ensure that Burgess Road and Vollmer Road are on a regular re-striping schedule **(\$)** If paint is wearing prematurely, determine if the appropriate striping treatment is being used and/or consider double-layer painting to provide more material and additional vertical paint depth.
- **High Priority** – Location 9: Install post reflectors and potentially flashing beacons onto the stop sign to add additional awareness to stop which will help during sunrise, sunset, and dark driving conditions. **(\$-\$\$\$)**
- **Medium Priority** – Location 1: Evaluate paving a wider apron or maintain the soft shoulder regularly with new compacted gravel/sand. **(\$\$\$)**
- **Medium Priority** – Location 4: Evaluate paving a wider apron, a safety edge or maintaining the soft shoulder regularly with new compacted gravel/sand. **(\$-\$\$\$)** Costs vary depending on right of way, drainage, utilities, etc.
- **Medium Priority** – Location 5: Evaluate installing delineators along all legs of the intersection to better define the edge of road to deter drivers from exiting the roadway or adding shoulders with a safety edge. **(\$-\$\$\$)**
- **Medium Priority** – Location 6: Regularly maintain the soft shoulder regularly with new compacted gravel/sand. Evaluate or adding shoulders with a safety edge. **(\$-\$\$\$)**
- **Low Priority** – Location 2: Ensure Burgess Road and Vollmer Road are on a regular paving schedule and repave when conditions warrant and funding is available. **(\$\$\$)**
- **Low Priority** – Location 3: Monitor pavement condition and maintain the road when conditions warrant between paving. **(\$\$)**
- **Low Priority** – Location 7: Evaluate drainage at the intersection; consider street cleaning maintenance at the intersection. **(\$-\$\$)**

Table 4 - Burgess Road / Vollmer Road Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	

Location Number	Photo	Location Number	Photo
3		4	
5		6	
7		8	

Location Number	Photo	Location Number	Photo
9		10	

Meridian Road / Woodmen Hills Drive

RSA Investigation

The intersection of Meridian Road and Woodmen Hills Drive is in the unincorporated area known as Falcon, located northeast of Colorado Springs. This intersection is in a developing rural residential area. Meridian Road runs north to south, and Woodmen Hills Drive runs east to west, shown in **Figure 6**. The speed limit along Meridian Road is 55 MPH and the speed limit for Woodmen Hills Drive is 30 MPH. The intersection is signalized. Curb and gutter are present along the east leg of Woodmen Hills Drive, but it ends before reaching the intersection. Although there are pedestrian countdown signals for crossing all four legs, the intersection lacks sidewalks and pedestrian accommodation.



Figure 6 - Meridian Road / Woodmen Hills Drive Study Area

The crash data identifies that rear-end crashes are the predominant crash types at this location. There were 14 crashes between 2015 through 2019, including zero fatality, seven injury and seven PDO crashes. Five crashes occurred during the nighttime hours. No pedestrian crashes but one bicycle crash was reported. **Table 5** summarizes the five-years of crash data reported at this intersection.

Table 5 - Meridian Road / Woodmen Hills Drive Crash Data

Severity		Road Conditions			Time of Day			Type of Crash					Total Number of Crashes
Injury	PDO	Dry	Icy	Wet	Dark - Lighted	Dark - Unlighted	Daylight	Approach Turn	Broadside	Rear-End	Bicycle	Fixed Object	
7	7	14	0	0	3	2	9	7	2	3	1	1	14

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off-peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 7** and **Table 6** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the intersection of Meridian Road / Woodmen Hills Drive.

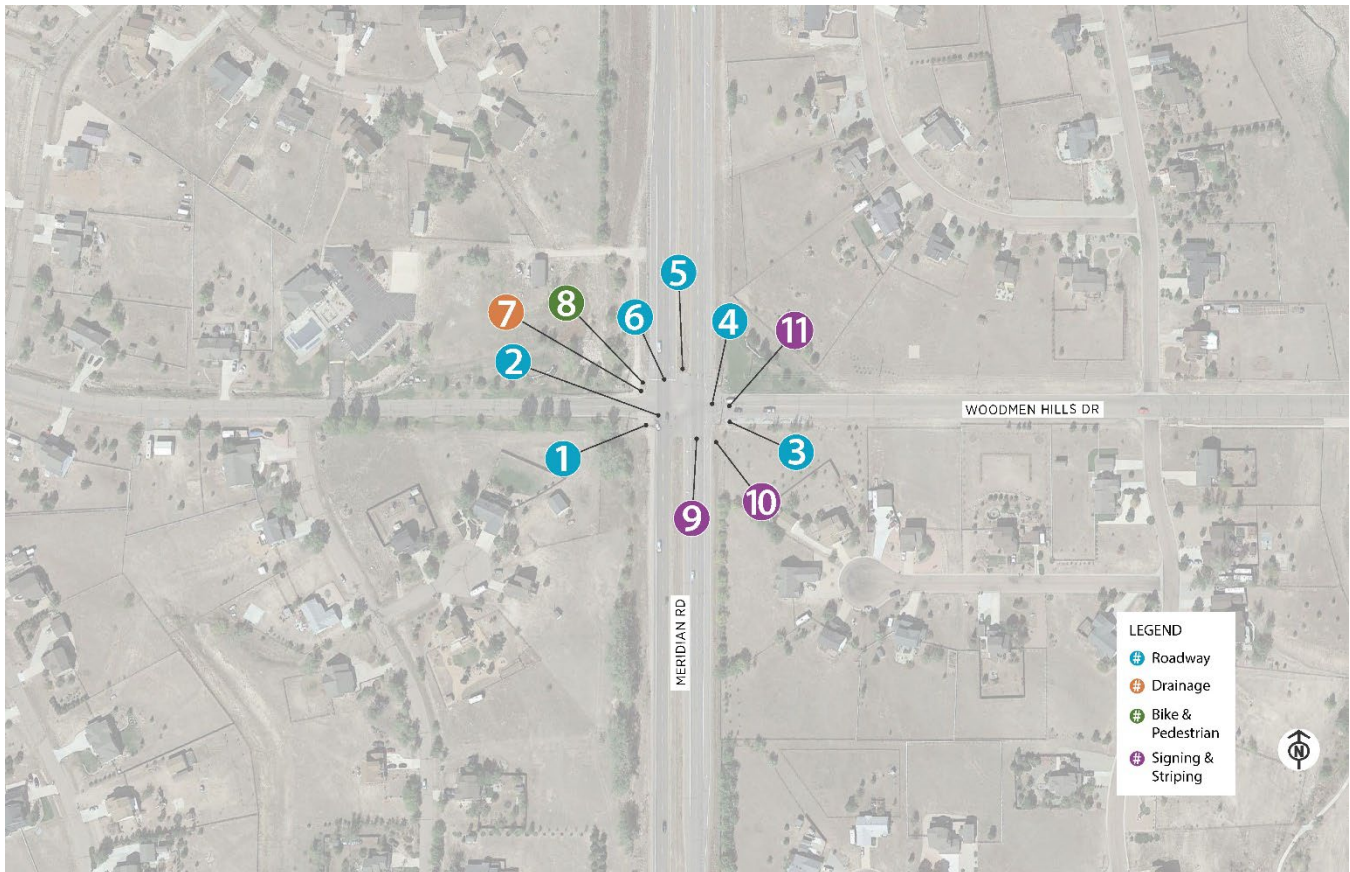


Figure 7 - Meridian Road / Woodmen Hills Drive Safety Issues Map

The audit findings included:

- No unusual driver behavior was observed to indicate issues contributing to approach turn and broadside crashes.
- Heavy traffic along Meridian Road was observed in the morning and afternoon commuter peak periods.
- The pedestrian countdown signals were tested and do work to adjust the signal timings for pedestrians. No pedestrians were observed at the intersection during the field visits.
- The nighttime visit indicated that all the signal heads were visible, the street signs had appropriate reflectivity; however, striping is difficult to see and lacks reflectivity.
- Location 1: Soft shoulder being worn away at the southwest corner and can cause vehicles to lose control, have a difficult time correcting loss of control, and may be accompanying causes to other types of crashes.



- Location 2: Span wire signal and signal faces without backplates reduces signal head visibility. Not clearly seeing the signals can contribute to rear end, broadside, sideswipe (same direction), and approach turn crashes.
- Location 3: Weeds growing next to the edge of pavement can make it difficult to determine the edge of the pavement, especially at night. This can contribute to vehicles leaving the roadway during dark driving conditions.
- Location 4: Transverse crack seen on the Woodmen Hills Drive east leg and poor pavement quality can impact driver or cyclist path decisions or steering. Pavement conditions can also create pedestrian tripping hazards.
- Location 5: Vegetation overgrowth in the median on Meridian Road north leg can impact the ability to determine the edge of pavement or reduce sight distance. Poor sight distance and ability to see edge of pavement can contribute to approach turn, broadside, off road, and loss of control crashes.
- Location 6: Transverse crack seen on the Meridian Road north leg and poor pavement quality can cause loss of control of vehicle, vehicle might not be able to remain within lane (sideswipe), impact cyclists or pedestrians' control to cross intersection if caught within pavement failure.
- Location 7: Sand and gravel in the roadway at the right turns. Debris in roadway indicated drainage issues and can cause drivers to lose control of vehicles in wet and dry conditions. It also impedes bicyclists from safely utilizing the intersection.
- Location 8: Intersection provides pedestrian countdown signals without sidewalks accommodation. Pedestrians use the intersection but without crossing facilities.
- Location 9: Worn pavement markings on the south leg of Meridian Road contribute to intersection visibility and definition. Reflective striping can reduce nighttime crashes such as rear-end crashes.
- Location 10: Sole DO NOT ENTER sign (R5-1) seen on the south leg of Meridian Road.
- Location 11: Westbound approach geometry and lane definition is not clearly defined and is wider than a typical two-lane roadway (approximately 41.5'), no stop bar is also provided to define the approach. Drivers were observed to stop in different locations, sometimes providing confusion for left turn and through vehicles. This can cause approach turn, sideswipe (same direction), and rear end crashes.

The recommended countermeasures are:




- **High Priority** – Review the striping plan and maintenance schedule for the Meridian Road / Woodmen Hills Drive intersection. (\$) In high-volume areas or where road sand may rub the paint off quickly, consider a double layer of paint to provide more material and vertical paint height to add durability and treatment duration.
- **High Priority** – Location 2: Install signal heads with backplates (\$/\$\$) Cost varies if the signal heads can be retro fitted with backplates or if new cables or poles would also be needed for the additional weight.
- **High Priority** – Location 9: Ensure that the intersections pavement markings are maintained regularly. (\$\$) If paint is wearing prematurely, consider double-layer painting to provide more material and additional vertical paint depth.
- **Medium Priority** – Consider reviewing the signal timing and updating the signal timings. Updated signal timings can provide better accommodations for pedestrians crossing the intersection. Longer red and yellow timing can help to reduce rear end crashes. (\$)

- **Medium Priority** – Consider installing Dilemma Zone (Smart Sensor Advance Radar) to reduce rear-end crashes. (\$)
- **Medium Priority** – Location 1: Evaluate paving a wider apron, a safety edge or maintain the soft shoulder regularly with new compacted gravel/sand. (\$-\$\$\$) Costs vary depending on right of way, drainage, utilities, etc.
- **Medium Priority** – Location 8: Add sidewalks along Woodmen Hills Drive and crosswalk markings. (\$\$\$)
- **Medium Priority** – Location 10: Include additional signage for the north leg to match the south leg signage. Provides consistencies for drivers. (\$)
- **Medium Priority** – Location 11: Consider maintaining a stop bar to help define the intersection and consider defining left-turn lane and a through/right-turn lane (\$)
- **Low Priority** – Consider Dynamic Speed Feedback signs along Meridian Road to reduce vehicle speeding. (\$)
- **Low Priority** – Location 3: Ensure that the Meridian Road, Woodmen Hills Drive intersection is on a regular landscaping maintenance schedule. (\$)
- **Low Priority** – Location 4: Monitor pavement condition and maintain the road when conditions warrant between paving. (\$\$)
- **Low Priority** – Location 5: Ensure that the Meridian Road, Woodmen Hills Drive intersection is on a regular landscaping maintenance schedule, ensure the posts the reflectors are on are upright, or consider larger reflectors. (\$)
- **Low Priority** – Location 6: Monitor pavement condition and maintain the road when conditions warrant between paving. (\$\$)
- **Low Priority** – Location 7: Evaluate drainage at the intersection; consider street cleaning maintenance at the intersection (\$/\$\$\$) Cost depends on drainage issue and level of effort is needed to repair.

Table 6 - Meridian Road / Woodmen Hills Drive Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	

Location Number	Photo	Location Number	Photo
3		4	
5		6	
7		8	

Location Number	Photo	Location Number	Photo
9		10	
11			

Ellicott Highway / Judge Orr Road

RSA Investigation

The intersection of Ellicott Highway and Judge Orr Road is in eastern El Paso County. This is a rural intersection with Ellicott Highway running north to south and Judge Orr Road running east to west, shown in **Figure 8**. Judge Orr Road is stop controlled while Ellicott Highway is uncontrolled (free flow). There are overhead warning flashers for each approach above the intersection. Signs along both roads indicate a speed limit of 55 MPH. The shoulders are unpaved on each leg of the intersection.



Figure 8 - Ellicott Highway / Judge Orr Road Study Area

The crash data identifies that broadside crashes are the predominant crash type at this location. There were seven crashes between 2015 through 2019, including one fatality, four injury and two PDO crashes. The fatality crash was a roadway departure crash into a fence and the cause was unknown. The four injury crashes included broadside (one crash), overturning (two crashes), departure crash into a fence. None of the crashes occurred under non-ideal road conditions, and none occurred during nighttime hours. No pedestrian or bicycle crashes were reported. **Table 7** summarizes the five-years of crash data reported at this intersection.

Table 7 - Ellicott Highway / Judge Orr Road Crash Data

Severity			Road Conditions	Time of Day		Type of Crash			Total Number of Crashes
Fatal	Injury	PDO	Dry	Dark - Unlighted	Daylight	Approach Turn	Broadside	Overtaking - Turn	
1	4	2	7	2	5	1	5	1	7

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following Figure 9 and Table 8 provide the RSA investigation findings of safety issues relating to the crash data and field observations for the intersection of Ellicott Highway / Judge Orr Road.

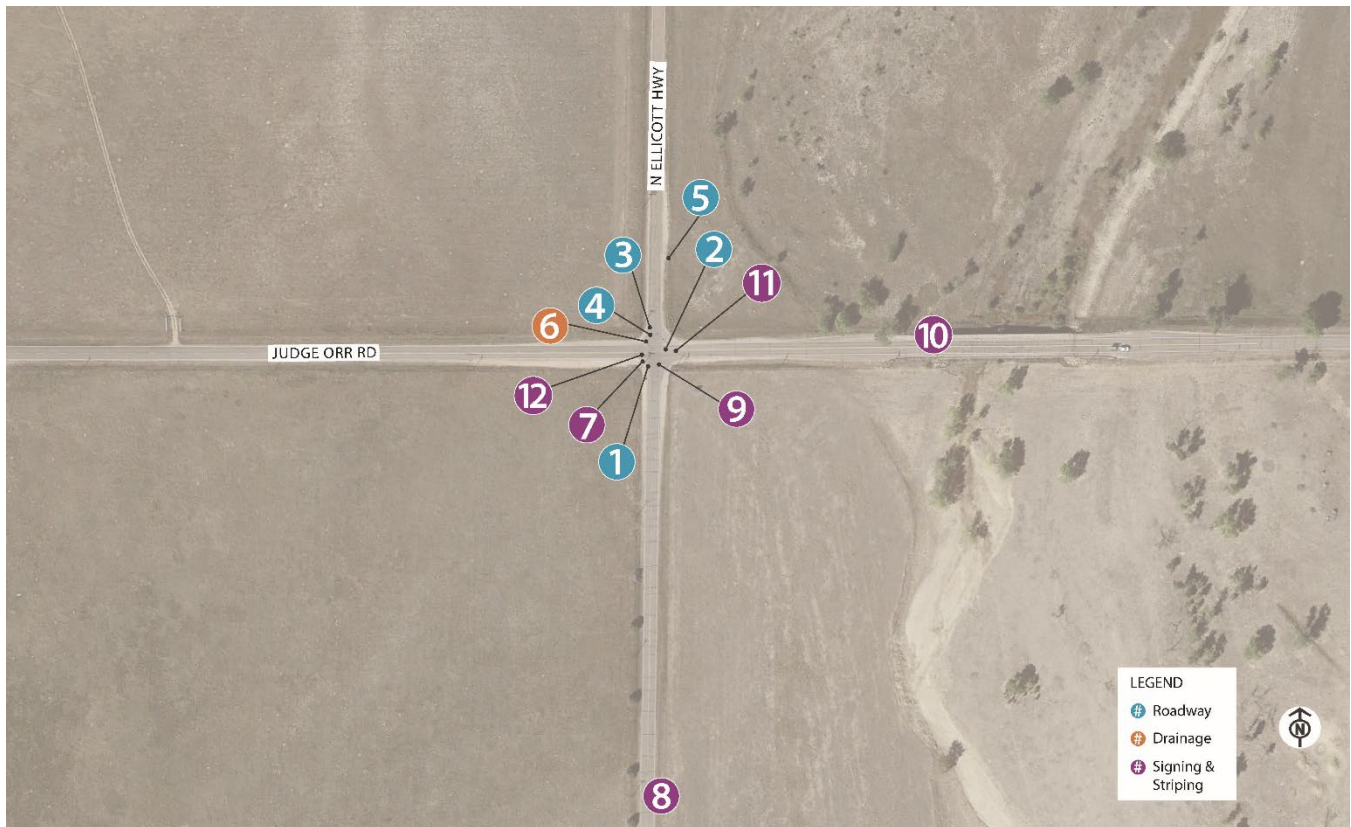


Figure 9 - Ellicott Highway / Judge Orr Road Safety Issues Map

The Audit Findings included:

- Most drivers observed at this intersection seemed very familiar with the intersection and the area in general. Therefore, it was not uncommon to see speeding and rolling stops.
- Observations also included larger vehicles, such as semi-trucks, having difficulty completing turns without entering the opposing travel lane and using the soft shoulder to make a turn.
- Bicyclists were observed along Judge Orr Road. No vehicle conflicts were observed.
- Based on reviewing older Google Earth imagery, it appears that vegetation mitigation has occurred to correct some of the sight distance limitations at the intersection. Sight distances were confirmed to meet standards.

- The INTERSECTION AHEAD signs are very close to the intersection and are not labeled with the cross-street name.
- The nighttime visit indicated that the intersection is dark. It is difficult to identify where the edge of pavement is located. The overhead warning flashers are clearly seen at night.
- The nighttime visit indicated that the street signs had appropriate reflectivity; however, intersection striping is difficult to see and lacks reflectivity.
- Location 1: Larger vehicles appear to use the soft shoulder to make right-turns for westbound to northbound movements indicating that the turning radii of intersection may need to be improved. It was also observed that trucks appear to need to use the oncoming traffic lane to navigate the turn. This can contribute to safety issues for other intersection users when a truck enters the intersection as a turning vehicle. Broadside, approach turn, head-on, sideswipe (same direction), sideswipe (opposite direction), and rear end crashes could result.
- Location 2: Confusing span wire flashers due to potential head alignment issues. Drivers can see the opposing or side-road flashers at times and may not understand what to do. The confusion can contribute to broadside, approach turn, sideswipe (same direction), and rear-end crashes.
- Location 3: Worn pavement on the north leg of intersection, poor pavement quality can impact vehicle and cyclist path control, contributing to sideswipe-type crashes.
- Location 4: Transverse crack seen on the north leg. Not repairing the crack could lead to further pavement damage potentially impacting intersection navigation.
- Location 5: Soft shoulders with significant drop off from the pavement can cause vehicles to lose control, have a difficult time correcting loss of control, can cause overturning crashes and be accompanying causes to other types of crashes.
- Location 6: Sand and gravel in the intersection. Debris in the roadway indicates drainage issues and can cause drivers to lose control of vehicles in wet and dry conditions.
- Location 7: No stop bars present for the west and east legs of the intersection. Stop bars help support the stop condition along Judge Orr Road and can reinforce the requirement for drivers to stop. Vehicles that do not stop or stop within the intersection can cause broadside, approach turn, and rear-end crashes.
- Location 8: Intersection sign without road name placard on the south leg. Complete navigation signage assists drivers to know where they are and make correct and timely decisions at intersections.
- Location 9: Intersection striping is not well defined and can cause drivers to improperly utilize the intersection such as not stopping at the correct location, completing turns into oncoming traffic, or driving vehicles off the roadway. Broadside, approach turn, sideswipe (opposite direction) and overturn type crashes are attributable to these conditions.
- Location 10: STOP AHEAD sign on east leg bridge is turned away from the road and drivers. This can cause drivers to not be able to react to the intersection appropriately and cause crashes.

- Location 11: Stop sign located on the westbound approach of Judge Orr Road. Observations noted that drivers may have issues seeing the signs during dawn, dusk, and night lighting conditions. Poor visibility of signage can contribute to broadside, approach turn, and rear-end crashes at side street STOP only intersections.
- Location 12: Worn pavement markings on the west leg. Reflective striping reduces nighttime crashes such as rear-end crashes.

Recommended countermeasures are:

- **High Priority** – Location 2: Implement an updated intersection warning system and consider implementing an Intersection Conflict Warning System (ICWS) at this location. **(\$\$)**
- **High Priority** – Location 7: Add stop bars on the pavement to increase the prominence of the stop condition along Judge Orr Road. **(\$)** If paint is wearing prematurely, consider double-layer painting to provide more material and additional vertical paint depth.
- **High Priority** – Location 9: Stripe the edge lines at the corners of the intersection and regularly maintain the stop bars. **(\$)** If paint is wearing prematurely, consider double-layer painting to provide more material and additional vertical paint depth.
- **High Priority** – Location 10: Fix sign alignment to face the roadway. Also, ensure signs are regularly maintained and replaced when needed. **(\$)**
- **Medium Priority** – Location 1: Maintain soft shoulders regularly or pave and widen shoulder apron to accommodate larger vehicles **(\$-\$\$\$)**.
- **Medium Priority** – Location 5: Evaluate paving a wider shoulder, utilizing a safety edge or maintain the soft shoulder regularly with new compacted gravel/sand. **(\$\$-\$\$\$)**
- **Medium Priority** – Location 11: Install flashing beacons to increase awareness of the required stopping condition if other intersection recommendations for the overhead lighting does not occur. **(\$\$)**
- **Low Priority** – Location 3: Ensure that Ellicott Highway and Judge Orr Road are on a regular paving schedule. **(\$\$\$)**
- **Low Priority** – Location 4: Monitor pavement condition and maintain the road when conditions warrant between paving. **(\$\$)**
- **Low Priority** – Location 6: Evaluate drainage at the intersection; consider street cleaning maintenance at the intersection. **(\$/\$\$\$)** Cost depends on drainage issue and level of effort is needed to repair.
- **Low Priority** – Location 8: Install intersection signs with the intersecting road name sign. **(\$)**
- **Low Priority** – Location 12: Ensure that Ellicott Highway and Judge Orr Road are on regular re-striping schedules. **(\$)** If paint is wearing prematurely, consider double-layer painting to provide more material and additional vertical paint depth.

Table 8 – Ellicott Highway / Judge Orr Road Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	
3		4	
5		6	

Location Number	Photo	Location Number	Photo
7		8	
9		10	
11		12	

Bradley Road / Wageman Drive

RSA Investigation

The intersection of Bradley Road and Wageman Drive is in Security-Widefield unincorporated community. This intersection is in a residential area and is within approximately 2.5 miles of five schools ranging from pre-school to high school. During the visit, school buses were observed turning onto the southwest leg of Wageman Drive. The speed limit for Bradley Road and Wageman Drive is 40 MPH and 30 MPH respectively. The residential areas near the intersection are accessible to Fort Carson and Peterson Air Force Base. Bradley Road runs northwest to southeast, and Wageman Drive runs northeast to southwest, which is shown in **Figure 10**. The intersection is unsignalized with STOP control on Wageman Drive. Curb, gutter, and sidewalks are present on Wageman Drive, but not on Bradley Road. Pedestrian ramps are only provided to cross Wageman Drive and pedestrian ramps are not provided to cross Bradley Road. Paved shoulders are present on Bradley Road.



Figure 10 - Bradley Road / Wageman Drive Study Area

The crash data identifies that broadside crashes are the predominant crash types at this location. There were 24 crashes between 2015 through 2019, including zero fatality, 13 injury and 11 PDO crashes. Of the 13 injury crashes, 11 crashes were broadside and the other two were fixed object. One of the crashes occurred with non-ideal road conditions (wet), and none occurred during nighttime hours. No pedestrian or bicycle crashes were reported. **Table 9** summarizes the 5-years of crash data reported at this intersection.

Table 9 - Bradley Road / Wageman Drive Crash Data

Severity		Road Conditions		Time of Day		Type of Crash			Total Number of Crashes
Injury	PDO	Dry	Wet	Dark - Unlighted	Daylight	Broadside	Sideswipe (SD)	Fixed Object	
13	11	23	1	6	18	20	1	3	24

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off-peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 11** and **Table 10** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the intersection of Bradley Road / Wageman Drive.



Figure 11 - Bradley Road / Wageman Drive Safety Issues Map

The audit findings included:

Heavy traffic was observed in the morning and afternoon peak periods. Most of the Wageman Drive peak-period traffic came to/from the south leg of the intersection.

- Peak period northbound left-turns from Wageman Drive were observed entering traffic with less-than-ideal gaps. This could be a contributor to the higher number of broadside crashes documented at this intersection.
- Traffic along Bradley Road were observed to be traveling slightly higher than the posted speed limit.
- Vehicles turning onto Bradley Road from Wageman Drive were observed to pull up into the pedestrian crosswalk to look for oncoming traffic along Bradley Road. Although legal, this was observed and attributed to the curves along Bradley Road to the east and west. Sight distances were evaluated and confirmed to meet standards.

- It was also observed that the westbound and northbound left-turning vehicles were using less-than-ideal gaps to enter traffic. The higher speeds along Bradley Road with shorter gaps in traffic could be contributing to the broadside crashes documented at this intersection.
- The nighttime visit indicated that the street signs had appropriate reflectivity; however, intersection striping is difficult to see and lacks reflectivity.
- Location 1: Scuff marks and damage on the south leg curb indicate the curve's radius is not sufficient for vehicles to complete the turn. Larger vehicles or vehicles with trailers may need to use opposing travel lanes to complete the turn.
- Location 2: Weeds can make it difficult to determine the edge of pavement, especially at night. Can cause vehicles to drive off the roadway during dark driving conditions.
- Location 3: Weed overgrowth on the northeast leg can make it difficult to determine the edge of pavement and create issues for pedestrians.
- Location 4: Weeds growing in the sidewalk could point to drainage issues. Further growth could make it challenging for pedestrians to use the sidewalk.
- Location 5: Missing intersection stop bars on the north intersection leg can make it difficult for drivers to see the intersection definition and understand where to stop. Reflective striping reduces nighttime crashes such as rear-end crashes.
- Location 6: Missing intersection striping on the north leg can contribute to driver alignment confusion. Drivers can drive on the opposite travel lane without knowing.
- Location 7: Vehicles move past the stop bar/stop sign into the pedestrian crossing area to improve the sight distance to navigate a turn onto Bradley Road. Stop sign placement is approximately 35' from the traveled way.




The recommended countermeasures are:

- **High Priority** – It is recommended to install an Intersection Conflict Warning System (ICWS) at this intersection if continued issues occur after other improvements are installed. ICWS would assist in reducing the potential for broadside crashes at the intersection. This intersection unlikely warrants a traffic signal based on traffic volumes. **(\$/\$/\$\$)** Cost depends if ICWS can be installed on any existing infrastructure.
- **High Priority** – Overhead intersection lighting is recommended and can reduce crashes that occur in the dark. **(\$/\$/\$\$)** Cost depends if lighting can be installed on any existing infrastructure.
- **High Priority** – It is recommended to monitor intersection traffic counts to identify if traffic control changes are warranted due to traffic increases on Bradley Road. A bi-yearly data collection plan in areas and intersections experiencing growth is important to monitor changes in local traffic. **(\$)**
- **Medium Priority** – Location 4: Evaluate drainage at the intersection **(\$/\$/\$\$)** Cost depends on drainage issue and level of effort is needed to repair.
- **Medium Priority** – Location 7: Recommend moving stop sign closer to the travel lane to improve sight distance. **(\$)**
- **Low Priority** – Location 1: Improve corner curb radii. **(\$\$\$)**
- **Low Priority** – Location 2: Ensure the Bradley Road, Wageman Drive intersection landscaping or weed control is regularly maintained. **(\$)**

- **Low Priority** – Location 3: Ensure the Bradley Road, Wageman Drive intersection landscaping or weed control is regularly maintained. (\$)
- **Low Priority** – Location 5: Install stop bars on the pavement to increase awareness of the stop condition. (\$)
- **Low Priority** – Location 6: Consider striping the center lane for the north leg of the intersection to help guide drivers. (\$)

Table 10 - Bradley Road/ Wageman Drive Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	
3		4	

Location Number	Photo	Location Number	Photo
5		6	
7			

SEGMENT LOCATIONS

Londonderry Drive

RSA Investigation

Londonderry Drive segment is a 2-lane median separated road located between Meridian Ranch Boulevard and Lambert Road in Peyton, CO shown in **Figure 12**. The 35 MPH corridor is adjacent to residential subdivisions. In addition, Falcon High School is located on the eastern side of Londonderry Drive and Meridian Ranch Elementary School is along the north side of Rainbow Bridge Drive.



Figure 12 - Londonderry Drive Study Area

The crash data identified that broadside crashes are the predominant crash type. Two of the crashes occurred with non-ideal road conditions (wet), and none occurred during nighttime hours. No pedestrian or bicycle crashes were reported. **Table 11** summarizes the five-years of crash data reported at this segment.

Table 11 – Londonderry Drive Crash Data

Severity		Road Conditions		Time of Day	Type of Crash			Total Number of Crashes
Injury	PDO	Dry	Wet	Daylight	Broadside	Sideswipe (SD)	Fixed Object	
1	5	4	2	6	3	1	2	6

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off-peak periods and nighttime visits. In addition, the

team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 13** and **Table 12** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the segment of Londonderry Drive.

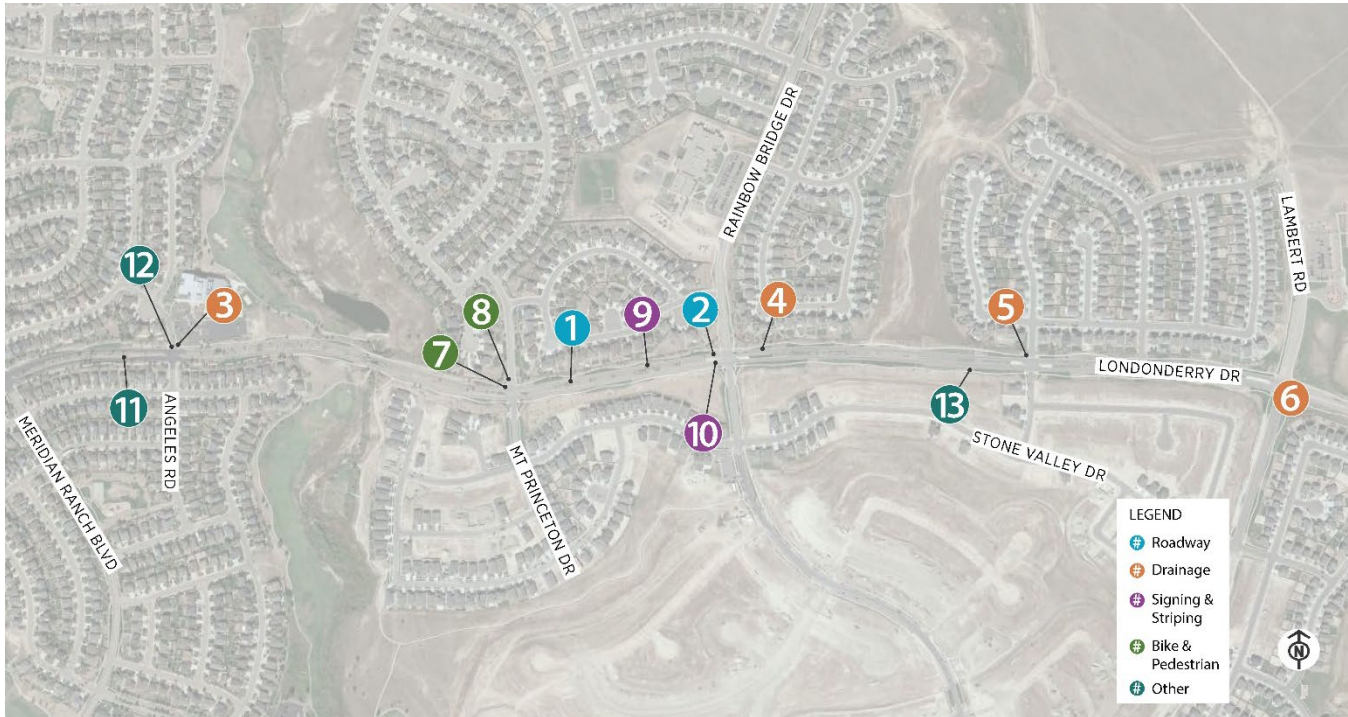


Figure 13 - Londonderry Drive Safety Issues Map

The audit findings included:

- Observations included rolling stops at all-way stop intersections of Rainbow Bridge Drive and Lambert Road. It was also observed that some vehicles along Londonderry Drive would stop suddenly, partly at the intersection, potentially due to a delayed reaction to not noticing the STOP signs.
- It was observed that vehicles were traveling at higher speeds than the posted speed limit. It was also observed there are not a lot of speed limit signs along Londonderry Drive to reiterate the posted speed limit from adjacent streets.
- Vehicles were not yielding to pedestrians entering the crosswalks.
- Pedestrians and bicyclists were observed to use the corridor a lot, potentially associated with the adjacent residential development and schools.
- Londonderry Drive has shoulder striping adjacent to the curb in some areas but not consistent within the whole study area. This can lead to confusion for bicyclists utilizing Londonderry Drive and for the drivers navigating the cyclists.
- Observations during the start- and end-times to the adjacent schools did not indicate irregular congestion or circulation issues. There were crosswalk crossing guards/attendants at the intersection of Rainbow Bridge Drive.
- The nighttime visit indicated that the street signs had appropriate reflectivity; however, striping is difficult to see and lacks reflectivity.
- The crosswalks were difficult to see during the night visit.

- Location 1: Alligator cracking and transverse cracking in pavement and can impact the vehicular and bicyclist path.
- Location 2: Pavement deterioration next to gutter pan and can impact cyclists' control to remain in travel lane if a wheel is caught within pavement failure.
- Location 3: Ponding may be occurring on north leg of Angeles Road. Poor drainage can impact driver control of a vehicle in wet conditions. In this location, poor drainage impacts the pedestrian ramp and causes a potential safety issue for pedestrians. During wet conditions, puddling, and during snow conditions could cause ice build-up.
- Location 4: Gravel in gutter pan near Rainbow Bridge Drive and can negatively impact cyclists. It also indicates potential drainage issues impacting drivers during wet conditions.
- Location 5: Sand accumulation in curb ramp on north leg of Boulder Ridge Drive may be attributed to drainage related issues. Ponding during wet conditions and ice during snow conditions could contribute to safety-related issues.
- Location 6: Mud in curb ramp on south leg of Lambert Road indicates potential drainage issues. Ponding during wet conditions and ice during snow conditions could contribute to safety-related issues.
- Location 7: Curb ramp settled on Mount Princeton Drive creating an ADA issue that has created a potential tripping hazard. Also, puddling and ice can be attributed to this drainage low spot.
- Location 8: Inlet not flush with sidewalk; narrow non-compliant sidewalk path beside inlet.
- Location 9: Paved shoulders were observed being used by cyclists. This condition could create conflicts between drivers and cyclists if the paved shoulder is less than 3-feet and traffic volumes are greater than 2,000/day.
- Location 10: Drivers exhibited behaviors of rolling through the All-way STOP at Rainbow Bridge Drive intersection. This can cause broadside and approach turn crashes and can create pedestrian-related safety issues.
- Location 11: Elevated vegetation in the median near Angeles Road is an example of potential sight triangle issues. When intersection sight distance is compromised, it can contribute to broadside crashes and vehicle/pedestrian conflicts.
- Location 12: Sight distance issues exist on the north leg of Angeles Road that can contribute to broadside, approach turn, bicyclist, and pedestrian-related crashes.
- Location 13: Wayfinding signs located close to the roadway can cause potential sight distance issues within the sight triangles. Lack of sight distance can cause broadside, approach turn, bicyclist, and pedestrian crashes.



The recommended countermeasures are:

- **High Priority** – Coordinate with Meridian Ranch Metro District to create a regular maintenance schedule for the center median vegetation and consider removing vegetation that blocks the 2.5 feet sight distance triangles. Examples would be tall grasses, bushes, or trees with low branches. Poor sight distance is related to the broadside crash patterns along Londonderry. Improved sight distances will reduce broadside crashes and improve visibility of pedestrians and cyclists. (\$)

- **High Priority** – Review the striping plan and maintenance schedule for Londonderry Drive. **(\$)** In high-volume areas or where road sand may rub the paint off quickly, consider a double layer of paint to provide more material and vertical paint height to add durability and treatment duration.
- **Medium Priority** – Consider a multiuse shoulder along Londonderry Drive. Currently, no bicyclist crashes have been recorded but conflicts were observed as part of the field reviews. **(\$\$)**
- **Medium Priority** – Consider Dynamic Speed Feedback signs along Londonderry Drive to help reinforce the posted speed limit especially due to the higher-than-average pedestrian and bicyclist activity. **(\$\$)**
- **Medium Priority** – Coordinate with Meridian Ranch Metro District to consider extending the center medians to create pedestrian refuge islands as part of the medians to protect pedestrians crossing. It was noted that pedestrians struggle to cross Londonderry Drive and refuge islands add additional protection. **(\$/\$/\$\$)** Cost depends on how many locations are chosen to implement the recommended improvement.
- **Medium Priority** – Location 3: Evaluate drainage at the intersection; **(\$/\$/\$\$)** Cost depends on drainage issue and level of effort is needed to repair.
- **Medium Priority** – Location 5 and 6: Evaluate drainage along the corridor and street cleaning maintenance should also be considered at the intersection. **(\$/\$\$)** Cost depends on drainage issue and what level of effort is needed to repair.
- **Medium Priority** – Location 7: Fix the ramp to be ADA compliant with the curb and pavement. **(\$\$)**
- **Medium Priority** – Location 8: Provide ADA compliant sidewalk and path. **(\$\$)**
- **Medium Priority** – Location 9: Review striping to consider providing a dedicated 3-feet of space in the shoulder of Londonderry Drive to better accommodate cyclists. Evaluate the need for additional bicycle accommodation signing. **(\$\$)**
- **Medium Priority** – Location 10: Consider installing pole reflectors or flashing lights on the stop signs to accentuate the intersection traffic control. Consider adding a median-mounted STOP sign. **(\$/\$\$)**
- **Medium Priority** – Location 11: Coordinate with Meriden Ranch Metro District to maintain the vegetation in the median regularly to mitigate potential sight distance issues. **(\$)**
- **Medium Priority** – Location 12: Coordinate with Meriden Ranch Metro District to improve sight distance with vegetation mitigation within the center median. **(\$)**
- **Medium Priority** – Location 13: Place signs outside of sight triangles. Ensure any signs that are not breakaway are located outside of the clear zone. **(\$)**
- **Low Priority** – Location 1: Monitor pavement condition and maintain the road when conditions warrant between paving. **(\$\$)**
- **Low Priority** – Location 2: Ensure that Londonderry Drive is on a regular paving schedule and damage is maintained; this could also be a potential drainage issue so evaluate drainage. **(\$/\$\$)** Cost depends on drainage issue and what level of effort is needed to repair.

- **Low Priority** –Location 4: Evaluate drainage along the corridor and street cleaning maintenance should also be considered at the intersection (**\$/\$\$**) Cost depends on drainage issue and what level of effort is needed to repair.

Table 12 - Londonderry Drive Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	
3		4	
5		6	

Location Number	Photo	Location Number	Photo
7		8	
9		10	
11		12	<p>No picture available</p>
13			

Judge Orr Road

The Judge Orr Road segment is a 2-lane undivided road located near Carpenter Road in Calhan, CO. The 55 MPH corridor is adjacent to undeveloped land and agricultural uses as shown in **Figure 14**.



Figure 14 - Judge Orr Road Study Area

The crash data identifies that tree/shrubbery fixed-object crashes are the predominant crash types at this location. There were six crashes between 2015 through 2019, including no fatality, five injury and one PDO crash. Of the five injury crashes, three were overturning vehicles, one animal crash, and one tree crash. Two of the crashes occurred with non-ideal icy road conditions, and three occurred during nighttime hours. No pedestrian or bicycle crashes were reported. **Table 13** summarizes the five-years of crash data reported at this segment.

Table 13 - Judge Orr Road Crash Data

Severity		Road Conditions		Time of Day		Type of Crash		Total Number of Crashes
Injury	PDO	Dry	Icy	Dark - Unlighted	Daylight	Overturning	Fixed Object	
5	1	4	2	3	3	3	3	6

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 15** and **Table 14** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the segment of Judge Orr Road.

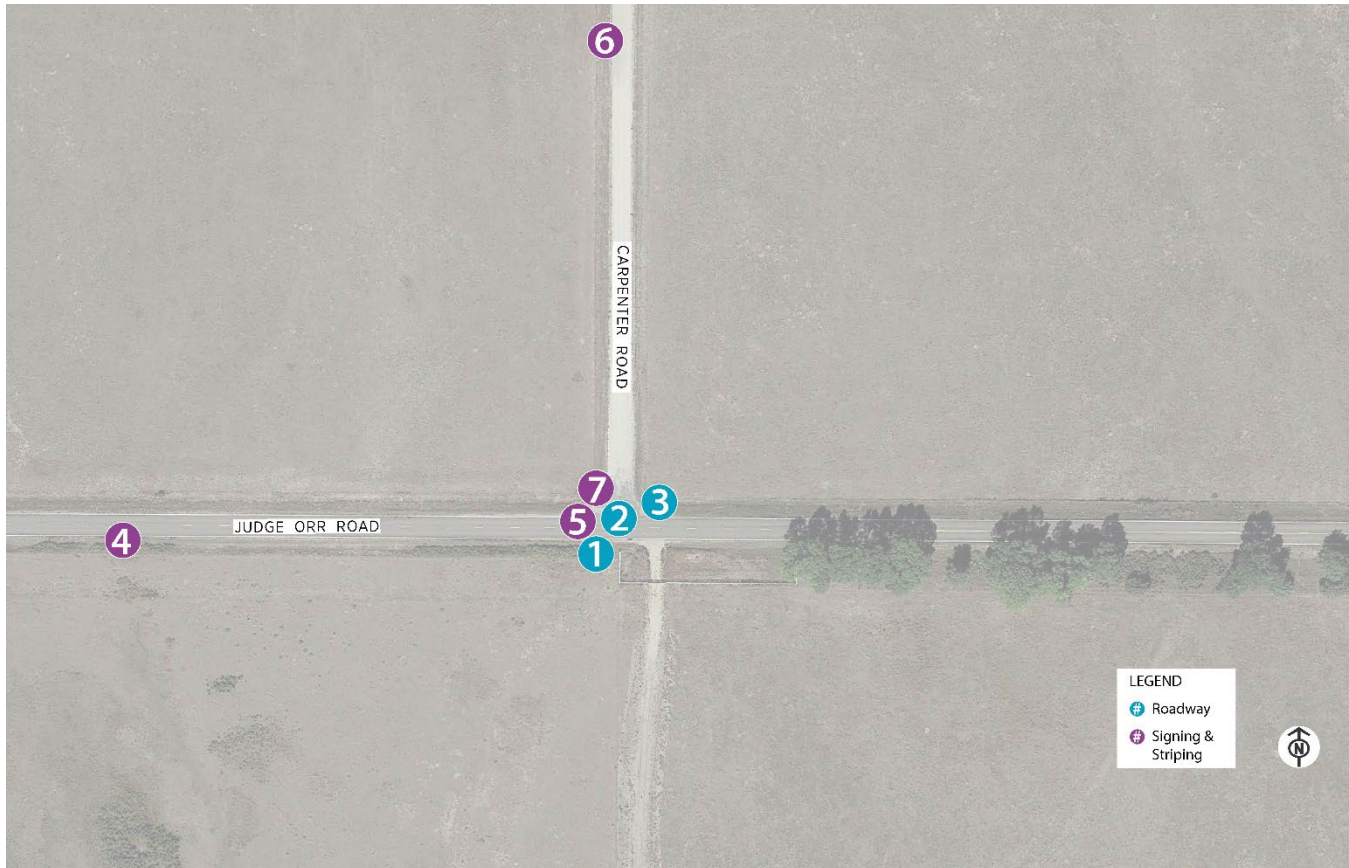


Figure 15 - Judge Orr Road Safety Issues Map

The audit findings included:

- This is a rural county road. Most drivers observed in this segment seemed very familiar with the area in general and it was not uncommon to see speeding vehicles.
- Due to the unpaved adjacent intersection of Carpenter Road, gravel and sand was present within the travel paths along Judge Orr Road.
- The trees on the southside were reviewed and did not present any sight distance issues.
- Pavement ended after the lane striping, small soft shoulders, and deep drainage ditches adjacent to the roadway.
- The nighttime visit indicated that the street signs had appropriate reflectivity; however, striping is difficult to see and lacks reflectivity.

- The nighttime visits also indicated Judge Orr Road is very dark and can be difficult to navigate at night.
- Location 1: Soft shoulder deterioration south of the Carpenter Road intersection has created a significant drop off from the pavement. This can cause overturning crashes and be a contributing factor to other types of crashes.
- Location 2: Alligator cracking near the intersection of Carpenter Road can impact the vehicle or bicyclist path.
- Location 3: No shoulder along the westbound lane of Judge Orr Road with a steep shoulder reduces opportunities for motorists to correct when they leave the roadway, typically resulting in overturning crashes. This is also a very dark area, and the edge of pavement is difficult to see in the night.
- Location 4: Intersection sign without road name. Complete navigation signage assists drivers to better understand where they are and make navigational decisions at intersection.
- Location 5: Worn pavement markings make it difficult for drivers see the definition of the roadway. Reflective striping can reduce nighttime crashes.
- Location 6: The STOP AHEAD sign is not noticeable in the dark. This can contribute to intersection crashes or driver confusion by not seeing the sign during nighttime conditions. It can also contribute to rear-end crashes.
- Location 7: STOP sign (R1-1) at the Carpenter Road intersection can be difficult for drivers to see due to angle and location. This condition can contribute to potential broadside crashes.

The recommended countermeasures are:

- **High Priority** – Location 1: Evaluate maintaining the soft shoulders regularly, installing safety edges, or consider installing a paved shoulder. The lack of level shoulder width could contribute to overturning vehicle crashes. **(\$/\$\$\$)** Cost depends on the course of action chosen.
- **High Priority** – Location 5: Ensure that Judge Orr Road is on a regular re-striping schedule. **(\$)** If paint is wearing prematurely, consider double-layer painting to provide more material and additional vertical paint depth.
- **Medium Priority** – Location 2: Monitor pavement condition and maintain the road when conditions warrant between paving. **(\$\$)**
- **Medium Priority** – Location 3: Install reflective delineators along the roadway to better define the edge of road to make drivers more aware of the roadway surface. **(\$)**
- **Medium Priority** – Location 6: Consider adding post reflectors first and potentially supplementing the sign with flashing beacons if issues persist. **(\$/\$\$)**
- **Medium Priority** – Location 7: Install post reflectors and check sign alignment. If the safety issues persist, install flashing beacons to improve awareness of the required stopping condition. **(\$)**
- **Low Priority** – Location 4: Install intersection signs with the intersecting road name sign placard. **(\$)**

Table 14 - Judge Orr Road Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	
3		4	
5		6	

Location Number	Photo	Location Number	Photo
7			

Palmer Park Boulevard

The Palmer Park Boulevard segment is a 4-lane road with a striped two-way left-turn lane generally located between Okeechobee Drive and Pahokee Drive in Colorado Springs, CO as shown in **Figure 16**. The 35 MPH corridor is adjacent to residential subdivisions and some civic facilities.



Figure 16 - Palmer Park Boulevard Study Area

The crash data identifies that overturning crashes are the predominant crash types at this location. There were five crashes between 2015 through 2019, including no fatality, two injury and three PDO crashes. None of the crashes occurred with non-ideal road conditions, and one occurred during nighttime hours. Three overturning crashes also occurred within this segment with two having injuries. No pedestrian or bicycle crashes were reported. **Table 15** summarizes the five-years of crash data reported at this segment.

Table 15 - Palmer Park Boulevard Crash Data

Severity		Road Conditions	Time of Day		Type of Crash			Total Number of Crashes
Injury	PDO	Dry	Dark-Lighted	Daylight	Overturning	Sideswipe (SD)	Fixed Object	
2	3	5	1	4	3	1	1	5

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 17** and **Table 16** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the segment of Palmer Park Boulevard.

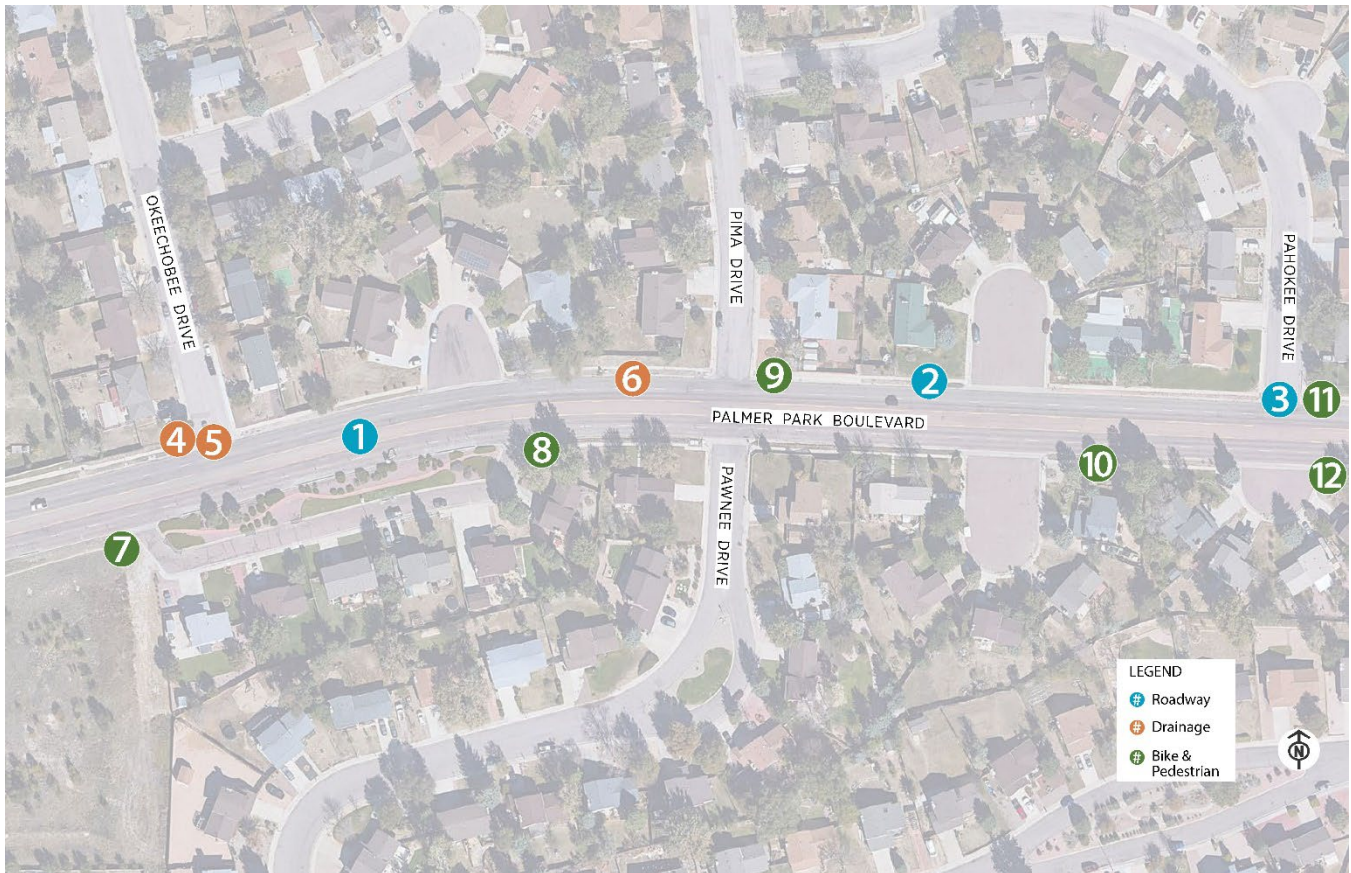


Figure 17 - Palmer Park Boulevard Safety Issues Map

The audit findings included:

- Most drivers observed in this segment seemed very familiar with the area in general and it was not uncommon to see speeding vehicles which may be contributing to the crashes in the corridor.
- Pedestrians were observed using the sidewalk facilities.
- It was observed that the most outer westbound lane has large drainage humps that can impact the motorist path and potential visibility.
- The nighttime visit indicated that the street signs had appropriate reflectivity.
- Vegetation within the curb and gutter limits the ability to see the pavement edges at nighttime.
- Location 1: The roadway is very wide which can promote speeding that can contribute to overturning crashes. Speeding also creates safety concerns for pedestrians crossing the roadway.
- Location 2 and 6: The weeds growing over the curb and into the gutter make it difficult to determine the edge of the roadway, particularly at nighttime. Vegetation in gutters also contributes to drainage issues.
- Location 3: There are large vertical humps in the roadway at Pahokee Drive, Pima Drive and Okeechobee Drive near drainage culverts. These could be contributing to overturning vehicles. This can be exasperated when combined with speeding.



- Location 4: Sand and gravel accumulate in curb ramp locations along the corridor. Due to the location, drainage conditions impact the pedestrian ramp and can contribute to pedestrian safety and accommodation issues. Ponding during wet conditions, and ice during snow conditions could contribute to safety issues.
- Location 5: Sand and gravel accumulation in the roadway may indicate that there are drainage issues. This can contribute to driver stopping issues in both wet and dry conditions.
- Location 7: There is missing sidewalk for approximately 1.5 blocks. This is a safety and accessibility concern for pedestrians. The existing worn path indicates heavy pedestrian use and the demand for a sidewalk. In adverse conditions, pedestrians without a sidewalk may walk on the street edge creating other safety issues.
- Location 8: There is a paved sidewalk traversing the driveway and an unpaved footpath across landscaped area where a sidewalk would typically be placed. The indirect sidewalk connection could be confusing to pedestrians, or this demonstrates the desire to stay on a direct path along the street.
- Location 9: The inlet is not flush with the sidewalk. Evaluate if there is sufficient width of sidewalk around the inlet and no ADA issues exist.
- Location 10: The tree is causing vertical clearance issues for pedestrians. This is a safety and accessibility issue.
- Location 11: A light pole located in the sidewalk path and is a potential ADA issue. The path also looks to be less than what is required to meet ADA compliance.
- Location 12: Vegetation overgrowth into the sidewalk area creates horizontal and vertical ADA issues, making traversing this section of sidewalk difficult.

Additional recommendations not included in Table 16 are:




- **Medium Priority** – Consider installation of a center median to reduce full access where it is not needed. This will assist in slowing down speeds and providing pedestrian refuges to cross Palmer Park Boulevard. Slower speeds can also reduce overturning vehicles. **(\$/\$\$\$)** Cost depends on size of project and locations of medians.
- **High Priority** – Location 3: Install Dynamic Speed Feedback signs to make drivers aware. Install warning signage/markings. Long term project would fix or reduce the vertical humps. **(\$/\$\$/\$\$\$)** Cost depends on type of improvement and extent of improvement implemented.
- **Medium Priority** – Location 1 Install Dynamic Speed Feedback signs to make drivers aware of their speed. As volumes increase, install raised medians to control access, reduce conflicts and reduce the driving width. **(\$/\$\$\$)** Cost depends on size of project and locations of medians.
- **Medium Priority** – Location 4: Evaluate drainage at the intersection **(\$/\$\$\$)** Cost depends on drainage issue and level of effort is needed to repair.
- **Medium Priority** – Location 7: Construct a paved sidewalk to complete connectivity **(\$\$\$)**
- **Medium Priority** – Location 8: Construct a paved sidewalk to complete connectivity if EPC owns and maintains the landscaped area. **(\$\$\$)**

- **Medium Priority** – Location 9: Provide wider sidewalk or replace concrete to be flush with inlet height and consistent with adjacent area. **(\$\$\$)**
- **Medium Priority** – Location 10: Direct property owner to trim the tree back to required height and width clearances based on ADA standards. **(\$)**
- **Medium Priority** – Location 11: Improve the sidewalk to meet ADA compliance standards and move the light pole out of the sidewalk path. **(\$\$\$)**
- **Medium Priority** – Location 12: Work with property owners to maintain their vegetation outside of the sidewalk area or remove nuisance vegetation from within the ROW. **(\$)**
- **Low Priority** – Consider a roadway reconfiguration for Palmer Park Boulevard that includes reducing the two lanes in each direction to one lane in each direction. Medians, turn lanes and/or multiuse shoulders can occupy the additional roadway width. Roadway reconfiguration can slow down vehicles, prevent overturning crashes and provide safer environment for pedestrians. **(\$\$\$)**
- **Low Priority** – Location 2: Ensure that Palmer Park Boulevard is on a routine landscaping and weed control maintenance schedule. **(\$)**
- **Low Priority** – Location 5: Evaluate drainage at the intersection; consider street cleaning maintenance at the intersection **(\$/\$\$\$)** Cost depends on drainage issue and level of effort is needed to repair.
- **Low Priority** – Location 6: Evaluate drainage; street cleaning maintenance should also be considered to reduce weeds and debris **(\$\$/\$\$\$)** Cost depends on level of potential drainage issue and corresponding level of effort to repair.

Table 16 - Palmer Park Boulevard Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	

Location Number	Photo	Location Number	Photo
3		4	
5		6	
7		8	

Location Number	Photo	Location Number	Photo
9		10	
11		12	

B Street

The B Street segment is a 4-lane road with a striped two-way left-turn lane located between Academy Boulevard and Highway 85, north of Fort Carson as shown in **Figure 18**. The 40 MPH corridor is adjacent to active railway to the west with residential and low-density commercial to the east.



Figure 18 - B Street Study Area

The crash data identifies that rear-end crashes are the predominant crash types at this location. There were 18 crashes between 2015 through 2019, including no fatality, six injury and 12 PDO crashes. Six of the crashes occurred with non-ideal (icy) road conditions, and ten occurred during nighttime hours. One pedestrian-involved crash was reported. No bicycle crashes were reported. **Table 17** summarizes the five-years of crash data reported at this segment.

Table 17 - B Street Crash Data

Severity		Road Conditions		Time of Day				Type of Crash				Total Number of Crashes
Injury	PDO	Dry	Icy	Dark - Lighted	Dark - Unlighted	Dawn or Dusk	Daylight	Pedestrian	Rear - End	Sideswipe (SD)	Fixed Object	
6	12	12	6	4	6	1	7	1	5	4	8	18

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 19** and **Table 18** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the segment of B Street.



Figure 19 - B Street Safety Issues Map

The audit findings included:

- B Street is a very wide street with many wide or redundant access drives, many of which are adjacent to intersections. It was observed that drivers turning onto B Street would struggle with access drive conflicts and associated right-of-way entering onto B Street.
- Sight distances were limited at certain access driveways due to curvature in the roadway.
- Most drivers observed in this segment seemed very familiar with the area in general and it was common to see speeding vehicles.
- Pedestrians were observed using the sidewalk facilities along this segment and struggling with the deficiencies in the quality of sidewalk and connectivity of sidewalk.

- The bus stops along the northwest side of B Street were poorly maintained and had overgrowth of the adjacent grass covering the bus stops.
- The nighttime visit indicated that the street signs had appropriate reflectivity; however, striping is difficult to see and lacks reflectivity. It was very difficult to navigate and stay in the correct lane due to how dark it was on B Street. There was very minimal lighting from the adjacent land uses to light up the roadway.
- Location 1: Wide roadway promotes speeding due to higher capacity with lower traffic volumes. Speeding contributes to increasing the severity of crashes.
- Location 2: Sand and gravel accumulation in a curb ramp may be attributed to corridor and intersection drainage flow issues. At curb ramps, drainage deposits impact pedestrian safety and accommodation. Ponding during wet conditions and ice during snow conditions could create safety issues.
- Location 3: Drainage treatments like those seen near Chamberlin Street should be reviewed to help address intersection drainage issues.
- Location 4: Weeds growing in the sidewalk can be a sign of potential drainage issues. In this location, the asphalt surface is not ADA compliant.
- Location 5: Ponding in gutter pan indicates potential drainage issues during weather events. This could negatively impact drivers that traverse through the ponding or potential icing during winter.
- Location 6: Bus stops along the corridor should be evaluated for ADA compliance and access. Stop access includes the path to the stop and the street crossings.
- Location 7: Old asphalt sidewalk seen throughout the corridor does not meet ADA standards. In some cases, it could cause pedestrians to use the roadway to avoid ADA related issues.
- Location 8: Landscape bed on the sidewalk at the Hampton St intersection creating a narrow path for pedestrians and can cause a safety issue.
- Location 9: Location of an unmaintained bus stop that can be seen at multiple locations along the corridor. These stops are not ADA compliant and should be reevaluated for improvement or removal.
- Location 10: Paved area outside of the curb is not ADA compliant. In some cases, it may cause pedestrians to use the roadway.
- Location 11: Paved area outside of the curb and curb ramp are not ADA compliant. In some cases, it may cause pedestrians to use the roadway.
- Location 12: Paved area outside of the curb is not ADA compliant. In some cases, it may cause pedestrians to use the roadway.
- Location 13: Crosswalk ends at an inlet and does not provide an ADA compliant pedestrian ramp. This causes pedestrians to walk in the roadway and can create confusion for drivers.
- Location 14: The intersection is not ADA compliant as it is missing the sidewalk/curb ramp/landing area. This causes pedestrians to potentially interact with vehicles in the curb radii area.
- Location 15: Pedestrian signal head is high. An ADA compliance evaluation for signal heads and push buttons to meet current standards is important for both compliance and accommodation.
- Location 16: The intersection is missing the sidewalk/curb ramp/landing area. This causes pedestrians to potentially interact with vehicles in the curb radii area.

- Location 17: Worn pavement markings were observed throughout the intersection, including crosswalks and stop bars. Reflective striping channelizes traffic and improves nighttime driving conditions.
- Location 18: Sight distance issue that can cause vehicles to not see oncoming traffic. Vehicles need to drive into the intersection more to improve sight triangles to see around the black fence. Sight obstructions can contribute to broadside, approach turn, and sideswipe crashes.
- Location 19: Fence is within sight triangle to view oncoming traffic. Sight obstructions can contribute to broadside, approach turn, and sideswipe crashes.
- Location 20: The signal heads at the Crestridge Avenue intersection are missing backplates. Signal heads without backplates can reduce signal head visibility. This can contribute to rear-end, sideswipe (same direction), broadside, and approach turn crashes.





The recommended countermeasures included:

- **High Priority** – Review the striping plan and maintenance schedule for B Street. (\$\$) In high-volume areas or where road sand may rub the paint off quickly, consider a double layer of paint to provide more material and vertical paint height to add durability and treatment duration.
- **High Priority** – Location 17: Maintain the intersection on a regular re-striping schedule (\$). If paint is wearing prematurely, consider double-layer painting to provide more material and additional vertical paint depth.
- **Medium Priority** – Implement leading pedestrian intervals (LPI) into the signal timings to improve pedestrian crossing safety. This provides additional visibility of pedestrians from vehicles. (\$)
- **Medium Priority** – Consider developing an access management plan to improve driveway spacing and configuration and installing a center median to reduce the number of full access driveways. This will also assist in reducing vehicle speeds and providing pedestrian refuges to cross B Street. Median refuge areas are recommended when the crossing distance is greater than 60-feet. (\$/\$\$\$) Cost depends on size of project and locations of medians.
- **Medium Priority** – Install street lighting along B Street. B Street is very dark at nighttime and additional lighting can improve safety during nighttime conditions. It will also improve safety for pedestrians out at night. (\$\$\$) Cost depends on existing infrastructure and extent of project.
- **Medium Priority** – Location 2: Evaluate drainage at the intersection; consider street cleaning maintenance at the intersection (\$/\$\$\$) Cost depends on drainage issue and level of effort is needed to repair.
- **Medium Priority** – Location 4: Corridor drainage should be evaluated. The sidewalk should be further evaluated and upgraded for ADA compliance. (\$/\$\$\$).
- **Medium Priority** – Location 6: Coordinate with Mountain Metro Transit (MMT) to evaluate ADA compliance needs and/or alternate locations for bus stops. Coordinate stop locations with EPC relating to potential street crossings, ADA compliance and access. (\$/\$\$\$)
- **Medium Priority** – Location 7: Construct paved sidewalk to provide an ADA compliant path for all pedestrians. (\$\$\$)

- **Medium Priority** – Location 8: Evaluate if narrowing the landscape bed is warranted or should be adjusted if EPC owns and maintains it
- **Medium Priority** – Location 9: Coordinate with Mountain Metro Transit (MMT) to evaluate ADA compliance needs and/or alternate locations for bus stops. Coordinate stop locations with EPC relating to potential street crossings, ADA compliance and access. **(\$/\$\$\$)**
- **Medium Priority** – Location 10: Replace the paved areas with sidewalks to provide safe and ADA compliant infrastructure for pedestrians. **(\$\$/\$\$\$)** If not part of the EPC maintained Right of Way, this could be a costly project.
- **Medium Priority** – Location 11: Replace the adjacent paved areas with sidewalks and install updated curb ramp to provide safe and ADA compliant infrastructure for pedestrians. If not part of the EPC maintained Right of Way, this could be a costly project. **(\$\$\$)**
- **Medium Priority** – Location 12: Update older infrastructure and replace the adjacent paved areas with sidewalks and install updated driveway transitions to provide safe and ADA compliant infrastructure for pedestrians. If not part of the EPC maintained Right of Way, this could be a costly project. **(\$\$\$)**
- **Medium Priority** – Location 13: Relocate the pedestrian crossing/crosswalk so it is out of the inlet area and install curb ramps **(\$\$\$)**
- **Medium Priority** – Location 14: Upgrade older infrastructure to newer ADA standards and stripe the crosswalk to align with new pedestrian ramps/landing areas. **(\$\$\$)**
- **Medium Priority** – Location 15: Evaluate if the pedestrian signal heads should be relocated. **(\$/\$\$\$)** Cost depends on recommendations.
- **Medium Priority** – Location 16: Upgrade older infrastructure to make the intersection compliant with newer ADA standards. Stripe the crosswalk straight across to avoid confusion, particularly for those that are visually impaired. **(\$\$\$)**
- **Medium Priority** – Location 18: If owned by EPC, consider relocating the fence or evaluating other types of sight distance improvements for the intersection. **(\$/\$\$\$)**
- **Medium Priority** – Location 19: If owned by EPC, consider relocating the fence or evaluate other types of sight triangle improvements for the intersection. **(\$/\$\$\$)**
- **Medium Priority** – Location 20: Install signal heads with backplates to increase intersection signal visibility to drivers **(\$\$/\$\$\$)** Cost varies if the signal heads can be retro fitted with backplates or if new cables or poles would also be needed for the additional weight.
- **Low Priority** – Update the traffic signals along B Street to meet current standards and add communication/interconnect capabilities. Providing updated traffic signals will also improve signal visibility, potentially reducing rear-end crashes. This countermeasure should be considered if an updated striping plan and corridor signal timings do not result in a reduction of crashes. **(\$\$\$)**
- **Low Priority** – Consider Dynamic Speed Feedback signs along the segment to improve driver awareness of speeds. **(\$\$)**





- **Low Priority** – Consider a roadway reconfiguration for B Street that includes reducing the two lanes in each direction to one lane in each direction. This should be considered as part of a larger corridor study in a coordinated effort. Medians, turn lanes and/or multiuse shoulders can occupy the additional roadway width. Roadway reconfiguration can help to reduce speeds, prevent overturning crashes, and provide a safer environment for pedestrians. **(\$\$\$)**
- **Low Priority** – Location 1: Conduct a coordinated corridor study to develop a plan for addressing safety concerns and the potential over-built roadway. Medians and multiuse shoulders can occupy the additional roadway width. A potential roadway reconfiguration can help vehicle speeds, assist in preventing overturning crashes and provide safer environment for pedestrians. **(\$\$\$)**
- **Low Priority** – Location 3 and 5: Drainage should be evaluated along the corridor. **(\$\$/\$\$\$)** Cost depends on drainage issue and what level of effort is needed to repair.

Table 18 - B Street Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	
3		4	

Location Number	Photo	Location Number	Photo
5		6	
7		8	
9		10	

Location Number	Photo	Location Number	Photo
11		12	
13		14	
15		16	

Location Number	Photo	Location Number	Photo
17		18	
19		20	

Academy Boulevard

The Academy Boulevard segment is a 5-lane to 6-lane expressway generally located between B Street and Bradley Road as shown in **Figure 20**. Northeast of this segment, Milton E Proby Parkway terminates into Academy Boulevard and Academy Boulevard provides access to Highway 85, Highway 115, and Interstate 25. The posted speed limit is 45 MPH. Notable adjacent uses include Pikes Peak Community College, Walmart Supercenter, and Fort Carson.



Figure 20 - Academy Boulevard Study Area

The crash data identifies head-on crashes are the predominant crash types at this location. There were 26 crashes between 2015 through 2019, including no fatality, 18 injury and 52 PDO crashes. Eleven of the 18 injury crashes were the result of fixed object crashes. Eight of the crashes occurred with non-ideal road conditions (icy or wet), and 22 crashes occurred during nighttime hours. No pedestrian or bicycle crashes were reported. Table 19 summarizes the five-years of crash data reported at this segment.

Table 19 - Academy Boulevard Crash Data

Severity		Road Conditions			Time of Day				Type of Crash					Total Number of Crashes
Injury	PDO	Dry	Icy	Wet	Dark - Lighted	Dark - Unlighted	Dawn or Dusk	Daylight	Head-On	Overturning	Rear-End	Sideswipe (SD)	Fixed Object	
18	52	62	4	4	14	8	5	42	1	1	40	11	17	70

Field Reviews, Audit Findings and Countermeasures

The field visits consist of driving all the roadways approaching and departing from the project area. Field visits are completed at multiple times of day including peak periods of travel (when the highest number of vehicles are on the roadway, typically morning and evening commuter periods), off peak periods and nighttime visits. In addition, the team walks the project area documenting roadway features, issues, and to observe traffic operations from various points.

The following **Figure 21** and **Table 20** provide the RSA investigation findings of safety issues relating to the crash data and field observations for the segment of Academy Boulevard.

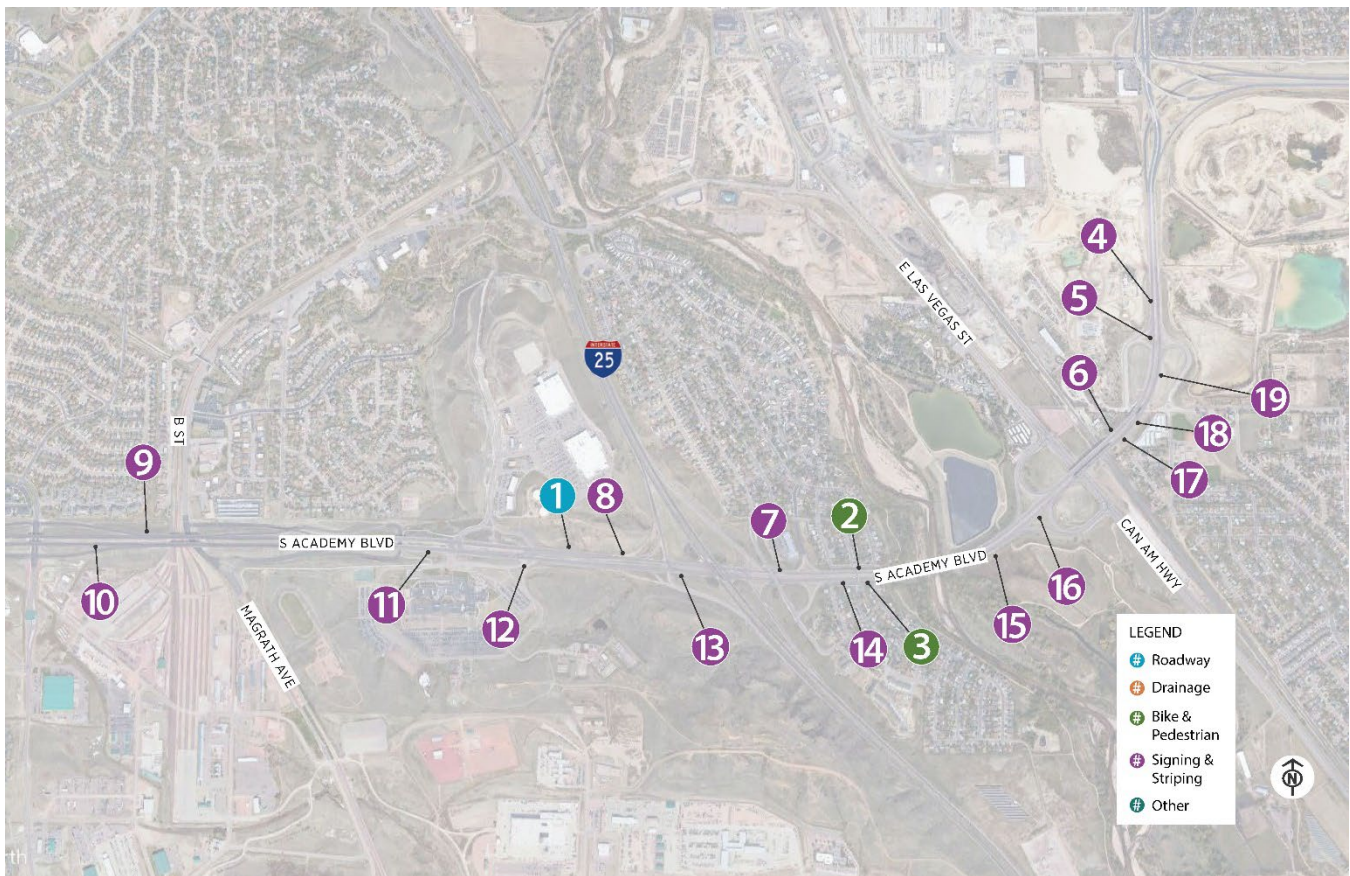


Figure 21 - Academy Boulevard Safety Issues Map

The audit findings included:

- Academy Boulevard has wayfinding and signage issues such as: the location of signage is in the incorrect location, damaged, bent, turned away from the roadway, or incorrectly indicating the start and end of lanes. Incorrect or misleading signage can increase rear-end and side-swipe crashes along Academy Boulevard.
- Congestion along Academy Boulevard occurs during the morning and evening commuter peak periods. It was observed that the eastbound left turn to north I-25 backs up into the main through lanes. Additionally, the ramp traffic for north I-25 back onto Academy Boulevard compounding the congestion. This congestion adds to the rear-end crashes within the study area.
- The nighttime visit indicated that the street signs had appropriate reflectivity; however, striping is difficult to see and lacks reflectivity. It was very difficult to navigate and stay in the correct lane due to how dark Academy Boulevard is. There was very minimal lighting from the adjacent land uses to light up the roadway. After the in-field evaluations were conducted, striping has been redone and the corridor from Venetucci Boulevard to Milton Proby Parkway is slated for a major widening project which will address other striping and sign issues.
- The South Academy Corridor will be undergoing significant improvements with a joint CDOT and EPC project with the Military Access, Mobility & Safety Improvement Project (MAMSIP) grant and with a Pikes Peak Rural Transportation Authority (PPRTA) project.

- Location 1: RIGHT LANE MUST TURN RIGHT Sign (R3-7) partially covered by vegetation and can cause drivers to shift lanes or stop suddenly if not visible. Poor visible signs cause rear end and sideswipe (same direction) crashes.
- Location 2: Bus stop located on westbound Academy Boulevard near the Coventry Drive exit is not ADA compliant. There are only multiuse shoulders for pedestrians to use the bus stop and could cause pedestrians to encroach on the roadway.
- Location 3: This bus stop located very close to the roadway going eastbound on Academy Boulevard near the Hartford St on ramp is not ADA compliant. There are only multiuse shoulders for pedestrians to use the bus stop and could cause pedestrians to encroach on the roadway.
- Location 4: RIGHT LANE MUST TURN RIGHT sign (R3-7) is the incorrect sign and can cause drivers to shift lanes or stop suddenly if not visible. Poor visible signs cause rear end and sideswipe (same direction) crashes.
- Location 5: MERGE sign (W4-1) placed before the Bradley Road ramp converges and a lane is added. The signage is incorrectly placed and causes confusion for drivers. It also can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 6: RIGHT LANE MUST EXIT sign (R3-33) posted after a guide sign and is confusing to drivers. It is also hard to see. Poor visible signs cause rear end and sideswipe (same direction) crashes.
- Location 7: Exit sign for Colorado Springs traveling westbound on Academy Boulevard with no signs alerting drivers that the right lane is exit only. The signage is incorrect and creates confusion for drivers. It also can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 8: SIGNAL AHEAD signs (W3-3) with destination signs pointing towards the community college. Confusing or incorrect signage letter can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 9: RIGHT LANE MUST TURN RIGHT sign (R3-7) posted after the solid white stripe when there is no additional signage located before warning of the exit only. Confusing or not visible can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 10: Faded MERGE sign (W4-1) Confusing or not visible can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 11: RIGHT LANE MUST TURN RIGHT sign (R3-7) posted after the solid white line with no additional signage located before it. This causes drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 12: Street sign directing drivers towards Venetucci Boulevard and PPCC is difficult to see as a driver. This causes drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 13: Damaged sign heading eastbound directing drivers towards Hartford Street. Lack of visible sign can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 14: Lane ends with no striping or signage. This causes drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 15: RIGHT LANE MUST TURN RIGHT sign (R3-7) posted after the solid white stripe for the eastbound Fountain exit when there is no additional signage located before warning of the exit only. This

causes drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.



- Location 16: Faded MERGE sign (W4-1) Lack of visible sign can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 17: Small Bradley Road guide sign headed eastbound on Academy Boulevard does not meet current standards. Lack of visible sign can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 18: RIGHT LANE MUST EXIT sign (R3-33) is difficult to see at the appropriate time. Lack of visible sign or location of sign can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.
- Location 19: R3-5 sign located after the solid white line with no additional signage warning of the right lane exit only. The location of the sign can cause drivers to shift lanes or stop suddenly which can cause rear end and sideswipe (same direction) crashes.

The recommended countermeasures are:

- **High Priority** –At the time of the in-field review, there was limited visible striping in the dark. If paint is wearing prematurely with the new restriping or corridor improvements, consider double-layer painting to provide more material and additional vertical paint depth. **(\$/\$\$)**
- **High Priority** – Consider completing an update to the signal timings along Academy Boulevard to improve efficiency within a congested corridor and reduce congestion-related crashes such as rear-end crashes. Updated and coordinated signal timings can contribute to improved travel conditions and reduced delays. Also, conducting a review of the current red and yellow times to understand if they provide enough time to reduce rear-end crashes. **(\$)**
- **High Priority** – Improve street lighting along Academy Boulevard. Nighttime observations concluded Academy Boulevard is very dark and drivers have difficulty seeing the roadway and intersections. This can contribute to rear-end and sideswipe (same direction) crashes. **(\$/\$/\$/\$)** Cost depends on the existing infrastructure and if additional lighting can be added to existing poles or new poles would be needed.
- **High Priority** – Complete a wayfinding, warning, and regulatory signing review along Academy Boulevard to assist navigation efforts and help prevent rear-end and sideswipe (same direction) crashes. **(\$/\$\$)**
- **Medium Priority** – Location 1: Ensure Academy Boulevard landscaping is regularly maintained. **(\$)**
- **Medium Priority** – Location 2: Coordinate with Mountain Metro Transit (MMT) to evaluate ADA compliance needs and/or alternate locations for bus stops. Coordinate stop locations with EPC relating to potential street crossings, ADA compliance and access. **(\$/\$/\$/\$)**
- **Medium Priority** – Location 3: Coordinate with Mountain Metro Transit (MMT) to evaluate ADA compliance needs and/or alternate locations for bus stops. Coordinate stop locations with EPC relating to potential street crossings, ADA compliance and access. **(\$/\$/\$/\$)**
- **Medium Priority** – Location 4: The R3-7 should be replaced with an R3-33. **(\$)**
- **Medium Priority** – Location 5: The MUTCD states that the ADDED LANE Sign (W4-3) should be used when two roadways converge but no merging is required (pg. 126) **(\$)**
- **Medium Priority** – Location 6: Consider overhead signs, re-stripe the acceleration/deceleration lane with a wide dotted line to increase visibility, as specified by the MUTCD. **(\$\$)**

- **Medium Priority** – Location 7: Signing and striping should be evaluated at this location to warn the drivers that are merging onto Academy Boulevard that there is only approximately 300' before the lane becomes a right turn only. (\$/\$\$)
- **Medium Priority** – Location 8: Verify the destination sign is the correct size and is using a font size visible to drivers; consider installing a separate guide sign approaching the intersection. (\$)
- **Medium Priority** – Location 9: The R3-7 should be replaced with an R3-33. The striping for the acceleration/deceleration lane should be a wide dotted stripe. (\$)
- **Medium Priority** – Location 10: Make sure signs on Academy Boulevard are regularly maintained and replaced when needed. (\$)
- **Medium Priority** – Location 11: Evaluate adding an additional R3-7 sign upstream of the current sign and update striping to meet current standards. (\$)
- **Medium Priority** – Location 12: Verify that the street sign is to the current standard and legible to drivers. (\$)
- **Medium Priority** – Location 13: Fix the sign and ensure signs on Academy Boulevard are regularly maintained and replaced when needed. (\$)
- **Medium Priority** – Location 14: Remove the yield signage and add a merge warning sign. (\$)
- **Medium Priority** – Location 15: The R3-7 should be replaced with an R3-33. Considering overhead guide signs and modifying the striping for the dropped lane approaching the exit would also provide benefit. (\$/\$\$\$)
- **Medium Priority** – Location 16: Replace sign. (\$)
- **Medium Priority** – Location 17: Replace sign with sign that meets current standards. Signs along Academy Boulevard should be consistent in size and evaluated to see if they are the correct size. (\$)
- **Medium Priority** – Location 18: Consider overhead guide signs and re-stripe the acceleration/deceleration lane with a wide dotted line, as specified by the MUTCD. This would apply to both directions of Academy Boulevard. (\$\$\$)
- **Medium Priority** – Location 19: Relocation and replaced with an R3-33. (\$)

Table 20 - Academy Blvd Potential Safety Issues and Possible Countermeasures

Location Number	Photo	Location Number	Photo
1		2	

Location Number	Photo	Location Number	Photo
3		4	
5		6	
7		8	

Location Number	Photo	Location Number	Photo
9		10	
11		12	
13		14	

Location Number	Photo	Location Number	Photo
15		16	
17		18	
19			