LOCAL ROADWAY SAFETY PLAN
CITY OF TEHACHAPI

JUNE 2022

Prepared for:
City of Tehachapi
Department of Public Works
115 S Robinson Street
Tehachapi, CA 93561

Prepared By:

1100 Corporate Center Drive, Suite 201
Monterey Park, CA 91754
T: 323.260.4703 | F: 323.260.4705
www.koacorp.com

JC11069

Table of Contents

List of Figures

List of Tables

Appendices

1.0 EXECUTIVE SUMMARY

The California Department of Transportation (Caltrans) established a program for cities to prepare a Local Roadway Safety Plan (LRSP) to identify safety needs and recommend projects to address these needs. This document serves as the LRSP for the City of Tehachapi.

OVERVIEW

An LRSP analyzes collision data, assesses infrastructure deficiencies through an inventory of roadway system elements, and identifies roadway safety solutions on a citywide basis. The State created the LRSP to help local agencies develop safety projects that can be submitted for funding by the Highway Safety Improvement Program (HSIP). HSIP Cycle 11, expected around May 2022, and subsequent cycles will require an LRSP or equivalent plans such as a Vision Zero Plan or System Safety Analysis Report.

This report has been prepared per Caltrans LRSP guidelines and the *Caltrans Local Roadway Safety Manual* (LRSM) version 1.5 dated June 2020. The general content of this LRSP report follows this outline:

- Crash data source and analysis techniques
- Crash data analysis results and highest occurring crash types
- High-risk corridor and intersection analysis and safety countermeasures
- Cost estimates of recommended improvements
- Prioritization of projects based on cost-benefit ratio and effectiveness of safety improvement
- Strategies for safety project implementation
- Traffic safety enforcement size analysis based on Office of Traffic Safety (OTS) data

The LRSP fulfills the following purposes:

- Identify the highest occurring collision types and the roadway characteristics contributing to the collisions.
- Identify high-risk corridors and intersections.
- Propose safety countermeasures to address the safety issues.
- Prioritize safety improvement projects based on benefit/cost ratio and other considerations.

PROMINENT COLLISION PATTERN

Five years of collision records were utilized from January 1, 2015 to December 31, 2019, adhering to the maximum period permitted by the HSIP for a safety infrastructure project application for federal funding. The collisions were categorized by severity, collision type, Primary Collision Factor (PCF), involved parties, lighting conditions, and facility type (signalized intersections, non-signalized intersections, and mid-block locations). A total of 408 crashes were recorded from 2015 to 2019. The following summarizes the collision patterns within the City:

- The most common collision types were broadside, rear-end, and sideswipe.
- Most of the collisions occurred from 12 PM to 3 PM
- At-fault motorists in collisions in Tehachapi tended be young drivers between the age group of 15 and 19 - about 20 percent of collisions

SAFETY MEASURES

The following transportation safety emphasis areas were identified based on the collision data analysis:

- Young Drivers
- Pedestrian Safety
- Driving Under the Influence
- Speeding and Rear End Collisions
- Elderly Drivers
- Automobile Right-of-Way/Broadside Collisions
- Unsafe Speeding

In addition to the transportation safety emphasis areas as mentioned above, non-engineering safety measures address traffic safety concerns through education, encouragement, and enforcement. Several state and federal grant programs offer funds for non-engineering roadway safety projects, as shown below:

- Advanced Transportation and Congestion Management Technologies Deployment Program (ATCMTD)
- Active Transportation Program (ATP)
- Sustainable Communities Grant Program
- California Office of Traffic (OTS) Safety Grants (NHTSA funding)

2.0 INTRODUCTION

The Kern County Council of Governments (COG) has retained KOA Corporation (KOA) to develop a Local Roadway Safety Plan (LRSP) for the City of Tehachapi. Traditionally, agencies have selected safety projects based on historical crash records, focusing on sites with a concentration of recent severe collisions. The LRSP shares a similar framework with the California Statewide Strategic Highway Safety Plan (SHSP), which focuses on engineering and non-engineering solutions towards roadway safety issues. The LRSP identifies the most common collision categories across a roadway network to target projects that address the factors associated with those categories. The LRSP allows agencies to assess risks before a collision by focusing on causal factors rather than collisions. Systemic improvements target broader geography than the traditional spot location improvements. The systemic project selection favors the broad implementation of cost-effective countermeasures.

2.1 FOUR E'S OF SAFETY

The LRSP does not only focuses on engineering improvements to mitigate crashes. The LRSP also addresses the safety improvements in other areas such as enforcement, education, and emergency services. According to the SHSP 2020-2024, two-thirds of all crashes result from aggressive driving. Male drivers are more likely to be at fault in aggressive driving-related crashes regardless of age. Making roadways safer requires the Four E's (Engineering, Enforcement, Education, and Emergency Services). Working together with the Four E's at the city level will help make city roads safer.

2.2 PURPOSE OF THE LRSP

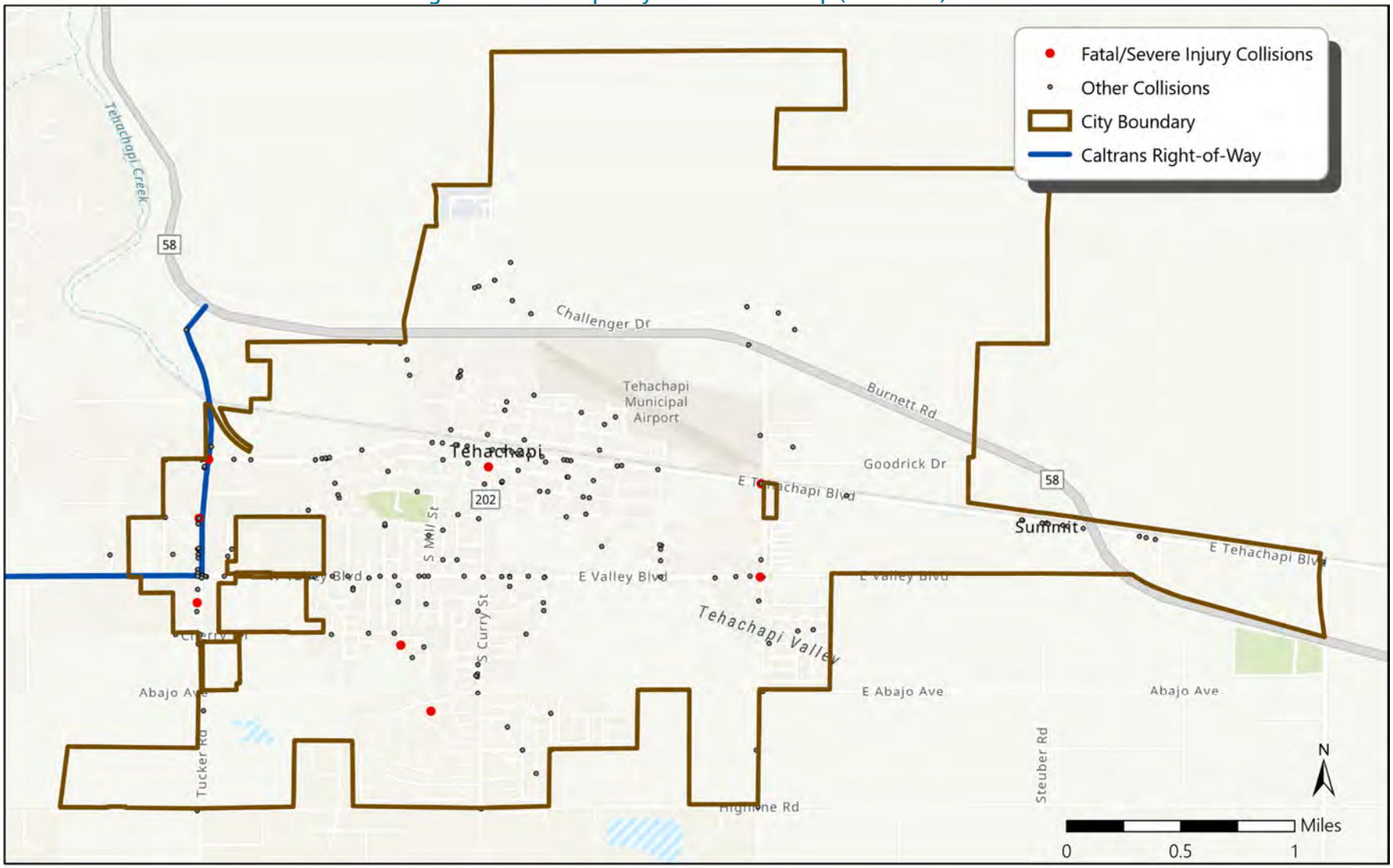
The LRSP systematically identifies and analyzes safety problems and recommends safety improvements. LRSP helps in understanding the safety issues at local not only through data-driven but also by outreaching out to the community. The goal is to reduce fatality and severe injury collisions. The results of the LRSP are summarized with a prioritized list of improvements and actions.

2.3 CITY OF TEHACHAPI

Tehachapi is a city located in the Tehachapi Mountains in Kern County. According to the 2010 census, the City had a population of 14,414; the US Census estimated the 2020 population at 19,939.

Based on the Statewide Integrated Traffic Records System (SWITRS) database, between January 2015 and December 2019, there were 408 collisions in Tehachapi, of which 2.3% resulted in fatal and severe injuries. **Figure 2.1** illustrates a map of the collisions citywide.

Figure 2.1: Tehachapi Citywide Collision Map (2015-2019)



Source: SWITRS, 2015-2019

2.4 LRSP OVERVIEW

The LRSP project includes four primary tasks. The following sections include a brief description of the tasks associated with this project, with a more detailed description of each task in subsequent sections of this document.

2.4.1 Data Collection

A comprehensive Geographic Information Systems (GIS) project database was developed by utilizing the following data:

- Five years (1/1/2015 to 12/31/2019) of collision data collected via the SWITRS collision database
- Location of signalized intersections

2.4.2 Safety Data Analysis

Following the comprehensive GIS project database development, the collision data was analyzed for the City of Tehachapi. Collisions were compared to the safety emphasis areas defined in the California SHSP. The safety data analysis is summarized in Section 4 of this document. The transportation emphasis areas are identified based on the collision data analysis and are discussed in Section 5 of this document.

2.4.3 Identify Safety Measures

In coordination with city staff, a list of engineering-related safety countermeasures and non-engineering safety measures were developed for use as recommendations in this LRSP. These countermeasures are discussed in Section 6 and Section 7 of this document.

2.4.4 Develop Safety Projects and Cost Estimation

Roadways and intersections were ranked based on the collision frequency. The top locations of interest will be investigated for further evaluation and potential safety improvements. The improvements include signal hardware improvement, additional warning signage, and bikeway-related features. Planning-level cost estimations are provided for each safety project. The list of safety projects are prioritized based on the following considerations:

- Benefit/Cost Ratio (for engineering solutions only)
- Funding availability for engineering and non-engineering programs
- Other factors recommended by city staff

The safety projects and cost estimates are discussed in Section 8 of this document.

3.0 METHODOLOGY

3.1 COLLISION DATA SOURCES

The collision data drew from two sources. The collision trend data was derived between 2015 and 2019 from the California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) database and the University of California, Berkeley's Transportation Injury Mapping System (TIMS).

3.1.1 SWITRS

The California Highway Patrol's SWITRS database contains data on statewide collisions. The SWITRS application provides geographically- and temporally-targeted collision reports in an electronic format. KOA used SWITRS to evaluate data on Tehachapi collisions between 2015 and 2019, both in aggregate and classified by control type (signalized, non-signalized, and midblock locations).

3.1.2 TIMS

The TIMS database contains geocoded collisions included in the SWITRS database. TIMS geocodes SWITRS collisions that involve either an injury or fatality (i.e., excluding property damage-only collisions). Thus, TIMS provides local agencies with an efficient and straightforward tool to conduct geographic analysis.

3.2 IDENTIFYING LOCATIONS FOR ENGINEERING COUNTERMEASURES

Crash data analysis for this LRSP was conducted using collision data from the SWITRS collision database. The collision records include a variety of information about each collision, including the location, date, time of the day, crash type, crash severity, primary violation category, transportation mode of the involved parties, and movement of the involved parties prior to the collision. Per California state law, motor vehicle collisions must be reported when vehicle or property damage exceeds $1,000, or when any parties suffer an injury or fatality. Collisions with no injured parties or little property damage might not be reported and, therefore, are not included in the collision database.

Caltrans' *Local Roadway Safety, A Manual for California's Local Road Owners*, Version 1.5, April 2020 (LRSM) encourages a pro-active rather than reactive approach to safety issue identification. Traditionally, agencies using a reactive approach have located and implemented safety projects solely based on recent crashes, specific crash concentrations, or safety issues raised by stakeholders. According to the LRSM, a proactive approach is preferred because with traditional methods, "crash concentrations and crash trends may be missed if local agencies rely exclusively on these identifiers for their roadway safety effort." A proactive approach would identify safety improvements by analyzing the safety of the entire roadway network. For this document, the process for identifying candidate locations for safety improvements considers any one of the following three factors:

- An extensive crash history at high-collision frequency locations provides insight into which roadway characteristics are associated with certain types of crashes
- Professional engineering judgment regarding the availability of feasible engineering countermeasures to fix the safety issues
- Applicability of the engineering countermeasures at other locations with roadway characteristics associated with similar types of crashes regardless of their crash history

The LRSM guidelines require analyzing at least three to five years of the most recent crash data. Five years of collision data from January 2015 to December 2019 was reviewed for the Arvin LRSP. The collision data adhere to the maximum threshold permitted by the Highway Safety Improvement Program (HSIP) for a safety infrastructure

project application for federal funding.

3.2.1 Ranking Function

A candidate intersection or roadway segment for safety improvements does not necessarily need to demonstrate a history of high or severe collisions to be considered for further evaluation. However, locations with high numbers of collisions are often good starting points for safety analysis due to the rich information provided by the collision history. Two ranking methods were utilized to identify high collision frequency intersections and roadway segments: Average Crash Frequency and Equivalent Property Damage Only (EPDO) scores. A brief description of each of the methods is provided in the following sections.

3.2.2 Average Crash Frequency

The average Crash frequency is the most basic method for assessing collision incidence. The analysis tallies the number of collisions at each location in the system, both aggregate and by category of interest (e.g., level of severity, collision type, etc.). The analysis then ranks intersection or roadway segments based on the collisions' frequency.

3.2.3 EPDO Scores

Equivalent Property Damage Only (EPDO) scores are calculated by assigning weighted factors to collisions by severity relative to property damage only collisions. The weights generally reflect the order of magnitude difference between the societal cost of fatal and severe injury collisions versus the non-severe injury collisions. **Table 3.1** shows the weights by collision severity, based on the Caltrans Local Roadway Safety Manual (LRSM), April 2020.

Table 3.1: Collision Weight by Severity

Collision Severity	Location Type	Crash Cost
**Fatality and Severe Injury	Signalized Intersection	$1,590,000
	Non Signalized Intersection	$2,530,000
Combined (KA)	Roadway	$2,190,000
Evident Injury – Other Visible (B)	-	$142,300
Possible Injury–Complaint of Pain (C)	-	$80,900
Property Damage Only (O)	-	$13,300

EPDO scores are useful for a benefit-to-cost analysis as collision costs can be translated into measurable benefits from installing improvements that reduce the collisions in question. However, EPDO scores may place undue weight on the injury outcomes of previous collisions rather than overall trends suggested by collision patterns regardless of injury outcome. Furthermore, a location's EPDO score could be inflated by a fatal or severe collision caused by DUI.

3.3 PROPOSING ENGINEERING COUNTERMEASURES

After ranking the intersections and roadway segments, the following steps were used to propose engineering countermeasures:

- Make citywide collision maps for dominant collision types such as rear-end collisions, broadside collisions, bicycle/pedestrian collisions, and collisions due to unsafe speed. Identify high-risk locations by collision type.
- Review crash details (party involved, movement before the crash, primary collision factor, violation code, time of the day, and others) at high-risk locations.
- Review field conditions through physical site visits in the City. Assess the nature of prevalent crash types with respect to the intersection's control type, geometrical features, and signal phasing/timing.
- Review past conditions via Google Map Street View, whenever necessary, to check whether any geometry, signal, or signage changes have been made in the past few years.
- Evaluate and screen countermeasures from the LRSM or Crash Modification Factor (CMF) Clearinghouse (http://www.cmfclearinghouse.org/), a searchable database that can be easily queried to identify CMFs and Crash Reduction Factors (CRFs).
- Identify intersections/roadway segments that do not have a demonstrated crash history but resemble other locations with documented crash history and risk factors. Once identified, these locations can be analyzed through the steps mentioned above.

4.0 SYSTEMIC SAFETY ANALYSIS – COLLISION TREND AND PATTERNS

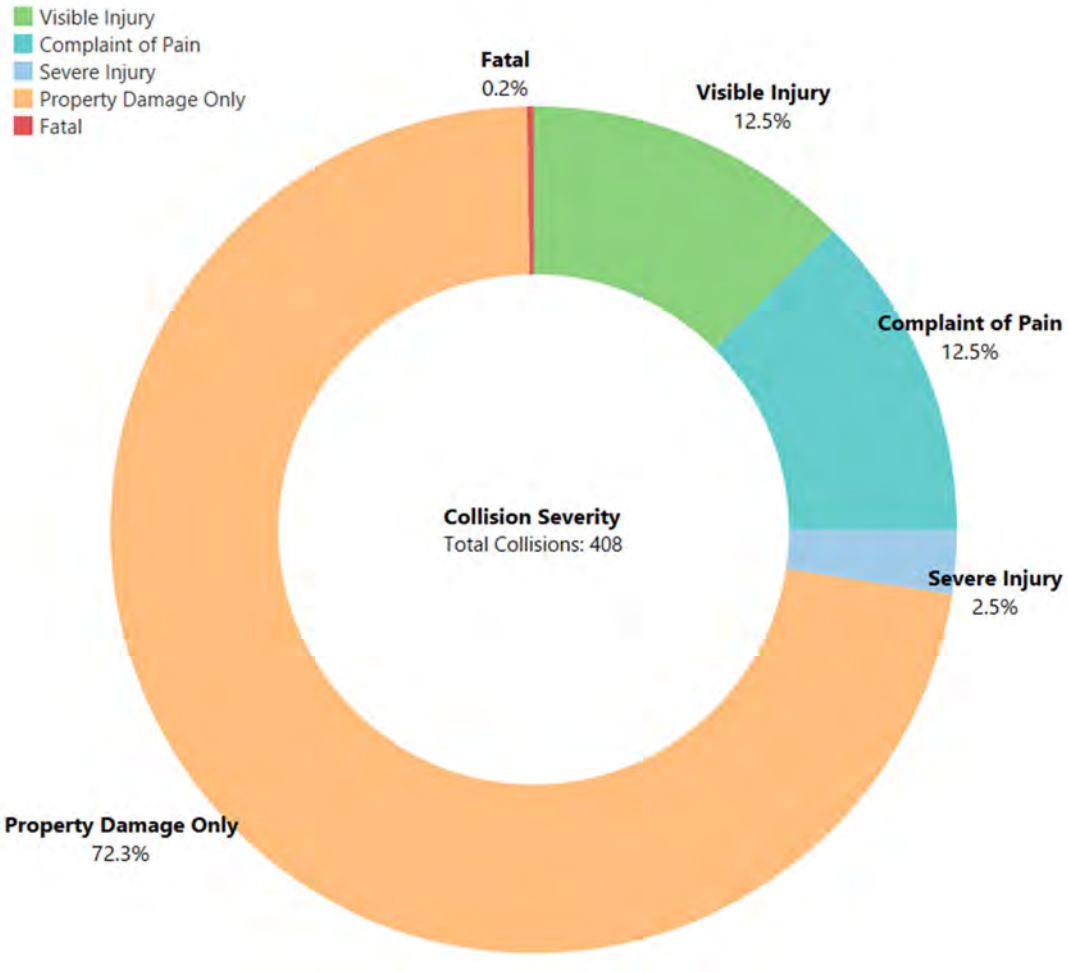
4.1 PRELIMINARY COLLISION ANALYSIS

4.1.1 Year Trend

From 2015 to 2019, a total of 408 collisions occurred on city roadways. Approximately 2.7 percent of collisions resulted in fatal or severe injuries (KSI), as shown in **Figure 4.1**. **Figure 4.2** shows that the annual number of collisions decreases from around 119 to 89 collisions between 2016 and 2018, but sharply increases between 2018 and 2019 to 134 collisions. Bicycle collisions have remained relatively stable, decreasing slightly between 2015 and 2018 and increasing slightly in 2019 to four collisions. Pedestrian collisions have a similar pattern, decreasing from 2016 to 2018, from four collisions to one collision, and rising to three collisions in 2019.

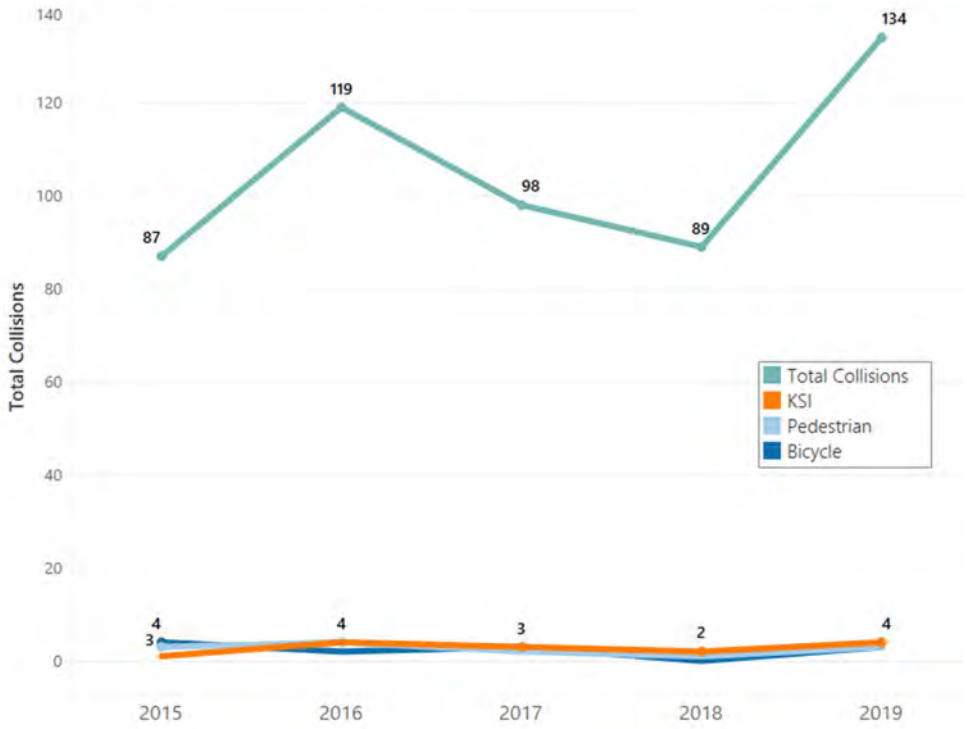
The number of fatal and severe injury (KSI) collision, as shown in **Figure 4.2**, has increased since 2017, from four KSI-related collisions to six in 2019.

Figure 4.1: Collision Severity



Source: SWITRS, 2015-2019

Figure 4.2: Total Collisions by Year



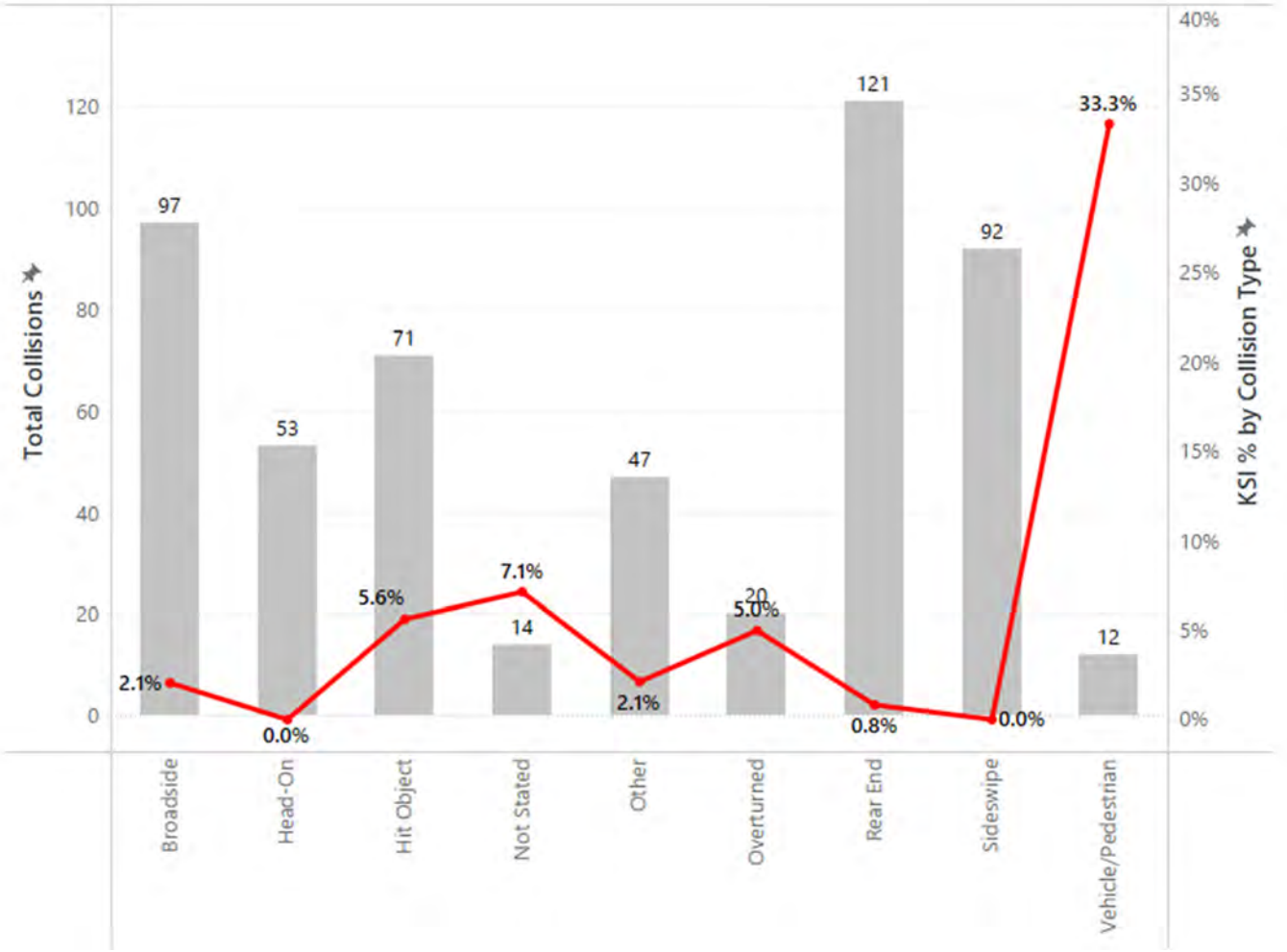
Source: SWITRS, 2015-2019

4.1.2 Collision Type

Figure 4.3 compares the percent of KSI collisions for each collision type with the total number of collisions for each type. The total number of collisions is categorized by collision type, as represented by the grey bars in the chart (see Y-Axis on the left side). Rear end collisions accounted for the largest category, comprising 29.7 percent of total collisions. Broadside (23.8 percent of total) and sideswipe (22.5 percent of total) made up the second- and third-largest crash categories.

The red line in the chart shows the percentage of each collision type that resulted in fatalities or severe injuries (see the Y-Axis on the right side). The labeled percentages represent the KSI collision percentages of each collision type. For example, as high as 33.3 percent of the pedestrian-related collisions were KSI collisions, 5.6 percent of the hit object collisions led to fatalities and severe injuries, and 0.8 percent of the rear end collisions resulted in victims killed or seriously injured.

Figure 4.3: Collisions by Type, Total Collisions vs. KSI Collisions



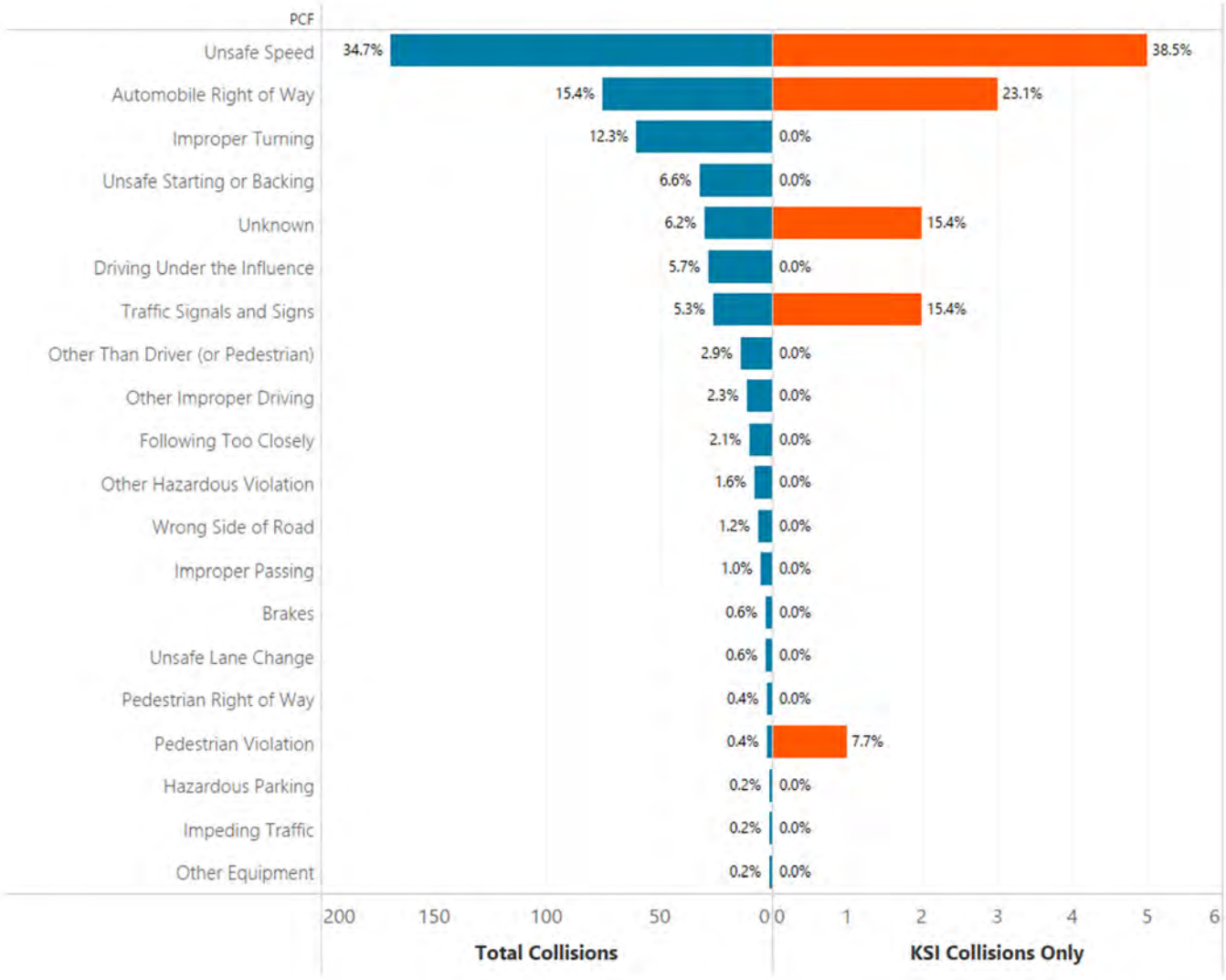
Source: SWITRS, 2015-2019

4.1.3 Primary Collision Factor (PCF)

Figure 4.4 summarizes the Primary Collision Factor (PCF) for all the collisions in the past five years. PCF is the leading cause of a collision based on the law enforcement officer who conducted the investigation. The blue bars on the left side represent total collisions, and the red bars on the right side represents KSI collisions.

As shown in **Figure 4.4**, unsafe speed (34.7%), automobile right-of-way (15.4%), and improper turning (12.3%) were the top three causes of all collisions. For KSI collisions, the top three were unsafe speed (38.5%), automobile right-of-way (23.1%), and traffic signal or sign violation (15.4%). Pedestrian violations were associated with 0.4 percent of total collisions but 7.7 percent of KSI collisions.

Figure 4.4: Collisions by Primary Collision Factor (PCF).Total Collisions vs. KSI Collisions

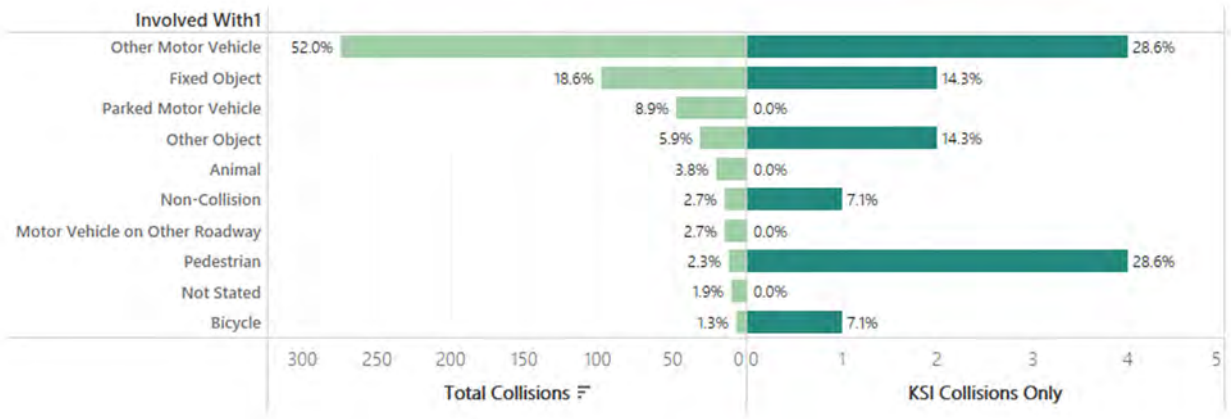


Source: SWITRS, 2015-2019

4.1.4 Motor Vehicle Involved With

Figure 4.5 summarizes the mode of transportation the at-fault party is involved with for all the collisions in the past five years. The motor vehicle involved with other motor vehicles was associated with 52.0 percent of total collisions, which was also tied to the highest KSI collisions at 28.6 percent. The motor vehicle involved with fixed object accounted for 18.6 percent. Bicycle- and pedestrian-related collisions in Tehachapi accounted for approximately 3.6 percent of total collisions but 35.7 percent of KSI collisions.

Figure 4.5: Primary Collision Factor vs. Top 4 Collision Types

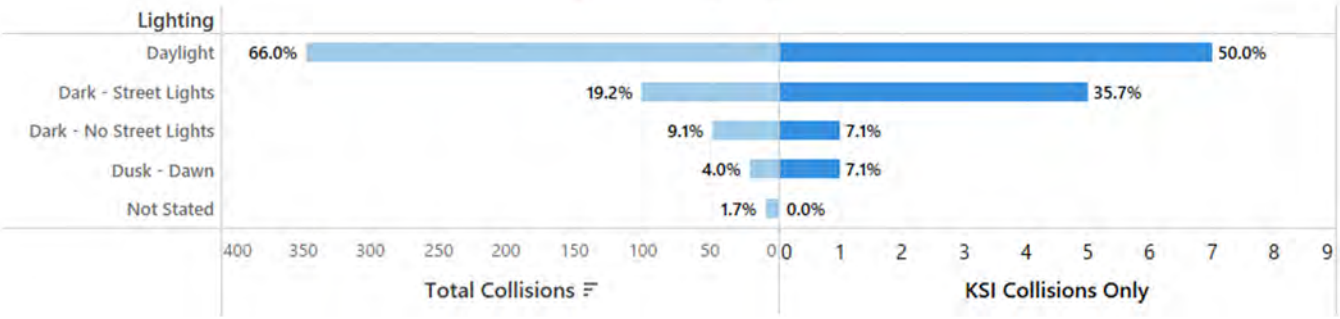


Source: SWITRS, 2015-2019

4.1.5 Lighting Conditions

Figure 4.6 summarizes the lighting conditions for all the collisions in the past five years. Most of the collisions occurred during daylight, 66.0 percent of total collisions. Under dark street lighting conditions, collisions accounted for 19.2 percent of total collisions. Daylight conditions were the highest frequency associated with KSI collision at 50.0 percent, with dark – street lights second at 35.7 percent.

Figure 4.6: Lighting

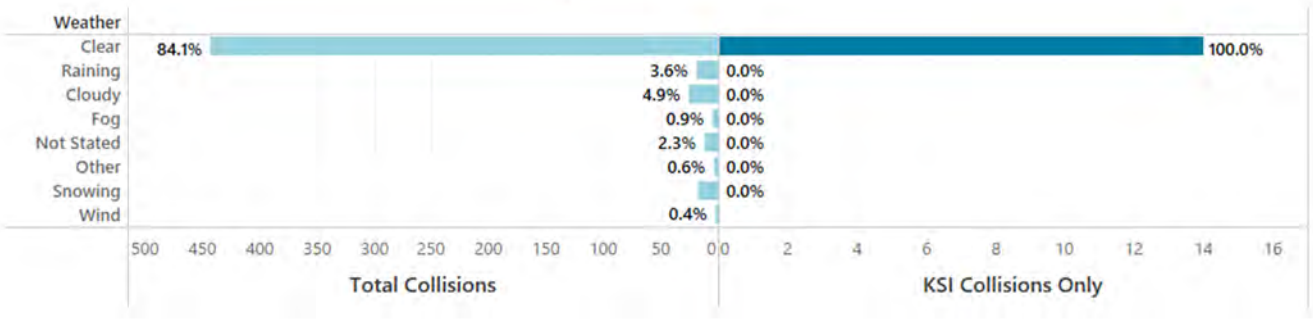


Source: SWITRS, 2015-2019

4.1.6 Weather

Figure 4.7 summarizes the weather conditions for all the collisions in the past five years. Most of the collisions occurred under clear weather, 84.1 percent of total collisions. Collisions occurred on a cloudy day accounted for 4.9 percent of total collisions, while rainy day conditions comprised 3.6 percent on total collisions. All KSI collisions occurred in clear conditions.

Figure 4.7: Weather

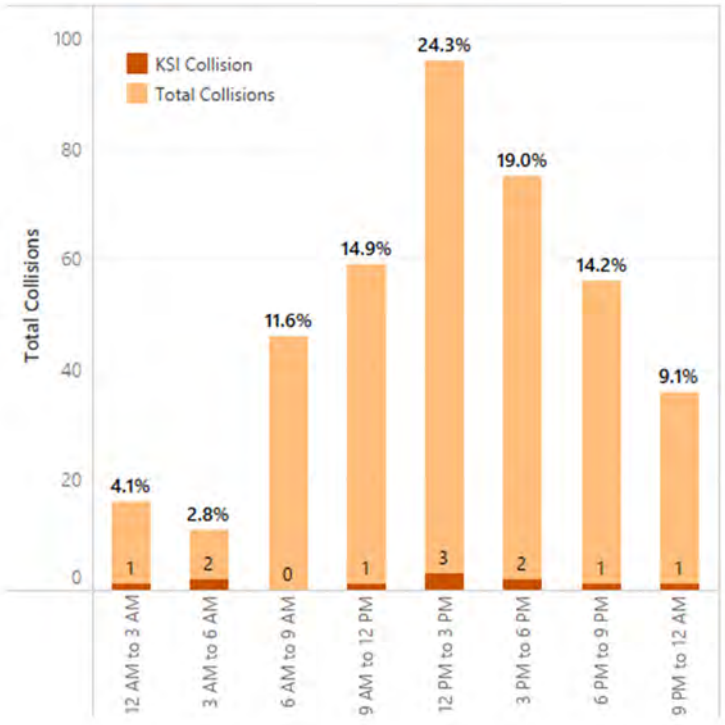


Source: SWITRS, 2015-2019

4.1.7 Time of Day

Figure 4.8 summarizes the time of day a collision occurred at in the past five years. Most of the collisions occurred in the afternoon with 24.3 percent associated between 12 PM to 3 PM, followed by 19.0 percent of the collisions between 3 PM and 6 PM. Also, KSI collisions associate the most during the timeframe between 12 PM and 3 PM.

Figure 4.8: Time of Day

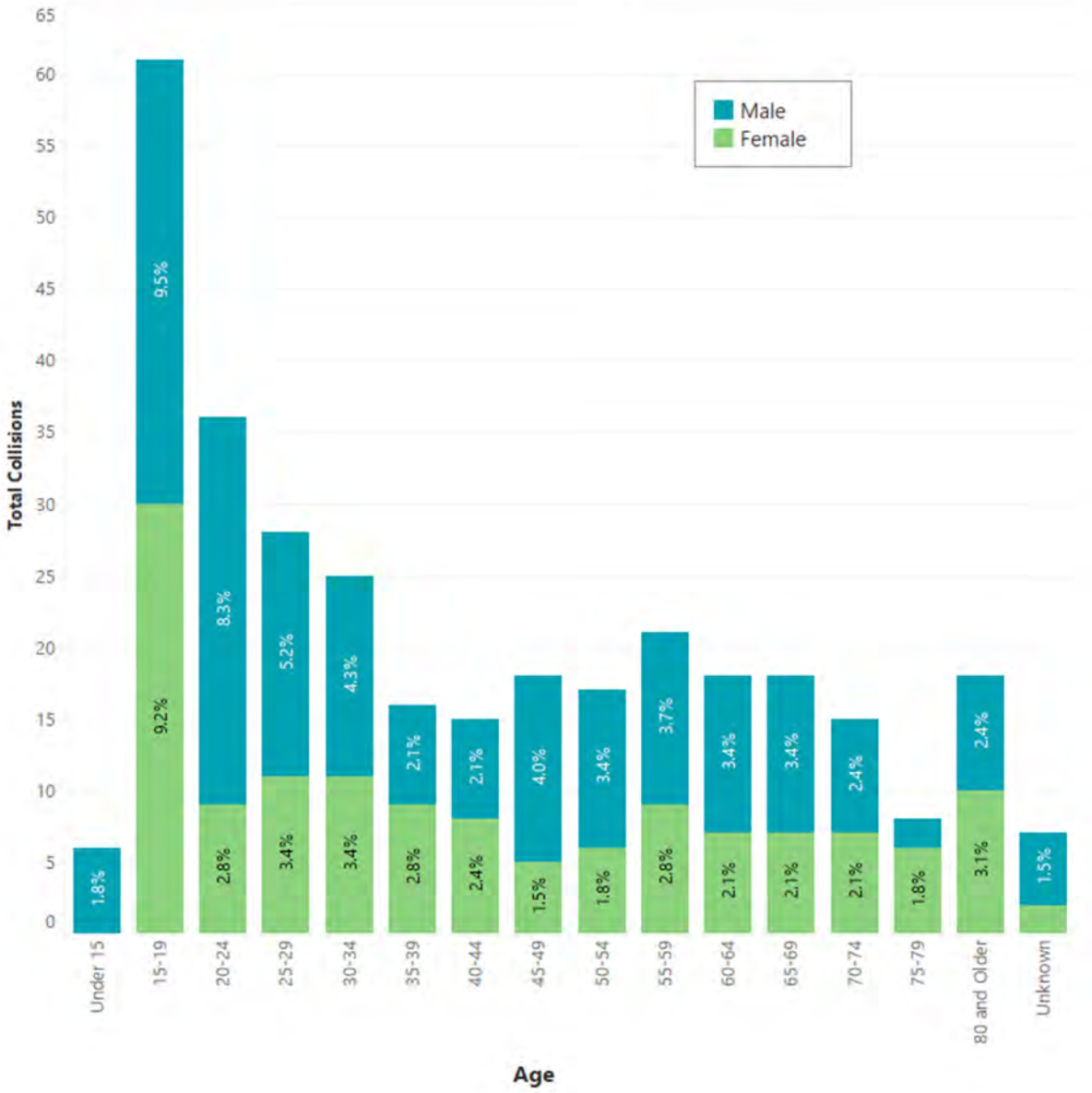


Source: SWITRS, 2015-2019

4.1.8 At-Faut Party

At-fault motorists in collisions in Tehachapi tended to be between the ages of 15 and 19, as shown in Figure 4.9. Nearly 9.5 percent of motorists were male in the 15-19 age group, followed by 9.2 percent of female motorists in the 15-19 age group. The 20-24 age group accounts for the second-largest share of at-fault motorists, with the number of at-fault motorists decreasing to the 40-44 age group and a small peak in the 55 to 59 age group. In almost all age groups, men accounted for the majority of at-fault. Note that some of the data are unknown in gender and age, which are not shown in the chart below.

Figure 4.9: At-Fault Party by Age and Gender



Source: SWITRS, 2015-2019

4.2 COLLISIONS BY FACILITY TYPE

Collision patterns were analyzed by facility type (intersections vs. mid-block locations) using the most recent five years of collision data (2016 to 2020). This analysis allowed for determining the effect of access control and intersection geometry on collision frequency. The analysis classifies collisions by facility type as follows:

- Collisions that occurred within 250 feet of signalized intersections are considered signalized intersection collisions;
- Collisions that occurred within 150 feet of non-signalized intersections are considered non-signalized intersection collisions;
- Collisions that occur more than 250 feet away from any signalized intersection and more than 150 feet away from any non-signalized intersection are classified as mid-block collisions.

Table 4.1 shows the total number of crashes associated with each type of facility, 55.4 percent of all collisions took place at non-signalized intersections, 26.2 percent of all collisions took place at mid-block locations, and 18.4 percent of collisions took place at signalized intersections. Bicycle collisions also had the highest frequency occurring at non-signalized intersections (100 percent of bicycles). Pedestrians occurred most at midblock and non-signalized intersection locations, at 41.7% of pedestrian collisions for both.

Table 4.1: Collisions by Facility Type

Transportation Mode	Signalized Intersection		Non-Signalized Intersection		Midblock Locations		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Total Number of Collisions	75	18.4%	226	55.4%	107	26.2%	408	100%
Bicycle Collisions	0	0.0%	6	100.0%	0	0.0%	6	100%
Pedestrian Collisions	2	16.7%	5	41.7%	5	41.7%	12	100%

Source: SWITRS, 2015-2019

Table 4.2 shows how the collision type varies by facility type. A majority of the collisions occurred at non-signalized intersections, and the most common collision type among them was rear end collision (25.2 percent). Sideswipe collisions comprise the largest share of crashes at midblock locations (22.4 percent). At signalized intersections, rear end collisions are the most common crash type (37.3 percent).

Rear end, broadside, and sideswipe collisions frequently occurred at all facility types, as shown in **Table 4.2**. At all facility types, rear end collisions accounted for 26.2 percent, broadside collisions accounted for 22.6 percent, and sideswipe accounted 19.9 percent of total collisions.

Broadside collisions had the greatest consistency in shares across the differing facility types of these collision types, comprising 24.0 percent of collisions at signalized locations, 23.0 percent at non-signalized locations and 20.6 percent at midblock locations.

Table 4.2: Collision Types by Facility Type

Collision Type	Signalized Intersections		Non-Signalized Intersections		Midblock Locations		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Broadside	18	24.0%	52	23.0%	22	20.6%	92	22.6%
Head-On	5	6.7%	23	10.2%	8	7.5%	36	8.8%
Hit Object	4	5.3%	21	9.3%	13	12.1%	38	9.3%
Not Stated	2	2.7%	4	1.8%	1	0.9%	7	1.7%
Other	2	2.7%	18	8.0%	11	10.3%	31	7.6%
Overturned	1	1.3%	2	0.9%	1	0.9%	4	1.0%
Rear End	28	37.3%	57	25.2%	22	20.6%	107	26.2%
Sideswipe	13	17.3%	44	19.5%	24	22.4%	81	19.9%
Vehicle/Pedestrian	2	2.7%	5	2.2%	5	4.7%	12	2.9%
Total	75	100%	226	100%	107	100%	408	100%

Source: SWITRS, 2015-2019

Table 4.3 shows the relationship between street lighting conditions and facility type. Nearly 90 percent of collisions occurred in the presence of lighting (i.e. either in daylight or night-time with street lighting). Collisions at signalized intersections were particularly likely to have occurred during daylight conditions (74.7 percent). Collisions under dark with no street lighting conditions most commonly occurred at midblock facility locations, with 9.3 percent of midblock collisions being during dark with no streetlights, and only 1.3 percent and 3.5 percent occurring at signalized intersections and non-signalized intersections, respectively.

Table 4.3: Street Lighting by Facility Type

Collision Type	Signalized Intersections		Non-Signalized Intersections		Midblock Location		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Dark - No Street Lights	1	1.3%	8	3.5%	10	9.3%	19	5%
Dark - Street Lights	13	17.3%	51	22.6%	28	26.2%	92	23%
Daylight	56	74.7%	158	69.9%	63	58.9%	277	68%
Dusk - Dawn	5	6.7%	8	3.5%	5	4.7%	18	4%
Not Stated	0	0.0%	1	0.4%	1	0.9%	2	0%
Total	75	100%	226	100%	107	100%	408	100%

Source: SWITRS, 2015-2019

Table 4.4 tabulates the PCFs by facility type. Overall, the three largest PCF categories included unsafe speed automobile right-of-way and improper turning. This order was true for all location types:

- At signalized intersections, unsafe speed was associated with 28.0 percent of collisions, automobile right-of-way with 14.7 percent, and improper turning with 14.7 percent of automobile right-of-way violations.
- At signalized intersections, unsafe speed was associated with 32.7 percent of collisions, automobile right-of-way with 17.3 percent, and improper turning with 11.9 percent of automobile right-of-way violations.
- At signalized intersections, unsafe speed was associated with 30.8 percent of collisions, automobile right-of-way with 17.8 percent, and improper turning with 15.0 percent of automobile right-of-way violations.

Table 4.4: Primary Collision Factor by Facility Type

Collision Type	Signalized Intersections		Non-Signalized Intersections		Midblock Location		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
-	2	2.7%	6	2.7%	10	9.3%	18	4.4%
Automobile Right of Way	**11**	**14.7%**	**39**	**17.3%**	**19**	**17.8%**	**69**	**16.9%**
Brakes	0	0.0%	1	0.4%	1	0.9%	2	0.5%
Driving or Bicycling Under the Influence of Alcohol or Drug	6	8.0%	11	4.9%	7	6.5%	24	5.9%
Following Too Closely	4	5.3%	2	0.9%	1	0.9%	7	1.7%
Hazardous Parking	0	0.0%	1	0.4%	0	0.0%	1	0.3%
Impeding Traffic	1	1.3%	0	0.0%	0	0.0%	1	0.3%
Improper Passing	0	0.0%	4	1.8%	1	0.9%	5	1.2%
Improper Turning	**11**	**14.7%**	**27**	**11.9%**	**16**	**15.0%**	**54**	**13.2%**
Other Hazardous Violation	1	1.3%	2	0.9%	0	0.0%	3	0.7%
Other Improper Driving	0	0.0%	2	0.9%	1	0.9%	3	0.7%
Other Than Driver (or Pedestrian)	0	0.0%	1	0.4%	2	1.9%	3	0.7%
Pedestrian Right of Way	0	0.0%	2	0.9%	0	0.0%	2	0.5%
Pedestrian Violation	1	1.3%	1	0.4%	0	0.0%	2	0.5%
Traffic Signals and Signs	10	13.3%	12	5.3%	2	1.9%	24	5.9%
Unknown	3	4.0%	18	8.0%	5	4.7%	26	6.4%
Unsafe Lane Change	0	0.0%	2	0.9%	1	0.9%	3	0.7%
Unsafe Speed	**21**	**28.0%**	**74**	**32.7%**	**33**	**30.8%**	**128**	**31.4%**
Unsafe Starting or Backing	3	4.0%	19	8.4%	8	7.5%	30	7.4%
Wrong Side of Road	1	1.3%	2	0.9%	0	0.0%	3	0.7%
Total	**75**	**100%**	**226**	**100%**	**107**	**100%**	**408**	**100%**

Source: SWITRS, 2015-2019

As mentioned earlier, rear end, broadside, and sideswipe collisions were the most-frequently-occurring collision type in Tehachapi. Unsafe speed was the most common Primary Collision Factor (PCF) for rear end collisions (comprising 63.6 percent) and the most common PCF for all collisions. Automobile right-of-way violation was the most common PCF associated with broadside collisions (comprising 48.9 percent) and the second-most common PCF for all collisions. Improper turning was the most common PCF associated with sideswipe collisions (comprising 32.1 percent) and the third-most common PCF for all collisions.

In Tehachapi, rear end, broadside, and sideswipe collisions were the most common at non-signalized intersections. **Table 4.5** shows the percentage of crashes associated with the unsafe speed PCF and classified as rear end crashes. The percentage of broadside collisions caused by automobile right-of-way violations ranges from 57.1 percent at the signalized intersection locations to 68.4 percent at non-signalized intersections.

Table 4.5: Rear End Collisions due to Unsafe Speed by Facility Type

Facility Type	Total Broadside Collisions	Rear End Collisions due to Unsafe Speed	Percentage of Rear End Collisions due to Unsafe Speed
Midblock locations	22	13	59.1%
Non-signalized intersections	57	39	68.4%
Signalized intersections	28	16	57.1%
Total	**107**	**68**	**63.6%**

Source: SWITRS, 2015-2019

Table 4.6 breaks down the broadside collisions caused by automobile right-of-way violations by facility type. The percentage of broadside collisions caused by automobile right-of-way violations ranges from 25.0 percent at the midblock locations to 61.5 percent at non-signalized intersections.

Table 4.6: Braodside Collisions due to Automobile Right-of-Way Violations by Facility Type

Facility Type	Total Rear End Collisions	Broadside Collisions due to Automobile Right-of-Way Violations	Percentage of Broadside Automobile Right-of-Way Violations
Midblock locations	22	11	50.0%
Non-signalized intersections	52	29	55.8%
Signalized intersections	18	5	27.8%
Total	**92**	**45**	**48.9%**

Source: SWITRS, 2016-2020

Table 4.7 shows the percentage of crashes associated with the improper turning PCF and classified as sideswipe crashes. The percentage of sideswipe collisions caused by improper turning ranges from 25.0 percent at the midblock locations to 61.5 percent at non-signalized intersections.

Table 4.7: Sideswipe Collisions due to Improper Turning by Facility Type

Facility Type	Total Sideswipe Collisions	Sideswipe Collisions due to Improper Turning	Percentage of Sideswipe Collisions due to Improper Turning
Midblock locations	22	11	50.0%
Non-signalized intersections	52	29	55.8%
Signalized intersections	18	5	27.8%
Total	**92**	**45**	**48.9%**

Source: SWITRS, 2016-2020

4.3 GEOGRAPHIC COLLISION ANALYSIS

The following series of maps illustrates the prominent collision factors, such as the location of top collision type, primary collision factor, and bicycle- and pedestrian-related collisions.

Figure 4.10 illustrates the citywide collision hotspot location in Tehachapi, the corridor on Tehachapi Boulevard had the highest concentration of crashes.

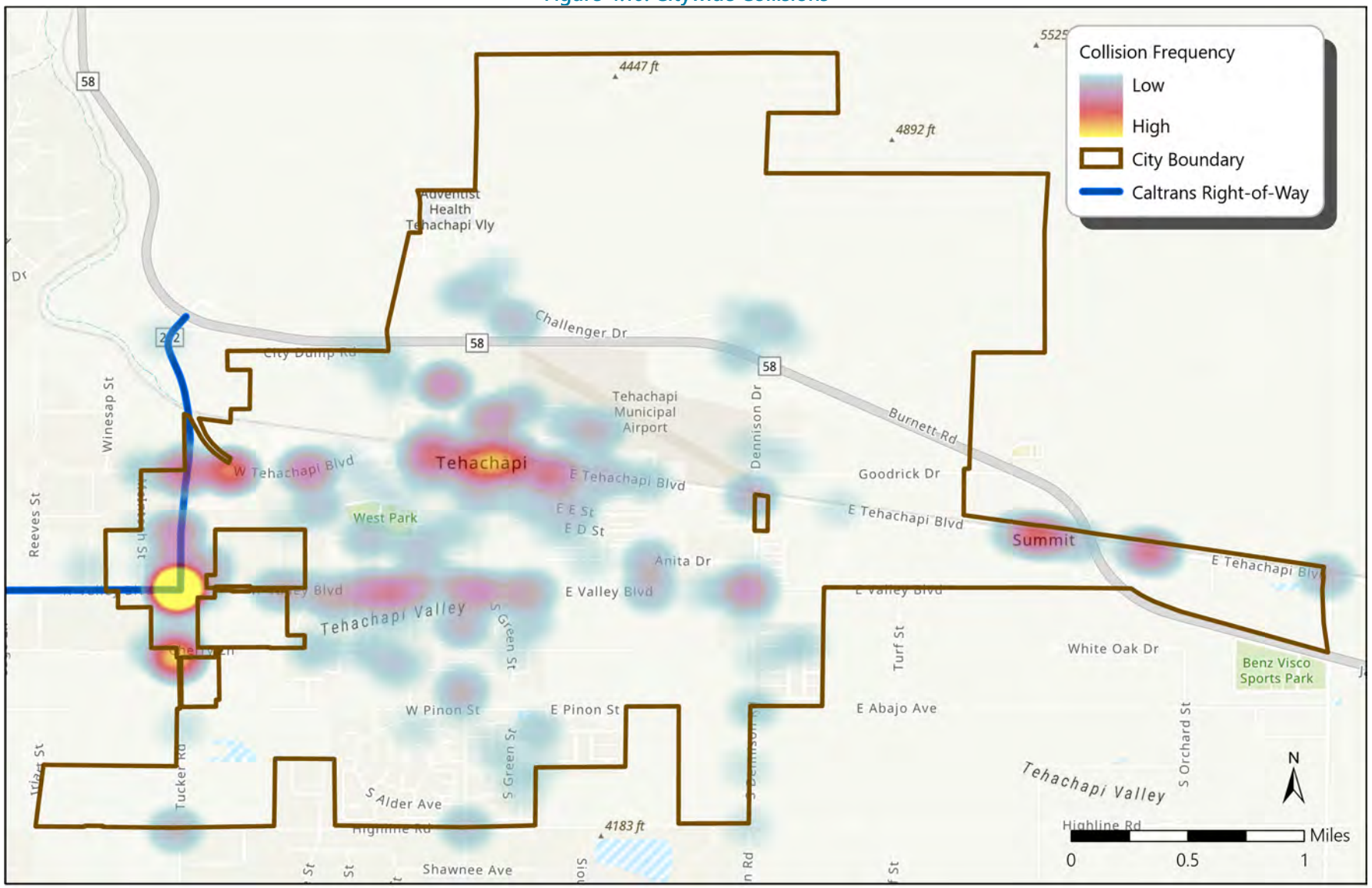
Figure 4.11 illustrates the location of rear end collisions in correlation with unsafe speed.

Figure 4.12 illustrates the location of broadside collisions in correlation with automobile right-of-way violations.

Figure 4.13 illustrates the location of sideswipe collisions in correlation with improper turning.

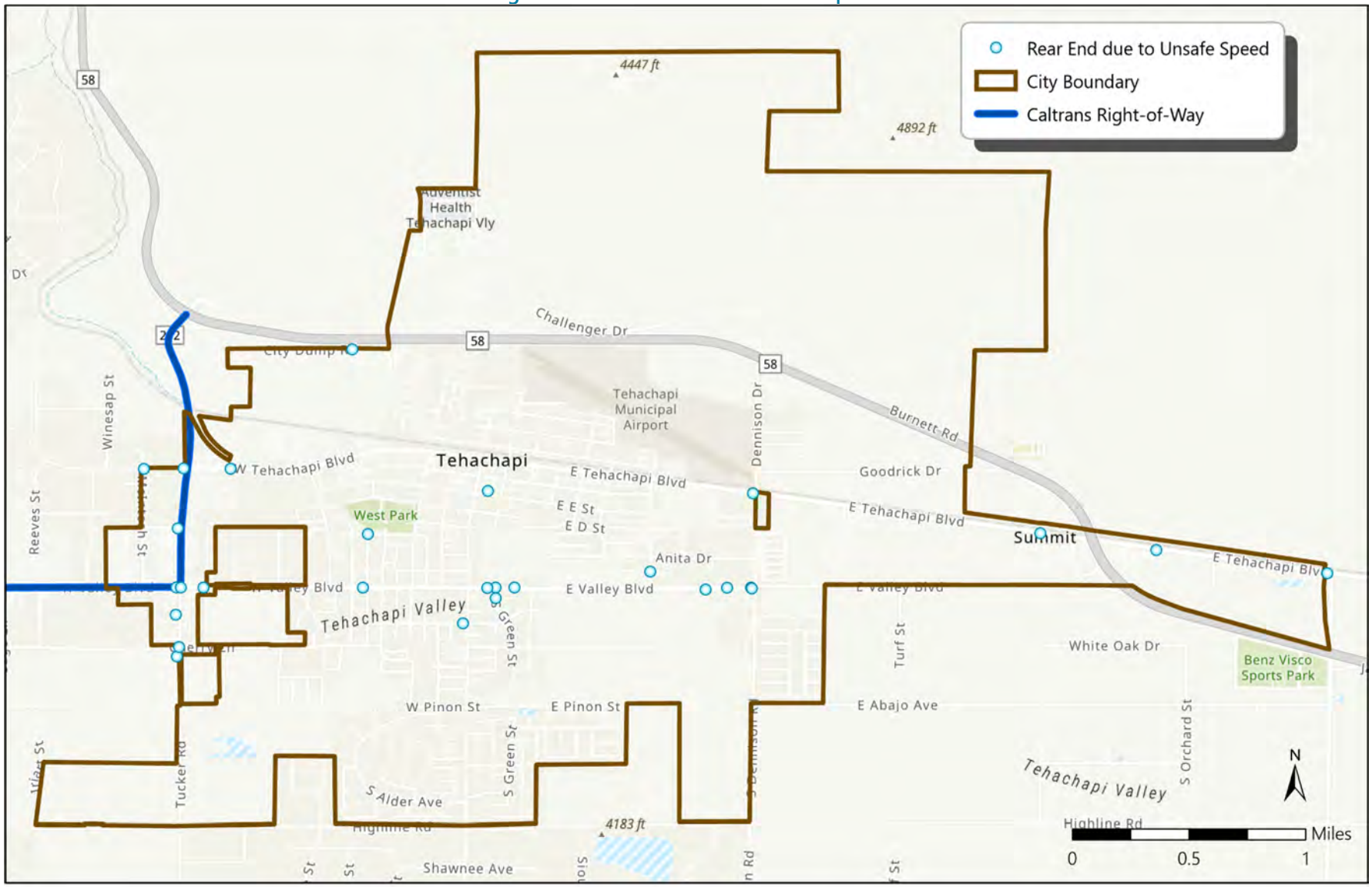
Figure 4.14 illustrates the location of the bicycle- and pedestrian-related collisions citywide.

Figure 4.10: Citywide Collisions



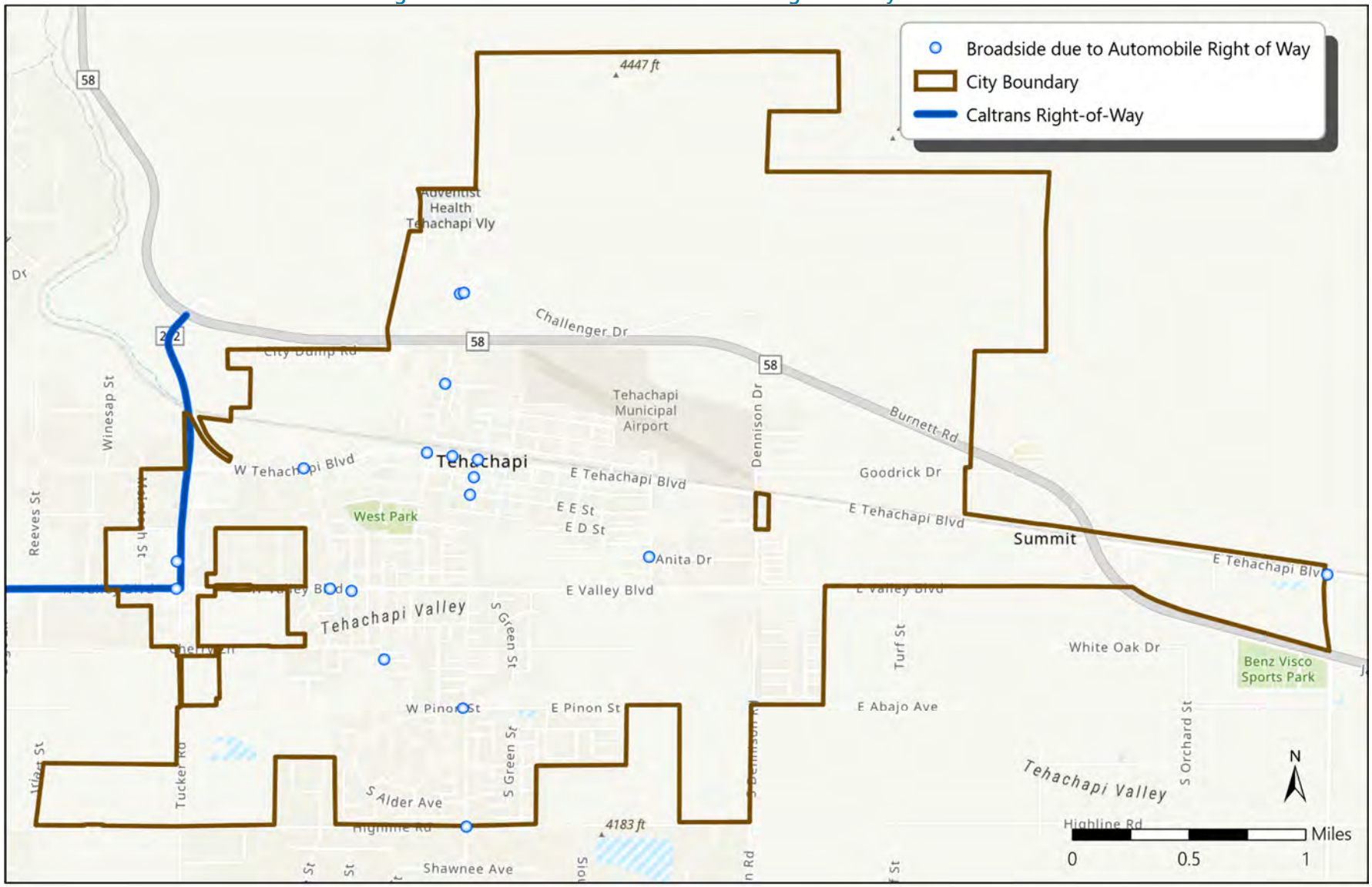
Source: SWITRS, 2015-2019

Figure 4.11: Rear End due to Unsafe Speed



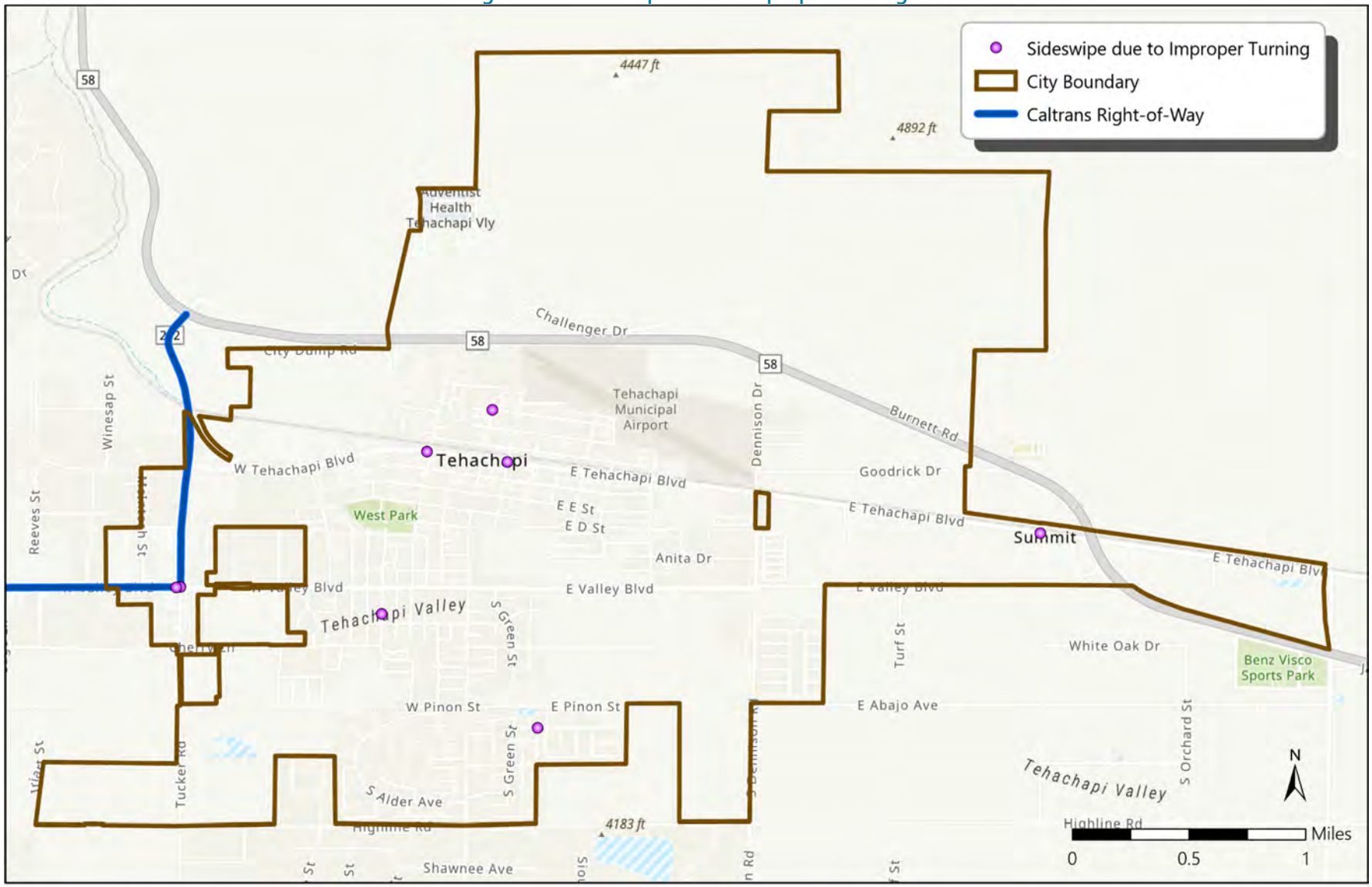
Source: SWITRS, 2015-2019

Figure 4.12: Broadside due to Automobile Right-of-Way Violations



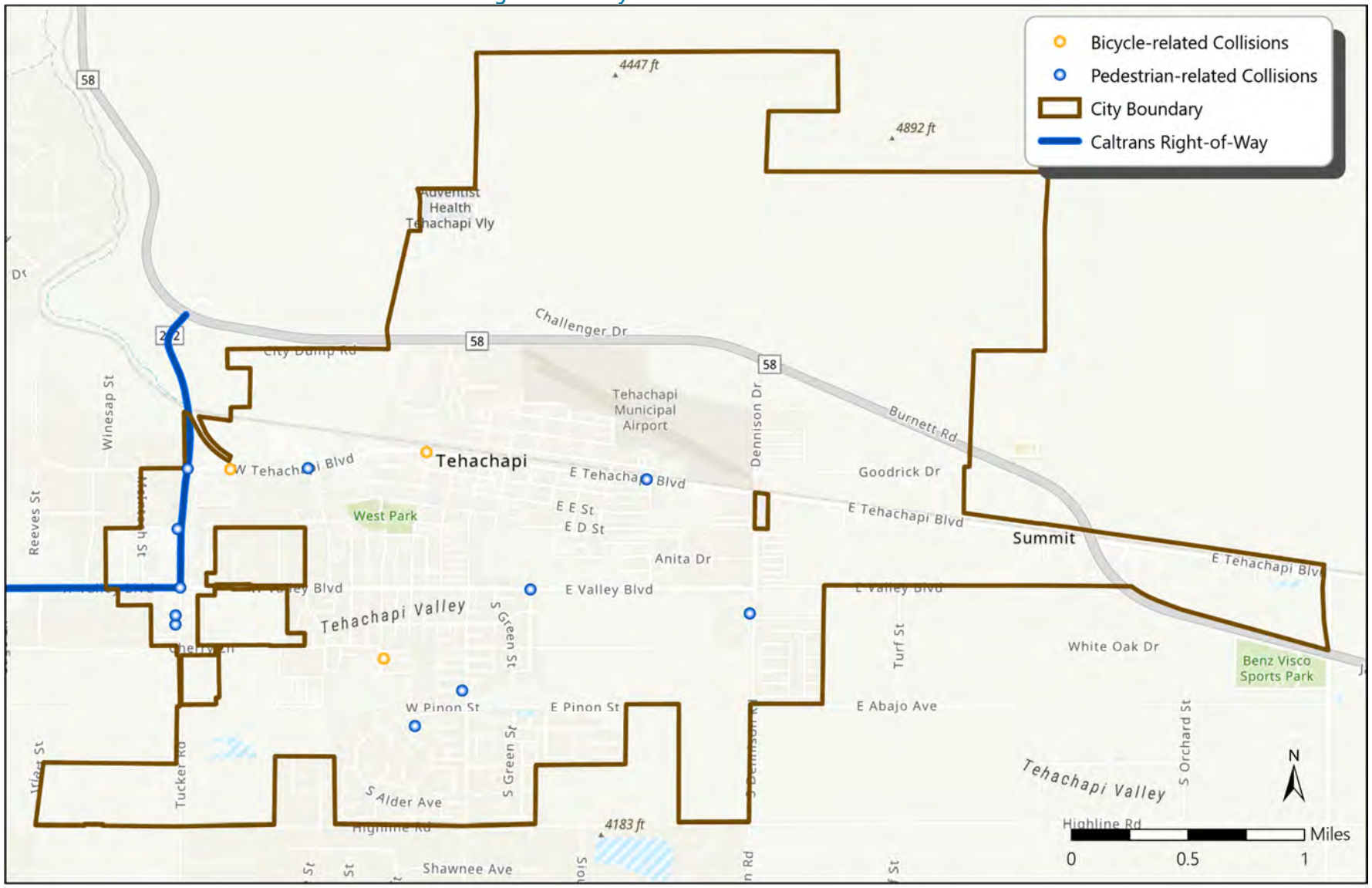
Source: SWITRS, 2015-2019

Figure 4.13: Sideswipe due to Improper Turning



Source: SWITRS, 2015-2019

Figure 4.14: Bicycle and Pedestrian Collisions



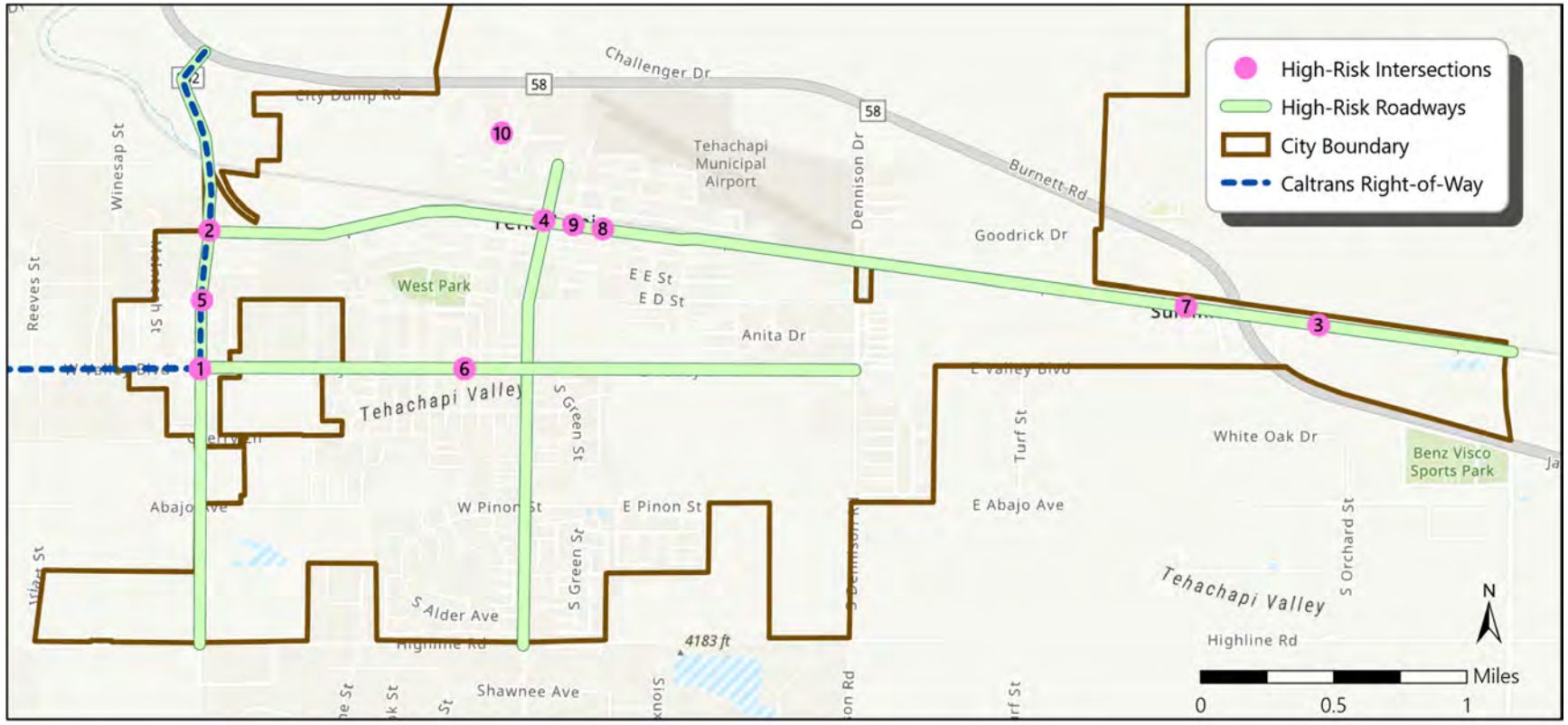
Source: SWITRS, 2015-2019

4.5 TOP COLLISION LOCATIONS

The initial step of the systemic analysis is evaluating the existing roadway network and its various characteristics. The analysis was divided into intersections and roadway segments, the two main ranking methods: average crash frequency and Equivalent Property Damage Only (EPDO) scores. The description of the ranking methods is discussed in Section 3.2 of this document.

Based on the collision analysis, the high-risk collision intersections and roadway segments in Tehachapi are shown in **Figure 4.15. Appendix A** provided a summary of all the collisions by intersection.

Figure 4.15 Top Collision Locations



4.5.1 Intersection Ranking

This is a general process for identifying potential locations by ranking the intersections based on Crash Frequency and EPDO score. The ranking is a quantitative method used to evaluate a particular corridor segment and compare it with various other segments. It is ultimately just a tool to streamline the collision analysis and the selection process for potential locations. **Table 4.9** shows the top 10 intersections by collision frequency and EPDO score. A majority of the intersections are located on Tehachapi Boulevard, while intersections with the highest EPDO score are most frequently located on Tucker Road.

- **Tucker Road and Valley Boulevard:** Crash Frequency rank 1st and EPDO score rank 3rd
- **Tucker Road and Tehachapi Boulevard:** Crash Frequency rank 2nd and EPDO score rank 2nd
- **Tucker Road and Conway Avenue:** Crash Frequency rank 3rd and EPDO score rank 1st
- **Tehachapi Boulevard and Curry Street:** Crash Frequency rank 3rd and EPDO score rank 4th

Table 4.9: Top Intersection Ranking

		COLLISION SEVERITY						COLLISION TYPE												
ID	Intersections	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	Property Damage Only	Total Collisions	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian	Control Type	Rank Collision Frequency	EPDO Score	Rank EPDO Score
1	TUCKER RD & VALLEY BL			4	4	23	31	8	1		1	2		15	3	1	Signal	1	90.1	3
2	TEHACHAPI BL & TUCKER RD		1		1	11	13	4	1			1		4	3		Signal	2	136.6	2
3	MONOLITH ST & TEHACHAPI BL				1	6	7	2		1				3	1		Non-Signal	3	12.1	5
4	CURRY ST & TEHACHAPI BL			1	1	5	7					1		4	2		Non-Signal	3	21.8	4
5	CONWAY AV & TUCKER RD	1		1		5	7	3			1			1	1	1	Non-Signal	3	205.9	1
6	MILL ST & VALLEY BL				1	5	6	2	1	1				2			Non-Signal	7	11.1	6
7	STEUBER RD & TEHACHAPI BL				1	5	6	1	1	2				1	1		Non-Signal	7	11.1	6
8	ROBINSON ST & TEHACHAPI BL				1	4	5		2					2	1		Non-Signal	9	10.1	8
9	GREEN ST & TEHACHAPI BL				1	4	5	1				1			3		Non-Signal	9	10.1	8
10	INDUSTRIAL PKWY & MILL ST				1	4	5	3						1	1		Non-Signal	9	10.1	8

4.5.2 Roadway Segment Ranking

The roadway segment rankings are also by Crash Frequency and EPDO scores. The ranking is a quantitative method used to evaluate a particular corridor segment and compare it with various other segments. It is ultimately just a tool to streamline the collision analysis and the selection process for potential locations. **Table 4.10** shows the top four roadway segments by collision frequency and EPDO score.

- **Tehachapi Boulevard from Tucker Road to Tehachapi Will Springs Road:** Crash Frequency rank 1st and EPDO score rank 3rd
- **Tucker Road[1] from Tehachapi Boulevard and Highland Road:** Crash Frequency rank 2nd and EPDO score rank 1st
- **Valley Boulevard from Sierra Vista to Dennison Road:** Crash Frequency rank 3rd and EPDO score rank 4th

Table 4.10: Top Roadway Segment Ranking

				COLLISION SEVERITY						COLLISION TYPE												
ID	Roadway	From	To	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	Property Damage Only	Total Collisions	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian	Rank Collision Frequency	EPDO Score	Rank EPDO Score
1	TEHACHAPI BL	Tucker Rd	Tehachapi Willow Springs Rd		1	9	12	67	89	16	9	7	2	6	1	27	20	1	1	144.4	3
2	TUCKER RD	North City Limit	Valley Blvd	1	1	6	8	56	72	23	4		3	3		19	17	3	2	275.9	1
		Valley Blvd	Highland Rd																		
3	VALLEY BL	Sierra Vista Dr	Dennison Rd		1	14	6	36	57	13	3	7	1	3		22	5	3	3	137.9	4
4	CURRY ST	J St	Highland Rd		1	1	2	11	15	7		1				3	3	1	6	29.8	6

SUMMARY

The collisions were based on the Statewide Integrated Traffic Records System (SWITRS) database from 2015 to 2019. Based on the collision data in Tehachapi, approximately 2.7 percent of the collisions resulted in fatal or severe injuries (KSI) in the 5-year period. Over the 5-years, the collisions trend peaks in 2016 and gradually decreases to 89 collisions in 2018, after which there is a sharp incline to 134 collisions in 2019. The following highlights the collision analysis:

- The top three collision type includes: rear end, broadside, and sideswipe
- The top three primary collision factor includes: unsafe speed automobile right-of-way, and improper turning
- Among all KSI collisions, 7.7 percent collisions were associated with pedestrian violation
- Collisions occurred under daylight conditions accounted for the most KSI collisions – 50 percent of all KSI collisions
- Most of the collisions occurred from 12 PM to 3 PM
- At-fault motorists in collisions in Tehachapi tended be young drivers between the age group of 15 and 19 - about 20 percent of collisions
- Broadside and rear end comprise the largest share of crashes at signalized intersections – 24 percent and 37.3 percent, respectively
- Sideswipes comprises the largest share of crashes at midblock locations (22.4 percent)

[1] *Tucker Rd is broken up into two segments. From Valley Boulevard to the north city limit Caltrans has jurisdiction. The City has jursidication from Valley Boulevard to Highland Road.*

- Approximately 64 percent of the rear end collisions were associated with unsafe speeding
- Approximately 49 percent of the broadside collisions were associated with automobile right-of-way
- Approximately 32 percent of the sideswipe collisions were associated with improper turning
- Top 10 intersections and top 5 roadway segments were ranked by Crash Frequency and EPDO score

5.0 OUTREACH

The Kern Council of Governments reached out to the community and stakeholders in the City of Tehachapi for feedback on potential traffic safety issues. A project website was developed for the public to submit written comments or submit comments on an interactive map. There was also a stakeholder meeting via Microsoft Teams on June 29, 2021 with minimal attendance. This meeting discussed the LRSP's data analysis findings and participants were able to provide comments on safety issues in Tehachapi.

Community members were encouraged to provide their comments related to roadway safety through a project website. The website was published on the Kern COG website. A total of 54 comments were submitted. A summary of the comments is below.

WEBSITE COMMENTS:

The following summarizes the website project website comments:

- Concern of broken road along Valley Boulevard, east of Clearview Street
- Concern of vehicle turning left on Valley Blvd and entering the gas station abruptly on the north east corner
- Lack of a crosswalk on S Curry Street south of E Orchard Parkway for pedestrians to get to the Warrior Park
- Concern with car speeds along Pinon Street and it is extremely dangerous.

6.0 TRANSPORTATION SAFETY EMPHASIS AREAS

Transportation safety emphasis areas provide a strategic framework for developing and implementing the Local Roadway Safety Plan (LRSP). The emphasis areas show the City of Tehachapi where to focus when developing projects and programs based on the LRSP. The emphasis areas listed below were identified by citywide collision analysis between 2015 and 2019. The collision analysis data was derived from the California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) and the University of California, Berkeley's Transportation Injury Mapping System (TIMS).

- Young Drivers
- Pedestrian Safety
- Driving Under the Influence (DUI)
- Automobile Right of Way/Broadside Collisions
- Unsafe Speeding

YOUNG DRIVER

The Young Driver emphasis area includes at-fault drivers responsible for a collision. Between the five years of collision data between 2015 and 2019, there were a total of 408 collisions that occurred on city roadways. Young adults accounted for 31.6% of those collisions. The 15-19 age group had the largest share of at-fault motorists of 18.7%. The 20-24 age group had the second largest of 11.1%. Between both the age groups, males tended to be the largest at fault. Males accounted for 19.6% of collisions for this group.

SPEEDING

The Speeding emphasis area is where a vehicle was driving past the speed limit and was involved in a collision. Unsafe speeds have been the primary collision factor in the City of Tehachapi and have also had the highest frequency of fatal and severe injuries at 38.5%. Unsafe speeding is most common at signalized, non-signalized intersections and midblock locations. Each has the highest frequency of unsafe speeds as the primary collision factor. Unsafe speed accounted for 34.7% of all collisions.

BICYCLE AND PEDESTRIAN SAFETY

Bicycle and Pedestrian Safety is an emphasis area that includes instances where pedestrians or bicyclists have been involved with a motor vehicle in a collision. Both pedestrian and bicycle collisions accounted for the highest fatal and severe injury frequencies of 35.7%. Although bicyclists and pedestrians only account for 3.6% of collisions, they are the most vulnerable road users as it may lead to a high frequency of fatal and severe injuries.

NON-SIGNALIZED INTERSECTIONS

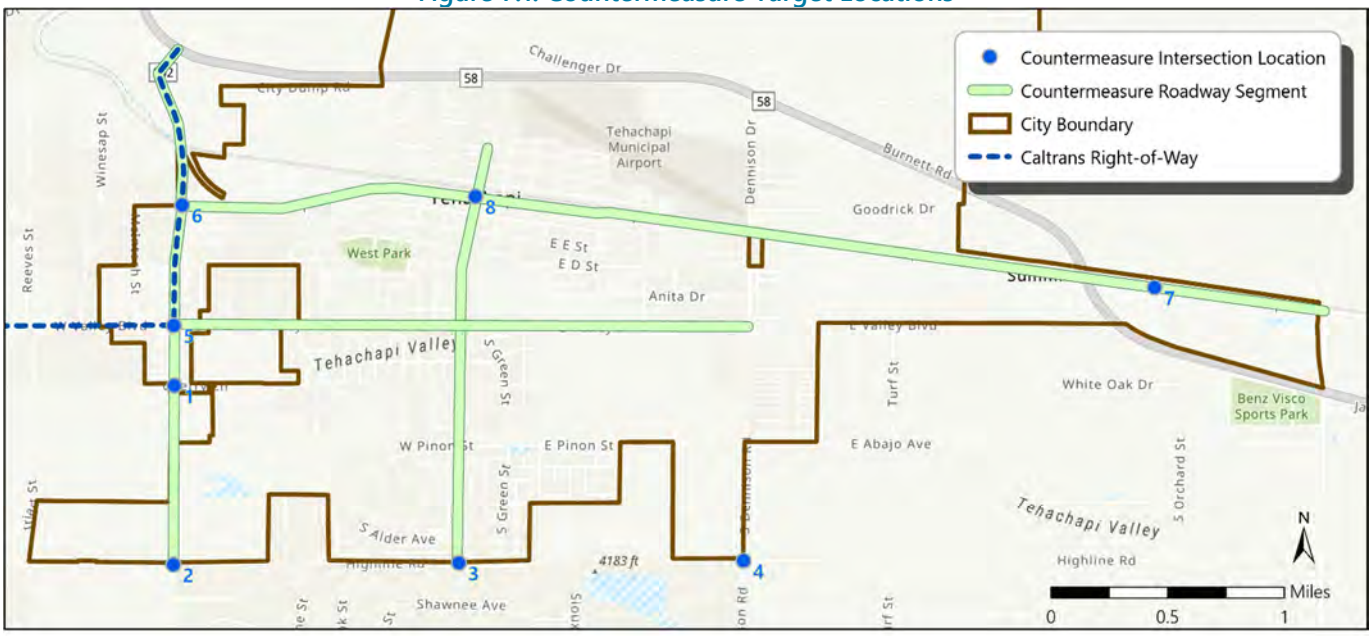
The Non-Signalized Intersections emphasis area is an intersection with no traffic signals, and a collision occurred at that intersection. A stop sign controls the intersection. In California City, 55.4% of collisions occurred at non-signalized intersections. All bicycle-related collisions and 41.7% of pedestrian-related collisions happened at non-signalized intersections. Most of the collisions involved were due to unsafe speeding (32.7%), Automobile Right of Way (17.3%), and Improper Turning (11.9%).

7.0 ENGINEERING COUNTERMEASURES

The recommended engineering countermeasures were derived from the collision pattern and trends and the emphasis areas from the previous sections. The recommended countermeasures identified below are based on a combination of collision data and responses from the community. The recommended countermeasures address pedestrian safety, automobile right of way/broadside collisions, unsafe speeding, and emergency services.

Collectively, the countermeasures target four major roadway segments and ten intersections, as shown in **Figure 7.1**. The following summarizes the engineering countermeasures locations and the collision patterns they address.

Figure 7.1: Countermeasure Target Locations



7.1 SUMMARY OF COUNTERMEASURE RECOMMENDATIONS

The top three types of most frequently encountered collisions in Tehachapi were broadside, rear end, and sideswipe. The common causes of these three collision types and the typical safety countermeasures addressing each collision type are listed in **Table 7.1**.

Table 7.1: Common Causes and Countermeasures-Citywide Collisions

Type	Causes	Potential Countermeasures
Broadside	• Automobile ROW • Traffic Signals and Signs • Improper Turning • Unknown • Unsafe Speed • Unsafe Starting or Backing • Wrong Side of Road	• Advanced dilemma zone detection • Upgrade signal hardware and improve the signal visibility • Improve signal timing (yellow, red intervals, pedestrian clearance) • Restrict turning movements out of driveways • Restrict parking on intersection approaches • Improve street lighting • Install advanced street name signage
Rear End	• Unsafe Speed • Following Too Closely • Unsafe Starting or Backing • Improper Turning • Unknown • Driving or Biking under the influence • Automobile ROW	• Advance Dilemma-Zone Detection • Emergency Vehicle Preemption (EVP) system • Reduce the number of travel lanes • Install bike lanes and reduce travel lane width • Reduce the speed limit/Calm Traffic • Improve crosswalk visibility • Install 12-inch signal heads • Replace signs indicating permitted turning movements on signals • Install advanced street name signage • Improve signal timing
Sideswipe	• Improper Turning • Unsafe Lane Change • Unknown • Automobile ROW • Unsafe Speed • Unsafe Starting or Backing • Driving under the influence	• Improve pavement marking visibility • Install advanced street name signage • Replace signs indicating permitted turning movements on signals • Install parking signs that are easier to interpret • Stripe red curb at intersection approaches

The Crash Reduction Factor (CRF) listed in the Local Roadway Safety Manual (LRSM) is directly connected to the Crash Modification Factor (CMF). A CRF is measured in the percentage of crash reduction expected after implementing a given countermeasure at a specific location. It plays an essential role in cost-effectiveness, which is the form of the Benefit/Cost Ratio (BCR).

Table 7.2 summarizes the list of safety countermeasures included in the LRSM and applied to this project. The table summarizes each countermeasure's applicable crash types, CRF, project life of the recommended improvement, maximum federal reimbursement percentage, and the opportunity for a systemic approach.

Table 7.2: Safety Countermeasures Applied to Tehachapi LRSP

CM No.	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	HSIP Funding Eligibility
R22	Upgrade Signage	All	15%	10	100%
R26	Dynamic Speed Warning Signs	All	30%	10	100%
R28	Edgeline and Centerline	All	25%	10	100%
R32PB	Bike Lanes	Pedestrian and Bicycle	35%	20	90%
NS01	Intersection Lighting	Night	20%	20	100%
NS06	Upgrage Signage	All	15%	10	100%
NS02	Convert to all-way STOP control	All	50%	20	100%
S02	Signal Hardware	All	15%	10	100%
S04	Advanced Dilemma Zone Detection	All	40%	10	100%
S03	Signal Timing	All	15%	10	50%
NS03	Traffic Signal	All	20%	20	100%
NS04	Roundabout (from an all way stop)	All	62%	20	100%
NS05	Roundabout (from a 2-way stop)	All	24%	20	100%

Source: Local Roadway Safety Manual, Version 1.5 April 2020

The countermeasure numbers (far left column) in **Table 7.2** represent the ID number for the types of improvements that are eligible for HSIP funding. Throughout this document, countermeasures eligible for HSIP funding will have the ID number, and those that are not eligible will not have an ID number.

7.2 ROADWAY SEGMENTS

7.2.1 Tehachapi Boulevard from Tucker Road to Tehachapi Willow Springs Road

Emphasis Areas: Bicyclists and Pedestrian Safety, Unsafe Speed, Non-Signalized Intersections

Tehachapi Boulevard is a 4-mile roadway segment running east and west from Tehachapi's eastern to western borders. Tehachapi Boulevard contains some traffic signals but primarily has stop-controlled intersections. The segment is surrounded primarily by commercial land use, running through downtown, and agriculture on the City's eastern side. Generally, the roadway provides two travel lanes. The segment has a posted speed limit of 35 mph.

A total of 89 collisions occurred along the segment between 2015 and 2019. Rear end (30%) and sideswipe (22%) collisions were the two largest crash categories on this corridor. The primary collision factor that was most common in this segment was unsafe speeding (26 percent). Collisions occurred throughout the segment, though the concentration was densest at non-signalized intersections in the downtown area. Half of the collisions occurred in the ¾-mile between Mill Street and Snyder Avenue on this segment. All bicycle (two) and pedestrian (one) collisions on the segment occurred in the downtown area. The primary cause of these collisions was right-of-way violation.

The recommendations for the Tehachapi Boulevard roadway include upgrading signage with fluorescent sheeting. The following signs are included:

- Stop Ahead sign, eastbound approach near Mill Street
- Stop Ahead sign, eastbound approach near Curry Street
- Stop Ahead sign, eastbound and westbound approaches near Robinson Street
- Stop Ahead sign, eastbound and westbound approaches near Dennison Road
- Crosswalk sign, eastbound and westbound at Pauley Street
- Crosswalk sign, eastbound and westbound at Davis Street
- Crosswalk sign, eastbound and westbound at Mojave Street
- Crosswalk sign, eastbound and westbound at Hayes Street

This treatment increases the visibility of signs. Other recommendations are to install dynamic speed feedback signs westbound 1100 feet west of Mount view Avenue and 300 feet west of Robinson Street, and eastbound 400 feet west of Snyder Avenue. These signs encourage motorists to abide by the posted speed limit. Finally, it is recommended to paint an edgeline on the southern edge of Tehachapi Boulevard from Dennison Road to Bailey Court. This treatment will visually narrow the lane, discouraging unsafe speeding. The recommendations are shown in **Appendix B.**

Summary of recommendations:

- R22 – Upgrade existing signage with florescent sheeting
- R26 – Install dynamic speed feedback warning signs
- R28 – Install edgeline eastbound from Dennison Road to Bailey Court

7.2.2 Tucker Road from Tehachapi Boulevard to Highline Road

Emphasis Areas: Bicyclists and Pedestrian Safety, Unsafe Speed

Tucker Road is a 1.5-mile segment running north and south of the city. This segment is within Tehachapi city limits, however, the City of Tehachapi does not have jurisdiction of Tucker Road from Valley Boulevard to the north city limit. The city has jurisdiction on Tucker Road from Valley Boulevard to Highline Road. The land use surrounding the segment is primarily commercial between Tehachapi Boulevard and Cherry Lane, and vacant or agricultural land elsewhere. The segment contains one to two travel lanes in each direction. Tucker Road has a center median from Valley Boulevard to Tehachapi Boulevard. From Valley Boulevard to Cherry Lane the segment has a center turn lane. North of Valley Boulevard the speed limit is 35 mph, south of Valley Boulevard, the speed limit is 40 mph.

A total of 76 collisions occurred along the segment between 2015-2019. The two largest crash categories on this corridor were broadside (30%) and rear end (26%) collisions. Most of these collisions occurred at the intersection of Valley Boulevard and Tucker Road. The top three causes of crashes in this segment were automobile right-of-way (29%), unsafe speed (20%), and improper turning (17%). There were three pedestrian-related collisions and one bicycle-related collision. One of the pedestrian-related collisions resulted in a fatality. These four collisions all occurred in the commercial section of the Tucker Road segment.

The recommendations for Tucker Road are as follows:

Between Tehachapi Boulevard and Valley Boulevard (Caltrans right-of-way)

As mentioned, the north end of Tucker Road between Tehachapi Boulevard and Valley Boulevard is Caltrans right-of-way. The recommendation for this portion of the segment is to install 6 foot bike lanes with 2 foot buffers for both northbound and southbound directions. This treatment will provide connectivity and increased comfort for bicyclists to travel to nearby amenities. It will also work to narrow the travel lanes visually, reducing speeds and improving safety for bicyclists. The recommendations are shown in **Appendix B.**

Between Valley Boulevard and Highline Road

The recommendations for the extent of Tucker Road within City of Tehachapi right-of-way (between Valley Boulevard and Highline Road) include upgrading the Stop Ahead sign on the northbound approach to Cherry Lane with fluorescent sheeting. This may increase awareness and visibility of the intersection for approaching motorists. It is also recommended that dynamic speed feedback warning signs be added at the northbound and southbound approaches of Cherry Lane to alert drivers of the approaching intersection, which is helpful due to its significant distance from other controlled intersections. A striped edgeline is also recommended on the east and west edges of the roadway from Cherry Lane to Highline Road, which will visually narrow the roadway and may discourage unsafe speeding. Lastly, a 6 foot bike lane with a 3 foot buffer is recommended on the northbound and southbound directions from Valley Boulevard to Cherry Lane. As mentioned above, this treatment will provide connectivity, comfort, and increased safety for bicyclists. It will also work to narrow the lane visually. The recommendations are shown in **Appendix B.**

Summary of recommendations:

- R22 – Upgrade existing signage with florescent sheeting
- R26 – Install dynamic speed feedback warning signs
- R28 – Install edgeline eastbound and westbound from Cherry Lane to Highline Road
- R32PB – Install buffered bike lanes on Tucker Road from Tehachapi Blvd to Cherry Lane

7.2.3 Valley Blvd from Sierra Vista Drive to Dennison Road

Emphasis Areas: Unsafe Speed, Non-Signalized Intersections

Valley Boulevard is a 2.3-mile roadway segment that runs east and west. The segment has two travel lanes, one in each direction. The segment is primarily residential, with a commercial cluster around the intersection of Tucker Road and Valley Boulevard. Valley Boulevard acts as a secondary arterial connecting to residential roads with more local traffic. There are frequent non-signalized intersections with residential roadways and some skewed intersections along this segment. The speed limit on the roadway is 45 mph.

A total of 58 collisions occurred in along the segment between 2015-2019. Rear end (37%) and broadside (22%) collisions. Most collisions occurred at the intersection of Valley Boulevard and Tucker Road. Other collisions were dispersed throughout the segment, primarily at non-signalized intersections. There were three pedestrian collisions and one bicycle collision on this segment. These four collisions primarily occurred at non-signalized intersections.

The recommendation for Valley Boulevard includes upgrading two Stop Ahead signs with fluorescent sheeting on the eastbound and westbound approaches to Snyder Avenue. Additionally, it is recommended that dynamic speed feedback warning signs are added at two locations, eastbound 1200 feet to the east of Tucker Road and westbound 1200 feet to the west of Mountain View Road.

Summary of recommendations:

- R22 – Upgrade existing signage with florescent sheeting
- R26 – Install dynamic speed feedback warning signs

7.2.4 Curry Street from J Street to Highline Road

Emphasis Areas: Unsafe Speed, Non-Signalized Intersections

Curry Street is a 1.75-mile roadway segment running north and south. There are two travel lanes, one in each direction of the roadway. South of Pinon Street, there is a raised center median. There is also a northbound and southbound Class III bike lane. The roadway is primarily residential and connects to local, residential roads. Tompkins Elementary School is located along the segment. There is only one signalized intersection and 25 non-signalized intersections on the segment. The speed limit ranges from 25-35 mph.

Curry Street had a total of 16 collisions. Of those collisions, the top collision types were broadside (44%) and sideswipe (25%) collisions. Collisions were distributed across the segment. The top primary collision factor was unsafe speed (38%). There was one pedestrian-related collision and no bicycle-related collisions. The pedestrian-related collision occurred at the crosswalk on Pine Court across Curry Street, where the driver was at fault, and the collision severity was complaint of pain.

The recommendations for the Curry Street roadway include upgrading signage with fluorescent sheeting.

Summary of recommendations:

- Stop signs SB & NB approaches of F Street
- Stop signs SB approach to Highline Rd
- Pedestrian crossing sign NB & SB approaches of E St
- Pedestrian crossing sign NB & SB approaches of D St
- School Crossing sign ~200 ft south of Valley Blvd
- School Crossing sign ~20 ft north of Cypress Ave
- School Crossing sign ~350 ft north of Pinon Ave

Additionally, it is recommended that three dynamic feedback signs are added, northbound and southbound at 1300 feet south of Valley Boulevard, and northbound at 400 feet north of Highline Road.

Summary of recommendations:

- R22 – Upgrade existing signage with florescent sheeting
- R26 – Install dynamic speed feedback warning signs

7.3 INTERSECTIONS

7.3.1 Tucker Road and Cherry Lane

Emphasis Areas: Unsafe Speed, Non-Signalized Intersections

The intersection of Tucker Road and Cherry Lane is in the southwestern portion of the City. The intersection is a four-legged, all-way stop-controlled intersection with a channelized right turn lane at the southbound approach and crosswalks on all but the west leg. The speed limit along Tucker Road is 45 mph and 40 mph on Cherry Lane.

This intersection experienced two collisions, one broadside, and one rear end collision. In both cases, the party at-fault was proceeding straight. The two causes of the collision were automobile right-of-way violation and unsafe speed. Both drivers at-fault were over 80 years old; recommendations for this intersection should consider older drivers as there is an assisted living facility nearby on Cherry Lane. There were no bicycle or pedestrian collisions.

The recommendations for this intersection include adding intersection lighting at the southwest and northeast corners of the intersection. This will increase visibility at the intersection, reducing the likelihood of conflicts. Additionally, the existing stop signs on Cherry Lane, both eastbound and westbound, consider upgrading to larger signs with solar-powered LED lights. This will enhance visibility of the intersection further away and may allow more reaction time for motorists. **Figure 7.1** illustrates the recommendations of this intersection. A summary of recommendations:

- NS01 – Install intersection lighting at the southwest corner and northeast corner of the intersection
- NS06 – Upgrade the existing 'STOP' signs to a larger stop sign with LED lights (solar power) on Cherry Lane in both (eastbound/westbound) approaches

Figure 7.1: Tucker Road and Cherry Lane

7.3.2 Tucker Road and Highline Road

Emphasis Areas: Unsafe Speed, Non-Signalized Intersections

The Tucker Road and Highline Road intersection is a four-legged intersection controlled by all-way stop signs with a channelized right turn lane in the eastbound direction (Highline Road). There is a significant distance between the intersection and adjacent intersections. The speed limit is 55 mph on Highline Road and 45 mph on Tucker Road.

A total of three collisions occurred at this intersection, most of which were sideswipe collisions. Automobile right-of-way, improper turning, and unsafe speeds were the primary collision factors involved in these collisions. There were no bicycle or pedestrian collisions.

The recommendations for Tucker Road and Highline Road include lighting at all corners to improve nighttime visibility and converting the all-way stop controlled intersection into a roundabout. This will slow down vehicles as they approach the intersection. **Figure 7.2** illustrates the recommendations of this intersection.

A summary of recommendations is listed below:

- NS01 – Install intersection lighting at all corners of the intersection
- NS04 – Convert the intersection to roundabout (from an all-way stop)

Figure 7.2: Tucker Road and Highline Road

7.3.3 Curry Street and Highline Road

Emphasis Areas: Non-Signalized Intersections

The Curry Street and Highline Road intersection is a two-way stop-controlled intersection with stop signs in eastbound and westbound directions (Highline Road). This intersection is located on the southern border of the City. The speed limit is 55 mph along Highline Road and 35 mph on Curry Street.

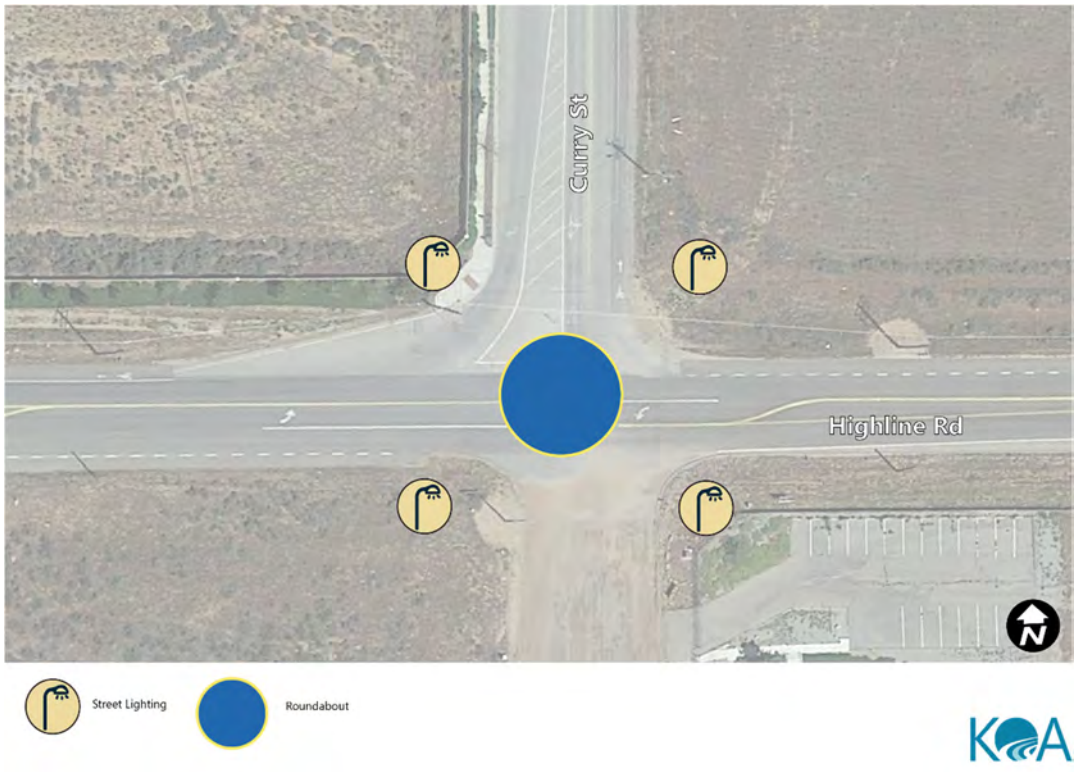
A total of three collisions occurred at this intersection: a broadside collision due to automobile right-of-way, a rear end collision due to unsafe starting or backing, and an unknown collision. The most severe collision resulted in visible injury, occurring in the rear end collision. There were no bicycle or pedestrian collisions.

The recommendations for Curry Street and Highline Road include lighting at all corners to enhance nighttime visibility. The intersection is also recommended to be converted into a roundabout. These treatments may enhance the visibility of the intersection for approaching motorists and make them slow down. **Figure 7.3** illustrates the recommendations of this intersection.

A summary of recommendations is listed below:

- NS01 – Install intersection lighting at all corners of the intersection
- NS05 – Convert intersection to round about (from a 2-way stop)

Figure 7.3: Curry Street and Highline Road



7.3.4 Dennison Road and Highline Road

Emphasis Areas: Non-Signalized Intersections

The Dennison Road and Highline Road intersection is a two-way stop intersection controlled by stop signs in the northbound and southbound direction. The north-south direction of the roadway is offset by 25 feet. The intersection is located on the southern border of the City. The posted speed limit on Highline Road is 55 mph, and Dennison Road is 35 mph.

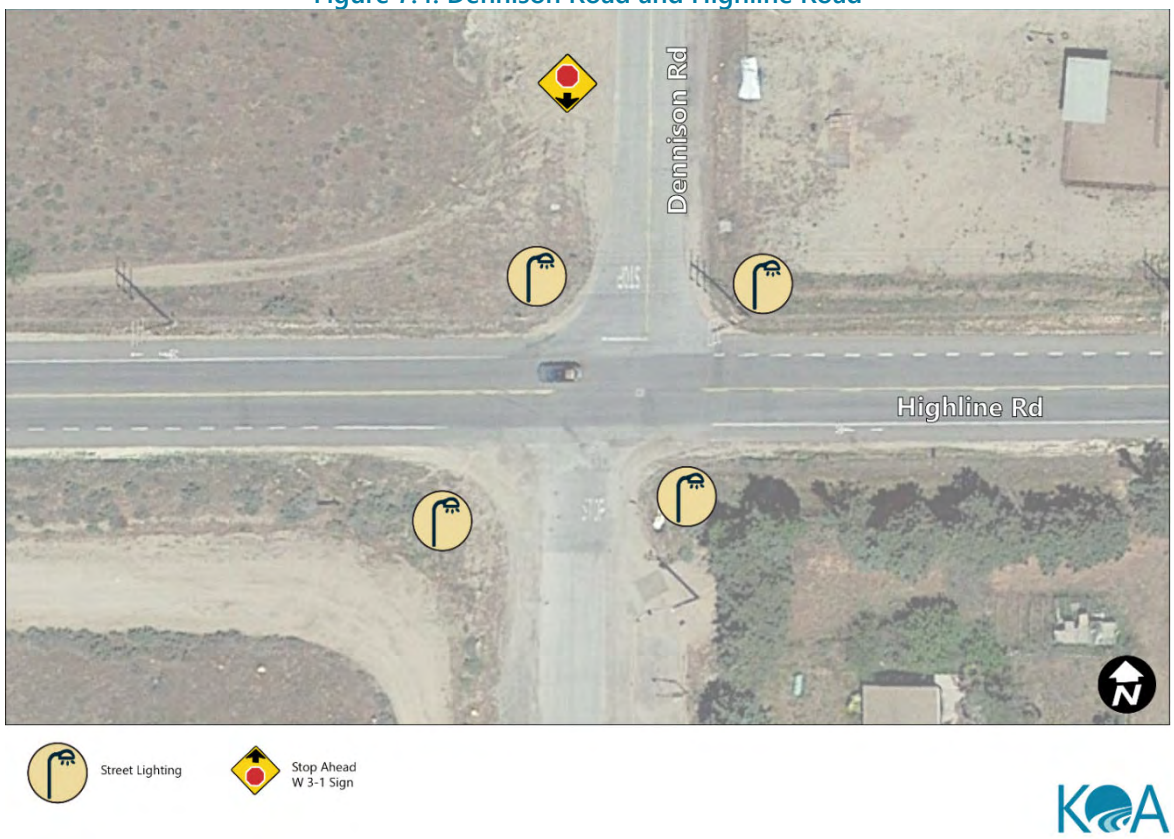
One collision occurred at this intersection: a sideswipe collision due to improper turning, resulting in only property damage. There were no bicycle- or pedestrian-related collisions.

The recommendations for Dennison Road and Highline Road include lighting at all corners to improve nighttime visibility. A "Stop Ahead" sign is recommended on the southbound approach. This treatment would improve sight distance for approaching motorists. **Figure 7.4** illustrates the recommendations of this intersection.

A summary of recommendations is listed below:

- NS01 – Install intersection lighting at all corners of the intersection
- NS06 – Install "Stop Ahead" sign (Dennison Road, southbound)

Figure 7.4: Dennison Road and Highline Road



7.3.5 Tucker Road and Valley Boulevard

Emphasis Areas: Unsafe Speed

The intersection of Tucker Road and Valley Boulevard is a four-legged signalized intersection. All legs have a protected left-turn phase, and the eastbound and westbound approaches have right-turn lanes. All legs have crosswalks. The distance between signalized intersections is significantly far from each other. The posted speed limit is 40 mph on Valley Boulevard and 45 mph on Tucker Road.

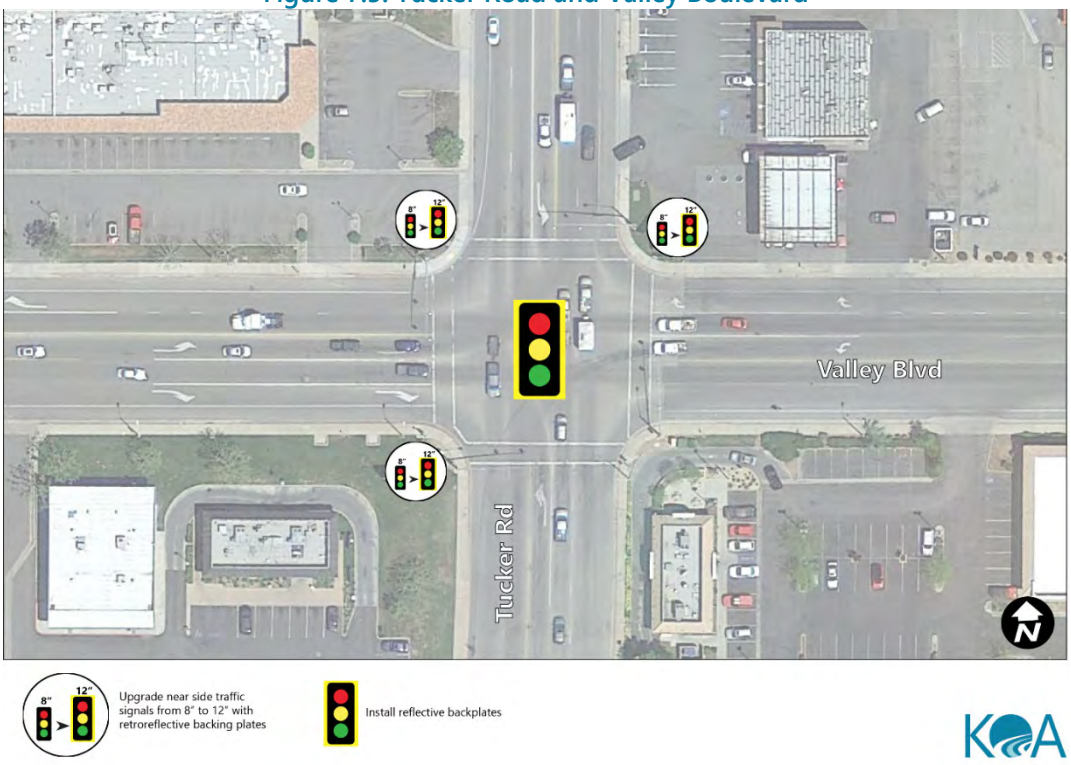
There were 35 collisions at this intersection between 2015 and 2019. Nearly half of collisions were rear end collisions (49%), with broadside collisions comprising (22%), and sideswipe comprising (14%). The primary causes of collisions were unsafe speeds (34%), automobile right-of-way violations (17%), and traffic signs or signals violations (17%). There was one pedestrian-related collision and no bicycle-related collision. The pedestrian-related collision was due to improper turning by the motorist and resulted in visible injury.

The recommendations for this intersection are to improve signal hardware by installing reflective backplates and upgrading to a larger signal head for the southbound, westbound, and eastbound near-side signals. **Figure 7.6** illustrates the recommendations of this intersection.

Summary of recommendations:

- S02 – Replace faded backplates and install reflective backplates at the intersection. Upgrade to larger signal head for the southbound, westbound, and eastbound near-side signals

Figure 7.5: Tucker Road and Valley Boulevard



7.3.6 Tehachapi Boulevard and Tucker Road

Emphasis Areas: Unsafe Speed

The intersection of Tucker Road and Tehachapi Boulevard is a four-legged signalized intersection. Protected left-turn phasing right-turn lanes are provided at this intersection. Also, crosswalks are provided for pedestrian crossings. The distance between signalized intersections is significantly far from each other. The posted speed limit is 35 mph on Tehachapi Boulevard and 45 mph on Tucker Road.

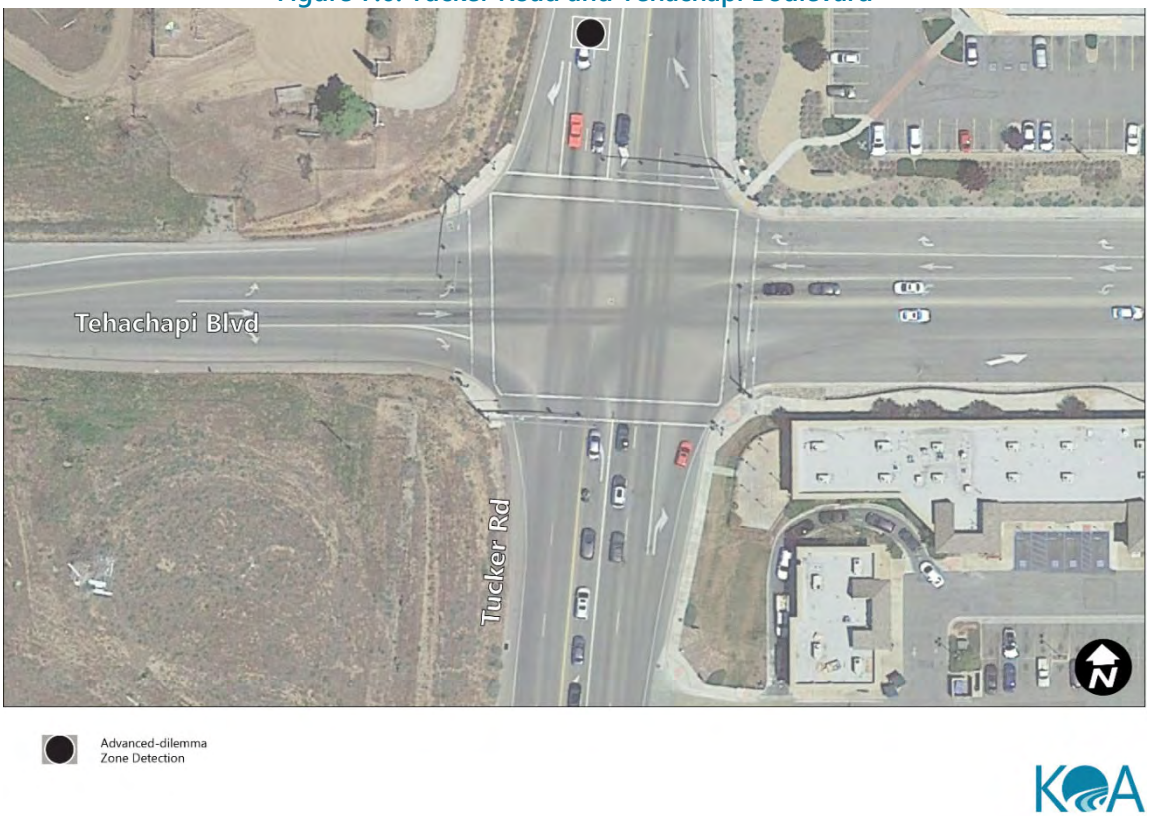
There were 17 collisions at this intersection between 2015 and 2019. The most common collision types were rear end collisions (49%), broadside collisions (24%), and sideswipe (18%). The primary causes of collisions were unsafe speeds (29%) and automobile right-of-way violations (24%). There were no pedestrian- or bicycle-related collisions.

The recommendation for this intersection is to install advanced dilemma zone detection on southbound Tucker Road. The benefits of this improvement may reduce the frequency of red-light violations that may associate with rear end or broadside collisions. Overall, it may reduce a motorist in the dilemma zone of deciding whether to take the speed through the intersection. **Figure 7.6** illustrates the recommendations of this intersection.

Summary of recommendations:

- S04 – Install Advanced Dilemma Zone Detection on Tucker Road, southbound approach

Figure 7.6: Tucker Road and Tehachapi Boulevard



7.3.7 Monolith Street and Tehachapi Boulevard

Emphasis Areas: Unsafe Speed

The intersection of Meyer St and Sycamore Rd is a three-legged signalized intersection. Northbound and westbound legs have a left-turn lane and the eastbound approach has a right-turn lane. Westbound and northbound legs have crosswalks. The intersection is located on the northeast side of the City. Tehachapi Boulevard has significantly higher speeds than Monolith Street.

There were 10 collisions at this intersection between 2015 and 2019. The most common collision types were rear end collisions (40%), broadside collisions (20%), and hit object (20%). The primary cause of collisions was unsafe speeds (50%). There were no pedestrian or bicycle collisions.

The recommendations for this intersection include installing advanced dilemma zone detection for eastbound and westbound Tehachapi Boulevard. This treatment changes signal timing to reduce the number of drivers that may have a difficult time deciding whether to stop. Additionally, it is recommended to improve signal hardware by installing reflective backplates, which will increase visibility of intersection control. **Figure 7.7** illustrates the recommendations of this intersection.

Summary of recommendations:

- S02 – Replace faded backplates and install reflective backplates at the intersection
- S04 – Install Advanced Dilemma Zone Detection on eastbound and westbound Tehachapi Boulevard

Figure 7.7: Monolith Street and Tehachapi Boulevard

7.3.8 Curry Street and Tehachapi Boulevard

Emphasis Areas: Bicyclists and Pedestrian Safety, Unsafe Speed

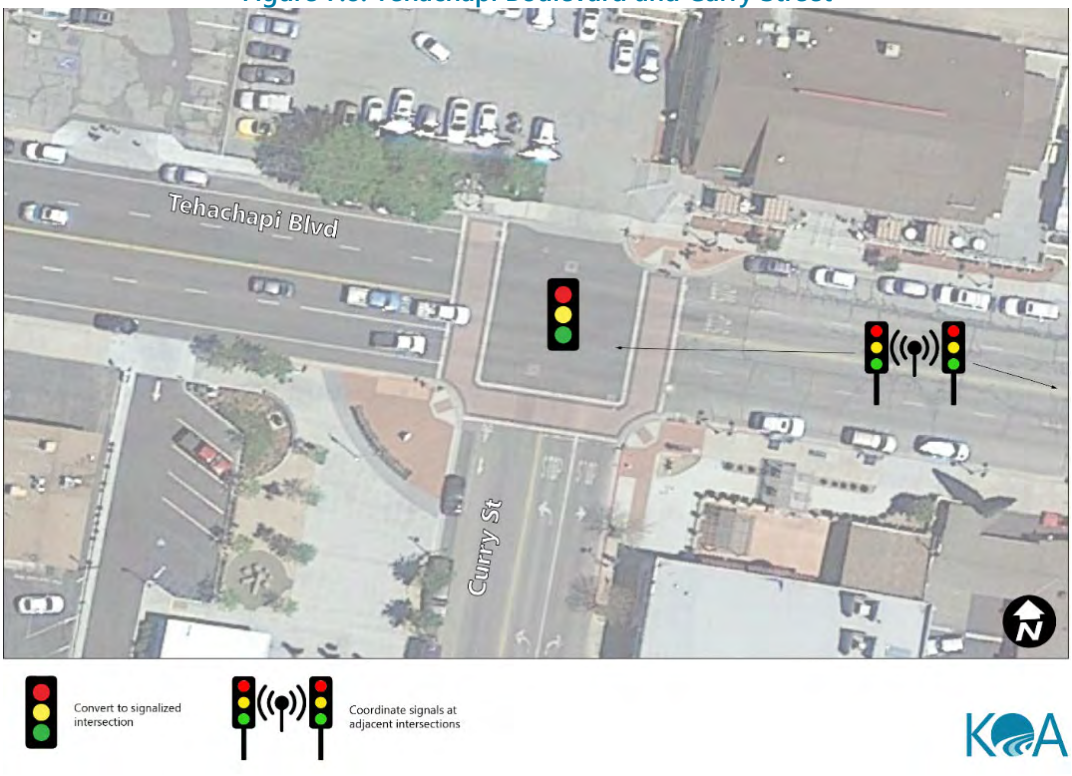
The intersection of Curry Street and Tehachapi Boulevard is a four-legged (one of which is the Tehachapi Village Marketplace parking entrance), stop-controlled intersection. There are northbound left-turn and right-turn lanes. All legs have a marked intersection except for across the parking lot egress. This intersection is the first pedestrian-oriented, downtown-in-character intersection when traveling eastbound on Tehachapi Boulevard. There is a bike lane on Curry Street. The posted speed limit on both roadways is 35 mph.

There were eight collisions at this intersection between 2015 and 2019. The most common collision types were rear end collisions (63%) and sideswipe collisions (25%). The primary cause of collisions was unsafe speeds (25%). There were no pedestrian- or bicycle-related collisions.

It is recommended to install a new traffic signal with flashing yellow arrow phasing in the eastbound and westbound directions. This will facilitate movement within the intersection, with multiple lanes on both Tehachapi Boulevard and Curry Street. Further, it is recommended to coordinate the traffic signals on Tehachapi Boulevard between Curry Street (new traffic signal) and Green Street. The coordination may include railroad preemption at the intersection of Green Street and Tehachapi Boulevard to improve the overall traffic operation. The railroad crossing on Green Street is approximately 150 feet from the intersection. This will facilitate a smoother, more clear flow of traffic. **Figure 7.8** illustrates the recommendations of this intersection. A summary of recommendations is listed below:

- NS03 – Install a new traffic signal at the intersection
- S03 – Coordinate signal timing at the intersection of Tehachapi Boulevard and Curry Street and the intersection of Tehachapi Boulevard and Green Street

Figure 7.8: Tehachapi Boulevard and Curry Street



8.0 NON-ENGINEERING SAFETY MEASURES

This section presents the non-infrastructure safety measures to Tehachapi roadway safety needs. The program promotes safe behavior in each plan's identified transportation safety emphasis areas through education, law enforcement, and encouragement.

8.1 YOUNG DRIVERS

The collision analysis revealed that roadways users under the age of 25 were at fault in 17.2% of property damage collisions and 31.6% of total collisions in the City of Tehachapi.[2] Younger drivers' relative lack of experience and judgment[3] makes them more prone to engage in risky behaviors, such as speeding or distracted driving. In Tehachapi, 91% of households own at least one vehicle, and in rural and suburban settings, motorists are more inclined to acquire licenses at an earlier age.[4] Therefore, educating young drivers on the importance of safe driving practices is a key pillar of the city's LRSP.

Based on the SWITRS collision data from 2015 to 2019, 11.3% of all collisions were driving under the influence (DUI), and drivers under the age of 25 caused 28.3% of those collisions. Drivers younger than 21, the minimum legal drinking age in California, were responsible for 8.7% of all DUI-related collisions. [5]The city may consider implementing programs warning youth about the dangers of drinking and driving.

EXISTING PROGRAMS

The California Highway Patrol (CHP) currently offers a program to teach driving safety to newly-licensed drivers call the "START SMART" program. "START SMART" offers traffic courses to teenagers who are ready to get behind the wheel and who have either signed up voluntarily or been referred by the court. The classes are usually hosted at a local CHP office and are accompanied by a mobile app with driving safety tips.

The following recommendations are non-engineering programs or program elements to address safety risks for young drivers.

EDUCATION

- Incorporate the "START SMART" into the high school curriculum. Move the class location from the CHP office to school campuses in the city and allow students to take the classes for elective units.
- Establish a school safety program in which officers and survivors of drunk driving accidents come to elementary, middle, and high schools to discuss the responsibilities and dangers associated with driving.
- Implement an interactive simulation program for high school students. The Every 15 Minutes program is an interactive simulation program that aims to challenge high school juniors and seniors about drinking, driving, and mature decision-making.
- Start a social media campaign at local middle and high schools, encouraging students to post videos on the danger of using their phones while driving. One possible concept might be "Save the Snap": a student gets out their phone just after putting the key into ignition only to get a comic reminder to "save the snap" for later.

---

[2] The property damage collision statistics was calculated by the total number of collisions. The KSI statistics was calculated by the total number of collisions but with the exclusion of collisions with "Unknown Age".

[3] Johnson, "Why Is 18 the Age of Adulthood If the Brain Can Take 30 Years to Mature?" https://bigthink.com/mind-brain/adult-brain

[4] US Census Burea, ACS 5-year estimates, 2019, "Household Size by Vehicles Available"

[5] The driving under the influence collision statistics was calculated based on the total number of DUI collisions.

Note: The Every 15 Minutes program is funded through the California Office of Traffic Safety, and the California Highway Patrol provides mini-grants to schools to implement the Every 15 Minutes program. The Every 15 Minutes program is a two-day program focusing on high school juniors and seniors, which challenges them to think about drinking, driving, personal safety, the responsibility of making mature decisions and the impact their decisions have on family, friends, their community, and many others.

ENFORCEMENT

- Monitor local liquor stores and bars suspected of selling alcohol to minors.
- Set up police checkpoints at night to enforce California's Graduated Licensing Law; prohibit young drivers under 18 from driving with someone under the age of 20 or between 11:00 pm and 5:00 am without an adult (25 years old) supervision and catch drunk drivers.

Table 8.1 presents potential funding sources for programs addressing safety challenges faced by young drivers.

Table 8.1: Young Driver Program Funding Sources

Description	Agency Responsible	Funding Program
Education		
Incorporate the "START SMART" into the high school curriculum. Move the class location from the CHP office to school campuses in the city.	Tehachapi Police Department, California Highway Patrol, Tehachapi Unified School District	OTS Grants
Establish a school safety program in which officers and survivors of drunk driving accidents come to elementary, middle, and high schools to discuss the responsibilities and dangers associated with driving.	Tehachapi Police Department, Tehachapi Unified School District	OTS Grants
Implement an interactive simulation program for high school students.	Tehachapi Unified School District	OTS Grants
Start a social media campaign at local middle and high schools, encouraging students to post videos on the danger of using their phones while driving.	Tehachapi Unified School District	OTS Grants
Enforcement		
Monitor local liquor stores and bars suspected of selling alcohol to minors.	City of Tehachapi, Kern County Sheriff's Department	OTS Grants
Set up police checkpoints at night to enforce California's Graduated Licensing Law.	Kern County Sheriff's Department	OTS Grants

8.2 UNSAFE SPEEDING

Between 2015 and 2019, unsafe speeding was the most commonly-reoccurring primary collision factor (PCF), associated with 34.7% of all collisions in the City of Tehachapi. Unsafe speeding associated with fatal or severe injuries (KSI) accounted for 38.5% of KSI collisions. Rear end collisions caused a majority of the unsafe speeding. Driving at unsafe speeds caused 63.6% of total rear-end crashes.

Speeding contributes significantly to crash frequency and severity. For instance, a car hitting a pedestrian is eight times more likely to kill that pedestrian when moving at 40 miles per hour than when moving at 20 miles per hour. Reducing rear end and other speeding-related collisions requires educating drivers on the dangers of speeding and stepping enforcement at intersections.

The following recommendations are non-engineering programs or program elements to address safety risks for unsafe speeding:

EDUCATION

- Create a social media campaign communicating the dangers of speeding.
- Host presentations and distribute flyers at community centers and high schools with infographics regarding speeding in Tehachapi.
- Install roadway signs along key roadways (Tehachapi Boulevard, Valley Boulevard, and Tucker Road) regarding the dangers of speeding.

ENFORCEMENT

- Install radar speed feedback signs at periodic intervals along arterials with reported speeding. These technologies display passing drivers' travel speed below a sign with the posted speed limit, thus showing whether drivers are traveling over the speed limit6 7. `
- Install Active Speed Monitors or Speed Trailers at periodic intervals along arterials with reported speeding.
- Expand the ticketing operations in which police officers are equipped with radar or lidar technology at strategic locations to ticket speeding drivers.

Table 8.2 presents potential funding sources for programs addressing safety challenges at non-signalized intersections

Table 8.2: Non-Signalized Intersections Program Funding Sources

Description	Agency Responsible	Funding Program
Education		
Host presentations and distribute flyers at local high schools and community centers.	Tehachapi Police Department, Mojave School District	OTS Grants
Create a social media campaign.	City of Tehachapi	OTS Grants
Install roadway signs along key roadways and intersections.	City of Tehachapi	OTS Grants

[6] *SRTS Guide: Active Speed Monitors. (2015, July). http://guide.saferoutesinfo.org/enforcement/active_speed_monitor.cfm*

[7] *SRTS Guide: Speed Trailers. (2015, July). http://guide.saferoutesinfo.org/enforcement/speed_trailer.cfm*

Description	Agency Responsible	Funding Program
Enforcement		
Install radar speed feedback signs at periodic intervals along arterials with reported speeding. These technologies display passing drivers' travel speed below a sign with the posted speed limit, thus showing whether drivers are traveling over the speed limit	Tehachapi Police Department	OTS Grants, Advanced Transportation and Congestion Management Technologies Deployment Program
Install Active Speed Monitors or Speed Trailers at periodic intervals along arterials with reported speeding.	Tehachapi Police Department	OTS Grants
Deploy police officers equipped with radar or lidar technology at strategic locations to ticket speeding drivers.	Kern County Sheriff's Department	OTS Grants

8.3 BICYCLISTS

The City of Tehachapi's 2012 Bicycle Master Plan (BMP) outlines the City's vision to become a more bicycle-friendly community, reduce the environmental impacts of vehicle travel, and improve community health. The City currently has bicycle facilities along much of Valley Boulevard and portions of Tucker Road, Tehachapi Boulevard, E Street, and C Street. More facilities are planned in the BMP, and the goal of increased bicycle infrastructure is supported in the 2011 General Plan, the 2003 Downtown Master Plan, and the 2010 Greater Tehachapi Area Specific and Community Plan.

However, the collision analysis shows that bicyclists face a disproportionate risk of fatality or severe injury in collisions. Between 2015 and 2019, bicycle-related collisions accounted for only 1.3% of total collisions in the City, but 7.1% of fatality and severe injury (KSI) collisions. In the 2017 California Office of Traffic Safety (OTS) rankings, Tehachapi placed 18th for the number of killed or injured bicyclists under 15 years old among 101 California cities.

The safety risks to bicycling in Tehachapi reflect a need for education and enforcement, as much for infrastructure. Beginning bicyclists may engage in risky behavior due to unfamiliarity with the rules of the road. From 2015 to 2019, 50 percent of at-fault parties with recorded age in bicycle collisions were bicyclists under the age of 13. The primary collision factor in these collisions was violating automobile right-of-way. Educational programs can ensure active transportation users know safe practices.

The reckless driving activity also poses a threat to bicyclists, particularly on roadways with unprotected facilities (the case in much of Tehachapi). Driving safety campaigns encouraging drivers to "pay attention" to pedestrians and bicyclists, while police enforcement can deter speeding and aggressive driving behavior.

EXISTING PROGRAMS

While the City of Tehachapi has several documents which support the expansion of bicycle culture and infrastructure in the City, there are limited enforcement, education, and emergency services focused on bicycling. In 2018, money from the Active Transportation Grant funded officers from the Tehachapi Police Department distributing helmets to

children and discussing the importance of bicycle safety.

There are online educational resources available at the State of California scale from programs such as Safe Routes to School and Vision Zero. Educational and law enforcement resources may be developed to complement investment in bicycle infrastructure in Tehachapi.

The following recommendations are non-engineering programs or program elements to address safety risks for bicyclists:

EDUCATION

- Implement a Bicycle Safety program in local schools for youth and at community centers for adults. These include bicycle rodeos[8], enclosed training courses with challenges addressing different skill areas (e.g., helmet fitting, starting and stopping, and traffic laws).
    - The City could consider commissioning a private agency to operate classes, much the way BikeNYC runs bicycle courses in the city of New York[9].
    - Integrate the curriculum into physical education classes in the Tehachapi Unified School District so that all children can benefit.
- Host hands-on bicycle safety events at local schools. These can include Bicycle Safety Skills Programs, which teach students how to operate bicycles safely, and bike to school days, carnival-like events featuring interactive educational activities about bicycling[10].
- Educate the police officer on bicycle rules and safety considerations so that they can enforce bicycle-related traffic violations.
- Launch an education campaign for motorists on pedestrian and bicyclist rights. This can include:
    - Neighborhood yard sign campaigns – encourage residents to post signs urging drivers to slow down/stop for bicyclists[11]. This may be targeted at residential areas where residents raise concerns about bicycle safety.
    - Advertising on the radio, streaming services (e.g., Pandora/Spotify) or social media[12]

ENFORCEMENT

- Implement targeted enforcement programs that devote police resources to areas where bicyclists face a high risk of collision or tend to engage in unsafe practices. Programs should be designed to both educate and enforce.
- Implement targeted referral programs to encourage parents to report bicycle or pedestrian collisions or near misses that occur on the way to school.

Table 8.3 presents potential funding sources for the programs addressing bicycle safety.

---

[8] *See Garden Grove Safe Routes to School Plan: Phase 1 Master Plan.*

[9] *Membership | Bike New York. (n.d.). Retrieved April 7, 2020, from https://www.bike.nyc/membership/*

[10] *KOA Corporation (March 2019). Garden Grove Safe Routes to School Plan: Phase 1 Master Plan.*

[11] *A Resident's Guide for Creating Safer a Communities for Walking and Biking—Safety | Federal Highway Administration. (n.d.). Retrieved April 8, 2020, from https://safety.fhwa.dot.gov/ped_bike/ped_cmnity/ped_walkguide/sec3.cfm*

[12] *For an example of what such an ad might sound like, see: https://www.sticktothelimitsf.org/*

Table 8.3: Bicyclists and Pedestrian Safety Program Funding Sources

Description	Agency Responsible	Funding Program
Education		
Implement a Bicycle Safety program in local schools and at community centers.	City of Tehachapi, Tehachapi Unified School District	Caltrans ATP, Sustainable Communities Grant Program
Host interactive Bicycle Education programs at local schools, such as Bicycle Rodeos.	City of Tehachapi, Tehachapi Unified School District	Caltrans ATP, Sustainable Communities Grant Program
Educate the police officers on bicycle rules and safety considerations so that they can enforce bicycle-related traffic violations.	Tehachapi Police Department	Caltrans ATP, OTS Grants
Launch an education campaign for motorists on bicyclists rights.	City of Tehachapi, Kern County Sheriff's Department	Caltrans ATP, OTS Grants
Enforcement		
Implement "Targeted Enforcement" programs which devote police resources to areas where bicyclists face a high risk of collision or tend to engage in unsafe practices.	Tehachapi Police Department	Caltrans ATP, OTS Grants
Implement "Targeted Referral" programs to encourage parents to report bicycle or pedestrian collisions or near misses that occur on the way to school.	Tehachapi Police Department	Caltrans ATP, OTS Grants

8.4 PEDESTRIANS

The plans outlined above in the bicycle section, also support the expansion of pedestrian infrastructure and safety initiatives. However, like bicyclists, pedestrians in Tehachapi bear an excessively high risk of fatality or severe injury in collisions. From 2015 to 2019, pedestrian collisions comprised of 28.6% of fatal or severe injury (KSI) collisions in Tehachapi involving a vehicle, despite only making up 2.3% of total collisions in the City. Conversely, 33 percent of all pedestrian collisions resulted in fatalities or severe injuries, a higher percentage than for any other collision type.

Tragically, pedestrians bore responsibility for only 30.8% percent of all pedestrian involved accidents. Of those pedestrians at-fault, 23.1&were under the age of 25. These age-based patterns suggest that young pedestrians may be more prone to make poor decisions.

Walking is perhaps the most universal form of transportation. Even drivers have to travel on foot between their parking spot and the store or office. Therefore, pedestrian safety risks pose a crucial challenge to any local roadway safety plan. Improving pedestrian safety in Tehachapi would make walking a more viable option for short trips, thereby assisting the City's goal of reducing emissions from vehicle travel.

EXISTING PROGRAMS

While the City of Tehachapi has several documents which support the expansion of pedestrian infrastructure in the City, there are limited enforcement, education, and emergency services focused on walking. There are online educational resources available at the State of California scale, from Safe Routes to School and Vision Zero programs. Educational and enforcement resources may be developed to complement investment in pedestrian infrastructure in Tehachapi.

The following recommendations are non-engineering programs or program elements to address safety risks for pedestrians:

EDUCATION

- Launch an education campaign for motorists on pedestrian rights. This can include:
    - Neighborhood yard sign campaigns – encourage residents to post signs urging drivers to slow down/stop for pedestrians. This may be targeted at residential areas where residents raise concerns about pedestrian safety.
    - Advertising on the radio, streaming services (e.g., Pandora/Spotify) or Social Media13
- Incorporate lessons on pedestrian rights and safety into "START SMART" and school safety education programs for young drivers (mentioned in Young Drivers Section).
- Incorporate pedestrian safety education into Physical Education classes in the Tehachapi Unified School District.
- Host hands-on pedestrian safety events at local schools. These can include pedestrian safety skills programs-teaching students how to cross the street safely and walk/bike to school days, carnival-like events featuring interactive educational activities about bicycling14.
- Host interactive pedestrian education programs at local schools. These include pedestrian rodeos15, enclosed training courses with challenges addressing different skill areas (e.g., rules of the road, blind spots, and directions to look in when crossing the street).

ENFORCEMENT

- Implement targeted referral programs to encourage parents to report pedestrian collisions or near misses that occur on the way to school.
- Employ pedestrian decoys-undercover officers posing as pedestrians crossing the street to both gauge the level of motorist non-compliance and draw publicity to the issue16.

Table 8.4 presents potential funding sources for programs addressing pedestrian safety.

---

[13] *For an example of what such an ad might sound like, see: https://www.sticktothelimitsf.org/*

[14] *KOA Corporation (March 2019). Garden Grove Safe Routes to School Plan: Phase 1 Master Plan.*

[15] *See Garden Grove Safe Routes to School Plan: Phase 1 Master Plan.*

[16] *"Pedestrian Decoy" Operations. (n.d.). SRTS Guide. Retrieved April 7, 2020, from http://guide.saferoutesinfo.org/enforcement/pedestrian_decoy_operations.cfm*

Table 8.4: Pedestrian Program Funding Sources

Description	Agency Responsible	Funding Program
Education		
Launch an education campaign for motorists on pedestrian rights.	City of Tehachapi, Tehachapi Police Department	Caltrans ATP, OTS Grants
Incorporate lessons on pedestrian rights and safety into "START SMART" and "School Safety" education programs.	City of Tehachapi, Tehachapi Unified School District, Tehachapi Police Department	Caltrans ATP, OTS Grants
Lobby the State government to add a pedestrian safety section to the California Department of Motor Vehicle's (DMV) Driver Education Handbook.	City of Tehachapi	N/A
Incorporate pedestrian safety education into Physical Education classes in the Tehachapi School District.	City of Tehachapi, Tehachapi Unified School District	Caltrans ATP, OTS Grants
Host hands-on Pedestrian Safety events at local schools. These can include Pedestrian Safety Skills Programs and "Walk/Bike to school days".	City of Tehachapi, Tehachapi Unified School District	Caltrans ATP, OTS Grants, Sustainable Communities Grants
Host interactive Pedestrian Education programs at local schools, such as Pedestrian Rodeos.	City of Tehachapi, Tehachapi Unified School District	Caltrans ATP, OTS Grants
Enforcement		
Implement "Targeted Referral" programs to encourage parents to report bicycle or pedestrian collisions or near misses that occur on the way to school.	Tehachapi Police Department	Caltrans ATP, OTS Grants
Employ pedestrian decoys-undercover officers posing as pedestrians crossing the street to both gauges the level of motorist non-compliance and draw publicity to the issue.	Tehachapi Police Department	OTS Grants

8.5 NON-SIGNALIZED INTERSECTIONS

In Tehachapi, 55.4% of total collisions and 63.6% of KSI collisions occurred at non-signalized intersections. Non-signalized intersections also comprised of 41.7% of pedestrian-related collisions and 100% of bicycle-related collisions. Most of the collisions were due to unsafe speed (32.7%), automobile right-of-way violations (17.3%), and improper turning (11.9%). Based on the collision data analysis, from 2015 to 2019, non-signalized intersections are the most common type of intersection and particularly important to implement safety initiatives geared at these intersections.

EXISTING PROGRAMS

There are no existing education, enforcement, or emergency response programs focused on non-signalized intersections in Tehachapi. In this way, most drivers are primarily informed about using non-signalized intersections safely during their driver's education program or prior to getting their license. This asserts the need for additional, continued resources to ensure drivers stay up-to-date through education and enforcement.

The following recommendations are non-engineering programs or program elements to address safety risks at unsignalized intersections:

EDUCATION

- Create a public awareness campaign regarding the safety risks at non-signalized intersections through social media and news outlets. Campaigns may include resources about non-signalized intersections and infographics such as.
    - 55.4% of collisions occur at non-signalized intersections (intersections with no traffic light)
    - 64% of collisions resulting in severe injury or fatality in Tehachapi occur at non-signalized intersections
    - 100% of bicyclists-related collisions on Tehachapi roadways in the last five years were located at non-signalized intersections
- Implement targeted safety education programs for vulnerable users such as children (administered in schools) and the elderly (administered at community gathering locations). The City may host public meetings and post flyers to convey the need for increased precaution at these intersections.
- Install roadside signs near key intersections (non-signalized intersections with a high rate of collisions), reminding motorists to come to a complete stop and look for pedestrians and bicyclists.
- Develop an online web page that will be pointed to in the above (public awareness campaign, education program, and roadside signs) to provide reminders and updates on the rules of the roads at unsignalized intersections. ITE provides a list of special safety considerations at unsignalized intersections that may be referenced for this website.[17]

ENFORCEMENT

- Position officers near key intersections to issue citations to motorists who fail to yield the right-of-way, stop at STOP signs, or abide by the speed limit. This may be coupled with placing a portable sign which reads "Intersection Enforcement" as the aim is not to write more tickets but rather change driver behavior

[17] *ITE. (2015). Unsignalized Intersection Improvement Guide. https://toolkits.ite.org/uiig/treatments.asp*

- Consider installing automated STOP sign enforcement that uses a camera to track whether a vehicle has slowed below a threshold (7 mph, is used in Washington DC). If it has not, an officer reviews the video to see if a violation has occurred and issues a citation if so.
- Deploy "decoy" officers at key intersections to safely approach the intersection as a pedestrian, then identify motorists who fail to yield to be stopped by another officer nearby.

EMERGENCY RESPONSE

- Update emergency medical resources such as extrication equipment to ensure better access to collision victims and quick response times.
- Conduct training specific to responses to common collision types; the three most common collision types at unsignalized intersections in Tehachapi are rear end, broadside, and sideswipe.

Funding Source **Table 8.5** presents potential funding sources for programs addressing safety challenges at unsignalized intersections.

Table 8.5: Unsignalized Intersection Program Funding Sources

Description	Agency Responsible	Funding Program
Education		
Create a public awareness campaign regarding the safety risks at unsignalized intersections through social media and news outlets.	City of Tehachapi	OTS Grants
Implement targeted safety education program for vulnerable users such as children and elderly active transportation users.	Kern County Sheriff's Department, Tehachapi Unified School District, Tehachapi Senior Center	OTS Grants
Install roadside signs near key intersections reminding motorists to come to a complete stop and look for pedestrians and bicyclists.	City of Tehachapi	OTS Grants
Develop an online web page to provide reminders and updates on the rules of the roads at unsignalized intersections.	City of Tehachapi	OTS Grants
Enforcement		
Position officers near key intersections to issue citations to motorists who fail to yield the right-of-way, stop at STOP signs, or abide by the speed limit.	Tehachapi Police Department	OTS Grants
Consider the installation of automated STOP sign enforcement which uses a camera to track whether a vehicle has slowed below a threshold.	Tehachapi Police Department, City of Tehachapi	OTS Grants

Description	Agency Responsible	Funding Program
Deploy "decoy" officers at key intersections to safely approach the intersection as a pedestrian, then identify motorists who fail to yield.	Tehachapi Police Department	OTS Grants

8.6 SUMMARY OF FUNDING SOURCES

Several state and federal grant programs offer to fund non-engineering roadway safety projects. The California Department of Transportation's (Caltrans) Active Transportation Program (ATP) aims to encourage bicycle and pedestrian use in the state by funding programs that increase bike or pedestrian mode share or improve bicycle or pedestrian safety. Caltrans also administers the Sustainable Communities Grant Program, which awards grants to municipal projects that reduce Greenhouse Gas Emissions and support Multi-modal transportation. The Sustainable Communities Program prioritizes projects that solicit stakeholder and community engagement and support state policies like the 2040 California Transportation Plan. The California Office of Traffic Safety awards grants for projects addressing any one or more of ten priority areas, including Driving Under the Influence, Distracted Driving, Pedestrian and Bicycle Safety, Police Enforcement, Safety Data Collection, and Marketing/Publicity Campaigns.

At the federal level, the Advanced Transportation and Congestion Management Technologies Deployment Program funds the use of technology to promote safety and efficiency in the transportation system. The Highway Safety Improvement Program (HSIP) funds safety projects on any public roadway. The program mainly funds engineering projects, but the legislation that created the program permits funding for law enforcement data collection efforts.

Table 8.6 Transportation Safety Funding Summary

Agency	Source	Eligible Programs	Areas Addressed
Federal Highway Administration (FHWA)	Highway Safety Improvement Program (HSIP)	Any work on public roads, bikeways and pedestrian paths/trails. For the most part, only engineering projects are eligible but the FAST act permits funding for data collection by law enforcement[1,2].	Data Collection
Federal Highway Administration (FHWA)	Advanced Transportation and Congestion Management Technologies Deployment Program	Funds advanced transportation and congestion management technologies to improve safety, efficiency and performance. Examples of funded project types include advanced traveler information systems and data collection and analysis efforts[3].	Digital Enforcement; Technology Partnerships
California Department of Transportation (Caltrans)	Active Transportation Program (ATP)	Local government projects that improve the safety or increase the mode share of bicycling and walking. Additional program objectives include reducing emissions and enhancing public health[4].	Bicycle and Pedestrian Education and Enforcement

Agency	Source	Eligible Programs	Areas Addressed
California Department of Transportation (Caltrans)	Sustainable Communities Grant Program	The program awards "Competitive Grants" to local governments. These grants prioritize projects that reduce Greenhouse Gas Emissions, support multi-modal transportation, involve stakeholder/ community engagement and support related plans like the California Transportation Plan and California Complete Streets Framework[5] .	Active Transportation
			Speed and Education
California Office of Traffic Safety	Office of Traffic Safety (OTS) Grants	Programs should address one of ten priority areas (six relevant ones listed to the right). Grant recipients should expect to wait up to 90 days before being reimbursed/funded, and should be able to provide traffic safety data to justify funded programs[6].	DUI
			Distracted Driving
			Ped/Bike Safety
			Police Enforcement
			Roadway Safety and Data Collection
			Social Media/Marketing

Sources:

- *Highway Safety Improvement Program Guidelines, April 2016*
- *Highway safety improvement program, Pub. L. No. 148, 23 US Code (2015). https://www.law.cornell.edu/uscode/text/23/148.*
- *Advanced Transportation and Congestion Management Technologies Deployment. February 2016. https://www.fhwa.dot.gov/fastact/factsheets/advtranscongmgmtfs.cfm.*
- *2021 Active Transportation Program Guidelines. March 25, 2020. Resolution G-20-31.*
- *California Department of Transportation. Sustainable Transportation Planning Grant Program. December 2019.*
- *California Office of Traffic Safety Grant Manual for Federal Fiscal Year 2020. December 2019.*

9.0 SAFETY PROJECTS

This section provides the project scope, collision reduction benefits calculation, cost estimation, and Benefit to Cost (B/C) ratio analysis. This section also discusses and summarizes the project prioritization for the HSIP application.

9.1 PROJECT SCOPES AND BENEFIT CALCULATIONS

The development of project scopes involves identifying one or more specific countermeasures at potential locations for safety improvements. Expected benefits are derived by applying the proposed countermeasures and corresponding Crash Reduction Factors (CRFs) to the expected crashes. This involves:

- Identifying the current number of crashes without treatment
- Applying CRFs by type and severity
- Applying a benefit value by crash severity
- Calculating the annual collision reduction benefits and multiplying by the project life in years

Caltrans has established some key requirements and procedures for its calls-for-projects to allow agencies maximum flexibility in combining countermeasures and locations into a single project while ensuring all projects can be consistently ranked on a statewide basis. These include:

- Only a maximum of three individual countermeasures can be utilized in the B/C ratio for a project.
- For a countermeasure to be utilized in the B/C ratio calculations, it must represent a minimum of 15 percent of the project's total construction cost. This is intended to ensure that minor and insignificant project elements are not misrepresented to the agency's major safety effort.

An engineer determining the benefits of newly installed infrastructure first determines the number of collisions with the potential to be prevented by the improvement. The engineer then applies the CRF, which gives the rough percentage of crashes that would be prevented. The next step in estimating the overall benefit of a proposed improvement project is multiplying the expected reduction in crashes by a generally accepted value for the "cost" of crashes. A project's expected "benefit" value is the expected "reduction in costs" value from reducing future crashes. The source for the costs by collision severity level was taken from Appendix D of the *Caltrans Local Roadway Safety Manual*, as discussed in Section 3.2.

The final step in calculating the total safety project benefits is to divide the benefits by the number of years the collision data was collected (five years for this project) and multiply this value by the project life in years.

For this LRSP, instead of calculating project benefits manually, project benefits were derived from entering collision data directly into the HSIP Analyzer tool. The tool auto-calculates project collision reduction benefits based on the method discussed above and reduces benefits calculated if more than one project is included due to cumulative effects.

The safety project scopes are listed in **Table 9.1**, including the applicable countermeasure category for each improvement and benefits calculated according to the method above.

Table 9.1: Safety Project Scopes

ID	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)
Roadway Segments							
A	Tehachapi Blvd from Tucker Rd to Tehachapi Willow Springs Rd	R22	Upgrage Signage	Upgrade existing signage with florescent sheeting: ● Stop Ahead sign, EB approach near Mill Street ● Stop Ahead sign, EB approach near Curry Street ● Stop Ahead sign, EB & WB approaches near Robinson Street ● Stop Ahead sign, EB & WB approaches near Dennison Road ● Crosswalk sign, EB & WB at Pauley Street ● Crosswalk sign, EB & WB at Davis Street ● Crosswalk sign, EB & WB at Mojave Street ● Crosswalk sign, EB & WB at Hayes Street	All	15%	10
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at: ● WB 1100 ft west of Mt View Ave ● WB 300 ft west of Robinson St ● EB 400 ft west of Snyder Ave	All	30%	10
		R28	Edgeline and Centerline	Install edgeline eastbound from Dennison Road to Bailey Court	All	25%	10
B	Tucker Rd fromTehachapi Blvd to Highland Rd	R22	Upgrage Signage	Upgrade existing signage with florescent sheeting: Stop Ahead sign, NB approach near Cherry Lane	All	15%	10
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at NB & SB approaches, 500 ft south of Cherry Ln	All	30%	10
		R28	Edgeline and Centerline	Install edgeline EB and WB from Cherry Lane to Highline Road	All	25%	10
		R32PB	Bike Lanes	Install buffered bike lanes on Tucker Road fromTehachapi Blvd to Cherry Lane	Ped and Bike	35%	20
C	Valley Blvd from Sierra Vista Dr to Dennison Rd	R22	Upgrage Signage	Upgrade existing signage with flourescent sheeting: ● Stop Ahead sign, EB approach of Snyder Ave ● Stop Ahead sign, WB approach of Snyder Ave	All	15%	10
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at: ● EB 1200 ft east of Tucker Rd ● WB 1200 ft west of Mountian View Ave	All	30%	10

ID	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)
D	Curry St from J St to Highland Rd	R22	Upgrage Signage	Upgrade existing signage with flourescent sheeting: ● Stop signs SB & NB approaches of F Street ● Stop signs SB approach to Highline Rd ● Pedestrian crossing sign NB & SB approaches of E St ● Pedestrian crossing sign NB & SB approaches of D St ● School Crossing sign ~200 ft south of Valley Blvd ● School Crossing sign ~20 ft north of Cypress Ave ● School Crossing sign ~350 ft north of Pinon Ave	All	15%	10
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at: ● NB and SB 1300 ft south of Valley Blvd ● NB 400 ft north of Highline Rd	All	30%	10
Intersections							
1	Tucker Rd & Cherry Ln	NS01	Intersection Lighting	Install intersection lighting at the SW corner and NE corner of the intersection	Night	20%	20
		NS06	Curry St & Highline Rd	Upgrade the existing 'STOP' signs to a larger stop sign with LED lights (solar power) on Cherry Lane in both (eastbound/westbound) approaches	All	15%	10
2	Tucker Rd & Highline Rd	NS01	Intersection Lighting	Install intersection lighting at all corners of the intersection	All	40%	20
		NS04	Rounabout	Convert the all-way stop controlled intersection to a roundabout	All	62%	20
3	Curry St & Highline Rd	NS01	Intersection Lighting	Install intersection lighting at all corners of the intersection	Night	40%	20
		NS05	Rounabout	Convert the two-way stop controlled intersection to a roundabout	All	24%	20
4	Dennison Rd & Highline Rd	NS01	Intersection Lighting	Install intersection lighting at all corners of the intersection	Night	40%	20
		NS06	Signs	Install Stop Ahead sign on Dennison Road, southbound approach	All	15%	10
5	Tucker Rd & Valley Blvd	S02	Signal Hardware	● Replace faded backplates and install reflective backplates at the intersection ● Upgrade to larger signal head for the southbound, westbound, and eastboud near-side signals	All	15%	10

ID	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)
6	Tucker Rd & Tehachapi Blvd	S04	Advanced Dilemma Zone Detection	Install Advanced Dilemma Zone Detection on Tucker Road, southbound approach.	All	40%	10
7	Monolith St & Tehachapi Blvd	S02	Signal Hardware	Replace faded backplates and install reflective backplates at the intersection	All	15%	10
		S04	Advanced Dilemma Zone Detection	Install Advanced Dilemma Zone Detection on Tehachapi Boulevard, both (eastbound/westbound) approach	All	40%	10
8	Curry St & Tehachapi Blvd	S03	Signal Timing	Coordinate signal timing at the intersection of Tehachapi Boulevard and Curry Street and the intersection of Tehachapi Boulevard and Green Street	All	15%	10
		NS03	Traffic Signal	Install a new traffic signal at the intersection	All	20%	20

9.2 COST ESTIMATE

Planning-level cost estimates were developed for each countermeasure. Cost estimates were prepared based on recent bid tabulations and estimates of current construction costs consisting of unit-based cost estimates and contingencies. The costs include construction costs and include engineering and administrative costs. A contingency is added to the construction cost of each project depending on the complexity of the scope. The engineering and administration cost is assumed to be 25 percent of the total construction cost, including the contingency. The cost estimates are included in **Appendix C**.

9.3 BENEFIT/COST RATIO

A Benefit/Cost Ratio (BCR) is the ratio of a project's Projects with a higher BCR mean greater benefits relative to costs, while a lower BCR means fewer benefits than costs.

Based on Caltrans's need for a fair, data-driven, statewide project selection process for HSIP call-for-projects, the benefit and cost calculations were completed using the same process shown in the HSIP Analyzer to calculate the B/C ratio of the project. The B/C ratios were used to identify the projects with high cost-effectiveness that may have a greater chance of receiving federal funding in Caltrans call-for-projects. **Table 9.2** summarizes the proposed safety projects with respective BCRs. The detail of the safety project, including the BCR analysis summary table, is provided in **Appendix D**.

Table 9.2: Benefits/Cost Ratio Analysis by Safety Project

ID	Location	CM #	Countermeasure Names	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/ Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
Roadway Segments											
A	Tehachapi Blvd from Tucker Rd to Tehachapi Willow Springs Rd	R22	Upgrage Signage	81	$4,194,200	$1,258,260	**$79,286**	31.7	100%	$79,286	$0
		R26	Dynamic Speed Warning Signs	81	$4,194,200	$2,516,520			100%		
		R28	Edgeline and Centerline	81	$4,194,200	$2,097,100			100%		
B	Tucker Rd fromTehachapi Blvd to Highland Rd	R22	Upgrage Signage	76	$6,746,600	$2,023,980	**$135,301**	46.8	100%	$121,770	$13,530
		R26	Dynamic Speed Warning Signs	76	$6,746,600	$4,047,960			100%		
		R28	Edgeline and Centerline	76	$6,746,600	$3,373,300			100%		
		R32PB	Bike Lanes	3	$4,522,300	$6,331,220			90%		
C	Valley Blvd from Sierra Vista Dr to Dennison Rd	R22	Upgrage Signage	58	$5,159,700	$1,547,910	**$45,581**	67.9	100%	$45,581	$0
		R26	Dynamic Speed Warning Signs	58	$5,159,700	$3,095,820			100%		
D	Curry St from J St to Highland Rd	R22	Upgrage Signage	16	$2,653,700	$796,110	**$52,130**	30.5	100%	$52,130	$0
		R26	Dynamic Speed Warning Signs	16	$2,653,700	$1,592,220			100%		
Intersections											
1	Tucker Rd & Cherry Ln	NS01	Intersection Lighting	0	$0	$0	**$183,866**	0.04	100%	$183,866	$0
		NS06	Curry St & Highline Rd	2	$26,600	$7,980			100%		
2	Tucker Rd & Highline Rd	NS01	Intersection Lighting	3	$39,900	$63,840	**$1,241,368**	0.1	100%	$1,241,368	$0
		NS04	Rounabout	3	$39,900	$98,952			100%		
3	Curry St & Highline Rd	NS01	Intersection Lighting	1	$13,300	$21,280	**$1,511,678**	0.2	100%	$1,511,678	$0
		NS05	Rounabout	3	$236,500	$227,040			100%		

ID	Location	CM #	Countermeasure Names	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/ Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
4	Dennison Rd & Highline Rd	NS01	Intersection Lighting	0	$0	$0	**$130,918**	0.03	100%	$130,918	$0
		NS06	Signs	1	$13,300	$3,990			100%		
5	Tucker Rd & Valley Blvd	S02	Signal Hardware	35	$1,319,500	$395,850	**$62,480**	6.3	100%	$62,480	$0
6	Tucker Rd & Tehachapi Blvd	S04	Advanced Dilemma Zone Detection	17	$2,810,400	$2,248,320	**$60,980**	36.9	100%	$60,980	$0
7	Monolith St & Tehachapi Blvd	S02	Signal Hardware	10	$200,600	$60,180	**$96,340**	1.7	100%	$96,340	$0
		S04	Advanced Dilemma Zone Detection	10	$200,600	$160,480			100%		
8	Curry St & Tehachapi Blvd	S03	Signal Timing	8	$303,000	$90,900	**$686,050**	0.4	50%	$343,025	$343,025
		NS03	Traffic Signal	8	$303,000	$242,400			100%		

As shown in the table above (**Table 9.2**), the improvements are listed by intersections. Some of the improvements have the BCR of zero due to no collisions associated with the improvement type. The calculated BCR for each project summarizes the cost-effectiveness of the 18 proposed safety projects without considering how the project would be funded.

9.4 PROJECT PRIORITIZATION

A prioritized list of safety projects for the HSIP application was identified. The B/C ratios may be used to identify the projects with high cost-effectiveness that have the greatest chance of receiving federal funding in Caltrans call-for-projects.

BCR is not the only guide to prioritizing and implementing a countermeasure. The safety project list will be used to reference which safety project to implement first. The implementation timeline will be dependent on the City's goals and funding eligibility. The City may choose to move forward with any of these safety projects in any order, depending on funding availability. If the applications are approved for funding, these projects should not be applied for future HSIP cycles. If the safety projects are not funded by the upcoming HSIP Cycle 11, then those projects could be considered for application from other funding sources.

Because HSIP grants are competitive, it is typically appropriate to apply only for projects with a higher BCR. According to the HSIP grant application guidelines, a safety project needs to be at least $100,000 and a minimum of 3.5 BCR to submit an HSIP Cycle application.

Taking the HSIP application into consideration, **Table 9.3** summarizes the BCR analysis for the safety project. The safety projects are categorized by countermeasure ID and are prioritized by BCR. The City may use the list from **Table 9.3** to determine which will be implemented based on the City's goals and funding availability.

Table 9.3: Recommended Safety Projects List

Location	CM #	Countermeasure Names	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	BCR	HSIP Max Share
Tehachapi Blvd from Tucker Rd to Tehachapi Willow Springs Rd	R22	Upgrage Signage	81	$4,194,200	$1,258,260	$79,286	67.9	100%
	R26	Dynamic Speed Warning Signs	81	$4,194,200	$2,516,520			100%
	R28	Edgeline and Centerline	81	$4,194,200	$2,097,100			100%
Valley Blvd from Sierra Vista Dr to Dennison Rd	R22	Upgrage Signage	58	$5,159,700	$1,547,910	$45,581	46.8	100%
	R26	Dynamic Speed Warning Signs	58	$5,159,700	$3,095,820			100%
Tucker Rd & Cherry Ln	NS01	Intersection Lighting	0	$0	$0	$183,866	36.9	100%
	NS06	Curry St & Highline Rd	2	$26,600	$7,980	$0		100%
Tucker Rd & Tehachapi Blvd	S04	Advanced Dilemma Zone Detection	17	$2,810,400	$2,248,320	$60,980	31.7	100%
Curry St from J St to Highland Rd	R22	Upgrage Signage	16	$2,653,700	$796,110	$52,130	30.5	100%
	R26	Dynamic Speed Warning Signs	16	$2,653,700	$1,592,220	$0		100%

The average BCR of HSIP 9 selected projects is 17.7. depending on the minimum reimbursement amount and BCR of HSIP Cycle 11, the City can either select the eligible individual projects or group projects as a systemic improvement, as shown in **Table 9.3**, for the HSIP funding application. The City may also determine which project to be prioritized based on available funding sources, public support, and other factors.

APPENDIX A
COLLISION HISTORY BY INTERSECTION

Intersection Collisions

Collision Data from 2015 to 2019

ID	Intersections	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Total Collisions
1	TUCKER RD & VALLEY BL			4	4	23	31
2	TEHACHAPI BL & TUCKER RD		1		1	11	13
3	MONOLITH ST & TEHACHAPI BL				1	6	7
4	CURRY ST & TEHACHAPI BL			1	1	5	7
5	DAVIS ST & TEHACHAPI BL					7	7
6	CONWAY AV & TUCKER RD	1		1		5	7
7	MILL ST & VALLEY BL				1	5	6
8	STEUBER RD & TEHACHAPI BL				1	5	6
9	CURRY ST & VALLEY BL					5	5
10	RT 58 & TEHACHAPI BL				1	4	5
11	ROBINSON ST & TEHACHAPI BL				1	4	5
12	GREEN ST & TEHACHAPI BL				1	4	5
13	INDUSTRIAL PKWY & MILL ST				1	4	5
14	GREEN ST & H ST					5	5
15	DENNISON RD & VALLEY BL		2		1	1	4
16	DENNISON RD & TEHACHAPI BL			1	2	1	4
17	ELM ST & VALLEY BL				1	3	4
18	CLEARVIEW ST & VALLEY BL			2		2	4
19	VALLEY BL & VALLEY BL		1			3	4
20	MAGELLAN DR & ZURICH ST					3	3
21	CURRY ST & HIGHLINE RD			1	1	1	3
22	MILL ST & TEHACHAPI BL				1	2	3
23	CURRY ST & E ST			1		2	3
24	HIGHLINE RD & TUCKER RD					3	3
25	STUEBER RD & TEHACHAPI BL			2		1	3
26	MCINTOSH ST & RED APPLE AV				2	1	3
27	TEHACHAPI BL & TEHACHAPI WILLOW SPRINGS RD				1	2	3
28	MOUNTAIN VIEW AV & TEHACHAPI BL			2		1	3
29	GRIFFIN ST & VALLEY BL			1	1	1	3
30	HAYES ST & TEHACHAPI BL					3	3
31	GREEN ST & VALLEY BL			1	1	1	3
32	F ST & MILL ST			1		2	3
33	TUCKER RD & TUCKER RD			1	1		2
34	RED APPLE AV & TUCKER RD					2	2
35	MULBERRY ST & VALLEY BL				1	1	2
36	CAPITAL HILLS PKWY & VOYAGER DR			1	1		2
37	CAPITAL HILLS PKWY & CHALLENGER DR				1	1	2
38	CURRY ST & F ST		1			1	2
39	CURRY ST & CURRY ST					2	2
40	CHERRY LN & ELM ST			1		1	2
41	PAULEY ST & TEHACHAPI BL				1	1	2
42	ASPEN DR & ASPEN DR					2	2
43	BRENTWOOD DR & CHERRY LN					2	2
44	D ST & MOUNT VIEW AV					2	2
45	COMMERCIAL WY & J ST					2	2
46	ANITA DR & SNYDER AV			1		1	2
47	BRENTWOOD DR & CURRY ST					2	2
48	CHERRY LN & MILLER LN					2	2
49	CHERRY LN & TUCKER RD					2	2
50	H ST & MILL ST					2	2
51	RT 202 & TEHACHAPI BL					1	1

Intersection Collisions
Collision Data from 2015 to 2019

ID	Intersections	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Total Collisions
52	MILLS ST & POLE 914IN					1	1
53	TUCKER RD & UTILITY POLL 881W					1	1
54	DENNISON RD & GEORGIA AV			1			1
55	CURRY ST & PINON ST				1		1
56	DENNISON RD & HIGHLINE RD					1	1
57	D ST & MOJAVE ST			1			1
58	DENNISON RD & PINION ST					1	1
59	DAVIS ST & F ST				1		1
60	DENNISON RD & PINON ST					1	1
61	MULBERRY ST & MULBERRY ST					1	1
62	CLEARVIEW CT & GREEN ST				1		1
63	RED APPLE RD & TUCKER RD		1				1
64	CANYON DR & MARGE LN					1	1
65	SNYDER AV & VALLEY BL			1			1
66	E ST & E ST					1	1
67	TUCKER RD & POLE #4275111E					1	1
68	E ST & MOJAVE AV					1	1
69	VALLEY BL & UP 204989E			1			1
70	E ST & MOUNTAIN VIEW AVE					1	1
71	C ST & MILL ST					1	1
72	E ST & ROBINSON ST					1	1
73	BAILEY CT & TEHACHAPI BL					1	1
74	ELM ST & JONATHAN PL					1	1
75	OAKFLAT DR & OAKFLAT DR					1	1
76	ELM ST & SHERWOOD PL		1				1
77	RED APPLE AV & REEVES ST					1	1
78	COMANCHE DR & DURHAM ST			1			1
79	BEAR MOUNTAIN BL & WALNUT DR			1			1
80	F ST & F ST					1	1
81	RT 58 & TUCKER RD					1	1
82	F ST & GREEN ST					1	1
83	ANITA DR & ANITA DR					1	1
84	COMANCHE DR & MARK RD			1			1
85	TEHACHAPI BL & TUCKER BL					1	1
86	F ST & PAULEY ST					1	1
87	TUCKER RD & UT POLE 4073283E					1	1
88	F ST & SNYDER AV				1		1
89	TUCKER RD & VALLEY RD					1	1
90	GREEN ST & GREEN ST					1	1
91	VALLEY BL & UTILITY POLE 4365415E					1	1
92	A ST & CARROLL WY					1	1
93	TEHAPACHI BL & CURRY ST					1	1
94	GREEN ST & SUTTER ST					1	1
95	ASPEN DR & LINDEN CT			1			1
96	APPLE WY & HOLLY DR					1	1
97	MOJAVE ST & ST					1	1
98	COMANCHE DR & VARSITY RD			1			1
99	C ST & PAULY ST					1	1
100	COMMERCIAL WY & GREEN ST					1	1
101	CURRY ST & J ST				1		1
102	H ST & H ST					1	1

Intersection Collisions

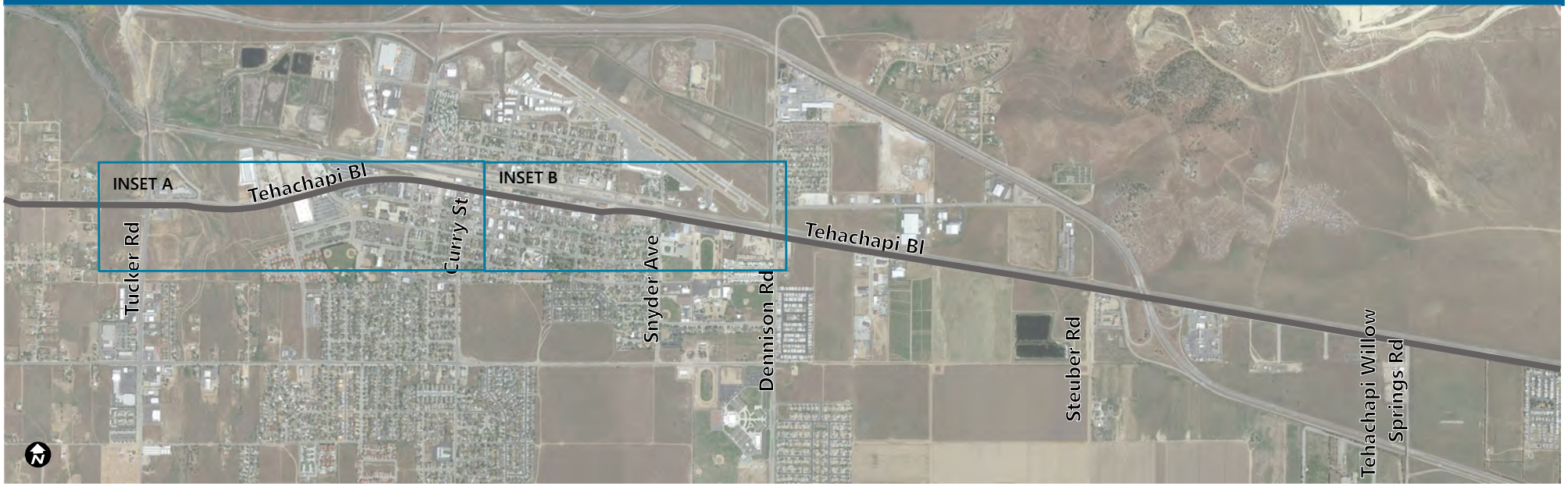
Collision Data from 2015 to 2019

ID	Intersections	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Total Collisions
103	OLD TUCKER RD & TEHACHAPI BL			1			1
104	MT VIEW AV & TEHACHAPI BL					1	1
105	PONDEROSA DR & SUTTER ST					1	1
106	BRETT AV & DENNISON RD					1	1
107	CURRY ST & SPRUCE ST					1	1
108	HAVEN DR & WALNUT DR				1		1
109	RED APPLE WY & TUCKER RD			1			1
110	CANYON DR EAST & VALERIE LN					1	1
111	ROYAL ST & WALNUT DR				1		1
112	CONWAY AV & MCINTOSH ST					1	1
113	ANGUS CT & SAN JUAN DR				1		1
114	HOOD ST & MEYER ST			1			1
115	SNYDER AV & TEHACHAPI BL					1	1
116	I ST & MOJAVE					1	1
117	BRENTWOOD DR & CLEARVIEW ST					1	1
118	A ST & PAULEY ST					1	1
119	TEHACHAPI BL & TEHACHAPI BL					1	1
120	JACOBSON CT & SNYDER AV				1		1
121	TEHACHAPI BL & THE DOG HOUSE					1	1
122	KELTON ST & VALLEY BL			1			1
123	BRENTWOOD DR & CURRY RD					1	1
124	KERN / KINGS CO LINE & VALLEY BL					1	1
125	CHERRY LN & OAKWOOD ST					1	1
126	LAS COLINAS ST & VALLEY BL				1		1
127	TUCKER RD & UTILITY POLE 4073283E				1		1
128	MAGELLAN DR & MAGELLAN DR					1	1
129	DAVIS ST & DAVIS ST					1	1
130	BURNETT RD & CHALLENGER DR				1		1
131	TUCKER RD & WALMART DRWY			1			1
132	MAPLE ST & MULBERRY ST					1	1
133	VALLEY BL & UTILITY POLE #4073606E					1	1
134	C ST & CURRY ST					1	1
135	VALLEY BL & UTILITY POLE SC190337					1	1
136	MESQUITE & PONDEROSA					1	1
137	WILD OLIVE DR & WILD OLIVE DR					1	1
138	MILL ST & MILL ST					1	1
139	CAMPUS DR & VARSITY RD				1		1
140	MILL ST & RT 58					1	1
141	H ST & UTILITY POLE 4690238E					1	1
	Grand Total	**1**	**7**	**36**	**42**	**214**	**300**

APPENDIX B
COUNTERMEASURE GRAPHICS

City of Tehachapi
COUNTERMEASURE CONCEPTS

Tehachapi Blvd from Tucker Rd to Tehachapi Willow Springs Rd



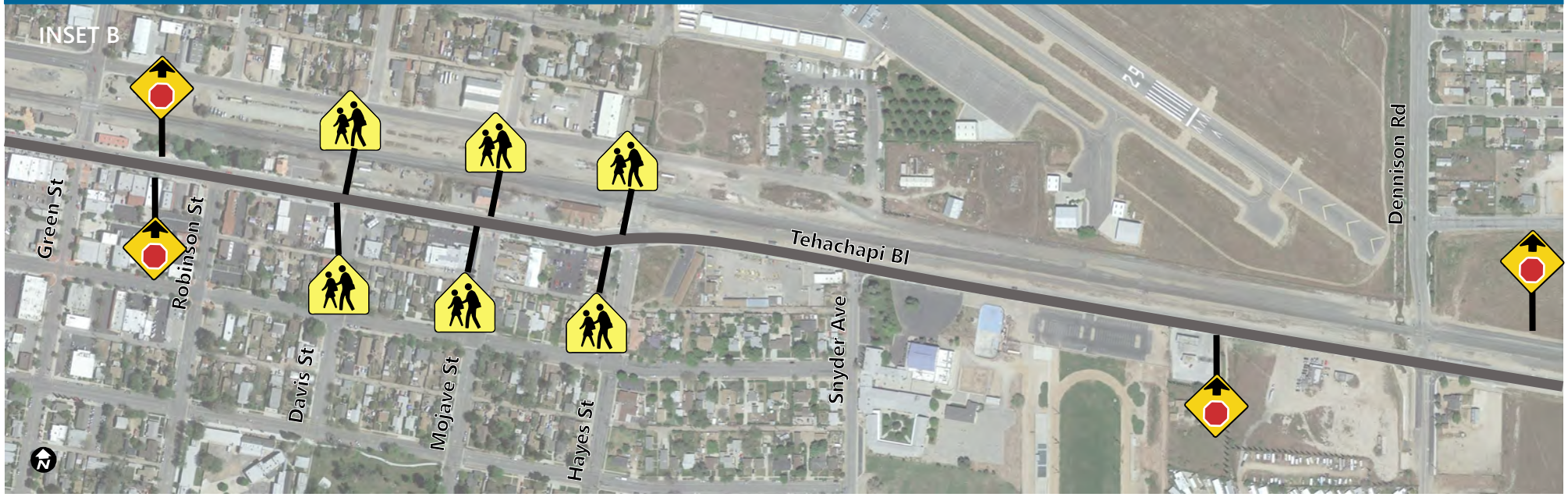
Upgrade Pedestrian sign to flourescent sheeting

Upgrade Stop Ahead sign to flourescent sheeting

Speed Feedback Sign

City of Tehachapi
COUNTERMEASURE CONCEPTS

Tehachapi Blvd from Tucker Rd to Tehachapi Willow Springs Rd

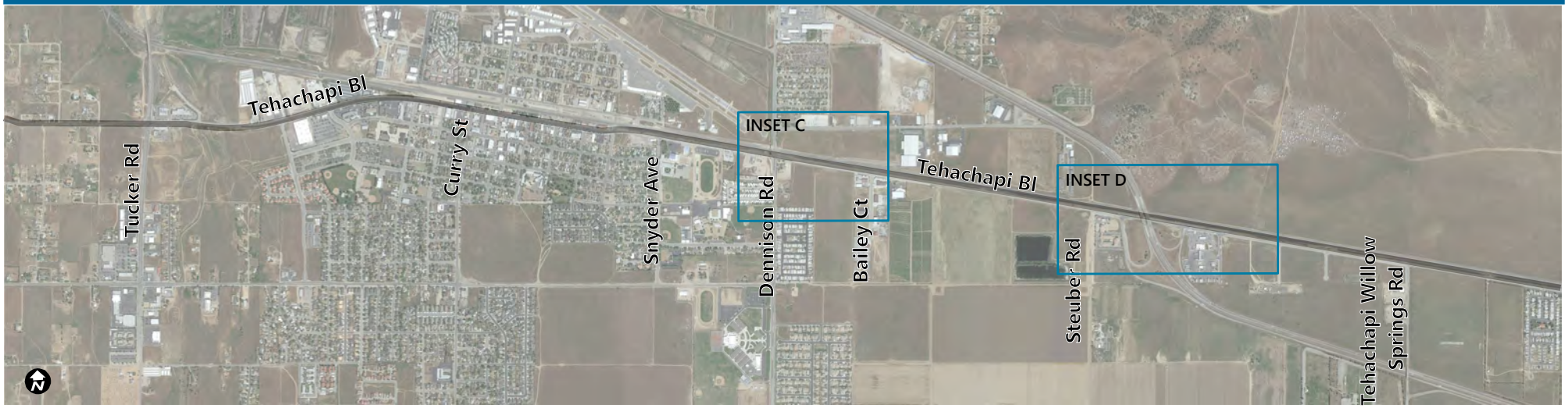


Upgrade Pedestrian sign to flourescent sheeting

Upgrade Stop Ahead sign to flourescent sheeting

City of Tehachapi
COUNTERMEASURE CONCEPTS

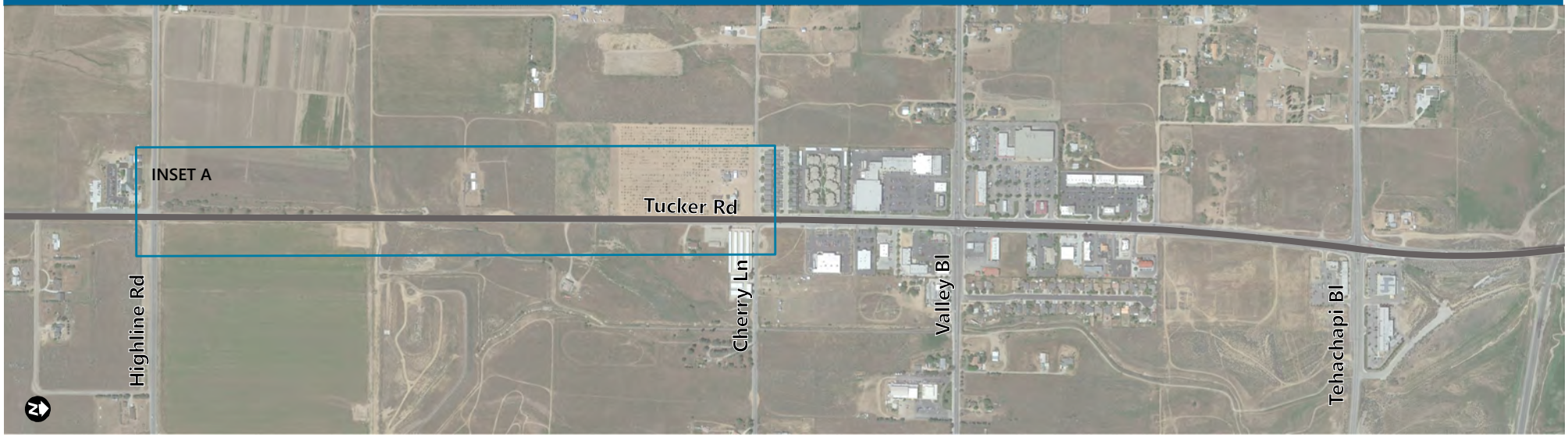
Tehachapi Blvd from Tucker Rd to Tehachapi Willow Springs Rd



Edgeline

City of Tehachapi
COUNTERMEASURE CONCEPTS

Tucker Rd from Tehachapi Bl to Highline Rd



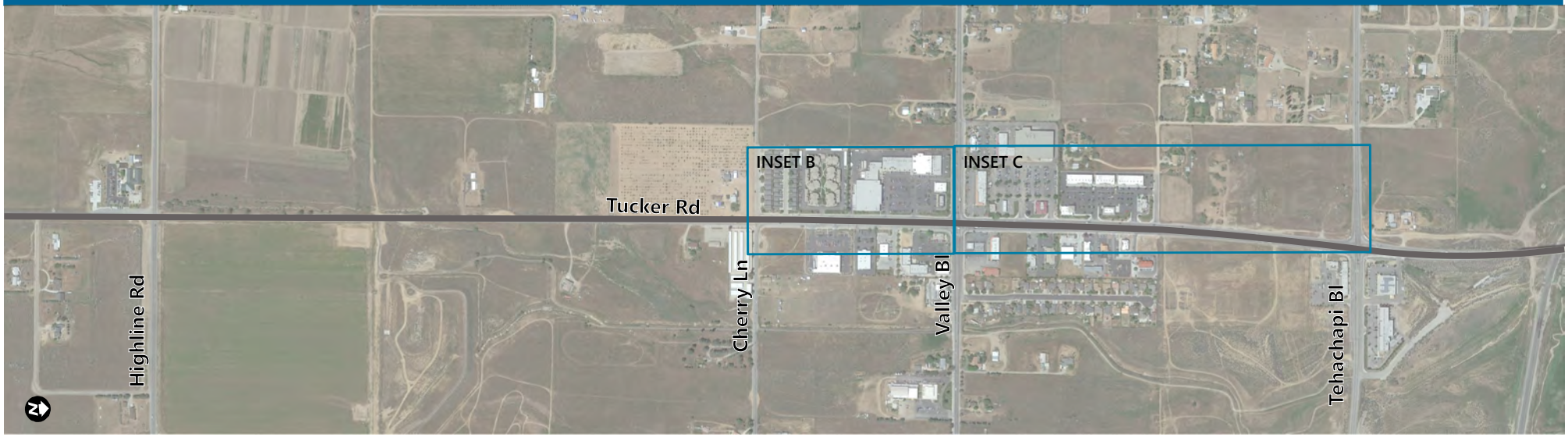
Upgrade Stop Ahead sign to flourescent sheeting

Edgeline

Speed Feedback Sign

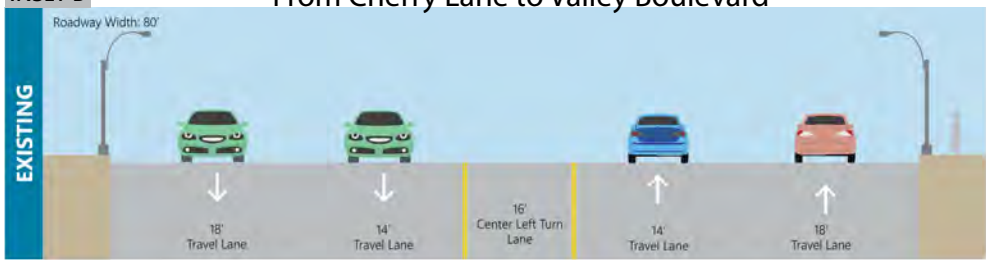
City of Tehachapi
COUNTERMEASURE CONCEPTS

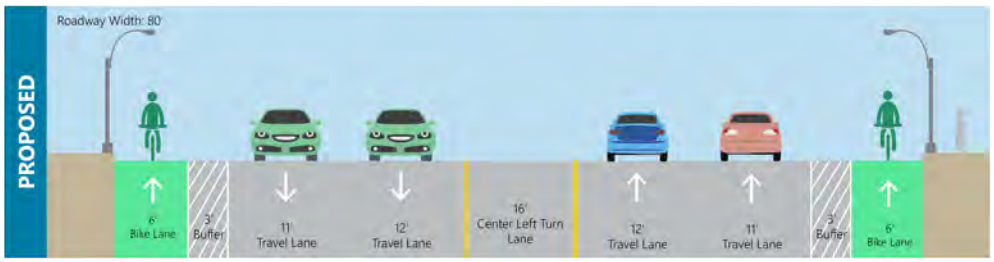
Tucker Rd from Tehachapi Bl to Highline Rd



INSET B

From Cherry Lane to Valley Boulevard



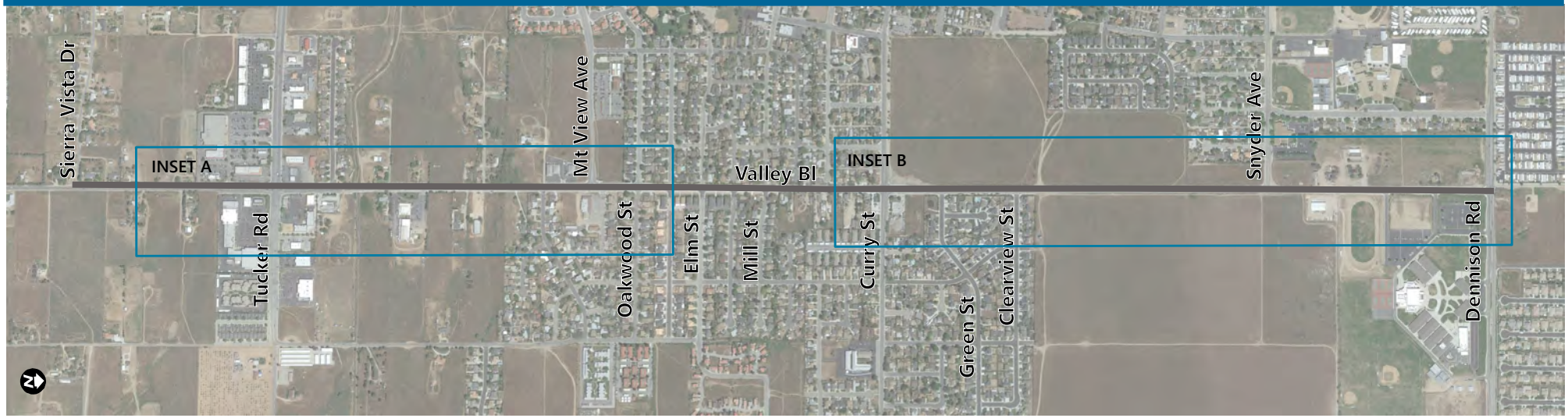


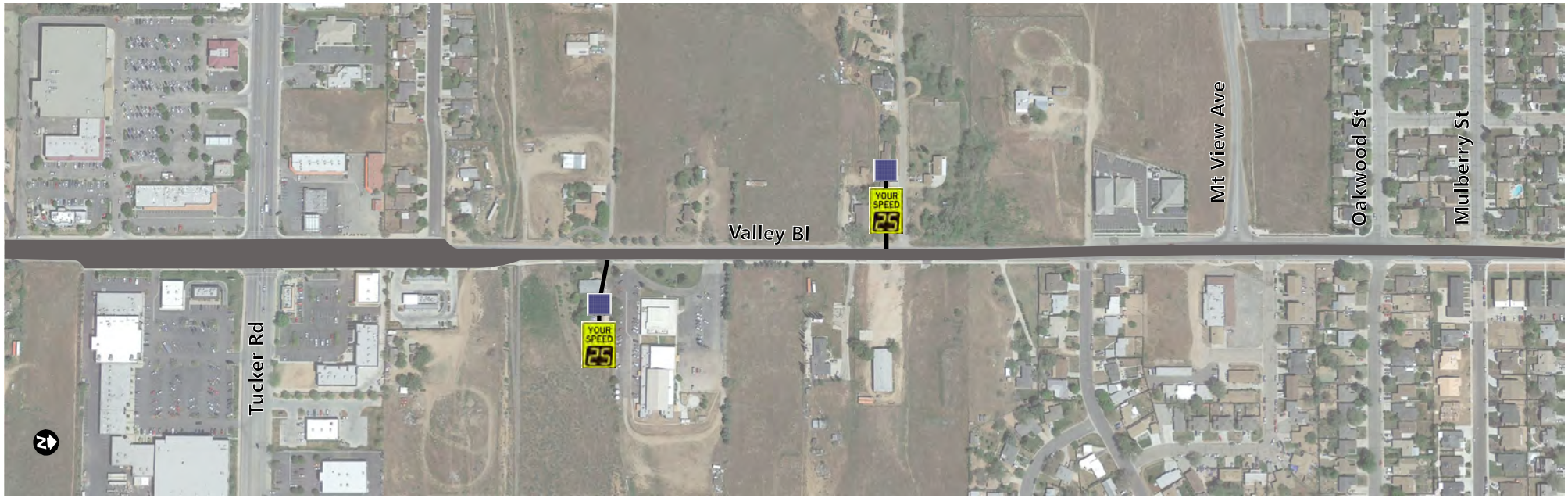
INSET C

From Valley Boulevard to Tehachapi Boulevard

City of Tehachapi
COUNTERMEASURE CONCEPTS

Valley Bl from Sierra Vista Dr to Dennison Rd



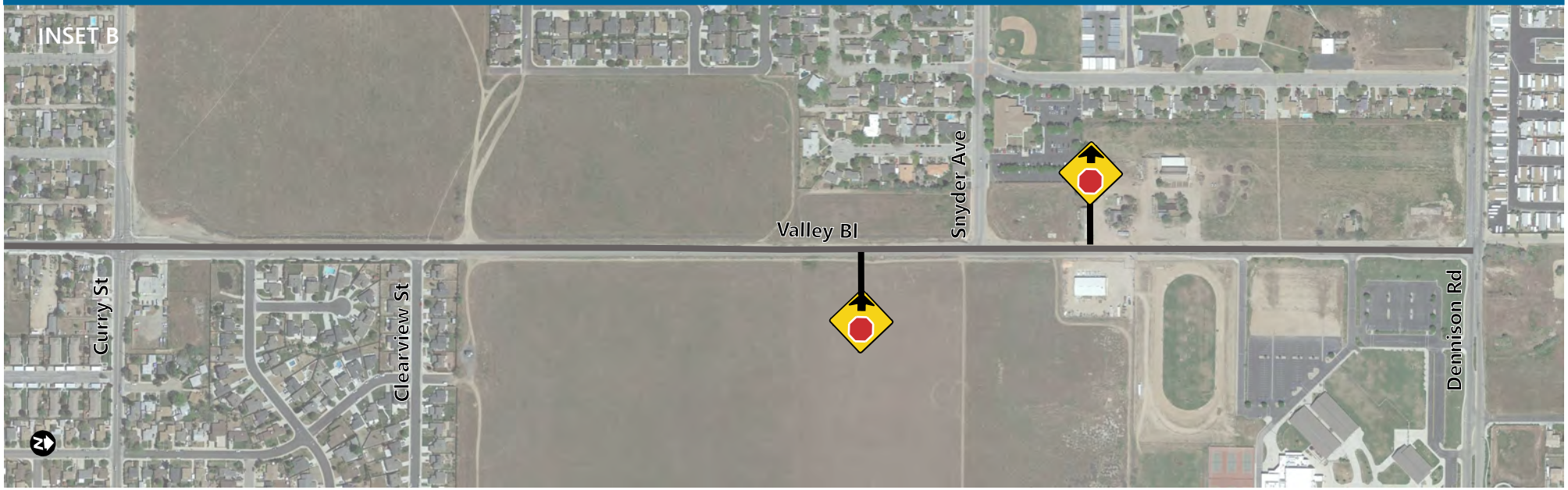


YOUR SPEED 25

Speed
Feedback Sign

City of Tehachapi
COUNTERMEASURE CONCEPTS

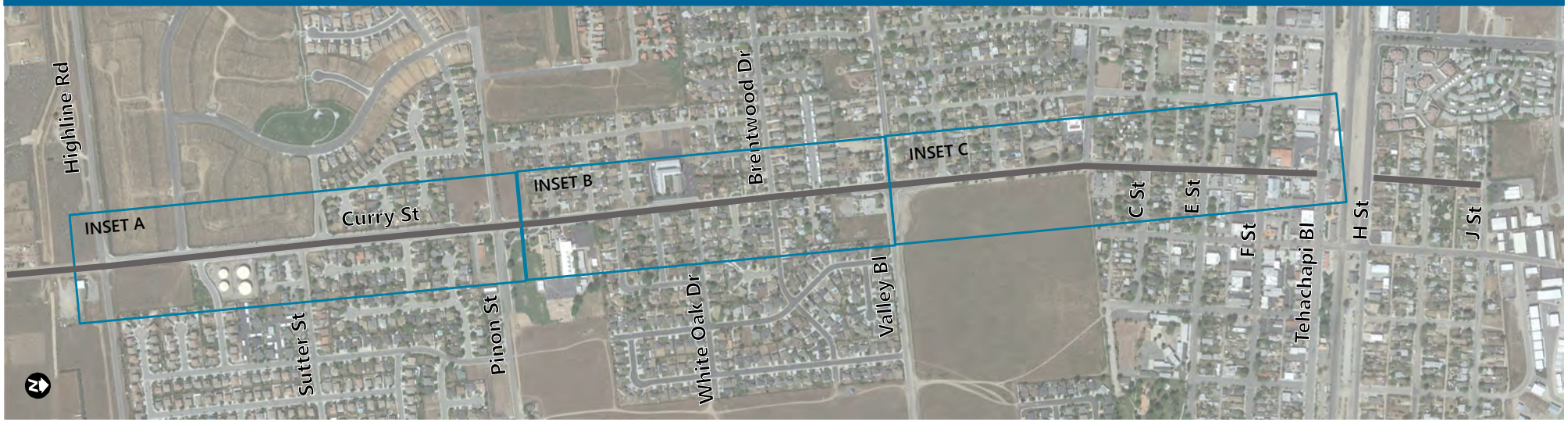
Valley Bl from Sierra Vista Dr to Dennison Rd



Upgrade Stop Ahead sign to flourescent sheeting

City of Tehachapi
COUNTERMEASURE CONCEPTS

Curry St from J St to Highline Rd



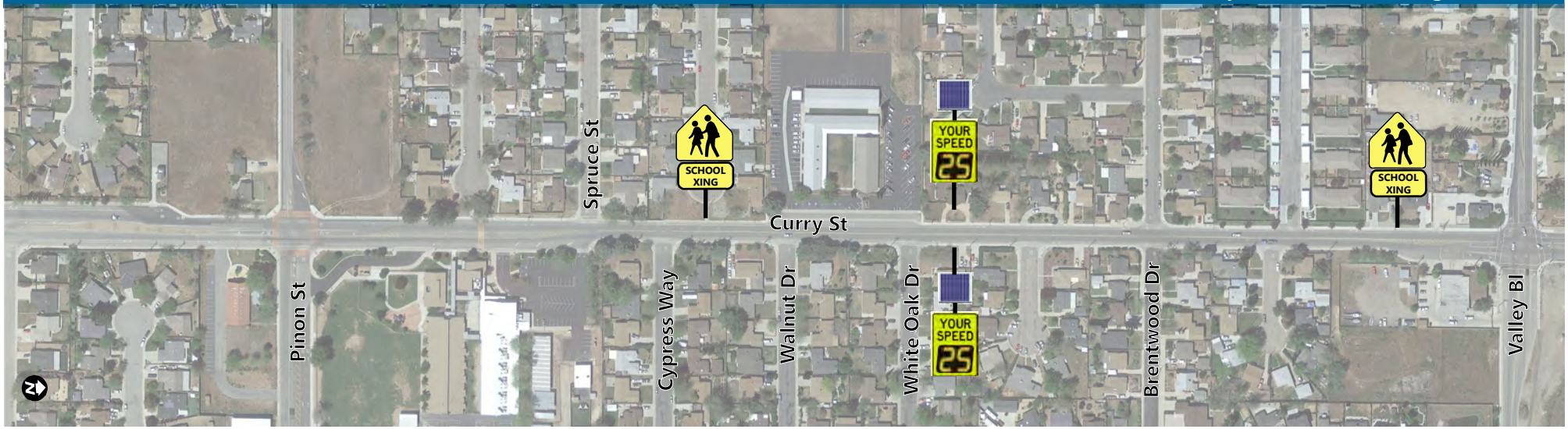
SCHOOL XING — Upgrade school crossing sign to flourescent sheeting

STOP — Upgrade Stop sign to flourescent sheeting

YOUR SPEED 25 — Speed Feedback Sign

City of Tehachapi
COUNTERMEASURE CONCEPTS

Curry St from J St to Highline Rd



STOP Upgrade Stop sign to flourescent sheeting

Upgrade Pedestrian crosswalk sign to flourescent sheeting

SCHOOL XING Upgrade school crossing sign to flourescent sheeting

YOUR SPEED 25 Speed Feedback Sign

KOA

APPENDIX C
SAFETY PROJECT COST ESTIMATES

CITY OF TEHACHAPI

TEHACHAPI BLVD FROM TUCKER RD TO TEHACHAPI WILLOW SPRINGS RD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	SIGNING AND STRIPING				
	REMOVE SIGN	14	EA	$150	$2,100
R22	INSTALL SIGN	14	EA	$500	$7,000
R26	INSTALL DYNAMIC SPEED WARNING SIGN	3	EA	$10,000	$30,000
R28	INSTALL STRIPING	1600	LF	$2	$3,200
				SIGNING AND STRIPING SUBTOTAL:	**$42,300**
				TOTAL FOR BASE BID ITEMS	**$42,300**
				MOBILIZATION & DEMOBILIZATION	**$4,230**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$5,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$3,760**
				PROJECT MANAGEMENT	**$4,230**
				30% CONTINGENCY	**$12,690**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$5,076**
				GRAND TOTAL	**$79,286**

CITY OF TEHACHAPI

TUCKER RD FROM TEHACHAPI BLVD TO HIGHLAND RD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	SIGNING AND STRIPING				
	REMOVE SIGN	1	EA	$150	$150
R22	INSTALL SIGN	1	EA	$500	$500
R26	INSTALL DYNAMIC SPEED WARNING SIGN	2	EA	$10,000	$20,000
R28 R32PB	INSTALL STRIPING	24000	LF	$2	$48,000
				SIGNING AND STRIPING SUBTOTAL:	**$68,650**
				TOTAL FOR BASE BID ITEMS	**$68,650**
				MOBILIZATION & DEMOBILIZATION	**$3,433**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$4,000**
				FINAL DESIGN	**$16,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$7,520**
				PROJECT MANAGEMENT	**$6,865**
				30% CONTINGENCY	**$20,595**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$8,238**
				GRAND TOTAL	**$135,301**

CITY OF TEHACHAPI

VALLEY BLVD FROM SIERRA VISTA DR TO DENNISON RD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	SIGNING AND STRIPING				
	REMOVE SIGN	2	EA	$150	$300
R22	INSTALL SIGN	2	EA	$500	$1,000
R26	INSTALL DYNAMIC SPEED WARNING SIGN	2	EA	$10,000	$20,000
	SIGNING AND STRIPING SUBTOTAL:				**$21,300**
	TOTAL FOR BASE BID ITEMS				**$21,300**
	MOBILIZATION & DEMOBILIZATION				**$5,325**
	TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY				**$2,000**
	FINAL DESIGN				**$4,000**
	CONSTRUCTION MANAGEMENT AND INSPECTION				**$1,880**
	PROJECT MANAGEMENT				**$2,130**
	30% CONTINGENCY				**$6,390**
	12% INFLATION (2% PER YEAR @ 6 YEARS)				**$2,556**
	GRAND TOTAL				**$45,581**

CITY OF TEHACHAPI

CURRY ST FROM J ST TO HIGHLAND RD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	SIGNING AND STRIPING				
	REMOVE SIGN	10	EA	$150	$1,500
R22	INSTALL SIGN	10	EA	$500	$5,000
R26	INSTALL DYNAMIC SPEED WARNING SIGN	2	LF	$10,000	$20,000
				SIGNING AND STRIPING SUBTOTAL:	**$25,000**
				TOTAL FOR BASE BID ITEMS	**$25,000**
				MOBILIZATION & DEMOBILIZATION	**$6,250**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$4,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$1,880**
				PROJECT MANAGEMENT	**$2,500**
				30% CONTINGENCY	**$7,500**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$3,000**
				GRAND TOTAL	**$52,130**

CITY OF TEHACHAPI
TUCKER RD & CHERRY LN
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	STREET LIGHTING				
NS01	INSTALL STREET LIGHTS	5	EA	$14,225	$71,125
				STREET LIGHTING SUBTOTAL:	**$71,125**
	SIGNING AND STRIPING				
	REMOVE SIGN	2	EA	$150	$300
NS06	INSTALL FLASHING BEACONS ON STOP SIGN	2	EA	$10,000	$20,000
				SIGNING AND STRIPING SUBTOTAL:	**$20,000**
				TOTAL FOR BASE BID ITEMS	**$91,125**
				MOBILIZATION & DEMOBILIZATION	**$4,556**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$20,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$18,800**
				PROJECT MANAGEMENT	**$9,113**
				30% CONTINGENCY	**$27,338**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$10,935**
				GRAND TOTAL	**$183,866**

CITY OF TEHACHAPI
TUCKER RD & HIGHLINE RD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	STREET LIGHTING				
NS01	INSTALL STREET LIGHTS	4	EA	$14,225	$56,900
				STREET LIGHTING SUBTOTAL:	**$56,900**
	STREET IMPROVEMENTS				
NS05	CONSTRUCT ROUNDABOUT	1	EA	$600,000	$600,000
				STREET IMPROVEMENTS SUBTOTAL:	**$600,000**
				TOTAL FOR BASE BID ITEMS	**$656,900**
				MOBILIZATION & DEMOBILIZATION	**$65,690**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$10,000**
				CONSTRUCTION SURVEY AND MONUMENTATION	**$5,000**
				FINAL DESIGN	**$65,690**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$94,000**
				PROJECT MANAGEMENT	**$65,690**
				STORM WATER BEST MANAGEMENT PRACTICES (BMPs)	**$2,500**
				30% CONTINGENCY	**$197,070**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$78,828**
				GRAND TOTAL	**$1,241,368**

CITY OF TEHACHAPI
CURRY ST & HIGHLINE RD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	STREET LIGHTING				
NS01	INSTALL STREET LIGHTS	4	EA	$14,225	$56,900
				STREET LIGHTING SUBTOTAL:	**$56,900**
	STREET IMPROVEMENTS				
NS05	CONSTRUCT ROUNDABOUT	1	EA	$800,000	$800,000
				STREET IMPROVEMENTS SUBTOTAL:	**$800,000**
				TOTAL FOR BASE BID ITEMS	**$856,900**
				MOBILIZATION & DEMOBILIZATION	**$85,690**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				CONSTRUCTION SURVEY AND MONUMENTATION	**$5,000**
				FINAL DESIGN	**$20,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$94,000**
				PROJECT MANAGEMENT	**$85,690**
				STORM WATER BEST MANAGEMENT PRACTICES (BMPs)	**$2,500**
				30% CONTINGENCY	**$257,070**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$102,828**
				GRAND TOTAL	**$1,511,678**

CITY OF TEHACHAPI
DENNISON RD & HIGHLINE RD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	STREET LIGHTING				
NS01	INSTALL STREET LIGHTS	4	EA	$14,225	$56,900
				STREET LIGHTING SUBTOTAL:	**$56,900**
	SIGNING AND STRIPING				
	REMOVE SIGN	1	EA	$150	$150
NS06	INSTALL SIGN	1	EA	$500	$500
				SIGNING AND STRIPING SUBTOTAL:	**$500**
				TOTAL FOR BASE BID ITEMS	**$57,400**
				MOBILIZATION & DEMOBILIZATION	**$2,870**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$20,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$18,800**
				PROJECT MANAGEMENT	**$5,740**
				30% CONTINGENCY	**$17,220**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$6,888**
				GRAND TOTAL	**$130,918**

CITY OF TEHACHAPI
TUCKER RD & VALLEY BLVD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	TRAFFIC SIGNAL				
S02	REMOVE VEHICLE HEAD	20	EA	$300	$6,000
	INSTALL 3-12" VEHICLE HEAD WITH MOUNTING	20	EA	$1,200	$24,000
				TRAFFIC SIGNAL SUBTOTAL:	**$30,000**
				TOTAL FOR BASE BID ITEMS	**$30,000**
				MOBILIZATION & DEMOBILIZATION	**$3,000**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$10,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$1,880**
				PROJECT MANAGEMENT	**$3,000**
				30% CONTINGENCY	**$9,000**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$3,600**
				GRAND TOTAL	**$62,480**

CITY OF TEHACHAPI
TUCKER RD & TEHACHAPI BLVD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	TRAFFIC SIGNAL				
S04	INSTALL ADVANCE DILEMMA ZONE DETECTION	1	LS	$30,000	$30,000
				TRAFFIC SIGNAL SUBTOTAL:	**$30,000**
				TOTAL FOR BASE BID ITEMS	**$30,000**
				MOBILIZATION & DEMOBILIZATION	**$1,500**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$10,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$1,880**
				PROJECT MANAGEMENT	**$3,000**
				30% CONTINGENCY	**$9,000**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$3,600**
				GRAND TOTAL	**$60,980**

CITY OF TEHACHAPI
MONOLITH ST & TEHACHAPI BLVD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	TRAFFIC SIGNAL				
S02	REMOVE VEHICLE HEAD	14	EA	$300	$4,200
	INSTALL 3-12" VEHICLE HEAD WITH MOUNTING	14	EA	$1,200	$16,800
S04	INSTALL ADVANCE DILEMMA ZONE DETECTION	1	LS	$30,000	$30,000
				TRAFFIC SIGNAL SUBTOTAL:	**$51,000**
				TOTAL FOR BASE BID ITEMS	**$51,000**
				MOBILIZATION & DEMOBILIZATION	**$3,060**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$10,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$3,760**
				PROJECT MANAGEMENT	**$5,100**
				30% CONTINGENCY	**$15,300**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$6,120**
				GRAND TOTAL	**$96,340**

CITY OF TEHACHAPI
CURRY ST & TEHACHAPI BLVD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	TRAFFIC SIGNAL				
S03	IMPROVE SIGNAL TIMING	1	EA	$5,000	$5,000
NS03	INSTALL NEW TRAFFIC SIGNAL	1	LS	$400,000	$400,000
				TRAFFIC SIGNAL SUBTOTAL:	**$405,000**
				TOTAL FOR BASE BID ITEMS	**$405,000**
				MOBILIZATION & DEMOBILIZATION	**$20,250**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$20,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$28,200**
				PROJECT MANAGEMENT	**$40,500**
				30% CONTINGENCY	**$121,500**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$48,600**
				GRAND TOTAL	**$686,050**

APPENDIX D
COLLISION BENEFIT ANALYSIS

Tehachapi LRSP
SAFETY PROJECTS
Collision Database From 2015 to 2019

	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/Cost Ratio (BCR)	HSIP Max Share
ROADWAY SEGMENTS													
A	Tehachapi Blvd from Tucker Rd to Tehachapi Willow Springs Rd	R22	Upgrage Signage	Upgrade existing signage with florescent sheeting: ● Stop Ahead sign, EB approach near Mill Street ● Stop Ahead sign, EB approach near Curry Street ● Stop Ahead sign, EB & WB approaches near Robinson Street ● Stop Ahead sign, EB & WB approaches near Dennison Road ● Crosswalk sign, EB & WB at Pauley Street ● Crosswalk sign, EB & WB at Davis Street ● Crosswalk sign, EB & WB at Mojave Street ● Crosswalk sign, EB & WB at Hayes Street	All	15%	10	81	$ 4,194,200	$1,258,260	**$79,286**	31.7	100%
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at: ● WB 1100 ft west of Mt View Ave ● WB 300 ft west of Robinson St ● EB 400 ft west of Snyder Ave	All	30%	10	81	$ 4,194,200	$2,516,520			100%
		R28	Edgeline and Centerline	Install edgeline eastbound from Dennison Road to Bailey Court	All	25%	10	81	$ 4,194,200	$2,097,100			100%
B	Tucker Rd fromTehachapi Blvd to Highland Rd	R22	Upgrage Signage	Upgrade existing signage with florescent sheeting: Stop Ahead sign, NB approach near Cherry Lane	All	15%	10	76	$ 6,746,600	$2,023,980	**$135,301**	46.8	100%
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at NB & SB approaches, 500 ft south of Cherry Ln	All	30%	10	76	$ 6,746,600	$4,047,960			100%
		R28	Edgeline and Centerline	Install edgeline EB and WB from Cherry Lane to Highline Road	All	25%	10	76	$ 6,746,600	$3,373,300			100%
		R32PB	Bike Lanes	Install buffered bike lanes on Tucker Road fromTehachapi Blvd to Cherry Lane	Ped and Bike	35%	20	3	$ 4,522,300	$6,331,220			90%
C	Valley Blvd from Sierra Vista Dr to Dennison Rd	R22	Upgrage Signage	Upgrade existing signage with flourescent sheeting: ● Stop Ahead sign, EB approach of Snyder Ave ● Stop Ahead sign, WB approach of Snyder Ave	All	15%	10	58	$ 5,159,700	$1,547,910	**$45,581**	67.9	100%
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at: ● EB 1200 ft east of Tucker Rd ● WB 1200 ft west of Mountian View Ave	All	30%	10	58	$ 5,159,700	$3,095,820			100%
D	Curry St from J St to Highland Rd	R22	Upgrage Signage	Upgrade existing signage with flourescent sheeting: ● Stop signs SB & NB approaches of F Street ● Stop signs SB approach to Highline Rd ● Pedestrian crossing sign NB & SB approaches of E St ● Pedestrian crossing sign NB & SB approaches of D St ● School Crossing sign ~200 ft south of Valley Blvd ● School Crossing sign ~20 ft north of Cypress Ave ● School Crossing sign ~350 ft north of Pinon Ave	All	15%	10	16	$ 2,653,700	$796,110	**$52,130**	30.5	100%
		R26	Dynamic Speed Warning Signs	Install dynamic speed warning signs at: ● NB and SB 1300 ft south of Valley Blvd ● NB 400 ft north of Highline Rd	All	30%	10	16	$ 2,653,700	$1,592,220			100%
INTERSECTIONS													
1	Tucker Rd & Cherry Ln	NS01	Intersection Lighting	Install intersection lighting at the SW corner and NE corner of the intersection[1]	Night	20%	20	0	$ -	$0	**$183,866**	0.04	100%
		NS06	Curry St & Highline Rd	Upgrade the existing 'STOP' signs to a larger stop sign with LED lights (solar power) on Cherry Lane in both (eastbound/westbound) approaches	All	15%	10	2	$ 26,600	$7,980			100%
2	Tucker Rd & Highline Rd	NS01	Intersection Lighting	Install intersection lighting at all corners of the intersection	All	40%	20	3	$ 39,900	$63,840	**$1,241,368**	0.1	100%
		NS04	Rounabout	Convert the all-way stop controlled intersection to a roundabout	All	62%	20	3	$ 39,900	$98,952			100%

	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/Cost Ratio (BCR)	HSIP Max Share
3	Curry St & Highline Rd	NS01	Intersection Lighting	Install intersection lighting at all corners of the intersection	Night	40%	20	1	$ 13,300	$21,280	**$1,511,678**	0.2	100%
		NS05	Rounabout	Convert the two-way stop controlled intersection to a roundabout	All	24%	20	3	$ 236,500	$227,040			100%
4	Dennison Rd & Highline Rd	NS01	Intersection Lighting	Install intersection lighting at all corners of the intersection	Night	40%	20	0	$ -	$0	**$130,918**	0.03	100%
		NS06	Signs	Install Stop Ahead sign on Dennison Road, southbound approach	All	15%	10	1	$ 13,300	$3,990			100%
5	Tucker Rd & Valley Blvd	S02	Signal Hardware	● Replace faded backplates and install reflective backplates at the intersection ● Upgrade to larger signal head for the southbound, westbound, and eastboud near-side signals	All	15%	10	35	$ 1,319,500	$395,850	**$62,480**	6.3	100%
6	Tucker Rd & Tehachapi Blvd	S04	Advanced Dilemma Zone Detection	Install Advanced Dilemma Zone Detection on Tucker Road, southbound approach.	All	40%	10	17	$ 2,810,400	$2,248,320	**$60,980**	36.9	100%
7	Monolith St & Tehachapi Blvd	S02	Signal Hardware	Replace faded backplates and install reflective backplates at the intersection	All	15%	10	10	$ 200,600	$60,180	**$96,340**	1.7	100%
		S04	Advanced Dilemma Zone Detection	Install Advanced Dilemma Zone Detection on Tehachapi Boulevard, both (eastbound/westbound) approach	All	40%	10	10	$ 200,600	$160,480			100%
8	Curry St & Tehachapi Blvd	S03	Signal Timing	Coordinate signal timing at the intersection of Tehachapi Boulevard and Curry Street and the intersection of Tehachapi Boulevard and Green Street	All	15%	10	8	$ 303,000	$90,900	**$686,050**	0.4	50%
		NS03	Traffic Signal	Install a new traffic signal at the intersection	All	20%	20	8	$ 303,000	$242,400			100%