CITY OF
MODESTO
CALIFORNIA

SYSTEMIC SAFETY ANALYSIS REPORT

FINAL | NOVEMBER 2020

prepared by FEHR PEERS

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ENGINEER'S SEAL

Ryan McClain, PE, TE
Professional Civil Engineer
Project Engineer

Phillip Soares, PE, TE, MPA
Senior Civil Engineer
City of Modesto

By signing and stamping this Systemic Safety Analysis Report, the engineer is attesting to this report's technical information and engineering data upon which local agency's recommendations, conclusions, and decisions are made.

STATEMENT OF PROTECTION OF DATA FROM DISCOVERY AND ADMISSIONS

SECTION 148 OF TITLE 23, UNITED STATES CODE

REPORTS DISCOVERY AND ADMISSION INTO EVIDENCE OF CERTAIN REPORTS, SURVEYS, AND INFORMATION—Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for any purpose relating to this section, shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at the location identified or addressed in the reports, surveys, schedules, lists, or other data.

Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Considerations and Limitations of this Study

The analysis and recommendations in this report are conceptual in nature based upon limited information, and before implementing any changes, or using any of its information for design or construction, the City should conduct a more detailed analysis and prepare design drawings that reflect a subsequent review of field conditions.

This is a review based on a small sample size of collisions. Past trends do not necessarily indicate a current problem, and random fluctuations in crash locations/ frequency are expected.

The scope of this work, including study locations, time frame, and topics, was determined by the client. While it is possible that some locations or issues were not addressed in this report, nothing should be inferred by their omission.

ACKNOWLEDGEMENTS

The 2020 City of Modesto Systemic Safety Analysis Report was funded through a Systemic Safety Analysis Report Program (SSARP) grant provided by the California Department of Transportation (Caltrans).

Input was sought from an advisory group consisting of staff from the City of Modesto. Fehr & Peers assisted the City of Modesto in preparing the plan.

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City of Modesto Project Management

Sandeep Sandhu

Cindy van Emple

James Ashby

Michael Sacuskie

Phillip Soares

Scott Collins

Advisory Group Members

Sgt. Lance Nicolai
Modesto Police Department

Bobby Moser
Stanislaus County Health Services Agency

Kyle Fliflet
Stanislaus County Health Services Agency

Fehr & Peers Team

Meghan Mitman

Ben Fuller

Ryan McClain

Ashlee Takushi

Terence Zhao

Catrina Meyer

O'Dell Team

Mike Persak

Vionna Adams


START CROSSING
Watch For
Vehicles
DON'T START
Finish Crossing
If Started
FLASHING
STEADY
DON'T CROSS
PUSH BUTTON
TO CROSS

EXECUTIVE SUMMARY

The purpose of the City of Modesto's Systemic Safety Analysis Report (SSAR) is to identify opportunities for the City to improve safety for all modes of travel through roadway design projects that are relevant to the project locations, feasible for implementation, and competitive for grant funding.

The City of Modesto, situated on the Tuolumne River in the northern San Joaquin Valley, is the largest city in Stanislaus County. It is located in the Central Valley, 68 miles south of Sacramento, 90 miles north of Fresno, and 92 miles east of San Francisco. Much of Modesto is surrounded by rich farmland and was once served by one of the busiest rail corridors in the country.

The purpose of the City of Modesto's Systemic Safety Analysis Report (SSAR) is to identify opportunities for the City to improve safety for all modes of travel through roadway design projects that are relevant to the project locations, feasible for implementation, and competitive for grant funding.

This plan lays the groundwork and provides the resources necessary for the preparation of successful Highway Safety Improvement Program (HSIP) and other local and federally funded grant applications by the City. This study was funded through the SSAR program grant provided by the California Department of Transportation (Caltrans).

The SSAR program was initiated by Caltrans to help local agencies take a proactive approach to identifying systemic and hot spot safety improvement projects by completing a system-wide, multi-year data-driven analysis of collisions. The SSAR includes collision and roadway database development, review of local collision data, a safety data analysis, collision profile development, safety countermeasure selection, and project development.

Section 2 summarizes the safety data used as part of the analysis for this report. Five years of the most current collision data (2011-2015) were extracted from both the Transportation Injury Mapping System (TIMS) and Statewide Integrated Traffic Records System (SWITRS) database. The most frequent collision types were broadside collisions involving motor vehicles, bicycles, and pedestrians. In addition to collision data, several pieces of contextual geographic data were analyzed in conjunction with collisions including posted speed, number of travel lanes, intersection control, signal phasing, and more.

The collision analysis process – also described in **Section 2** – involved mapping collisions by mode and severity for the purpose of identifying collision hot spots, and a systemic safety analysis that involved connecting contextual variables with collision factors. For the systemic analysis process, thirteen key crash types were identified involving vehicle, bicycle and pedestrian collisions, mapped, and paired with

potential safety countermeasures in **Section 3**.

To address the safety patterns identified in the collision analysis, a safety Countermeasure Toolbox is presented in the appendices. The Toolbox includes a set of infrastructure improvement projects that can be used in HSIP funding applications. Each countermeasure is described along with key information from the California Local Roadway Safety Manual, including crash reduction factors and opportunities for systemic implementation. These countermeasures are used in the project lists in **Section 4** and can be a resource to the City for future planning and safety improvements.

Section 4 includes a variety of recommended priority projects at intersections, mid-block locations, and along roadway segments. The locations of these projects represent a variety of roadway contexts seen throughout the City of Modesto. To aid in the preparation of HSIP grant applications, project cut sheets were developed for ten projects, which include cost estimates, benefit/cost ratios, and planning graphics that illustrate the proposed improvements. The estimated total value of benefits of these projects is $170 million.

This section also includes additional funding sources that can be used to finance safety projects around the City; this list includes regional, state, and federal funding programs, along with a description of the program purpose.

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Summary & Analysis of Safety Data

- *Summary of Safety Data Collected*
- *Analysis of Safety Data Collected*
- *Contextual Data and Systemic Analysis*

SUMMARY OF SAFETY DATA

Chapter 2 of Caltrans' Local Roadway Safety Manual (LRSM) instructs safety practitioners to "consider a wide range of data sources to get an overall picture of the safety needs." Both crash data and contextual data were collected and analyzed as part of this plan, as well as anecdotal input from City staff and community stakeholders.

Killed or Severely Injured (KSI) in a Collision

Severe injuries resulting from a traffic crash can result in a number of catastrophic impacts, including permanent disability, lost productivity and wages, and ongoing healthcare costs.

These injuries can include:

- Broken or fractured bones
- Dislocated or distorted limbs
- Severe lacerations
- Severe burns
- Skull, spinal, chest or abdominal injuries
- Unconsciousness at or when taken from the collision scene

Throughout this Plan, the acronym KSI is used to denote crashes where someone was killed or seriously injured.

Data Source and Overview

For this SSAR, five years of the most current crash data available (2011-2015) were extracted from the Statewide Integrated Traffic Records System (SWITRS) and Transportation Injury Mapping System (TIMS) databases. The datasets included extensive collision detail such as collision location, type, severity, parties involved, contributing factors, etc.

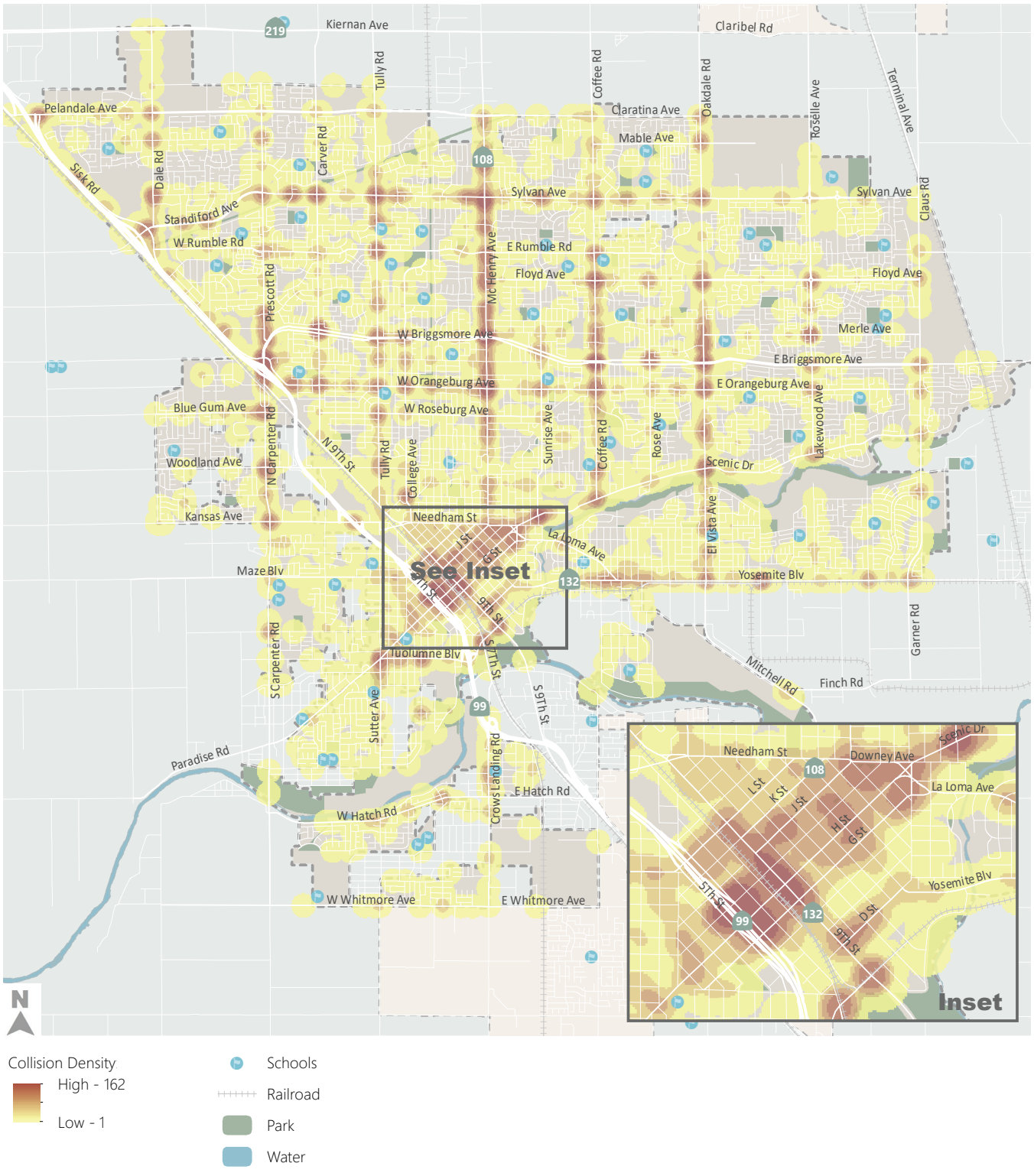
The SWITRS collision dataset includes collisions of all severity levels, including property damage-only collisions; however, these records generally do not have coordinates coded, which can be challenging to analyze geospatially. The TIMS collision dataset is a geocoded version of the SWITRS database, but only includes collision records where an injury was recorded (it does not include property damage-only collisions). Since the focus of this study is to address killed and severely injured (KSI) collisions, the collision analysis is largely focused on the TIMS dataset, with supplemental information from the SWITRS dataset.

Collision Landscape Summary

Between 2011 and 2015, 9,116 collisions were reported in the City of Modesto. Of these, 4,300 resulted in injuries or fatalities, the geographic distribution of which is shown on the map on the facing page. Of these collisions, there were 295 KSI collisions, 53 of which were fatalities.

During this five year period, 479 collisions (5%) involved a bicyclist and 439 collisions (5%) involved a pedestrian. Of the KSI collisions, 38 collisions (13%) involved a bicyclist and 76 collisions (26%) involved a pedestrian.

All Collisions Resulting in Injuries or Fatalities, 2011-2015



ANALYSIS OF SAFETY DATA

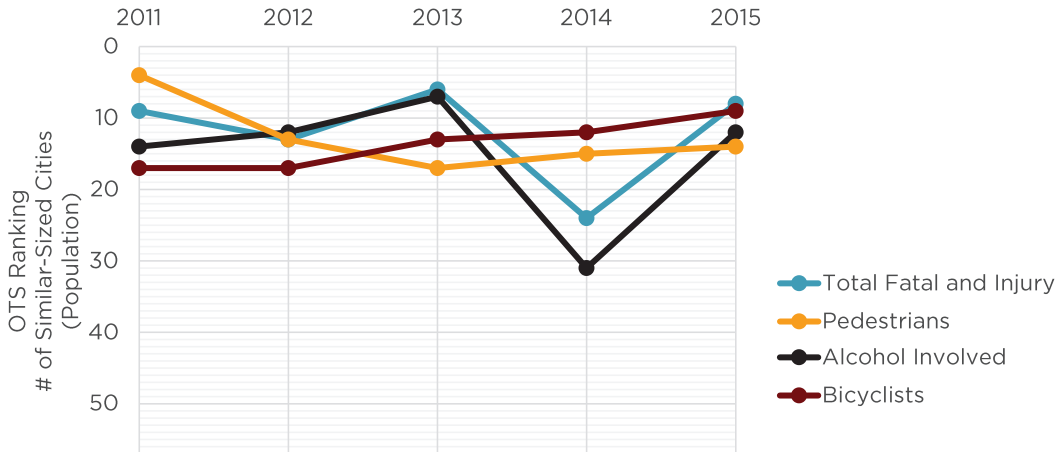
OTS Rankings

The California Office of Traffic Safety (OTS) produces rankings so jurisdictions can compare their traffic safety statistics to other jurisdictions with similar-sized populations. There are approximately 56 similar-sized cities as Modesto in which the OTS rankings are compared to.

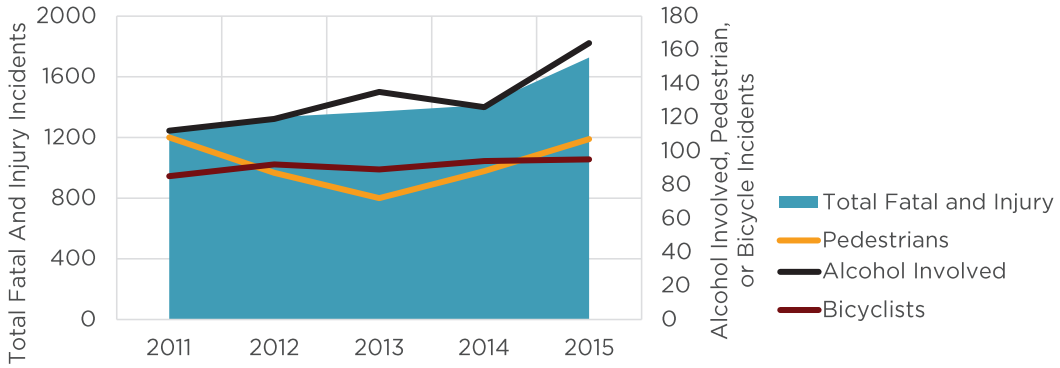
Although there was a dip in ranking in 2014 for Total Fatal and Injury collisions as well as Alcohol Involved collisions, the larger trend is that Modesto ranks high compared to similarly-sized cities in the following collision categories:

- Total Fatal and Injury
- Alcohol Involved
- Pedestrians
- Bicyclists

OTS Rankings by Year, 2011-2015



Collisions by OTS Categories, 2011-2015



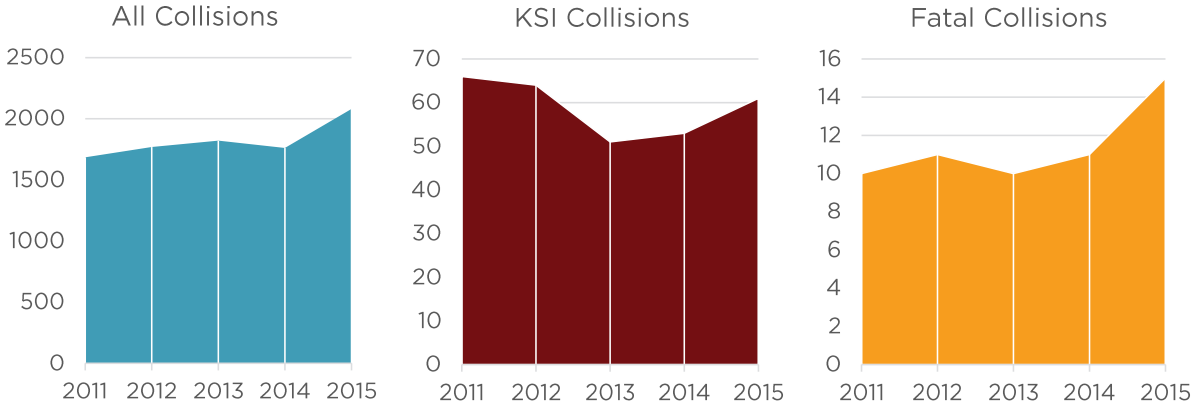
Annual Collision Trends

Annual collision trends show a rise in collisions since 2011. The total number of collisions rose from 1,685 in 2011 to 2,080 in 2015, with a notable spike in 2015. KSI collisions dipped in 2013 and 2014, but show an upward trajectory. Fatal collisions increased to 15 in 2015, up from 10 to 11 per year.

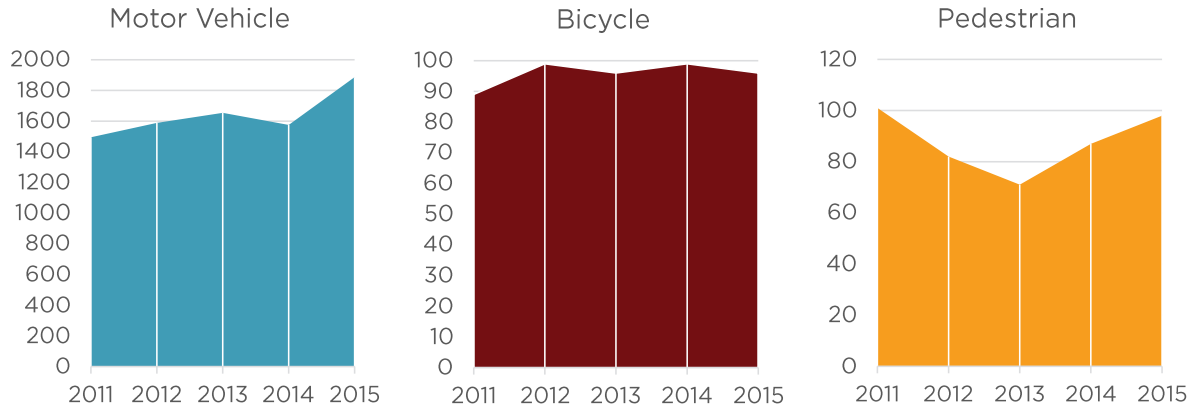
Broken down by mode, collisions trend up for vehicles, and are flat for bicyclists and pedestrians. Motor vehicle collisions rose from 1,495 in 2011 to 1,886 in 2015, with a notable spike in 2015. Bicycle collisions were relatively constant, averaging about 96 per year. The number of pedestrian collisions decreased from 101 in 2011 to 71 in 2013, but then crept back up to 98 in 2015.

Pedestrians and bicycles together account for 39 percent of all KSI collisions, and those KSI collisions account for only 1% of total collisions in Modesto between 2011 and 2015.

Collisions by Severity, 2011-2015



Collisions by Mode, 2011-2015



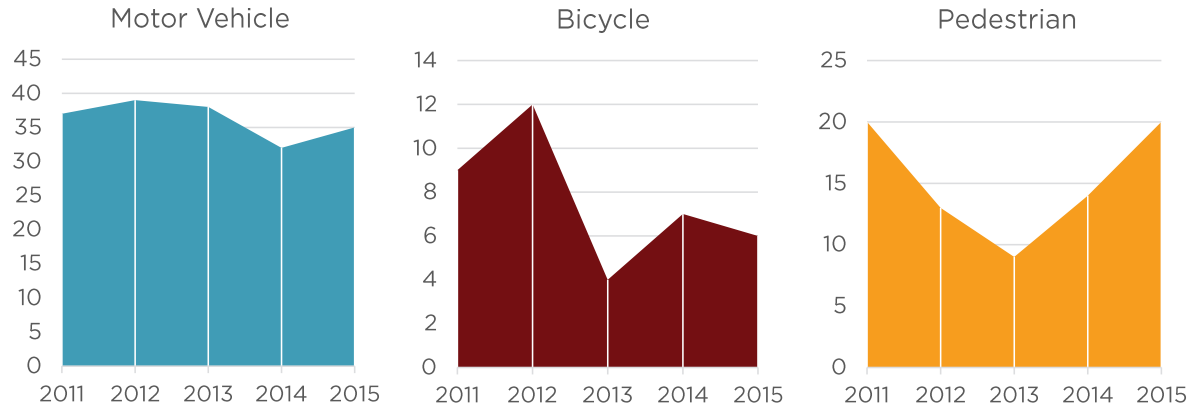
KSI Collision Trends

Motor vehicle KSI collisions remained relatively constant, averaging about 36 per year. By comparison, bicycle KSI collisions fluctuated between 4 to 12 per year, but appear to be trending down. Pedestrian KSI collisions follow a similar trend to pedestrian collisions overall: down in 2013, but back up by 2015.

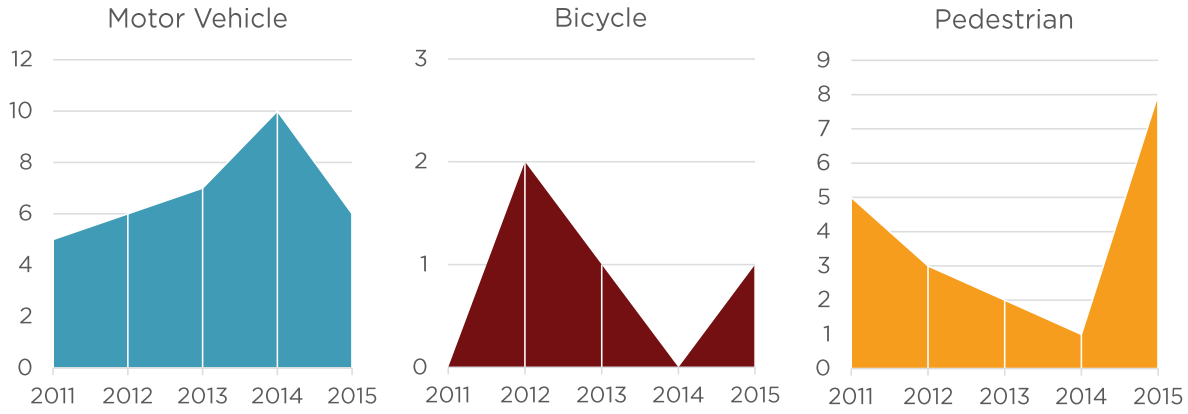
Fatal Collision Trends

Looking at fatal collisions by year, pedestrian fatalities, despite being on the decline through 2014, spiked in 2015 (at 8 fatalities), surpassing the number of motorist fatalities. Motor vehicle fatalities rose through 2014, but fell back down in 2015. Bicycle fatalities fluctuated between 0 and 2 per year.

KSI Collisions, 2011-2015



Fatal Collisions, 2011-2015



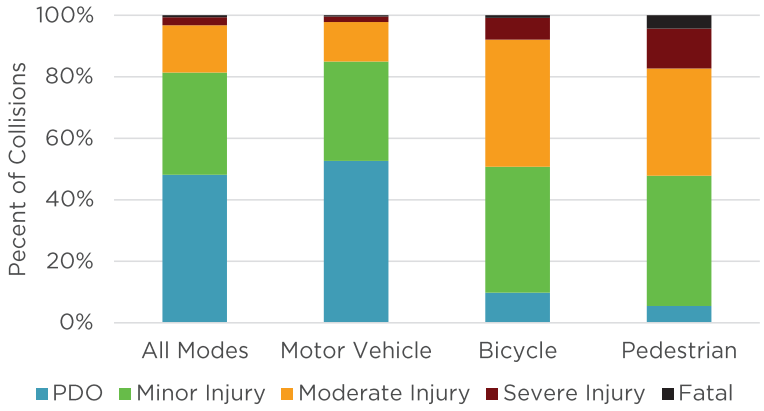
Collision Severity

Vulnerable road users, including bicyclists and pedestrians, are more susceptible to fatal or severe injury collisions.

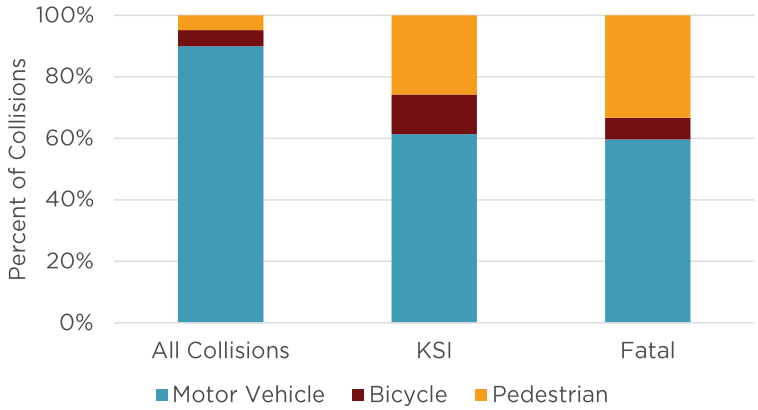
Broken down by collision severity, KSI collisions made up 2% of motorist collisions, 8% of bike collisions, and 17% of pedestrian collisions, while fatal collisions made up less than 1% of motorist collisions, 1% of bike collisions, and 4% of pedestrian collisions.

Broken down by collision mode. motor vehicle collisions were 90% of all collisions but accounted for only 60% of fatal collisions. By contrast, pedestrian collisions made up 5% of all collisions but 33% of fatal collisions. Bicycle collisions made up 5% of all collisions, 7% of fatal collisions.

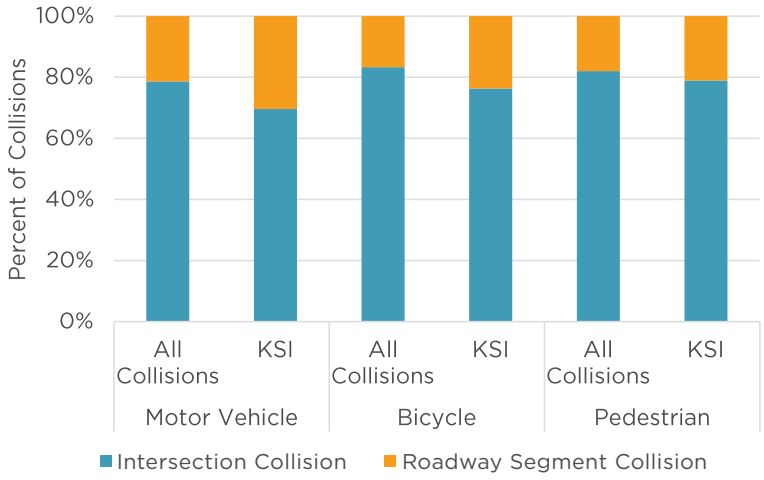
Collision Severity by Mode



Mode Share by Collision Severity



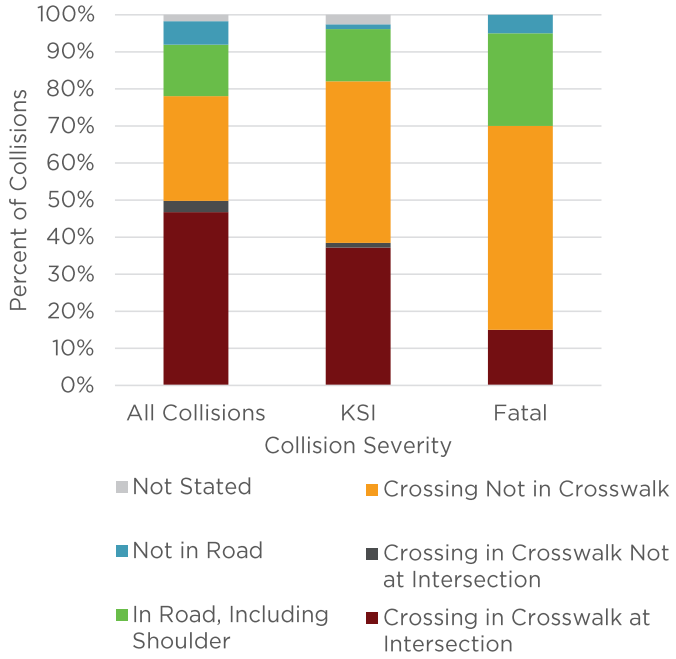
Collisions by Location



Collision Location

Most collisions occurred at intersections, across all modes; nearly 80% of all collisions either occurred at intersections or were intersection-related. However, a slightly higher share of KSI collisions occurred along roadway segments or midblock.

Pedestrian Collisions by Pedestrian Location



Pedestrian Location

The largest share of pedestrian collisions were of pedestrians crossing in a crosswalk at an intersection (47% of all pedestrian collisions). However, pedestrian collisions in a crosswalk at an intersection were only 37% of pedestrian KSI collisions and 15% of pedestrian fatal collisions.The largest share of pedestrian KSI and fatal collisions were pedestrians crossing not at a crosswalk (44% and 55%, respectively).

Lighting

The lighting at the time of a collision influences visibility of conflicting modes. A significant share of collisions occur at night, especially pedestrian-involved collisions.

AT INTERSECTIONS

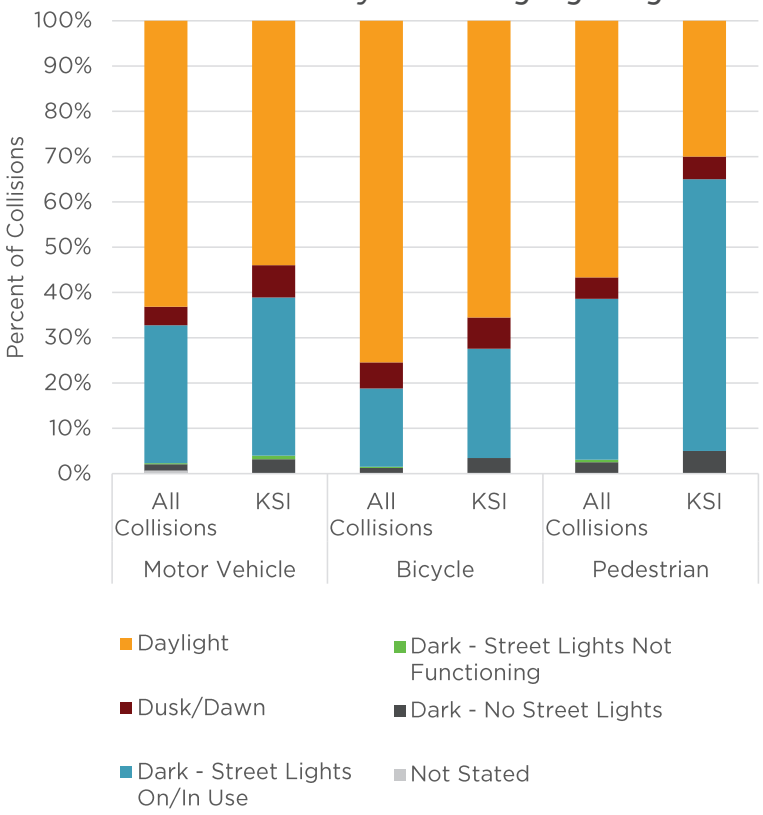
46% of KSI vehicle collisions occurred when dark, as did 35% of KSI bicycle collisions, and 70% of KSI pedestrian collisions. Across all modes, 4% of all KSI collisions occurred when streetlights were out or not present altogether.

ON ROADWAY SEGMENTS

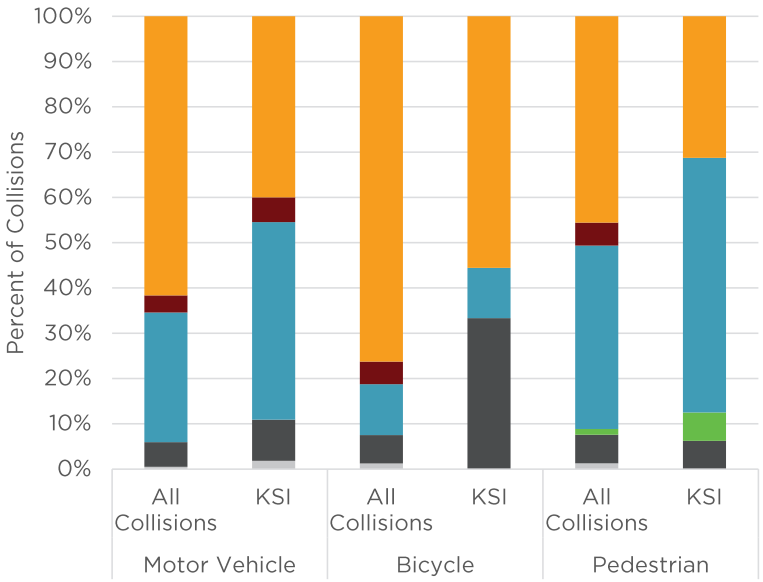
On roadway segments, a higher percentage of collisions occurred during evening hours at locations without streetlights (dark gray color-coding on the charts) than at intersections. This is true across all modes, but especially for bicycles.

58% of KSI vehicle collisions occurred when dark, as did 44% of KSI bicycle collisions, and 69% of KSI pedestrian collisions. Across all modes, 13% of all KSI collisions occurred when streetlights were out or not present altogether.

Intersection Collisions by Prevailing Lighting



Roadway Segment Collisions by Prevailing Lighting



Primary Collision Factors

The primary collision factor (PCF) is the primary action or behavior for why a given collision occurred, as understood by the reporting officer. It is not uncommon for multiple factors to contribute to the cause of a collision.

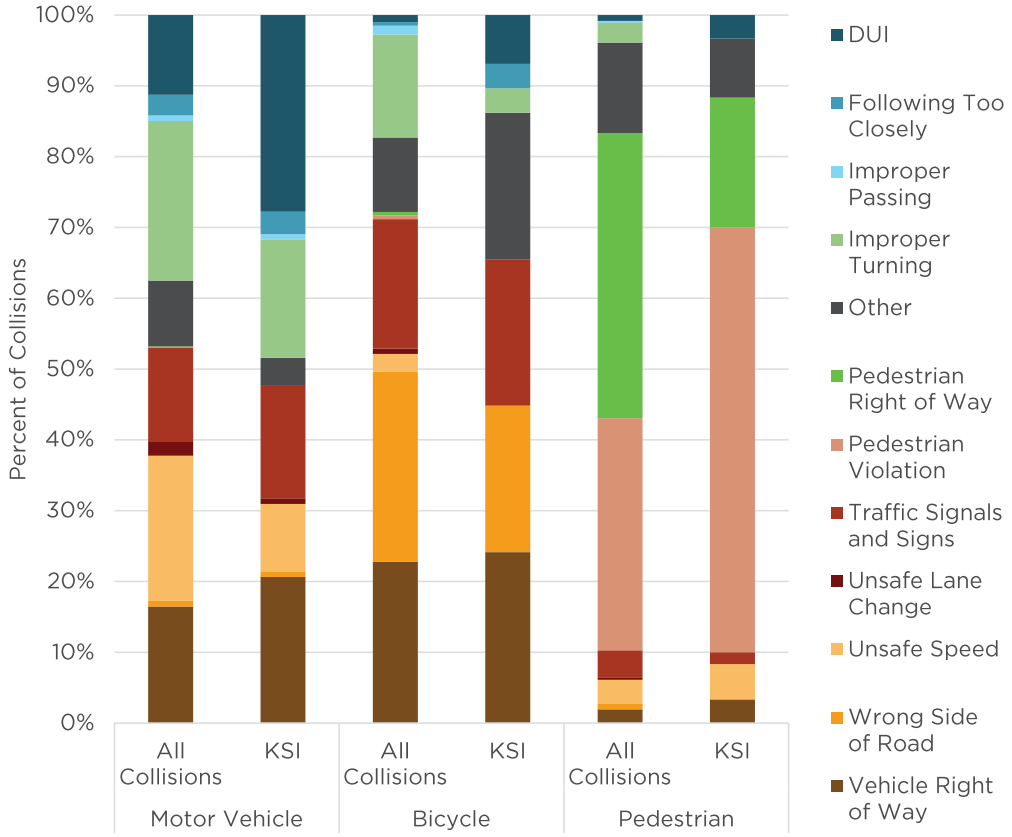
AT INTERSECTIONS

The collision factors contributing to the largest share of KSI vehicle collisions included DUI (28%), Vehicle Right-of-Way, (21%), and Improper Turning (17%).

The collision factors contributing to the largest share of KSI bicycle collisions also included Vehicle Right-of-Way (24%), as well as Wrong Side of Road (21%) and Traffic Signals & Signs violations (21%).

The collision factors contributing to the largest share of KSI pedestrian collisions included Pedestrian Violation (60%) and Pedestrian Right-of-Way (18%).

Intersection Collisions by Primary Collision Factor



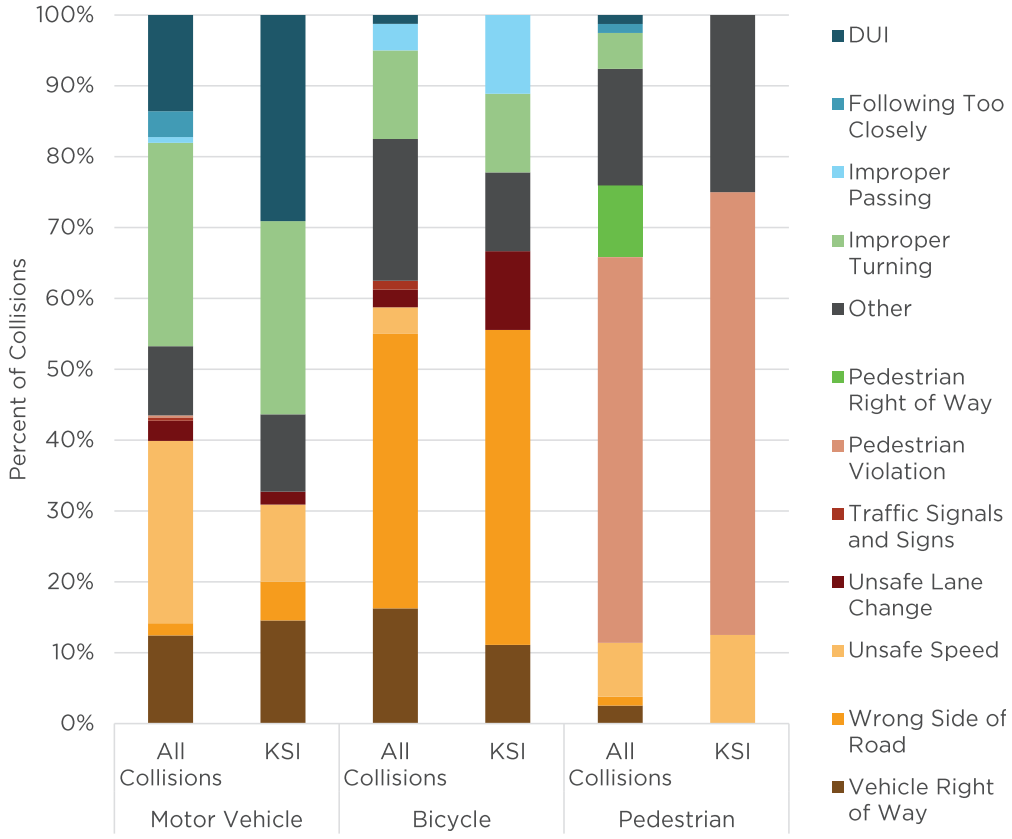
ON ROADWAY SEGMENTS

As with intersection collisions, the collision factors contributing to the largest share of KSI vehicle collisions included DUI (29%), Improper Turning (27%), and Vehicle Right-of-Way (15%).

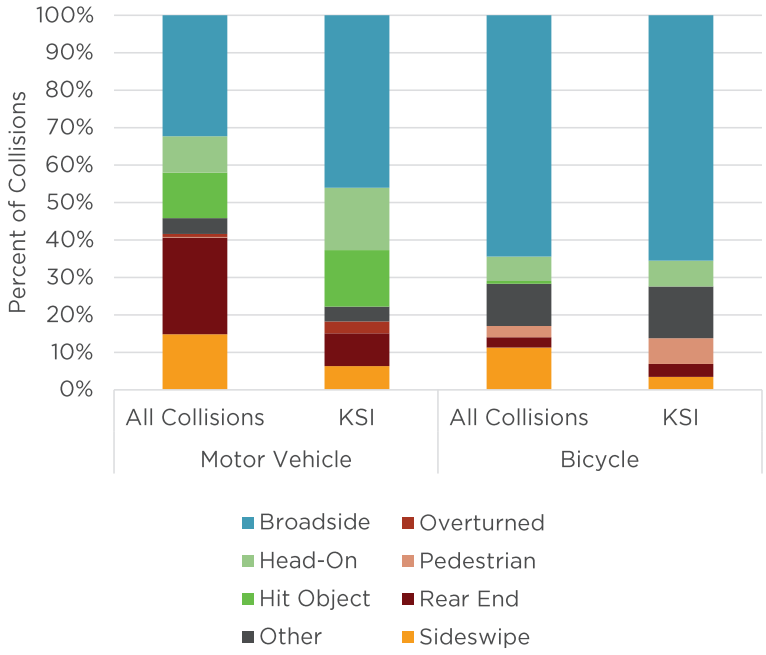
The collision factors contributing to the largest share of KSI bicycle collisions included Vehicle Right-of-Way (44%), Wrong Side of Road (11%), and Improper Turning (11%).

The collision factors contributing to the largest share of KSI pedestrian collisions included Pedestrian Violation (63%).

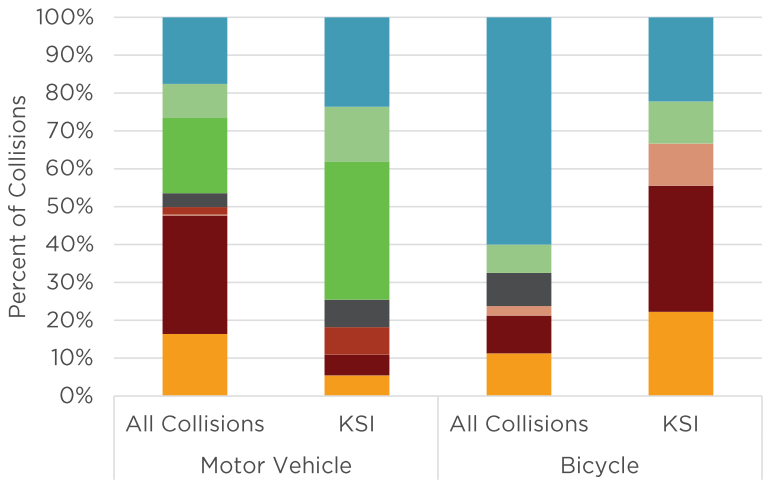
Roadway Segment Collisions by Primary Collision Factor



Intersection Collisions by Collision Type



Roadway Segment Collisions by Collision Type



Collision Types

AT INTERSECTIONS

While various types of collisions occur at intersections, broadside collisions were the highest occurring type for both motor vehicle and bicycle modes.

The largest share of KSI vehicle collisions included Broadside (46%), Head-On (17%), and Hit Object (15%), and the largest share of KSI bicycle collisions included Broadside (66%).

ON ROADWAY SEGMENTS

There is greater variety in collision types along roadways. For motor vehicle KSI collisions, there was a higher rate of hit object collisions and a lesser rate of broadside collisions than at intersections. Similarly, bicycle KSI collisions experienced a lesser share of broadside collisions.

The largest share of KSI vehicle collisions included Hit Object (36%), Broadside (24%), and Head-On (15%); and the largest share of KSI bicycle collisions included Rear End (33%), Broadside (22%), and Sideswipe (22%).

Hot Spot Analysis

Following the conventional collision mapping processes, we identified the top intersections and corridors that account for a disproportionate share of severe and fatal pedestrian collisions. The Hot Spot analysis identified the intersections and corridors that account for a disproportionate share of severe or total motor vehicle, pedestrian, and bicycle collisions.

There are six intersections in the City that have between 26 to 30 collisions in the analysis period.

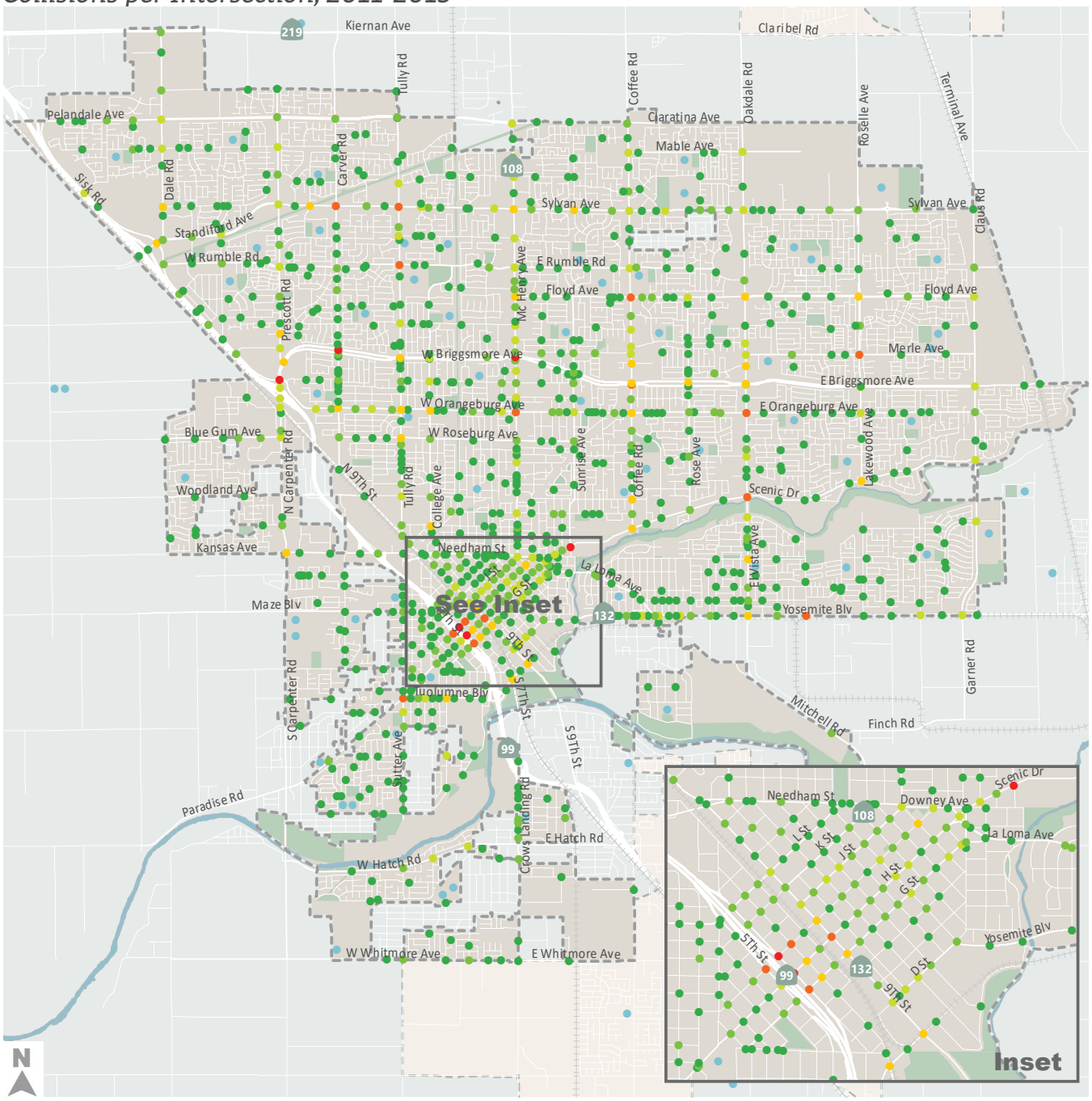
- W Briggsmore Avenue/ N Carpenter Road and Sisk Road/W Orangeburg Avenue
- W Briggsmore Avenue and Carver Road
- W Briggsmore Avenue and McHenry Avenue
- I Street and 6th Street
- H Street and 6th Street
- Scenic Drive and Bodem Street

In addition, there were five roadway segments within the City that have between 31 and 70 collisions per segment.

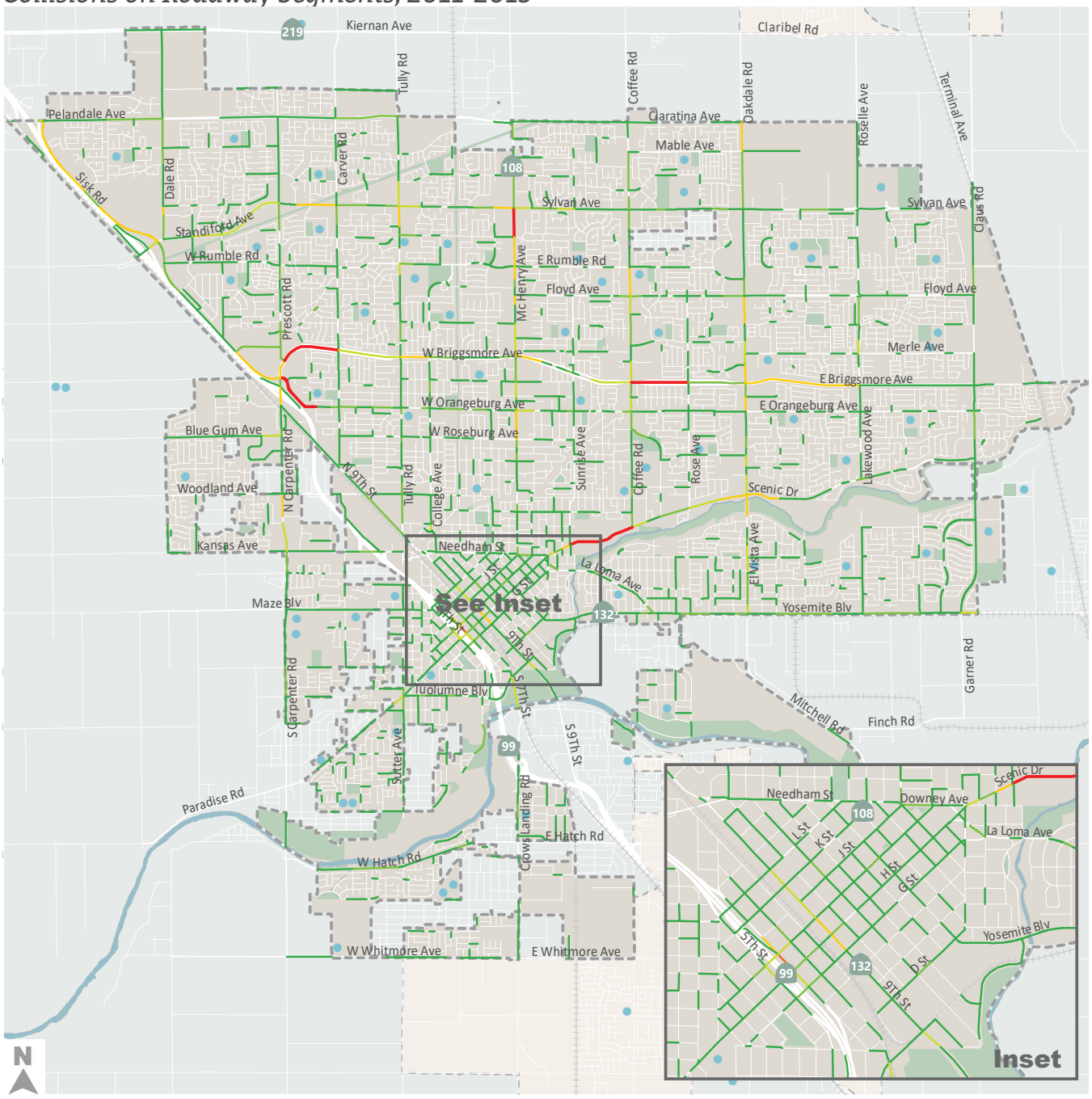
- McHenry Avenue between Standiford Avenue/Sylvan Avenue and Woodrow Avenue
- W Briggsmore Avenue between Prescott Road and Carver Road
- W Orangeburg Avenue between W Briggsmore Avenue and Martin Avenue
- Scenic Drive between Bodem Street and Coffee Road
- E Briggsmore Avenue between Coffee Road and Rose Avenue

The following pages map the results of the Hot Spot analysis.

Collisions per Intersection, 2011-2015



Collisions on Roadway Segments, 2011-2015



CONTEXTUAL DATA AND SYSTEMIC ANALYSIS

Contextual Data

To understand more about collision patterns in Modesto, several contextual factors were analyzed along with the characteristics of each collision. Assembled contextual data included:

- Roadway travel lanes
- Roadway functional classification
- Posted speed limit
- Shoulder type
- Center turn lane
- Intersections
- Intersection control
- Highway interchanges
- Left-turn protection for signalized intersections
- Midblock crosswalks
- Railroad crossings
- Roundabouts
- Location of schools
- Location of transit stops
- Location of parks
- Existing bicycle facilities
- Planned bicycle facilities
- Low income communities

In addition to the quantitative and geographic data collected and analyzed as part of this project, outreach to stakeholders and the public was also performed to collect information on and understand local safety issues from a qualitative perspective. This is important because of the significance of under-reporting and near misses that exist, especially for pedestrian and bicycle conditions.

A stakeholder meeting was performed as part of a two-day walking audit on Tuesday, May 14, 2019 and Wednesday, May 15, 2019. Participants included representatives of City staff from the Transportation Engineering and Design (TED) and Planning Division of the Community and Economic Development Department, the Traffic Engineering and Operations Division of the Public Works Department, Stanislaus County Health Services Agency, the City of Modesto Police Department, and staff members at a number of schools. Stakeholders helped substantiate the safety issues identified in the data and provided valuable feedback on other areas of concern. The project team also set up a booth at the City's Public Works Day on May 12, 2018, where feedback from the public was solicited to understand their transportation safety concerns.

Photos from Outreach

Systemic Analysis

Systemic analysis is a proactive safety approach that focuses on evaluating an entire roadway network, focusing not only on the history of crash data, but also on the contextual characteristics surrounding crashes, and how those characteristics create risk in locations with and without a history of crashes. By merging adjacent road, intersection, and land use features with collision data, we can uncover relationships between contextual factors and correlate the risk of frequent and severe crashes.

To understand the relationship between contextual characteristics and collision characteristics, we developed a series of systemic matrices that illustrate the number of crashes at the intersection based on a collision characteristic and a contextual characteristic. Systemic matrices were developed for each mode, with separate matrices for all injury collisions and for KSI collisions, and further separated by intersection collisions and roadway collisions.

From the systemic matrices, 13 collision profiles were identified to highlight the most common and severe collision patterns in Modesto.

Sample Collision Matrix (motor vehicle collisions along roadway segments)

Along Roadway Segments

Number of Lanes		Two-Lane			Three-Lane			Four-Lane			Five-Lane			Six+ Lane			Segment Total
Posted Speed		25-30	35-45	50-65	25-30	35-45	50-65	25-30	35-45	50-65	25-30	35-45	50-65	25-30	35-45	50-65	
Violation	Driving Under Influence	39	8	1	0	0	1	10	39	2	0	1	0	3	2	0	106
	Unsafe Speed	42	24	4	3	1	1	31	165	8	0	0	0	19	17	0	315
	Following Too Closely	8	3	2	0	0	0	2	33	3	0	0	0	4	6	0	61
	Wrong Side of Road	2	3	0	0	0	0	3	5	0	0	0	0	0	1	0	14
	Improper Passing	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Unsafe Lane Change	0	1	0	1	0	0	5	15	0	0	0	0	0	2	0	24
	Improper Turning	48	15	3	2	0	0	12	62	5	0	0	0	2	12	0	161
	Auto Right-of-Way Violation	31	7	2	1	0	2	16	115	1	0	0	0	6	29	0	210
	Traffic Signs and Signals	1	3	0	1	0	2	4	13	0	0	0	0	8	4	0	36
	Other Hazardous Movement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other Than Driver (or Pedestrian)	5	1	0	0	0	0	2	8	1	0	0	0	0	3	0	20
	Unsafe Starting or Backing	9	1	0	0	0	0	1	1	0	0	0	0	1	0	0	13
	Other Violation or Not Stated	7	2	1	1	0	0	3	6	0	0	0	0	2	0	0	22
Total Collisions		194	68	13	9	1	6	89	462	20	0	1	0	45	76	0	984
Roadway Miles		552.1	24.9	7.7	4.0	1.7	0.1	8.8	58.3	7.6	0.0	0.2	0.0	1.4	7.6	0.0	674.6
Collisions per Mile		0.35	2.73	1.69	2.26	0.60	112.12	10.13	7.92	2.63	0.00	5.75	0.00	32.96	9.96	0.00	1.46

List of Collision Profiles

	Collision Profile	Lanes	Speed (MPH)	Mode	Profile Collisions		KSI Profile Collisions	
					#	% of total	#	% of total
1	Broadside Vehicular Collisions at Signalized Intersections with Permissive Lefts	4-5	35-45	Vehicle	159	6.6%	6	2.1%
2	Broadside Vehicular Collisions at Intersections Caused by Signal Violations	4-5	35-45	Vehicle	193	8.0%	9	3.2%
3	Broadside Vehicular Collisions on High-Speed Roadways	4	35-45	Vehicle	134	5.5%	12	4.3%
4	Driving Under the Influence	All	All	Vehicle	202	8.4%	22	7.8%
5	Vehicular Collisions on 6-Lane Roadways	6	All	Vehicle	480	19.9%	16	5.7%
6	Broadside Collisions at Large, Signalized Intersections Involving Bicycles	4-5	35-45	Bicycle	52	2.2%	5	1.8%
7	Broadside Collisions at Unsignalized Intersections Involving Bicycles	≤3	25-30	Bicycle	49	2.0%	5	1.8%
8	Broadside Collisions on High-Speed Roadways Involving Bicycles	4	35-45	Bicycle	28	1.2%	2	0.7%
9	Bicycle Collisions Involving Wrong-Way Riding	4	35-45	Bicycle	41	1.7%	3	1.1%
10	Pedestrian Collisions at Crosswalks at Large Signalized Intersections with Permissive Lefts	4-5	35-45	Pedestrian	59	2.4%	7	2.5%
11	Pedestrian Right-Of-Way Collisions at Uncontrolled Crosswalks at Large Intersections	4-5	35-45	Pedestrian	48	2.0%	9	3.2%
12	Pedestrian Right-Of-Way Collisions at Uncontrolled Crosswalks at Small Intersections	≤3	25-30	Pedestrian	55	2.3%	10	3.6%
13	Pedestrian Violation Collisions on Large Roadways Not at Crosswalks	≥4	All	Pedestrian	35	1.4%	14	5.0%

3

Safety Guidance

- *Guide for Addressing Systemic Collision Profiles*
- *Countermeasure Guidance*

GUIDE FOR ADDRESSING SYSTEMIC COLLISION PROFILES

This section provides an overview of each collision profile, including a description of the profile, a map of the collisions, and identification of applicable countermeasures for feasibility and implementation consideration. The purpose of this guide is to support the City in identifying future safety improvements beyond those described in this report and to document the process that was used to identify top systemic projects that are included in the Prioritized Project List.

A detailed description of all countermeasures named in the next section is presented in the Countermeasure Toolbox in **Appendix A**, which can be used as a reference.


MODESTO
WATER WEALTH CONTENTMENT HEALTH
9TH Street
9TH Street

PROFILE 1

BROADSIDE VEHICULAR COLLISIONS AT SIGNALIZED INTERSECTIONS WITH PERMISSIVE LEFTS

Left-turning movements are generally acknowledged to be the highest-risk movements at intersections. The FHWA states that vehicles making permissive left turn movements encounter potential conflicts from multiple sources including opposing through traffic, through traffic in the same direction, and crossing vehicular and pedestrian traffic. This profile suggests the examination of signal operations such as converting permissive left turns to protected phasing, including a flashing yellow arrow and extending the yellow and all-red time. The Manual on Uniform Traffic Control Devices (MUTCD) provides more information on the standards and applications of the permissive and protected phasing.

Profile Characteristics

4-5
LANES

35-45
SPEED (MPH)

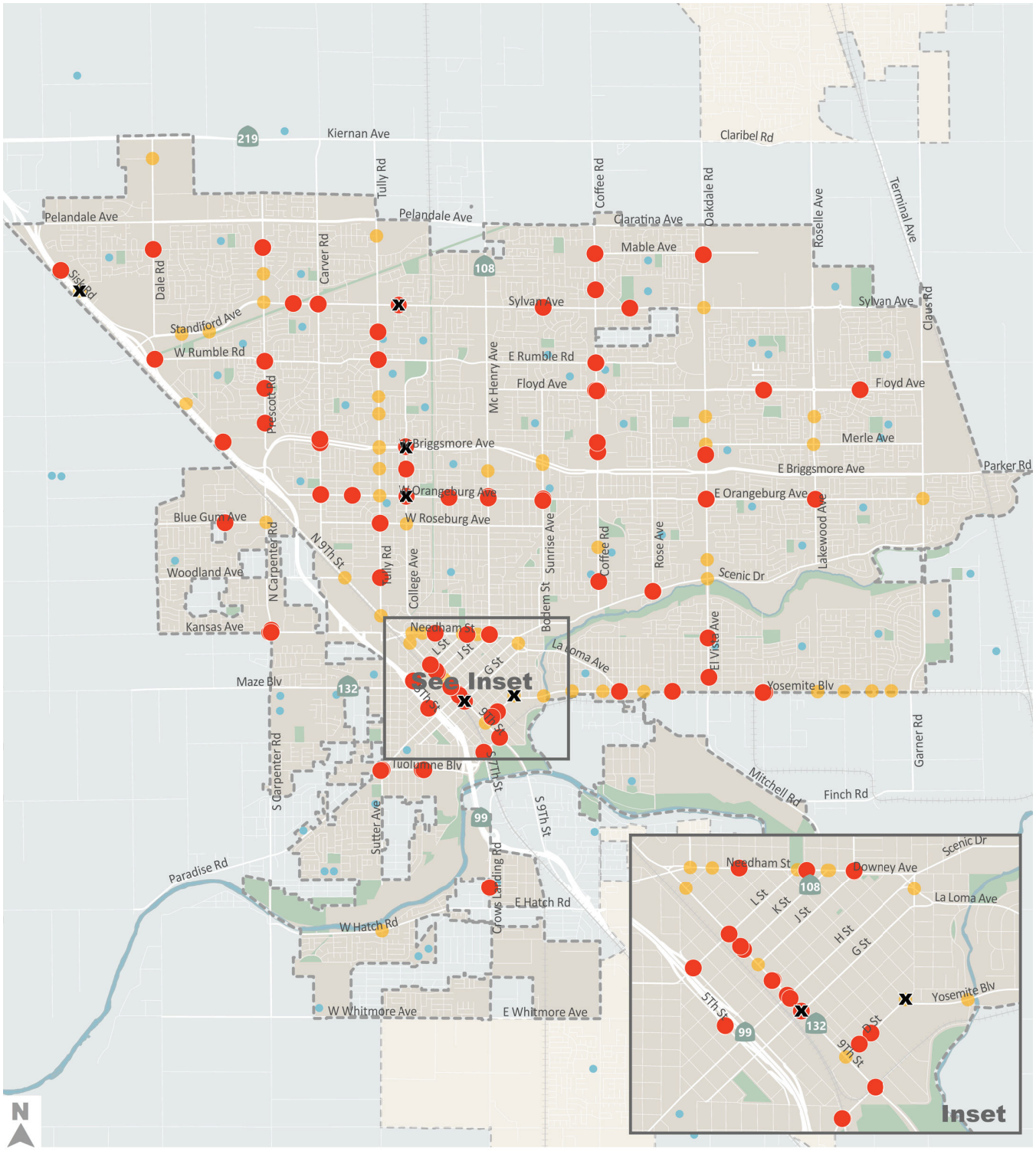
Profile Statistics

159
COLLISIONS FIT THIS PROFILE

6.6%
SHARE OF TOTAL CRASHES

Potential Countermeasures

Profile 1 *Broadside Vehicular Collisions at Signalized Intersections with Permissive Lefts - Collision Locations*



- KSI Vehicle Collisions meeting the profile (6)
- Other Vehicle Collisions meeting the profile (153)
- Location that met the profile, but a collision did not occur
- Schools
- Railroad
- Water
- Park

PROFILE 2

BROADSIDE VEHICULAR COLLISIONS AT INTERSECTIONS CAUSED BY SIGNAL VIOLATIONS

2

This profile focuses on broadside collisions caused by signal violations, which typically refers to red light running, where a driver enters an intersection when the traffic signal is solid red. This profile suggests an evaluation to examine ways to avoid potential collisions, such as signal timing adjustments. Providing adequate clearance time or coordinating signal operations with nearby intersections can also help to reduce crashes.

Profile Characteristics

4-5

LANES

35-45

SPEED (MPH)

Profile Statistics

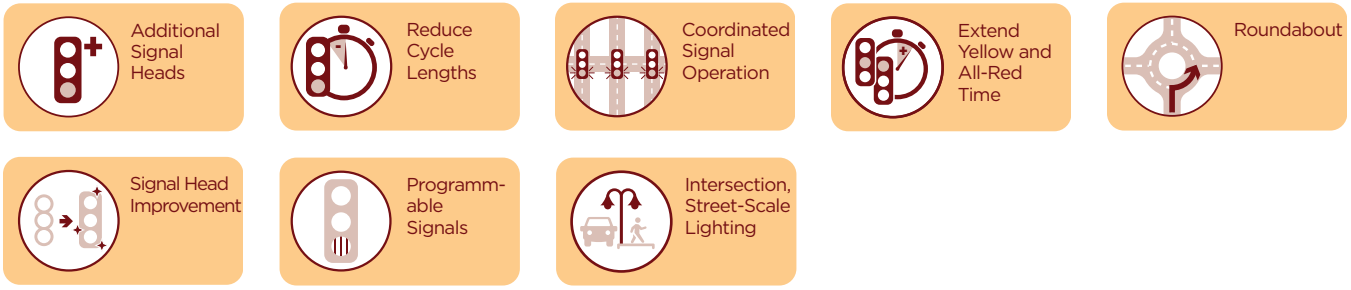
193

COLLISIONS FIT THIS PROFILE

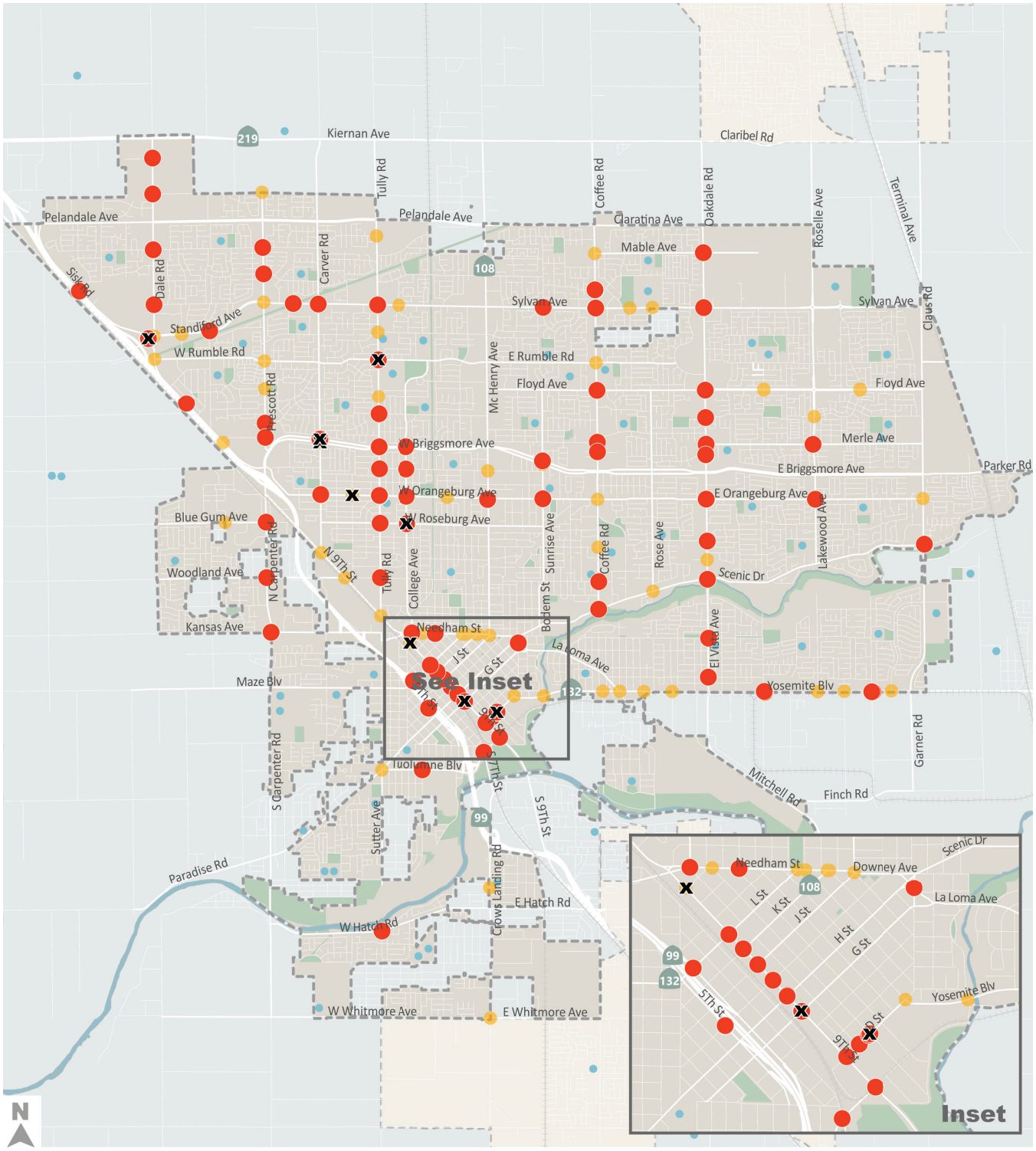
8.0%

SHARE OF TOTAL CRASHES

Potential Countermeasures



Profile 2 *Broadside Vehicular Collisions at Intersections Caused by Signal Violations - Collision Locations*



- KSI Vehicle Collisions meeting the profile (9)
- Other Vehicle Collisions meeting the profile (184)
- Location that met the profile, but a collision did not occur
- Schools
- Railroad
- Water
- Park

PROFILE 3

BROADSIDE VEHICULAR COLLISIONS ON HIGH-SPEED ROADWAYS

This profile focuses on broadside collisions along 4 lane roadway segments where a collision occurred resulting from a motorist turning out of or into a driveway. On high-speed roadways, this profile suggests an evaluation of appropriate countermeasures to better accommodate turning traffic mid-block. Potential countermeasures for this profile include raised median, road diet, access management, roadway lighting, and removal of sight obstructions.

Profile Characteristics

4
LANES

35-45
SPEED (MPH)

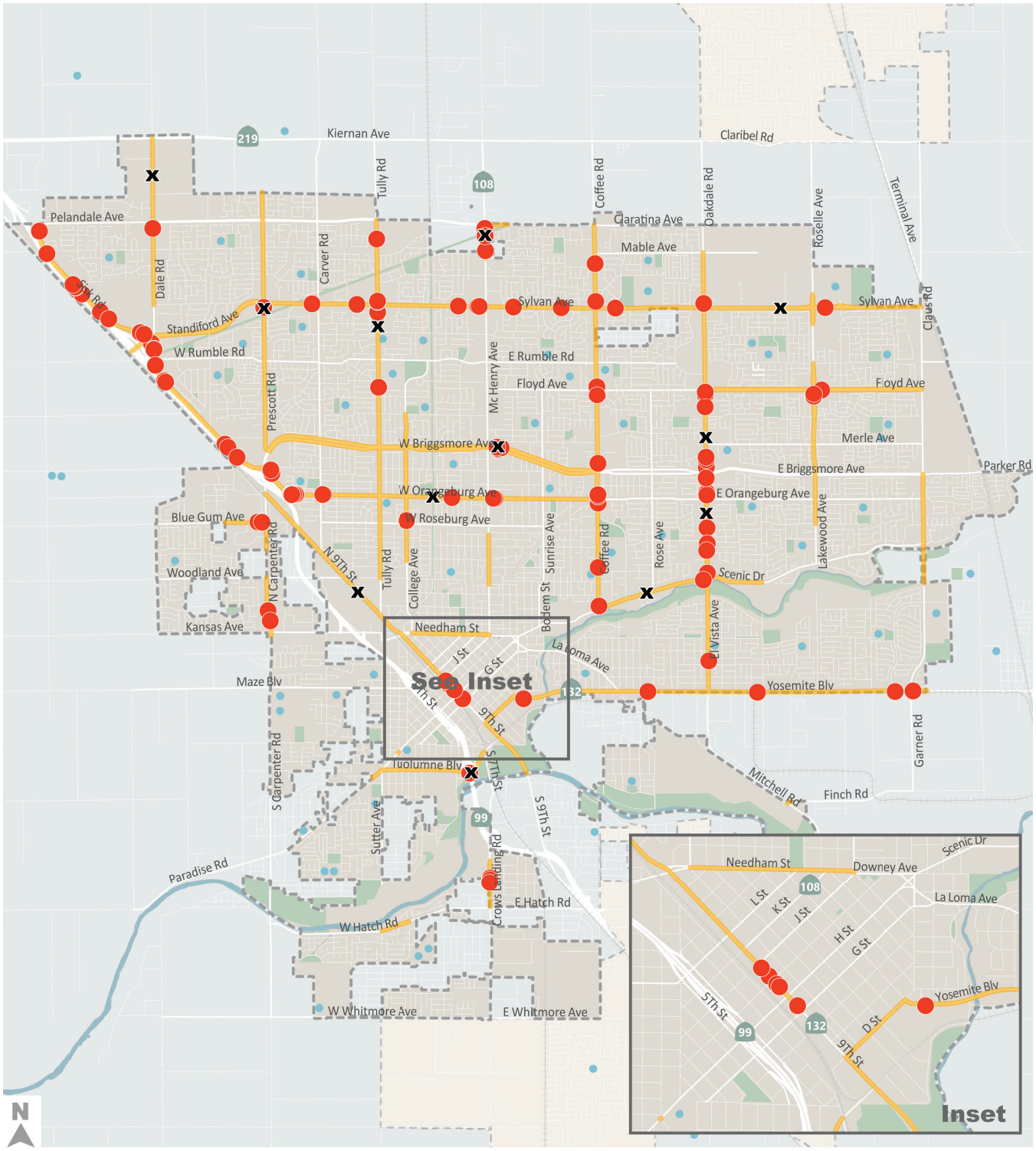
Profile Statistics

134
COLLISIONS FIT THIS PROFILE

5.5%
SHARE OF TOTAL CRASHES

Potential Countermeasures

Profile 3 *Broadside Vehicular Collisions on High-Speed Roadways - Collision Locations*



PROFILE 4

DRIVING UNDER THE INFLUENCE

The City of Modesto is consistently ranked by the California Office of Traffic Safety in the highest quartile among similar-sized cities for alcohol-related collisions. This profile highlights alcohol-related collisions throughout the City. A total of 22 collisions were documented as KSI collisions during the analysis period. Non-engineering interventions will be needed to address challenges associated with this profile. These will be documented and included in the forthcoming Local Roadway Safety Plan (LRSP).

Profile Statistics

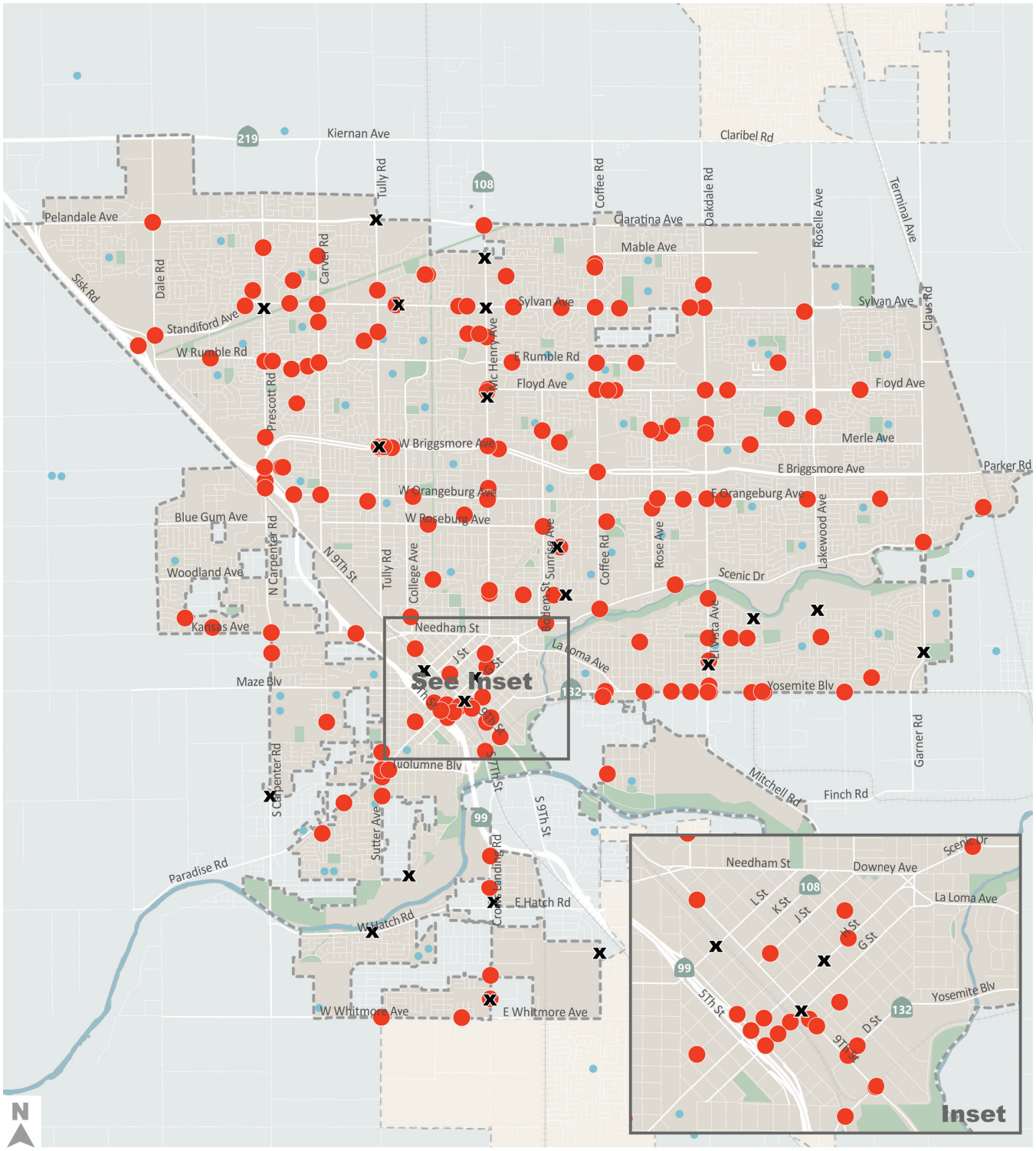
202

COLLISIONS FIT THIS PROFILE

8.4%

SHARE OF TOTAL CRASHES

Profile 4 *Driving Under the Influence - Collision Locations*



PROFILE 5

VEHICULAR COLLISIONS ON 6-LANE ROADWAYS

Collisions occur more frequently on multi-lane roadways where motorists are traveling at higher speeds, and this typology can result in higher rates of KSI collisions. The City of Modesto has several 6-lane roadways. This profile points towards countermeasures such as lane narrowing, road diets, edge line and center line rumble strips, and access management to minimize the number of conflict points along the roadway.

Profile Characteristics

6

LANES

Profile Statistics

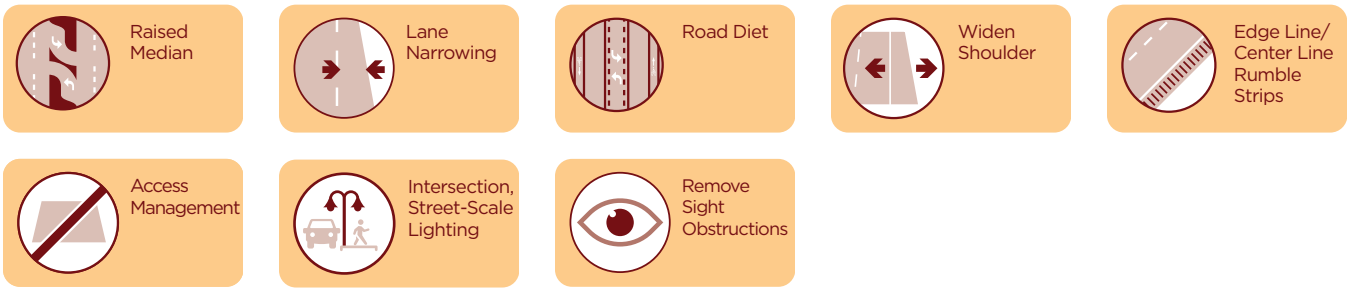
480

COLLISIONS FIT THIS PROFILE

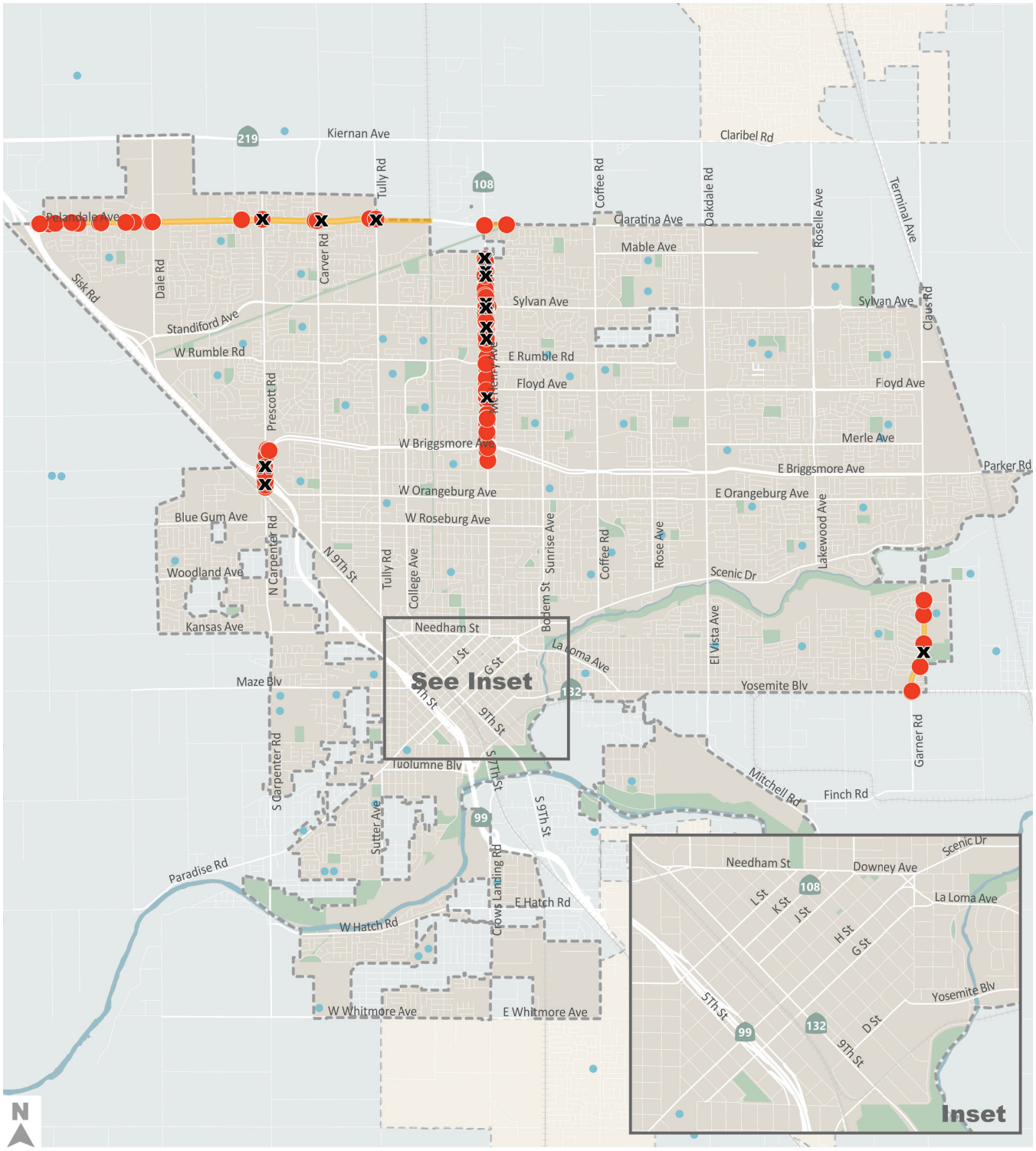
19.9%

SHARE OF TOTAL CRASHES

Potential Countermeasures



Profile 5 *Vehicular Collisions on 6-Lane Roadways - Collision Locations*



X KSI Vehicle Collisions meeting the profile (16)

Other Vehicle Collisions meeting the profile (464)

Schools

Railroad

Water

Park

PROFILE 6

BROADSIDE COLLISIONS AT LARGE, SIGNALIZED INTERSECTIONS INVOLVING BICYCLES

6

This profile focuses on broadside collisions involving bicyclists at signalized intersections. On larger roadways with motorists traveling at high speeds, this profile suggests an evaluation of appropriate countermeasures to improve visibility, provide dedicated space, and adjust signal timings to accommodate bicyclists. Common countermeasures for consideration include implementing additional signal heads, increasing green time for bicyclists, and installing green paint at conflict areas.

Profile Characteristics

4-5
LANES

35-45
SPEED (MPH)

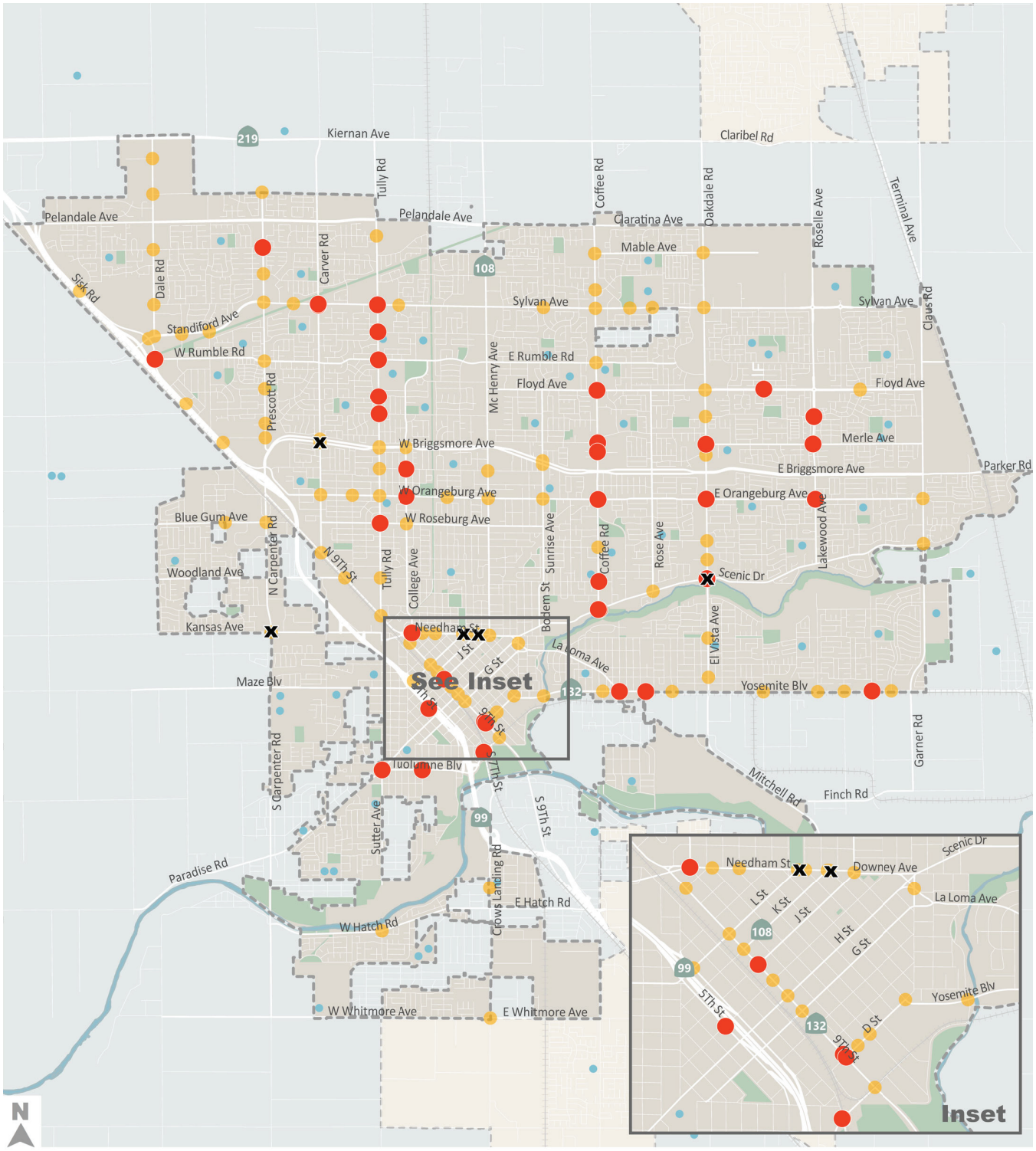
Profile Statistics

52
COLLISIONS FIT THIS PROFILE

2.2%
SHARE OF TOTAL CRASHES

Potential Countermeasures

Profile 6 *Broadside Collisions at Large, Signalized Intersections Involving Bicycles - Collision Locations*



- KSI Bicycle Collisions meeting the profile (5)
- Other Bicycle Collisions meeting the profile (47)
- Location that met the profile, but a collision did not occur
- Schools
- Railroad
- Water
- Park

PROFILE 7

BROADSIDE COLLISIONS AT UNSIGNALIZED INTERSECTIONS INVOLVING BICYCLES

This profile focuses on broadside collisions where bicyclists were hit by drivers at an unsignalized intersection. Many factors contribute to these collisions including sight-line obstructions, failure to yield right of way, and disregard of traffic control. Potential countermeasures include converting the intersection to an all-way stop control (if warranted), installing additional intersection-scale lighting, and installing a traffic circle.

Profile Characteristics

≤3

LANES

25-30

SPEED (MPH)

Profile Statistics

49

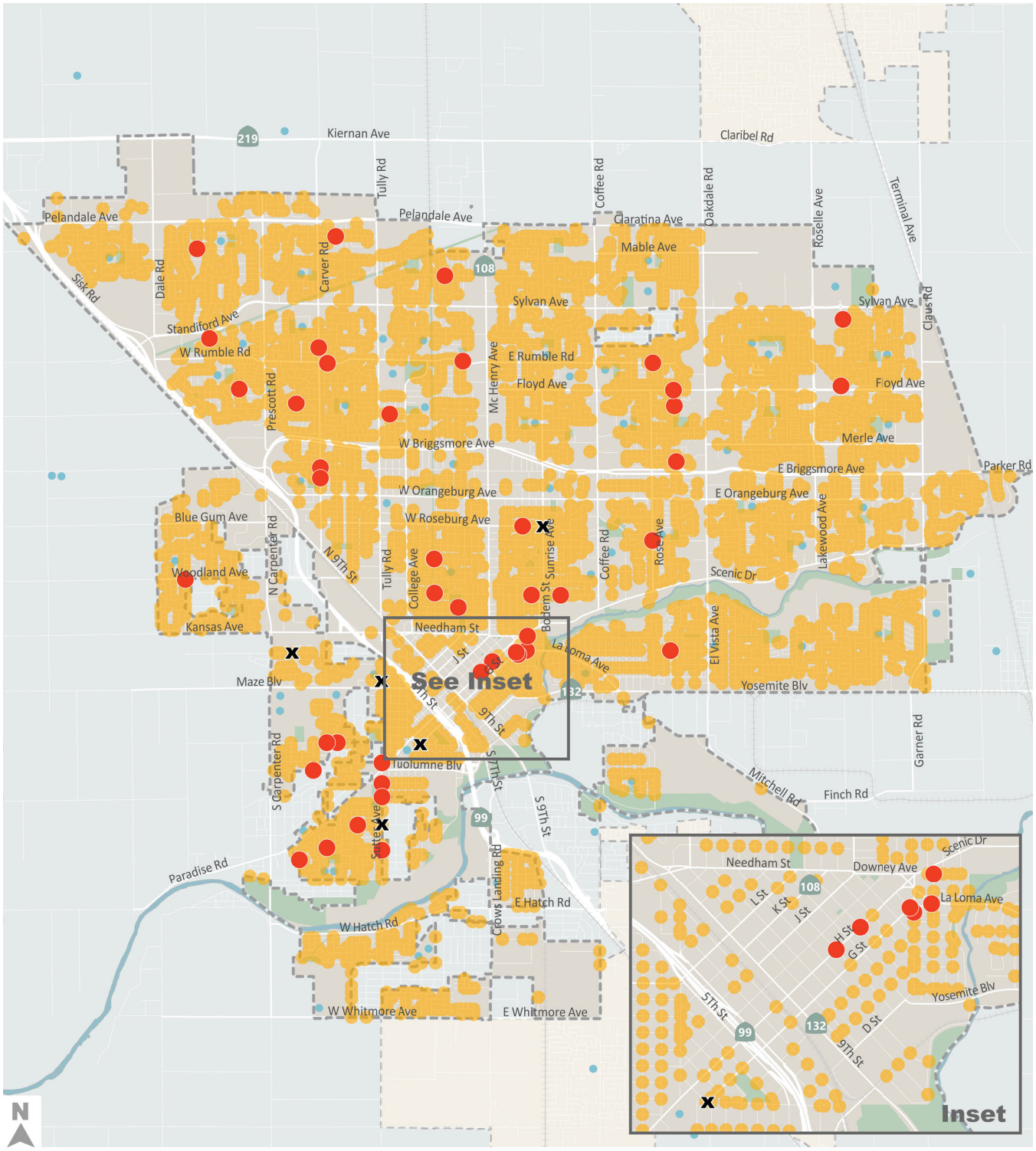
COLLISIONS FIT THIS PROFILE

2.0%

SHARE OF TOTAL CRASHES

Potential Countermeasures

Profile 7 *Broadside Collisions at Unsignalized Intersections Involving Bicycles - Collision Locations*



- KSI Bicycle Collisions meeting the profile (5)
- Other Bicycle Collisions meeting the profile (44)
- Location that met the profile, but a collision did not occur
- Schools
- Railroad
- Water
- Park

PROFILE 8

BROADSIDE COLLISIONS ON HIGH-SPEED ROADWAYS INVOLVING BICYCLES

On high speed roadways, the severity of bicycle and motor vehicle collisions increases. This profile focuses on these higher-speed broadside collisions. In this high-speed, high-stress context, physical separation of bicyclists from vehicles is important. In this respect, Class I bike paths and Class IV separated bike lanes, featuring dedicated space separated from other traffic, are the most comfortable for bicyclists. Other countermeasures to evaluate and consider including green paint to signify conflict zones, removing sight obstructions, and installing additional lighting to increase the visibility of bicyclists. In addition, access management can be considered to reduce the number of conflicts between bicyclists and motorists.

Profile Characteristics

4
LANES

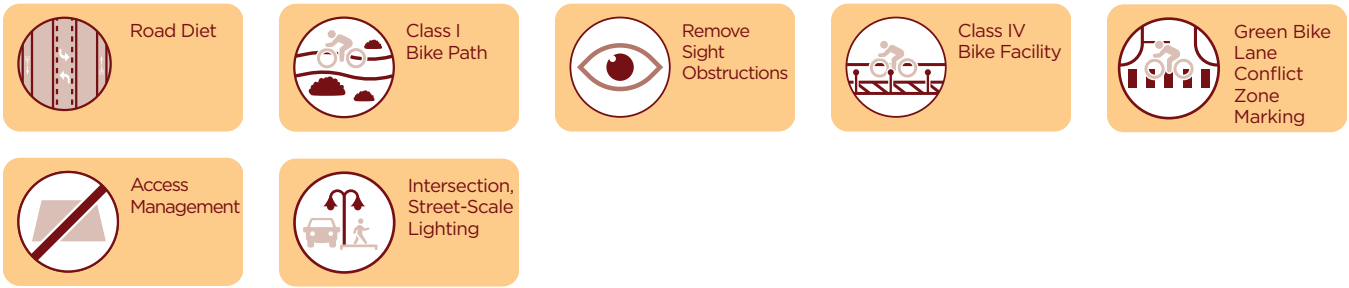
35-45
SPEED (MPH)

Profile Statistics

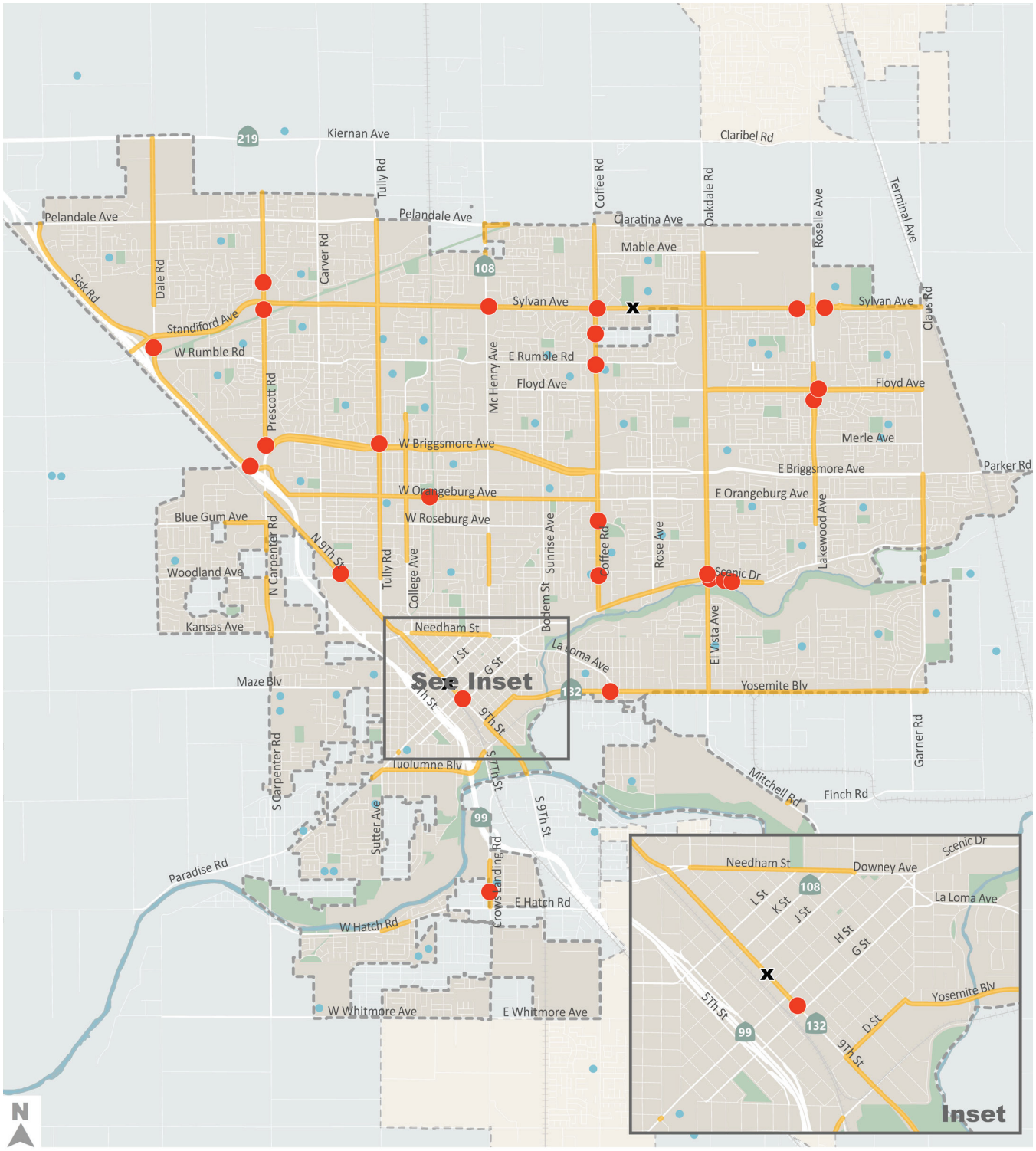
28
COLLISIONS FIT THIS PROFILE

1.2%
SHARE OF TOTAL CRASHES

Potential Countermeasures



Profile 8 *Broadside Collisions on High-Speed Roadways Involving Bicycles - Collision Locations*



PROFILE 9

BICYCLE COLLISIONS INVOLVING WRONG-WAY RIDING

9

The California Vehicle Code specifies where and how bicyclists must operate. Bicyclists, for the most part, have the same rights and responsibilities as motor vehicle drivers; with few exceptions, bicyclists are generally required to travel on the right side of roadways in the direction of traffic. This profile focuses on corridors with traffic moving at higher speeds, and focuses on countermeasures that increase visibility of bicyclists and compliance of motorists and bicyclists alike. Some of these countermeasures include installing separated bike paths, installing bicycle wrong way signs, and removing sight obstructions. Education and enforcement are important complements to this profile, but should not be used in lieu of engineering interventions that can promote accessibility and safety.

Profile Characteristics

4

LANES

35-45

SPEED (MPH)

Profile Statistics

41

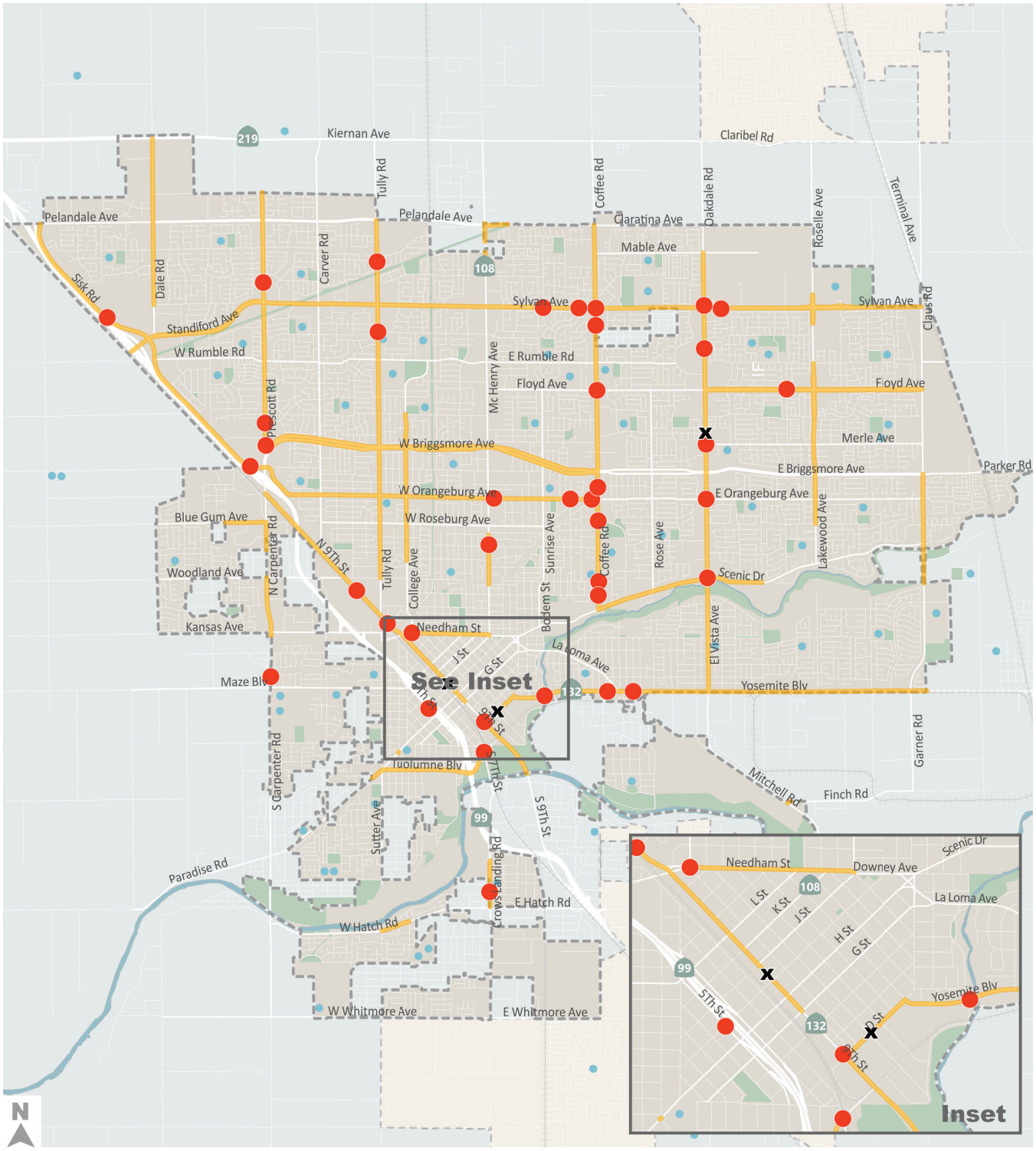
COLLISIONS FIT THIS PROFILE

1.7%

SHARE OF TOTAL CRASHES

Potential Countermeasures

Profile 9 *Bicycle Collisions Involving Wrong-Way Riding - Collision Locations*



PROFILE 10

PEDESTRIAN COLLISIONS AT CROSSWALKS AT LARGE SIGNALIZED INTERSECTIONS WITH PERMISSIVE LEFTS

On high-speed, 4-5 lane roadways in the City, 59 pedestrian collisions occurred when vehicles were making a permissive left turn. On wider roadways, motorists must pay attention to multiple sources of conflict, including opposing through traffic and crossing vehicular and pedestrian traffic. This profile suggests countermeasures to ideally separate users and remove the conflict via protected turn phases, leading pedestrian intervals, and pedestrian scrambles. Where that is not possible, additional countermeasures to consider include painting high visibility crosswalks, extending pedestrian crossing time, and shortening the crossing distance for pedestrians with curb extensions.

Profile Characteristics

4-5
LANES

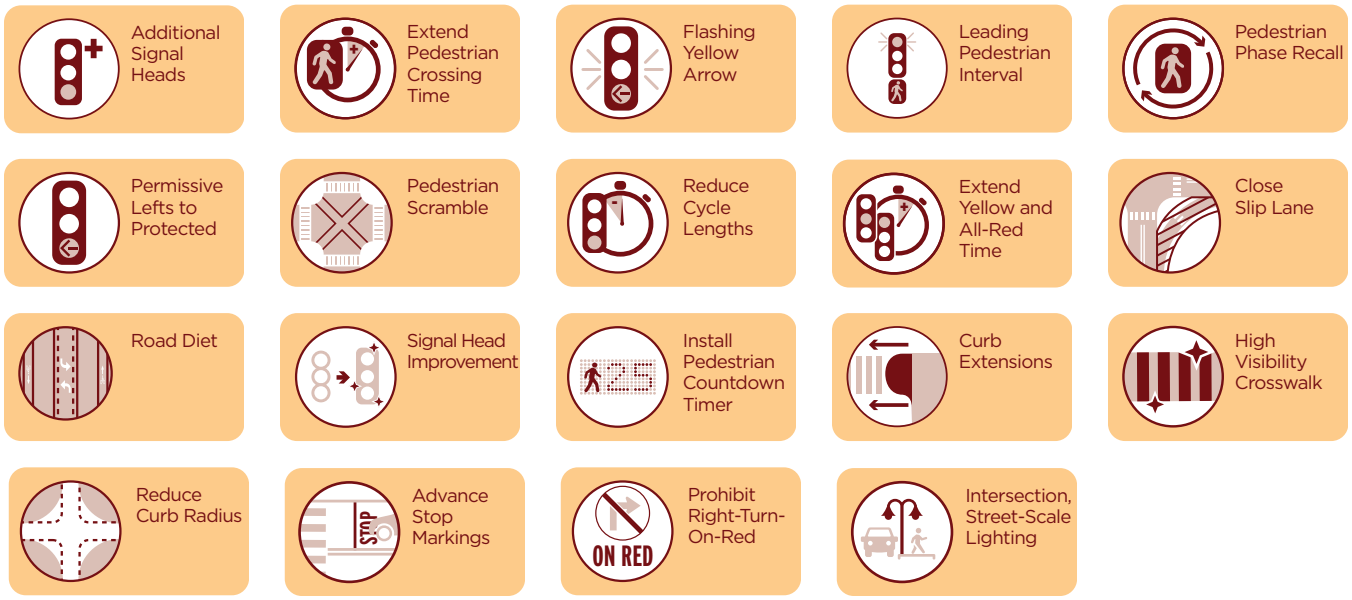
35-45
SPEED (MPH)

Profile Statistics

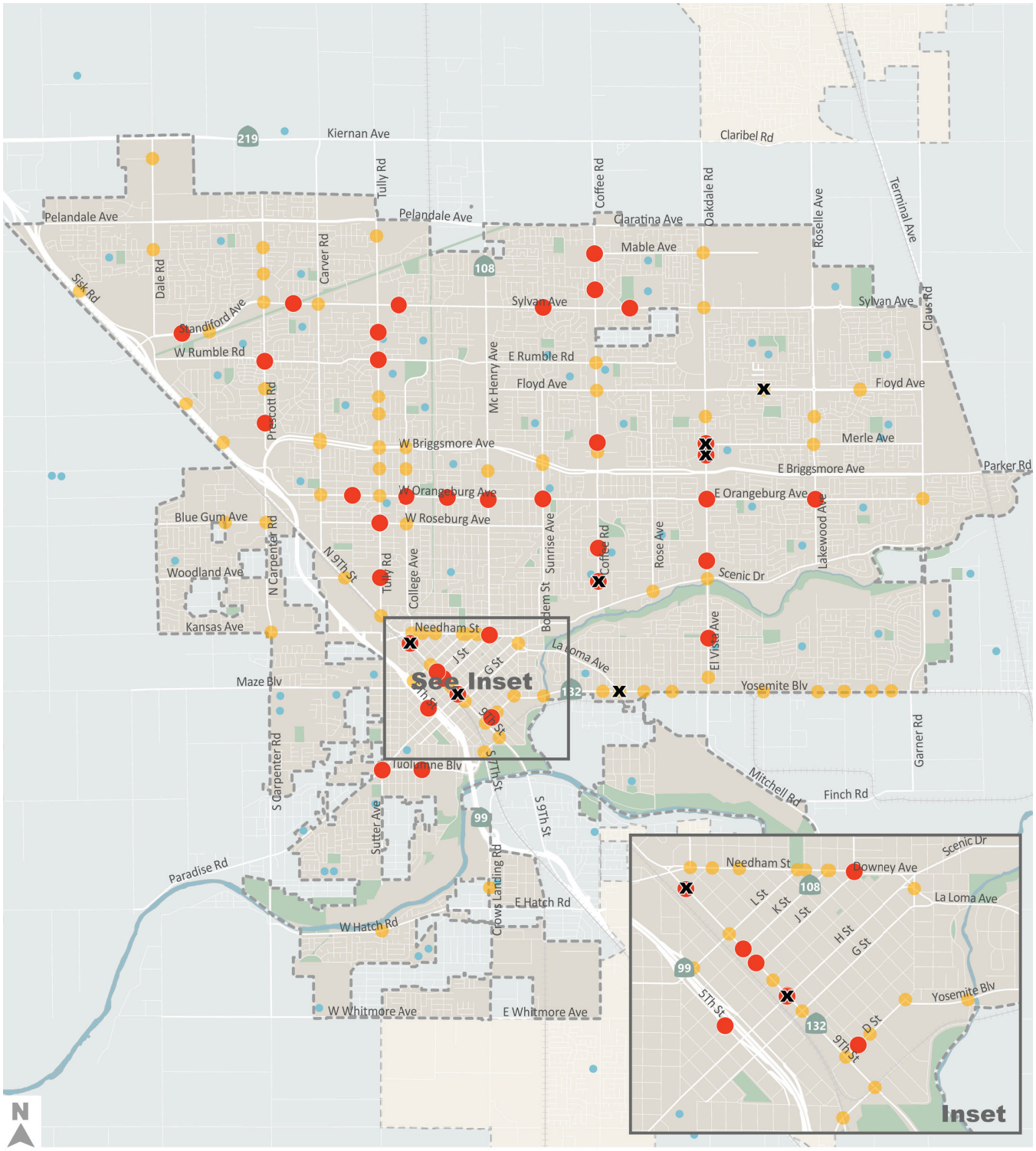
59
COLLISIONS FIT THIS PROFILE

2.5%
SHARE OF TOTAL CRASHES

Potential Countermeasures



Profile 10 *Collision Locations Pedestrian Collisions at Crosswalks at Large Signalized Intersections with Permissive Lefts - Collision Locations*



- KSI Pedestrian Collisions meeting the profile (9)
- Other Pedestrian Collisions meeting the profile (50)
- Location that met the profile, but a collision did not occur
- Schools
- Park
- Railroad
- Water

PROFILE 11

PEDESTRIAN RIGHT-OF-WAY COLLISIONS AT UNCONTROLLED CROSSWALKS AT LARGE INTERSECTIONS

The FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* provides guidance on the installation of countermeasures at uncontrolled pedestrian crossing locations. On larger roadways with motorists traveling at higher speeds, this profile suggests an evaluation of appropriate crossing improvements to improve pedestrian visibility and driver compliance. Common elements considered include RRFBs, PHBs, pedestrian refuge islands, and enhanced signage and pavement markings.

Profile Characteristics

4-5
LANES

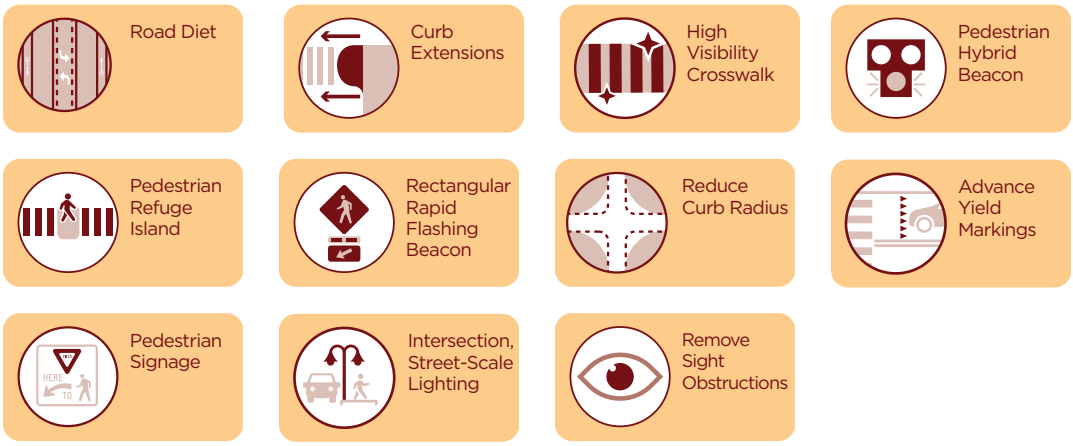
35-45
SPEED (MPH)

Profile Statistics

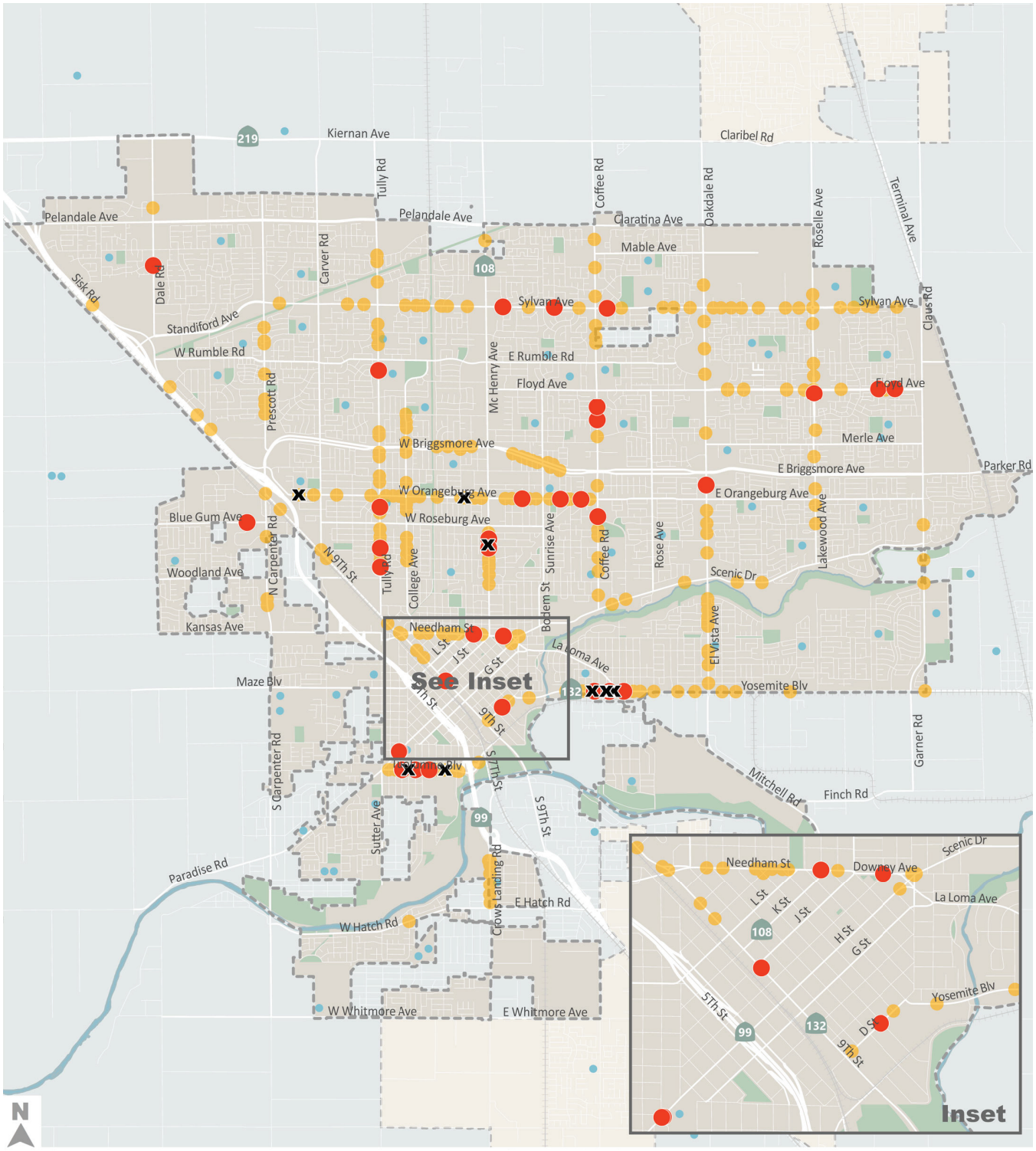
48
COLLISIONS FIT THIS PROFILE

2.0%
SHARE OF TOTAL CRASHES

Potential Countermeasures



Profile 11 *Pedestrian Right-of-Way Collisions at Uncontrolled Crosswalks at Large Intersections*



PROFILE 12

PEDESTRIAN RIGHT-OF-WAY COLLISIONS AT UNCONTROLLED CROSSWALKS AT SMALL INTERSECTIONS

12

The FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* provides guidance on the installation of countermeasures at uncontrolled pedestrian crossing locations. On smaller, uncontrolled streets, this profile suggests an evaluation to examine appropriate crossing improvements to improve pedestrian visibility and driver compliance. Common elements considered include curb extensions and enhanced signage and pavement markings, but may also call for RRFBs and PHBs.

Profile Characteristics

≤3
LANES

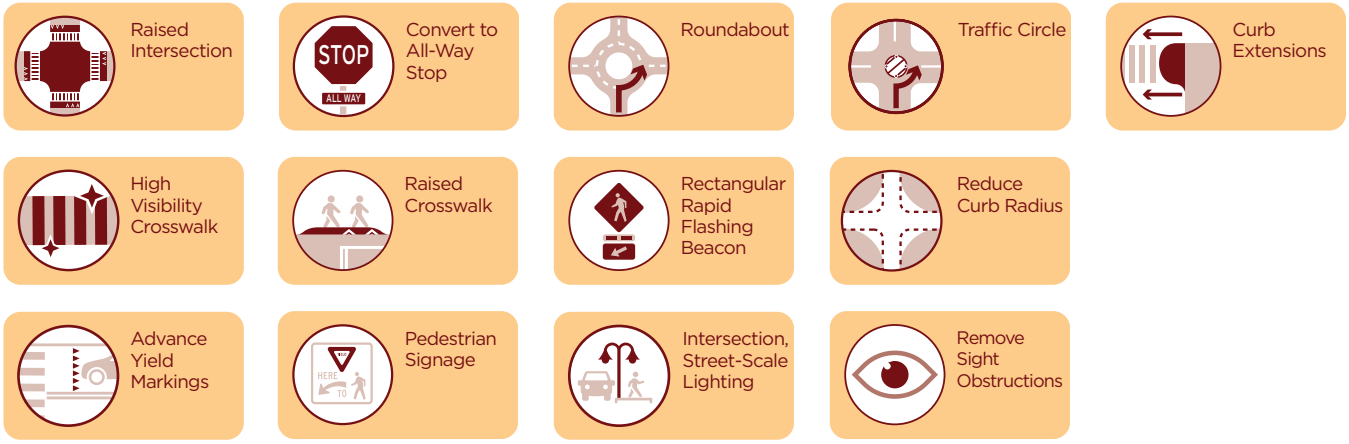
25-30
SPEED (MPH)

Profile Statistics

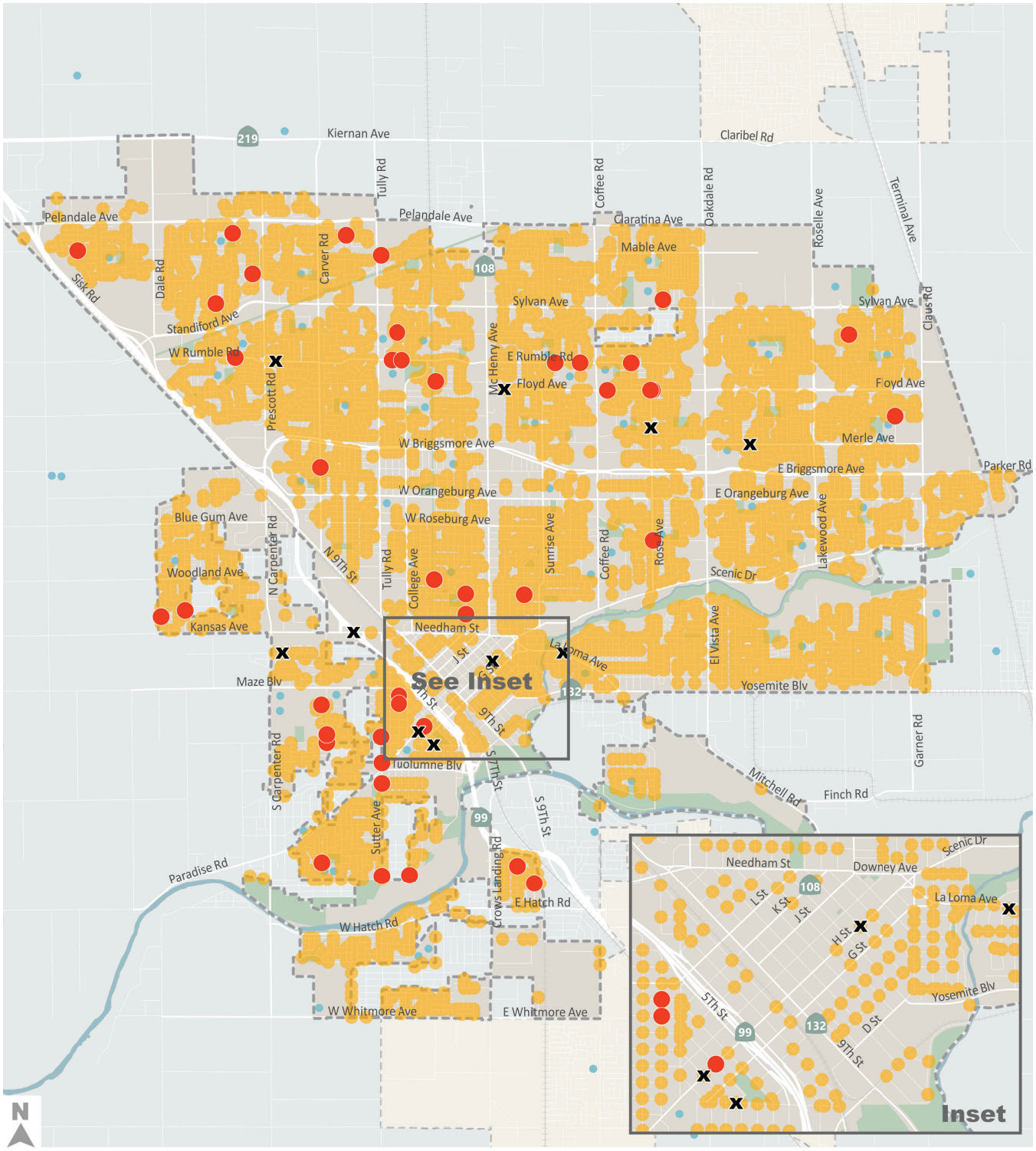
55
COLLISIONS FIT THIS PROFILE

2.3%
SHARE OF TOTAL CRASHES

Potential Countermeasures



Profile 12 *Pedestrian Right-of-Way Collisions at Uncontrolled Crosswalks at Small Intersections - Collision Locations*



PROFILE 13

PEDESTRIAN VIOLATION COLLISIONS ON LARGE ROADWAYS NOT AT CROSSWALKS

13

On wide, multi-lane roadways, pedestrian violations occur because of long crossing distances and infrequent marked crossings. Out of the 35 collisions that meet this profile, 14 were KSI collisions. This profile suggests an evaluation to assess pedestrian desire lines and to increase the visibility of pedestrians along roadways. Common elements to consider include installing sidewalks, installing new, enhanced pedestrian crossings to meet pedestrian desire lines, or restricting/discouraging pedestrians from crossing at mid-block locations.

Profile Characteristics

≥4

LANES

Profile Statistics

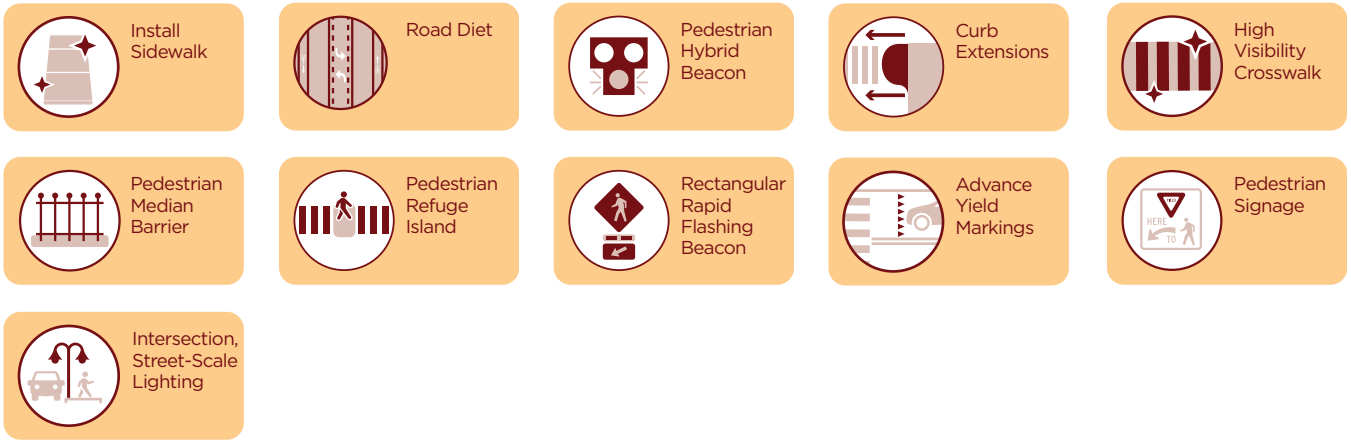
35

COLLISIONS FIT THIS PROFILE

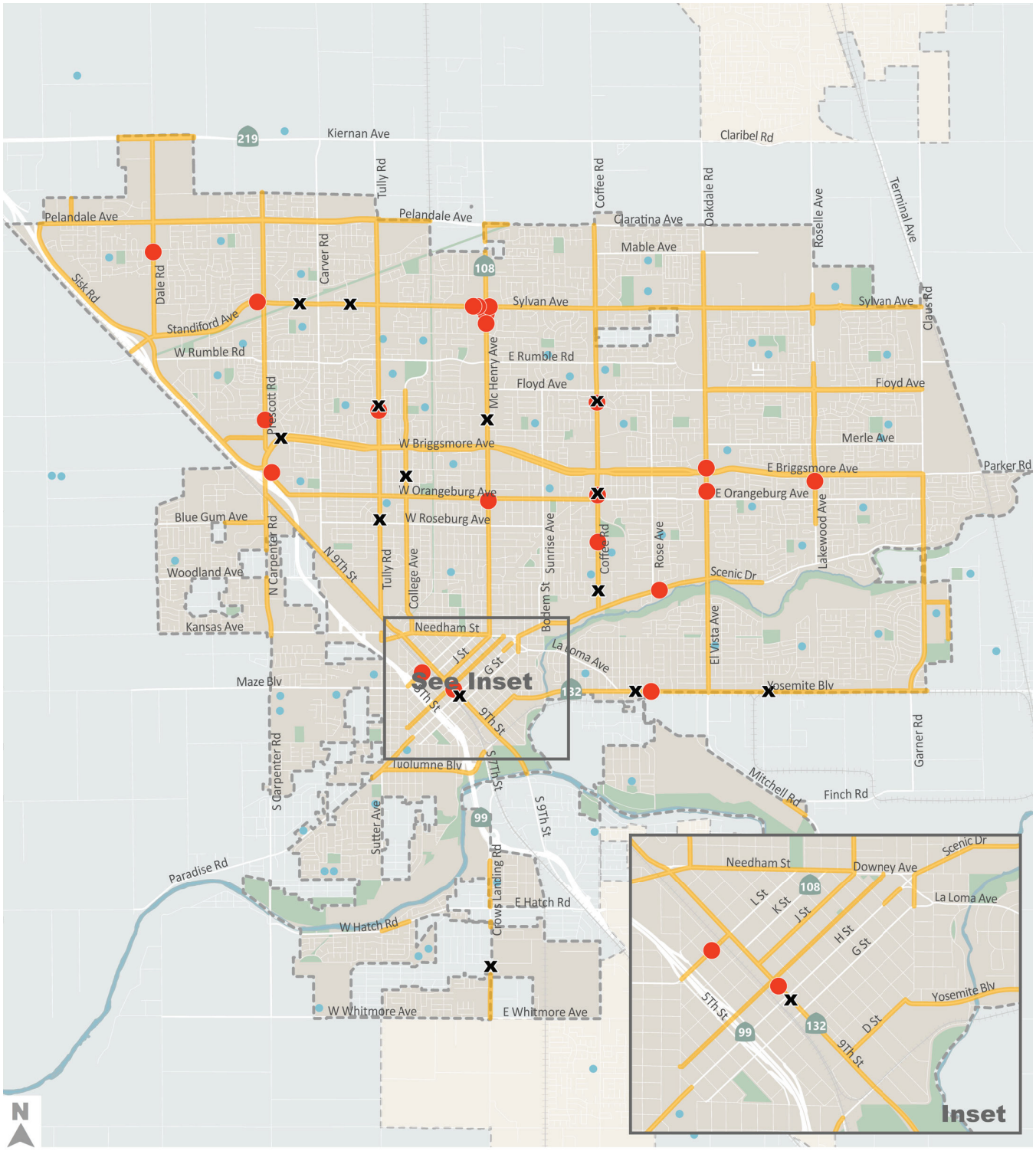
1.5%

SHARE OF TOTAL CRASHES

Potential Countermeasures



Profile 13 *Pedestrian Violation Collisions on Large Roadways Not at Crosswalks - Collision Locations*



COUNTERMEASURE GUIDANCE

The following charts provide guidance on appropriate countermeasures for specific location contexts identified in the collision profiles. **Appendix A** includes an in-depth countermeasure toolbox that highlights countermeasures included in the Caltrans Local Roadway Safety Manual (LRSM) and can be advantageous for use in Caltrans Highway Safety Improvement Program (HSIP) grant funding applications. Many of the countermeasures included in this chapter helped to shape the 10 Priority Project Location Recommendations included in this report.

Countermeasure	Profiles												
	1	2	3	4	5	6	7	8	9	10	11	12	13
A. SIGNAL TIMING & PHASING													
Additional Signal Heads		x				x				x			
Extend Pedestrian Crossing Time										x			
Flashing Yellow Arrow	x									x			
Leading Pedestrian Interval										x			
Pedestrian Phase Recall										x			
Permissive Lefts to Protected	x									x			
Pedestrian Scramble										x			
Reduce Cycle Lengths		x				x				x			
Coordinated Signal Operation		x				x							
Extend Green Time for Bikes						x				x			
Extend Yellow and All-Red Time	x	x				x				x			
B. INTERSECTION & ROADWAY DESIGN													
Close Slip Lanes										x			
Raised Intersection							x					x	
Convert Two-Way Stop to All-Way Stop							x					x	
Install Sidewalks													x
Protected Intersection						x							
Raised Median			x		x								
Lane Narrowing					x		x				x	x	
Road Diet	x		x		x	x		x		x	x		x
Widen Shoulder					x								
Roundabout	x	x				x	x				x	x	
Signal Head Improvements	x	x				x				x			
Traffic Circle							x					x	
Programmable Signals, Visors, or Louvers		x											
Edge Line/Center Line Rumble Strips					x								

Countermeasure	Profiles												
	1	2	3	4	5	6	7	8	9	10	11	12	13
C. BIKEWAY DESIGN													
Bicycle Crossing (Solid Green Paint)						x							
Bicycle Signal/Exclusive Bike Phase						x							
Bike Detection						x							
Bike Box						x							
Class I Bicycle Path or Mixed-Use Trail								x	x				
Class II Bike Lane								x					
Class IV Separated Bikeway								x					
Green Bike Lane Conflict Zone Markings								x					
Two-Stage Turn Queue Bike Box						x							
D. PEDESTRIAN CROSSINGS													
Install Pedestrian Countdown Timer										x			
Pedestrian Hybrid Beacon (PHB)											x		x
Curb Extensions										x	x	x	x
High-Visibility Crosswalk										x	x	x	x
Pedestrian Median Barrier													x
Raised Crosswalk												x	
Pedestrian Refuge Island											x		x
Rectangular Rapid Flashing Beacon (RRFB)											x	x	x
Reduce Curb Radius						x				x	x	x	
E. SIGNS AND MARKINGS													
Advanced Stop Markings										x			
Advanced Yield Markings											x	x	x
Prohibit Right-Turn-On-Red						x				x			
Bicycle Wrong Way Signs									x				
Pedestrian Signage											x	x	x
E. OTHER													
Access Management			x		x			x	x				
Intersection and Street-Scale Lighting	x	x	x		x	x	x	x	x	x	x	x	x
Remove Obstructions for Sightlines			x		x		x	x	x		x	x	

4

Project Guidance

- *Project Recommendations*
- *Funding and Implementation Recommendations*

PROJECT RECOMMENDATIONS

Twenty Priority Projects are summarized in this chapter, with ten Projects highlighted with cutsheets to support applications for HSIP funding and other key safety grant funding opportunities.

Potential project locations were initially identified in consideration of the 13 collision profiles identified along with identification of top hot spot locations. From this initial premise, several processes were undertaken to identify a prioritized project list recommended for implementation.

First, the SSAR Project Team and Stakeholder Advisory Group completed a two-day walking audit around the City on Tuesday, May 14 and Wednesday, May 15, 2019, the map for which may be found in **Appendix B**. This walking audit provided first-hand insight into the challenges roadway users face throughout the City.

This walking audit guided the project team to identify 20 priority projects. These 20 projects were presented to the public to facilitate feedback regarding project prioritization through both an evening community meeting on September 11, 2019 as well as through a published survey. The resulting list of 20 projects and the respective community prioritization are shown on the following pages. For each of the 20 projects, project cost estimates and the resulting benefit/cost ratios (developed using the Cycle 9 HSIP Analyzer) are also shown in the project list. Following the project list are project cutsheets for ten selected projects chosen from this list.. These ten projects were chosen as projects that may compete well for grant funding, align with City priorities, and account for community priority ranking.

Potential Project List

Project	Overall BCR	Community Priority	Cost Estimate
1. Pedestrian improvements at intersection of Chapman Rd and Pelandale Ave Update signal timings, extend median to create pedestrian refuge, and tighten curb radii	6.53	Low	$85,100 (22% HSIP eligible)
2. Pelandale Ave access improvements: Blue Bird Dr to Dale Rd Install a new traffic signal at Blue Bird Dr and Pelandale Ave, and install raised median to restrict access to right-in/right-out (except allowing lefts onto Honey Creek Rd from Pelandale Ave).	2.55	Low	$1,456,000 (90% HSIP eligible)
3. Standiford Ave/Sylvan Ave PHBs: Longbridge Dr to Northampton Ln Install Pedestrian Hybrid Beacons across Standiford Ave at Longbridge Dr and across Sylvan Ave at Bridgeford Ln and at Northampton Ln. Longbridge Dr crossing to be installed across the east leg with a refuge island, and restrict lefts out from Longbridge Dr onto Standiford Ave.	16.94	Medium	$1,192,100 (90% HSIP eligible)
4. Bus access improvements at the intersection of Standiford Ave and McHenry Ave Redesign the driveway along Standiford Ave into the Promenade Shopping Center, west of McHenry Ave, to a standard driveway curb-cut. Move westbound bus stop to the east side of the driveway and install a bus turn out. Install a curb extension on the southeast corner of the intersection. Relocate bus stops closer to the intersection. Reduce the eastbound right turn lane width to accommodate a bike lane, and install green conflict striping for the eastbound approach, and through the intersection in both the eastbound and westbound directions.	42.06	Medium	$481,500 (1% HSIP eligible)
5. Protected left turn improvements at the intersections of Orangeburg Ave and Carver Rd; Coldwell Ave and Tully Rd; Coffee Rd and Floyd Ave; and Coffee Rd and Rumble Rd Protected left turns will be installed at these locations.	8.64	Medium	$1,747,200 (100% HSIP eligible)
6. Intersection improvements at Tully Rd and Rumble Rd Install advanced stop bars, high visibility crosswalk striping, curb extensions, blank-out no right turn sign facing westbound traffic to be activated during northbound pedestrian phase, protected left turns on all approaches, and leading pedestrian intervals. Restripe eastbound and westbound approaches to accommodate exclusive left turn lanes.	8.18	High	$998,000 (75% HSIP eligible)
7. Briggsmore Ave corridor study Conduct a corridor study for Briggsmore Ave to identify multimodal safety improvements.		Low	

Project	Overall BCR	Community Priority	Cost Estimate
8. Rumble Rd pedestrian improvements: Conant Ave to Keller St Enhance school crossings along Rumble Rd in this stretch with crosswalk improvements (e.g., high visibility crosswalk striping, in-street pedestrian crossing signs, refuge islands, curb extensions) and traffic calming (e.g., speed cushions, traffic circles).	1.02	Low	$2,687,600 (50% HSIP eligible)
9. Oakdale Rd improvements (phase 1): Celeste Dr to Lancey Dr Redesign the intersection of Oakdale Rd and Merle Ave, which includes moving northern crosswalk south of 1823 Oakdale Road driveway, reducing the driveway curb cut, installing protected left turns for the westbound approach, and signalizing driveway crossing on west side. Implement leading pedestrian intervals at the intersections of Oakdale Rd with Merle Ave and Lancey Dr. Install blank-out no right turn signs on all approaches. Install raised median along Oakdale Rd from Merle Ave to Celeste Dr and restrict lefts out from Celeste Dr onto Oakdale Rd. Install a new pedestrian crossing on the north leg of Celeste Dr and Oakdale Rd with a Pedestrian Hybrid Beacon and median refuge. Install new signal interconnect from Oakdale Rd to Merle Ave.	16.63	Medium	$1,105,900 (75% HSIP eligible)
10. Oakdale Rd improvements (phase 2): Sylvan Ave to Celeste Dr and Lancey Dr to Scenic Dr Install raised medians to restrict mid-block access to primarily right-in/right-out (with left-in permitted at defined locations). Project to include improvements at the intersection of Scenic Dr and Oakdale Rd, which include removal of a southbound left turn lane, installation of pedestrian refuge, and tightening curb radii.	40.28	High	$1,702,000 (88% HSIP eligible)
11. Pedestrian improvements at the intersection of Claus Rd and Creekwood Dr Implement an at-grade crosswalk on the south approach with median refuge and curb extensions, protected-only left turn phasing, and leading pedestrian intervals with blank-out no right turn signs.	0.93	Low	$780,600 (88% HSIP eligible)
12. Coffee Rd enhanced crossings: Morris Ave to Multnomah Dr Install a traffic signal at Chadwick Ct and PHBs at Morris Ave and at Multnomah Dr. Enhance signalized crossings at Lucern Ave and at Fairmont Ave with high visibility crosswalk striping and protected left turns. Align bus stops to be adjacent to the far side of the enhanced crossings.	4.85	Medium	$2,521,800 (88% HSIP eligible)
13. Coffee Rd bicycle improvements: Sylvan Ave to Scenic Dr Complete gaps in Class II facilities, including conflict zone green paint. Identify driveways and side streets with deficient sight distance and remove obstructions. Install raised medians to restrict access at select locations.	32.35	Medium	$2,200,400 (90% HSIP eligible)

Project	Overall BCR	Community Priority	Cost Estimate
14. Protected intersections at Coffee Rd and Scenic Dr Redesign the Coffee Road/Scenic Road intersection as a protected intersection to facilitate northbound/southbound bicycle travel through the intersection. Relocate the west crosswalk to the east side of the intersection.	17.15	Medium	$711,800 (34% HSIP eligible)
15. Improvements at intersection of Paradise Rd, Sutter Ave, MLK Dr, and Tuolumne Blvd Redesign intersection to enhance multi-modal safety. Consider single lane roundabout alternative.	4.62	High	$3,307,000 (100% HSIP eligible)
16. Tuolumne Boulevard Complete Streets: Paradise Rd to SR-99 Implement a road diet on Tuolumne Blvd and provide enhanced crosswalks (high visibility striping, curb extensions, and RRFB's), protected left turns at Roselawn Ave, and buffered bike lanes.	13.62	High	$1,788,800 (68% HSIP eligible)
17. Sutter Ave Complete Streets: Paradise Rd to Robertson Rd Implement a complete streets project to include Class II bike lanes, sidewalk in missing locations, and curb extensions at Elsie Street and at South Avenue. Project to include removal of on-street parking on one side of Sutter Avenue.	20.23	Medium	$977,800 (90% HSIP eligible)
18. Intersection improvements at Bodem St and Scenic Dr Remove southbound right turn lane, reduce the curb radius of the northeast corner, install a raised crosswalk for the crossing of the channelized turn, realign crosswalks with high visibility striping, implement protected-only phasing on all approaches, and reduce design walking speed to 2.8 fps for senior center.	13.54	High	$735,300 (56% HSIP eligible)
19. Downtown Complete Streets study Conduct a complete streets study to identify potential cross-downtown bicycle facilities. Improvements to consider include removing travel lanes along G Street and/or H Street to implement Class IV facilities, implementing a bicycle connection from the Virginia Avenue Corridor Trail to G Street/H Street, and redesigning the Burney Street/G Street/18th Street intersections. Intersection redesign to consider a roundabout at Burney Street/G Street and closing 18th Street between G Street and Burney Street. Study to evaluate two-way versus one-way cycle tracks, and to identify crossing improvements.		High	
20. Intersection improvements at 9th St and O St Install bicycle and pedestrian improvements.		Low	

PROJECT **3** | ADDRESSES SYSTEMIC PROFILES 1 2 **3** **4** 5 6 7 **8** 9 10 **11** 12 13

3

STANDIFORD AVENUE-SYLVAN AVENUE PHBs

INTERSECTIONS OF STANDIFORD AVENUE AND LONGBRIDGE DRIVE AND SYLVANE AVENUE AND BRIDGEFORD LANE

Existing Conditions

This stretch of Standiford Avenue/Sylvan Avenue connects residential areas to retail areas along the corridor. This stretch of roadway has experienced several pedestrian collisions, including a fatal collision. At the intersection of Standiford Avenue and Longbridge Drive, there is a residential trail connection area with transit stops and retailers near this location, creating a high desire line for bicyclists and pedestrians. Bridgeford Lane serves residential neighborhoods and has existing crosswalks. This project aims to install PHBs at these locations to enhance pedestrian accessibility and motor vehicle yielding behavior.

Project Recommendations

- Install Pedestrian Hybrid Beacons across Standiford Avenue at Longbridge Drive and across Sylvan Avenue at Bridgeford Lane
- Install Longbridge Drive crossing across the east leg with a refuge island
- Restrict lefts out from Longbridge Drive onto Standiford Avenue.

TARGET MODES

2

KSIs, 2011-2015

$1,192,200

TOTAL COST, 90% ($1,072,980) HSIP-FUNDED

$14,211,513

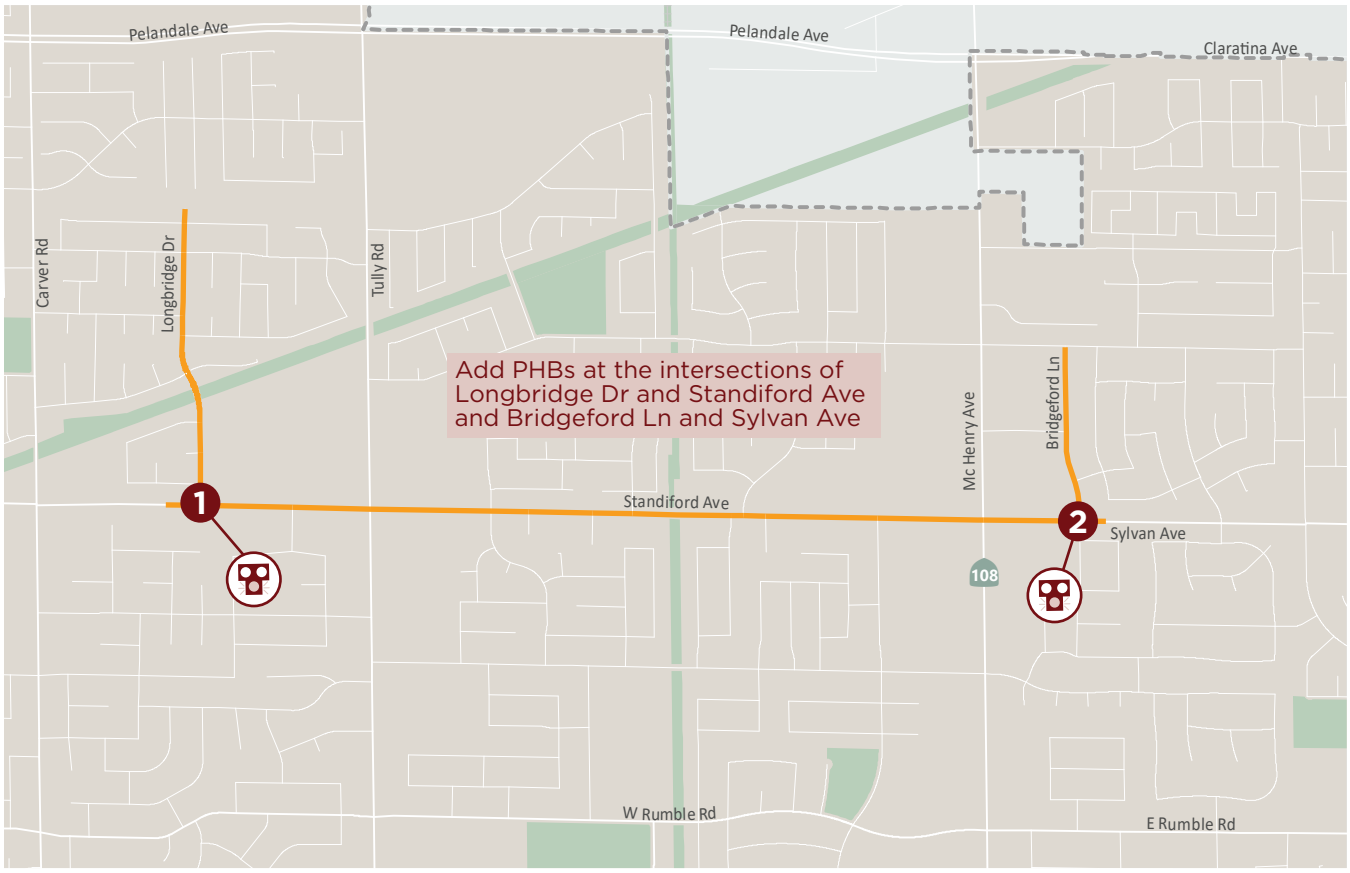
TOTAL BENEFITS

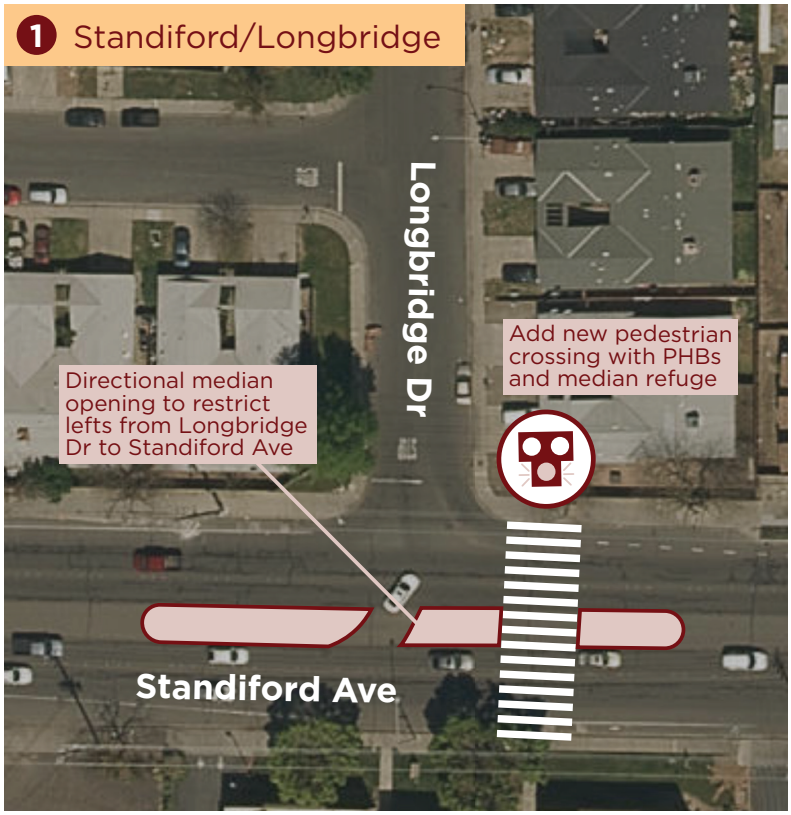
11.92

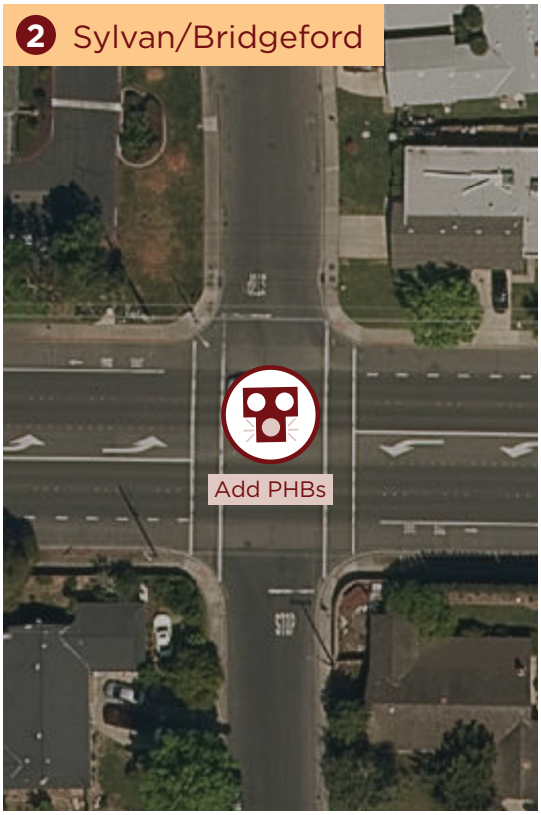
B/C RATIO

Cost

Install raised median with directional opening and pedestrian refuge	**$100,000**
Pedestrian Hybrid Beacon (PHB) (with intersection improvements)	**$555,000**
Contingency and non-construction costs	**$537,100**
Total	**$1,192,200**


Pelandale Ave
Pelandale Ave
Claratina Ave
Carver Rd
Longbridge Dr
Tully Rd
Add PHBs at the intersections of Longbridge Dr and Standiford Ave and Bridgeford Ln and Sylvan Ave
Mc Henry Ave
Bridgeford Ln
1
Standiford Ave
2
Sylvan Ave
108
W Rumble Rd
E Rumble Rd


1 Standiford/Longbridge
Longbridge Dr
Add new pedestrian crossing with PHBs and median refuge
Directional median opening to restrict lefts from Longbridge Dr to Standiford Ave
Standiford Ave


2 Sylvan/Bridgeford
Add PHBs

PROJECT 5 | ADDRESSES SYSTEMIC PROFILES 1 2 3 4 5 6 7 8 9 10 11 12 13

5

PROTECTED LEFT TURN IMPROVEMENTS

INTERSECTIONS OF ORANGEBURG AVENUE AND CARVER ROAD, COLDWELL AVENUE AND TULLY ROAD, COFFEE ROAD AND FLOYD AVENUE, COFFEE ROAD AND RUMBLE ROAD

Existing Conditions

The intersections listed in Project 5 are currently operating with permissive left turn phasing (where left turning traffic must yield to on-coming through traffic and pedestrians). Permissive left turns can often result in broadside collisions between vehicles due to misjudgment of gaps in through traffic, getting stuck in the intersection at the end of a phase, and mistaking the permissive phase as a protected phase. Permissive left turns can also be detrimental to pedestrians and bicyclists as drivers can be focused on finding a gap in traffic and less attentive to conflict pedestrians and bicyclists. A protected left turn phase provides a green arrow for left turning vehicles, thereby eliminating conflict points between on-coming through traffic, bicyclist, and pedestrians.

Project Recommendations

Install protected left turns at the following intersections:

- Orangeburg Ave/Carver Rd
- Coldwell Ave/Tully Rd
- Coffee Rd/Floyd Ave
- Coffee Rd/Rumble Rd

5

KSIs, 2011-2015

TARGET MODES

$1,747,200

TOTAL COST, 100% HSIP-FUNDED

$15,095,808

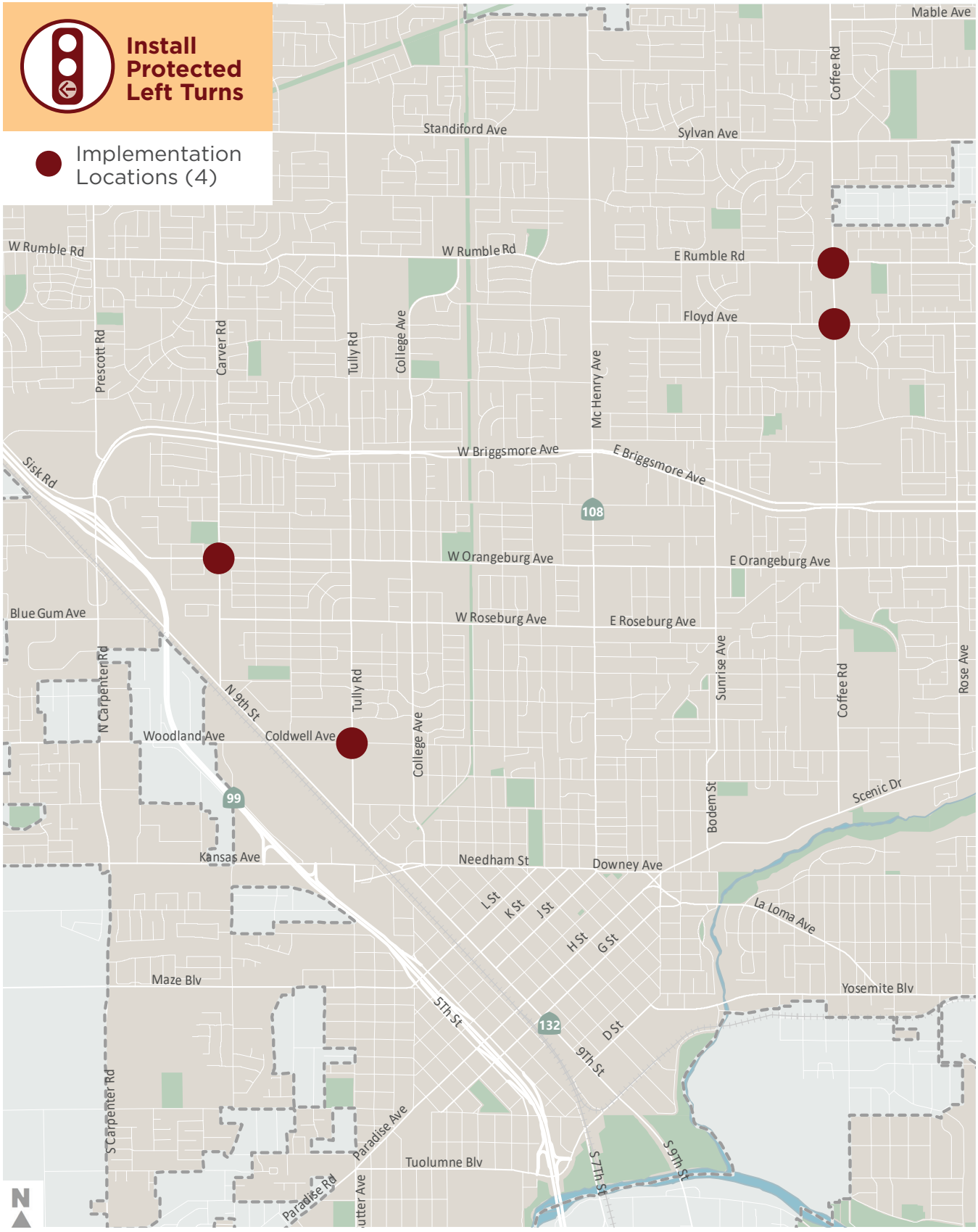
TOTAL BENEFITS

8.64

B/C RATIO

Cost

Install new signal heads and protected left turns	**$960,000**
Contigency and non-construction costs	**$787,200**
Total	**$1,747,200**


Install Protected Left Turns
Implementation Locations (4)
Mable Ave
Coffee Rd
Standiford Ave
Sylvan Ave
W Rumble Rd
W Rumble Rd
E Rumble Rd
Floyd Ave
Prescott Rd
Carver Rd
Tully Rd
College Ave
Mc Henry Ave
W Briggsmore Ave
E Briggsmore Ave
Sisk Rd
108
W Orangeburg Ave
E Orangeburg Ave
Blue Gum Ave
W Roseburg Ave
E Roseburg Ave
N Carpenter Rd
N 9th St
Tully Rd
Sunrise Ave
Coffee Rd
Rose Ave
Woodland Ave
Coldwell Ave
College Ave
99
Bodem St
Scenic Dr
Kansas Ave
Needham St
Downey Ave
L St
K St
J St
H St
G St
La Loma Ave
Maze Blv
Yosemite Blv
57th St
132
D St
9th St
S Carpenter Rd
Paradise Ave
Tuolumne Blv
S 7th St
S 9th St
Paradise Rd
N

PROJECT 6 | ADDRESSES SYSTEMIC PROFILES **1 2 3 4** 5 **6** 7 **8** 9 **10** 11 12 13

6

INTERSECTION IMPROVEMENTS AT TULLY ROAD AND RUMBLE ROAD

INTERSECTION OF TULLY ROAD AND RUMBLE ROAD

Existing Conditions

Tully Road and Rumble Road are both among the most heavily used roadways in Modesto. This particular intersection is in a school zone, and is signalized with permissive left turns. Although the crosswalks are painted yellow to indicate the intersection is near a school, the paint on these crosswalks are fading due to wear and tear and do not qualify as being high-visibility. This intersection has experienced a number of both pedestrian and bicycle collisions and is a relatively high-stress facility for these users, especially during the morning and afternoon hours when children are heading to or from school. This project aims to improve pedestrian and bicycle safety by enhancing pedestrian visibility and reducing conflict points between roadway users.

Project Recommendations

- Install advanced stop bars, high visibility crosswalk striping, and curb extensions.
- Add blank-out no right turn sign on all approaches.
- Reconfigure signals to add leading pedestrian intervals and protected left turns on all approaches
- Restripe eastbound and westbound approaches to accommodate exclusive left turn lanes.

TARGET MODES

1

KSIs, 2011-2015

$998,000

TOTAL COST, 90% ($898,200) HSIP-FUNDED

$6,792,052

TOTAL BENEFITS

6.81

B/C RATIO

Cost

Install new signal heads and protect left turns	**$483,000**
Install pedestrian signage	**$15,000**
High visibility crosswalks (with existing striping removal)	**$9,000**
Leading Pedestrian Interval (LPI)	**$4,000**
Blank-out no right turn signs	**$5,000**
Curb extensions at crosswalks	**$12,000**
Contigency and non-construction costs	**$470,000**
Total	**$998,000**


Protected left turns
Add LPI
Blank-out no right turn signs on all approaches
High-visibility crosswalks with curb extensions
Rumble Rd
Tully Rd

PROJECT 8 | ADDRESSES SYSTEMIC PROFILES 1 2 3 **4** 5 6 7 8 9 10 11 **12** 13

8

RUMBLE ROAD PEDESTRIAN IMPROVEMENTS

CONANT AVENUE TO KELLER STREET

Existing Conditions

This stretch of Rumble Road connects residential areas to several elementary, middle, and high schools and parks along the corridor, and has experienced multiple pedestrian collisions. The high volumes along Rumble Road make this roadway a relatively high-stress facility for pedestrians. The existing infrastructure has deteriorated due to wear and tear, and crossings are not as prominent to drivers. This project aims to enhance school pedestrian safety by implementing pedestrian crossing improvements and traffic calming measures.

Project Recommendations

- Enchance school crossing along Rumble Road with crosswalk improvements at Conant Ave, Park Pl, Holiday Ln, Pembroke Dr, York Way, Wales St, Napier Dr, College Ave, Edward Ave, Hampshire Ln, Claremont Ave, Highgate Rd, Warwick Ln, and Bay Ln.
- Enhancements include crosswalk improvements (e.g., high visibility crosswalk striping, in-street pedestrian crossing signs, refuge islands, curb extensions) and traffic calming (e.g., speed cushions, traffic circles).

TARGET MODES

1

KSIs, 2011-2015

$2,687,600

TOTAL COST, 100% HSIP-FUNDED

$1,388,807

TOTAL BENEFITS

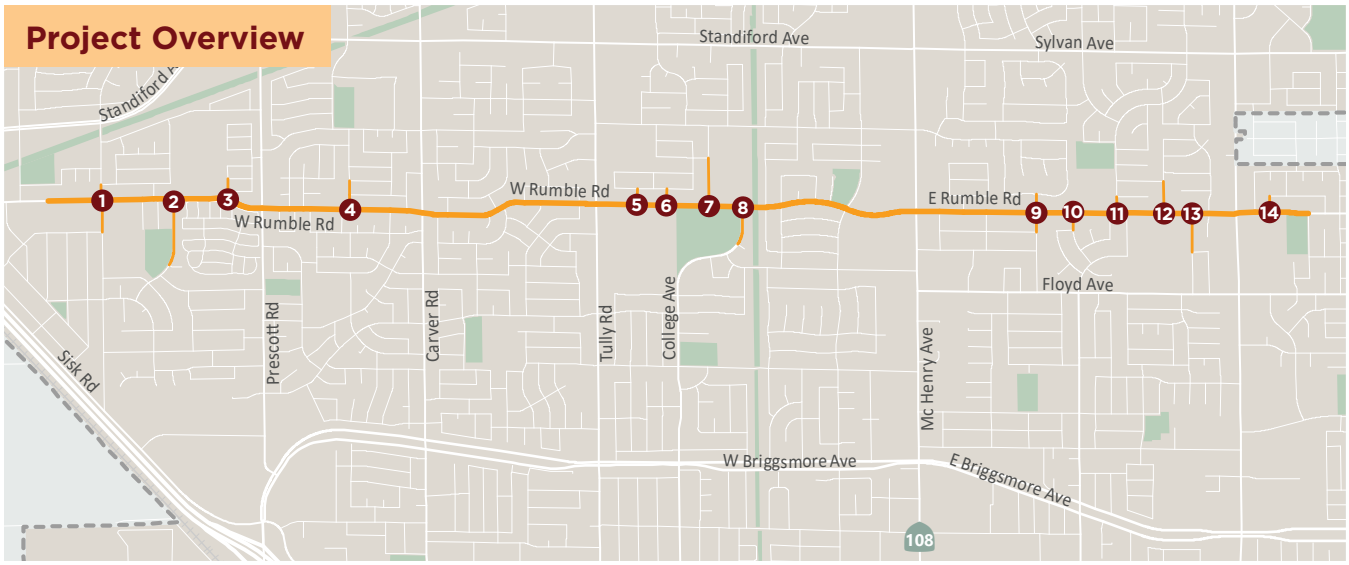
0.52

B/C RATIO

Cost

Install pedestrian signage	**$24,000**
High visibility crosswalks (with existing striping removal)	**$33,000**
Curb extensions at crosswalks	**$1,365,000**
Contigency and non-construction costs	**$1,265,600**
Total	**$2,687,600**

Project Overview



1 Rumble / Conant

2 Rumble / Park

PROJECT 9 | ADDRESSES SYSTEMIC PROFILES 1 2 3 4 5 6 7 8 9 10 11 12 13

9

OAKDALE ROAD: PHASE 1

CELESTE DRIVE TO LANCEY DRIVE

Existing Conditions

Oakdale Road from Celeste Drive to Lancey Drive connects residential areas to a number of pedestrian generators, including Orchard Elementary, Saint Joseph's Church, and nearby commercial. This stretch of Oakdale Road has experienced a number of pedestrian collisions and is a relatively high-stress facility for pedestrians. The intersection of Celeste Drive and Merle Avenue is complex and right-of-way may not be clear. The northern crossing at this intersection is pushed north such that pedestrians may not be easily visible to westbound traffic. The residential accesses create numerous conflict points along the corridor. This project aims to improve pedestrian safety by simplifying potential conflict points along the corridor, enhancing pedestrian visibility, and improving accessibility.

Project Recommendations

- Redesign Oakdale Road/Merle Avenue intersection. Includes moving northern crosswalk south of 1823 Oakdale Road driveway, reducing driveway curb cut, installing protected left turns for the westbound approach, and signalize driveway crossing on west side.
- Implement leading pedestrian intervals at the Oakdale Road intersections with Merle Avenue and Lancey Drive.
- Install blank-out no right turn signs on all approaches at Merle Avenue and Oakdale Road, and at Lancey Drive and Oakdale Road.
- Install raised median along Oakdale Road from Merle Avenue to Celeste Drive and restrict lefts out from Celeste Drive onto Oakdale Road.
- Install a new pedestrian crossing on the north leg of Celeste Drive and Oakdale Road with a Pedestrian Hybrid Beacon and median refuge.
- Install new signal interconnect from Oakdale Road to Merle Ave.

TARGET MODES

4

KSIs, 2011-2015

$891,022

TOTAL COST, 90% ($802,260) HSIP-FUNDED

$16,955,242

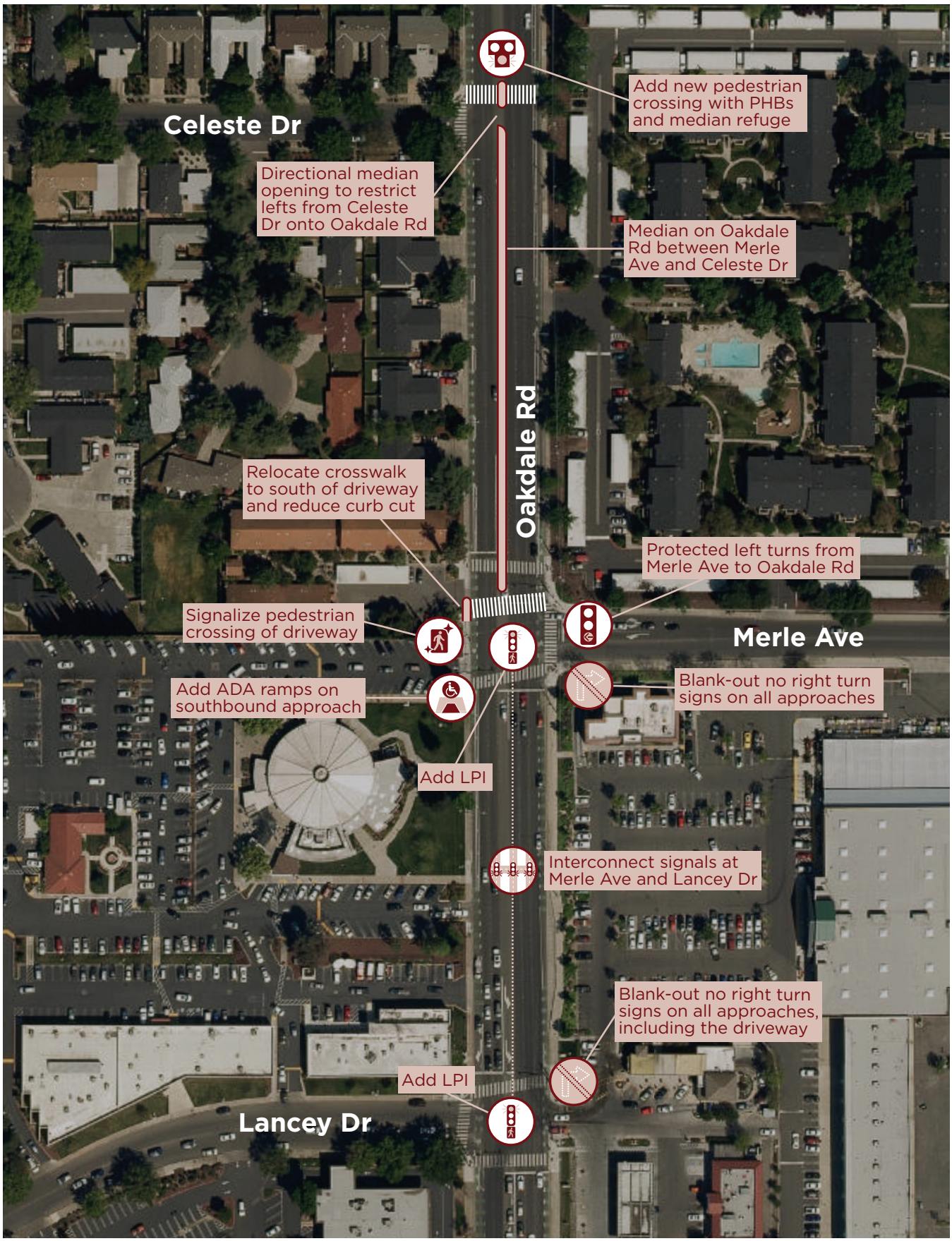
TOTAL BENEFITS

19.02

B/C RATIO

Cost

Protected left turn phase (where left turns already exist)	**$80,000**
Leading Pedestrian Interval (LPI)	**$8,000**
Install raised median with directional opening and pedestrian refuge	**$80,000**
Upgrade pedestrian crossings (crosswalks, ADA ramps, signage)	**$50,440**
Pedestrian Hybrid Beacon (PHB)	**$150,000**
Signal timing improvements	**$103,000**
Contigency and non-construction costs	**$419,582**
Total	**$891,022**


Celeste Dr
Add new pedestrian crossing with PHBs and median refuge
Directional median opening to restrict lefts from Celeste Dr onto Oakdale Rd
Median on Oakdale Rd between Merle Ave and Celeste Dr
Oakdale Rd
Relocate crosswalk to south of driveway and reduce curb cut
Protected left turns from Merle Ave to Oakdale Rd
Signalize pedestrian crossing of driveway
Merle Ave
Blank-out no right turn signs on all approaches
Add ADA ramps on southbound approach
Add LPI
Interconnect signals at Merle Ave and Lancey Dr
Blank-out no right turn signs on all approaches, including the driveway
Add LPI
Lancey Dr

PROJECT 11 | ADDRESSES SYSTEMIC PROFILES 1 2 3 4 **5** 6 7 8 9 10 11 12 13

11

PEDESTRIAN IMPROVEMENTS AT CLAUS ROAD AND CREEKWOOD DRIVE

INTERSECTION OF CLAUS ROAD AND CREEKWOOD DRIVE

Existing Conditions

The intersection of Claus Road and Creekwood Drive is the main intersection serving Peter Johansen High School. Claus Road in the project vicinity is a six-lane roadway, with motorists traveling at high speeds. Despite there being a pedestrian bridge to facilitate safe crossings, students were observed to cross Claus Road at-grade on the south leg, which is particularly concerning as there is no crosswalk, no pedestrian actuation for the signal phase, and the signal is not timed to provide adequate time to cross. This project focuses on enhancing pedestrian safety by constructing an at-grade crossing on the south approach that includes a median refuge and curb extensions to reduce the crossing distance, as well as signal enhancements.

Project Recommendations

Implement an at-grade crosswalk on the south approach with median refuge and curb extensions, protected-only left turn phasing, and leading pedestrian intervals with blank-out no right turn signs.

TARGET MODES

0

KSIs, 2011-2015

$780,600

TOTAL COST, 90% ($702,720) HSIP-FUNDED

$1,027,141

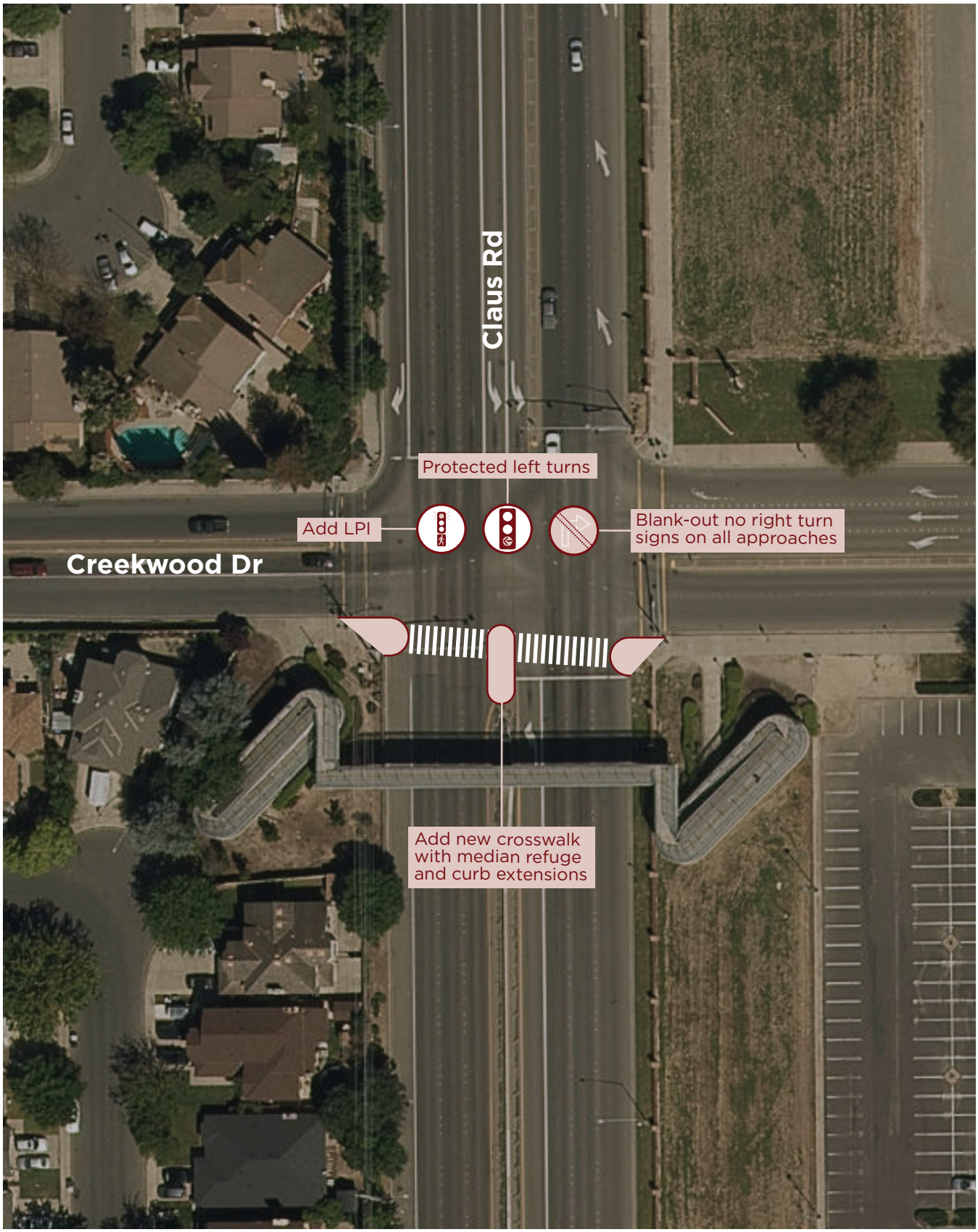
TOTAL BENEFITS

1.32

B/C RATIO

Cost

Leading Pedestrian Interval (LPI)	**$4,000**
Install pedestrian refuge islands	**$60,000**
Convert signals to protected left turns	**$320,000**
High visibility crosswalks (with existing striping removal)	**$4,500**
Blank-out no right turn signs	**$20,000**
Curb extensions at crosswalks	**$4,500**
Contigency and non-construction costs	**$367,600**
Total	**$780,600**


Claus Rd
Creekwood Dr
Protected left turns
Add LPI
Blank-out no right turn signs on all approaches
Add new crosswalk with median refuge and curb extensions

PROJECT 12 | ADDRESSES SYSTEMIC PROFILES 1 2 3 4 5 6 7 8 9 10 11 12 13

12

COFFEE ROAD ENHANCED CROSSINGS

EAST MORRIS AVENUE TO MULTNOMAH DRIVE

Existing Conditions

This stretch of Coffee Road serves a variety of retail, residential, medical, and institutional land uses, including Thomas Downey High School and John Muir Elementary School. It has experienced several pedestrian and bicycle collisions, with 3 KSI collisions during the study period. It is a higher-stress facility for pedestrians and bicyclists given the multi-lane cross-section and higher speeds. Given the limited crossing facilities along the corridor, the project aims to provide new, enhanced crossings to improve accessibility and to further improve existing crossings.

Project Recommendations

- Install a traffic signal at Chadwick Court and PHBs at East Morris Avenue and at Multnomah Drive.
- Enhance signalized crossings at Lucern Avenue and at East Fairmont Avenue with high visibility crosswalk striping and protected left turns.
- Align bus stops to be adjacent to the far side of the enhanced crossings.

TARGET MODES

3

KSIs, 2011-2015

$2,521,800

TOTAL COST, 100% HSIP-FUNDED

$10,773,702

TOTAL BENEFITS

4.27

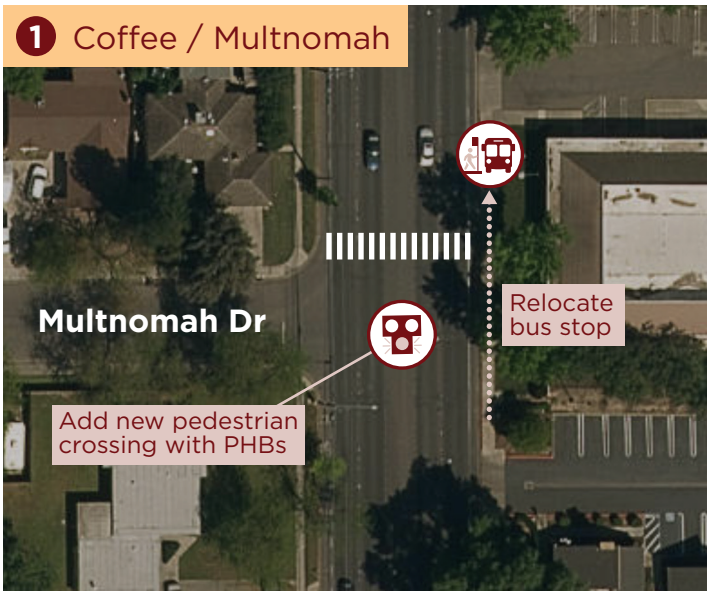
B/C RATIO

Cost

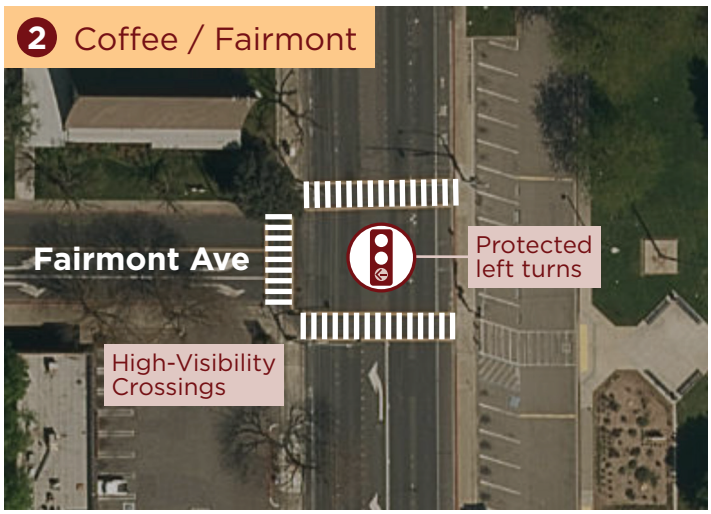
Install new signal (with intersection improvements)	**$400,000**
Pedestrian Hybrid Beacon (PHB) (with intersection improvements)	**$400,000**
Convert signals to protected left turns	**$560,000**
High visibility crosswalks	**$15,600**
Relocate bus stop	**$10,000**
Contigency and non-construction costs	**$1,136,200**
Total	**$2,521,800**

Project Overview

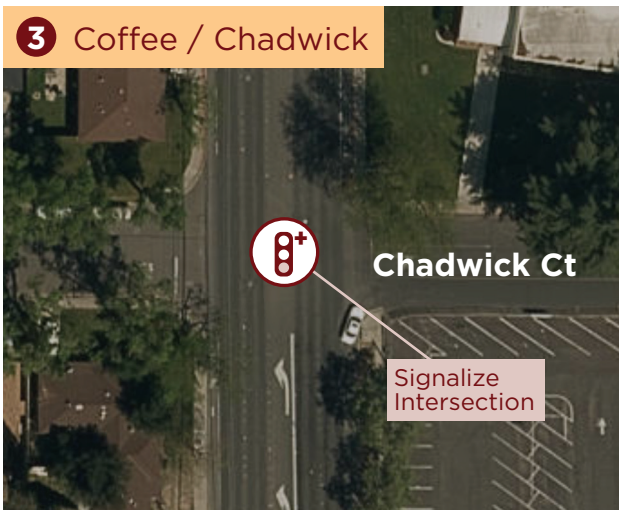
1 Coffee / Multnomah



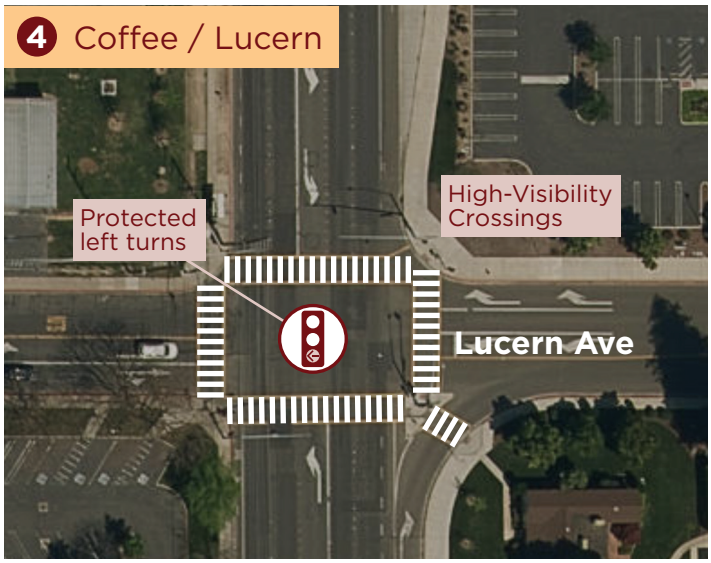
2 Coffee / Fairmont



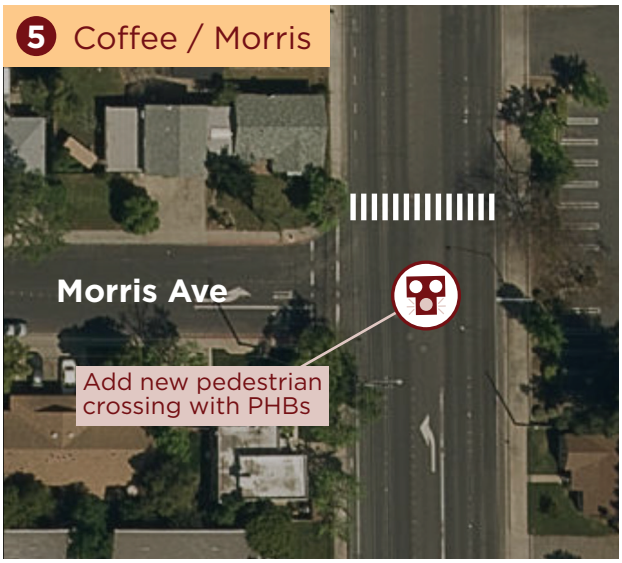
3 Coffee / Chadwick



4 Coffee / Lucern



5 Coffee / Morris



PROJECT 13 | ADDRESSES SYSTEMIC PROFILES 1 2 3 4 5 6 7 8 9 10 11 12 13

COFFEE ROAD BICYCLE IMPROVEMENTS

SYLVAN AVENUE TO SCENIC DRIVE

13

Existing Conditions

Coffee Road from Sylvan Avenue to Scenic Drive spans most of the City from the north to south. This stretch serves most land uses that exist in the City – residential, retail, medical and institutional services. There have been 11 KSI collisions along the corridor during the study period. This project focuses on improving bicycle safety by closing the gaps in the Class II bicycle facilities, and by installing medians where appropriate to reduce the number of conflict points between motorists and bicyclists. This project also includes implementing conflict green paint, as well as identifying driveways and side streets with deficient sight distance and removing any sight obstructions, all aiming to enhance visibility of bicyclists to motorists.

Project Recommendations

- Complete gaps in Class II facilities, including conflict zone green paint.
- Identify driveways and side streets with deficient sight distance and remove obstructions.
- Install raised medians to restrict access at select locations.

TARGET MODES

11

KSIs, 2011-2015

$2,200,400

TOTAL COST, 90% ($1,980,360) HSIP-FUNDED

$71,182,940

TOTAL BENEFITS

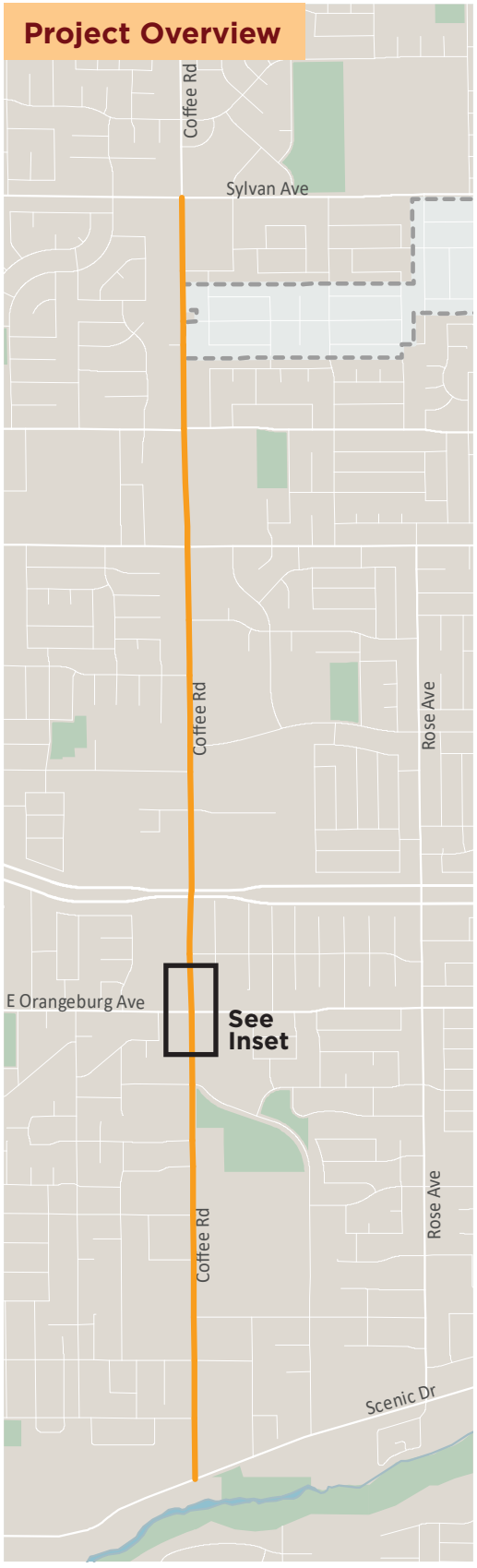
32.35

B/C RATIO

Cost

Install Class II bike lanes	**$52,000**
Bike lane conflict zone green marking	**$290,000**
Roadway re-striping (with existing striping removal)	**$247,000**
Install raised median	**$560,000**
Clear sight triangles	**$60,000**
Contigency and non-construction costs	**$991,400**
Total	**$2,200,400**

Project Overview



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PROJECT 14 | ADDRESSES SYSTEMIC PROFILES 1 **2** **3** **4** 5 **6** 7 **8** 9 10 11 12 13

14

COFFEE ROAD AND SCENIC DRIVE PROTECTED INTERSECTION

INTERSECTION OF COFFEE ROAD AND SCENIC DRIVE

Existing Conditions

The intersection of Coffee Road and Scenic Drive is large, being up to seven lanes wide on the west approach. The intersection serves an office park and public trail to the south, and multiple retailers to the north. There have been two KSI collisions at this intersection during the study period, and this project aims to create a safer space for all users. A protected intersection, identified as an at-grade intersections where cyclists and pedestrians are separated from cars, will help facilitate pedestrian and bicycle travel through the intersection, which includes relocating the west crosswalk to the east leg to reduce conflict points and eliminate the double threat between southbound right turning traffic and pedestrians crossing Scenic Drive.

Project Recommendations

- Redesign the Coffee Road/Scenic Road intersection as a protected intersection to facilitate northbound/southbound bicycle travel through the intersection.
- Relocate the west crosswalk to the east side of the intersection.

TARGET MODES

2

KSIs, 2011-2015

$1,184,300

TOTAL COST, 100% HSIP-FUNDED

$4,105,466

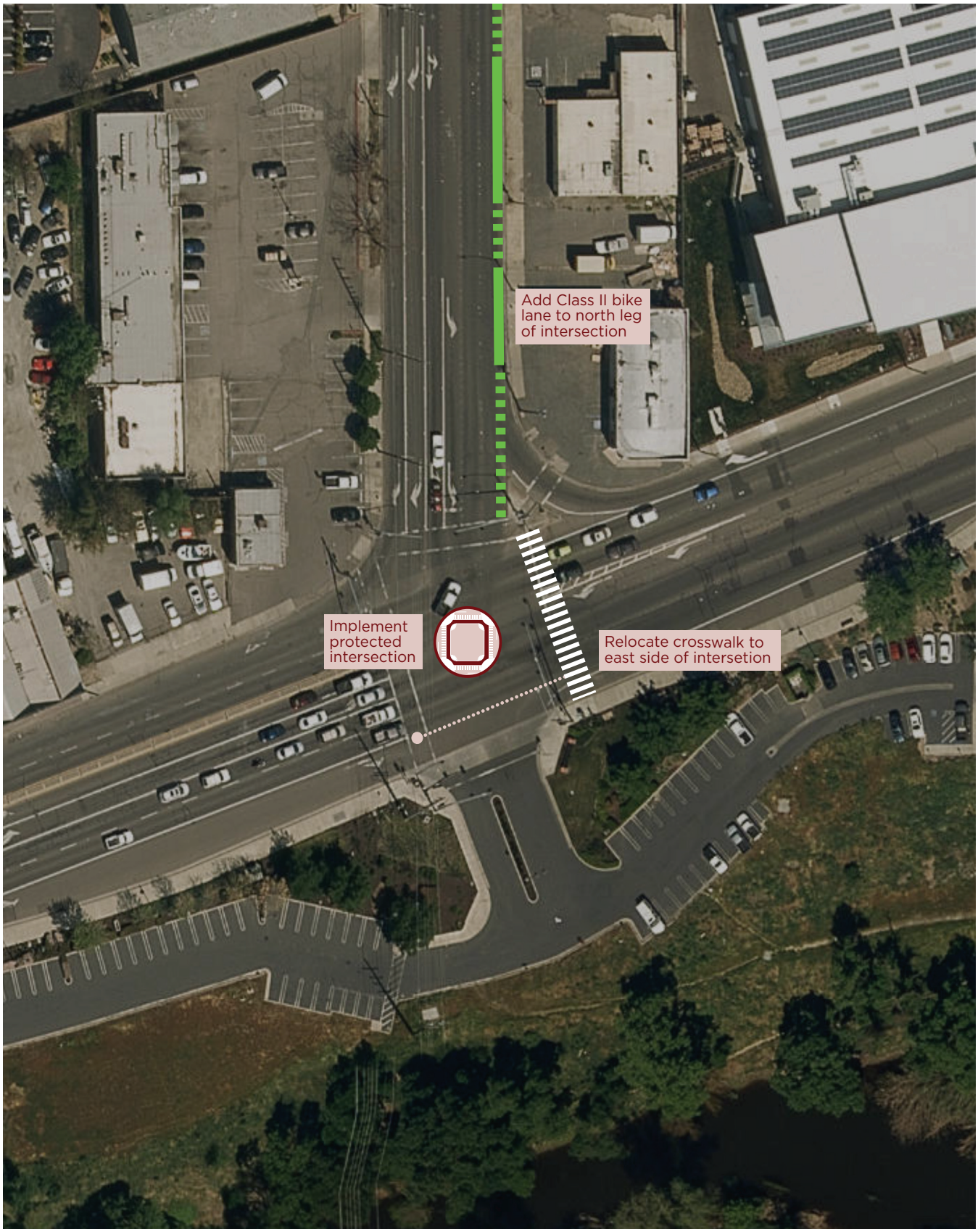
TOTAL BENEFITS

3.47

B/C RATIO

Cost

Implement protected intersection (with signal modifcations)	**$600,000**
Install green bike lanes on northern leg intersection	**$16,600**
High visibility crosswalks (with existing striping removal)	**$6,000**
Leading Pedestrian Interval (LPI)	**$4,000**
Contigency and non-construction costs	**$557,700**
Total	**$1,184,300**


Add Class II bike lane to north leg of intersection
Implement protected intersection
Relocate crosswalk to east side of intersetion

PROJECT 15 | ADDRESSES SYSTEMIC PROFILES 1 2 3 4 5 6 7 8 9 10 11 12 13

15

INTERSECTION IMPROVEMENTS AT PARADISE ROAD, SUTTER AVENUE, MLK DRIVE, AND TUOLUMNE BOULEVARD

INTERSECTION OF PARADISE ROAD, SUTTER AVENUE, MLK DRIVE, AND TUOLUMNE BOULEVARD

Existing Conditions

This five-leg intersection has multiple conflict points and long crossing distances for pedestrians and bicyclists. This project is focused on simplifying the number of conflict points and enhancing the pedestrian environment. The City is currently pursuing a road diet of Paradise Road, and Project 16 would install a road diet on Tuolumne Boulevard; these two projects would present an opportunity to consider a single lane roundabout at this location. The project assumes a single lane roundabout would be feasible at this location. If it is determined that a roundabout would not be feasible, alternative safety countermeasures should be considered to achieve the goals of this project, such as curb extensions, protected left turns, high visibility striping, etc.

Project Recommendations

- Redesign intersection to enhance multi-modal safety.
- Consider single lane roundabout alternative.

TARGET MODES

1

KSIs, 2011-2015

$3,307,000

TOTAL COST, 100% HSIP-FUNDED

$15,266,040

TOTAL BENEFITS

4.62

B/C RATIO

Cost

Install roundabout	**$2,000,000**
Contigency and non-construction costs	**$1,307,000**
Total	**$3,307,000**


MLK Dr
Consider single-lane roundabout
Tuolumne Ave
Paradise Rd
Sutter Ave
Sample Implementation

FUNDING AND IMPLEMENTATION

Although many countermeasures identified in this report are well-suited for HSIP grant funding, Modesto is encouraged to continue exploring diverse funding sources for implementation of safety projects. The following pages summarize potential local, state, and federal funding sources related to transportation safety.

Developer Fees

California law allows local governments to establish and charge a fee on residential and non-residential development in order to fund the need for public facilities and to service population growth. Public facility fees can be charged to new development based on density and traffic impacts, and can go to a variety of public facilities, one being local roadways.

BUILD Grant

The U.S. Department of Transportation provides an opportunity to invest in road, rail, transit and port projects through the Better Utilizing Invested to Leverage Development (BUILD) Grant, previously known as the TIGER Grant. Congress has dedicated nearly $7.1 billion for ten rounds of National Infrastructure Investment to fund projects that have a significant local or regional impact. In each round, DOT examines and judges projects on their merit to produce high benefits for the community it serves, and to explore ways to deliver projects that have difficulty being supported through traditional DOT programs.

Affordable Housing and Sustainable Communities Program (AHSC)

The AHSC Program, administered by the Strategic Growth Council and implemented by the Department of Housing and Community Development (HCD), funds land-use, housing, transportation, and land preservation projects to support infill and compact development that reduces greenhouse gas (GHG) emissions. This program will assist project areas by providing grants and/or loans, or any combination thereof, that will achieve GHG emission reductions and benefit Disadvantaged Communities, Low-Income Communities, and Low-Income Households through increased accessibility of affordable housing, employment centers, and key destinations via low-carbon transportation. This results in fewer vehicle miles traveled through shortened or reduced trip lengths or mode shifts from Single Occupancy Vehicles to use of transit, bicycling, or walking. The project areas this funding is geared toward are transit oriented development (TOD) Project Areas, Integrated Connectivity Project (ICP) Project Areas, or Rural Innovation Project Areas (RIPA).

SB1 Funding

The U.S. Department of Transportation's Senate Bill 1 (SB 1), also known as the Road Repair and Accountability Act of 2017, is a landmark transportation investment to rebuild California by fixing neighborhood streets, freeways, and bridges in communities across California and targeting funding toward transit and congested trade and commute corridor improvements.

The largest portion of SB 1 funding goes to California's state-maintained transportation infrastructure. With this funding, Caltrans has a goal of repairing or replacing 17,000 miles of pavement in 10 years, spending $250 million annually for congestion solutions, over $700 million for better transit commutes and supporting freight improvements. The other portion of SB 1 funding will go to local roads, transit agencies, and expanding the state's pedestrian and cycle routes. SB 1 funds various grants, which can be found below.

Local Streets and Roads Program (LSRP)

California State Senate Bill 1 has dedicated approximately $1.5 billion per year appointed by the State Controller (Controller) to cities and counties for basic road maintenance, rehabilitation, and critical safety projects on the local streets and roads system. Cities and counties must submit a proposed project list adopted at a regular meeting by their board or council that is then submitted to the California Transportation Commission (Commission). Once reviewed and adopted by the Commission, eligible cities and counties receive funding from the Controller and an Annual Project Expenditure Report is sent to the Commission to be transparent with program funding received and expended.

Local Partnership Program (LPP)

The Local Partnership Program's purpose is to provide local and regional transportation agencies that have passed sales tax measures, developer fees, or other imposed transportation fees with a funding of $200 million annually from the Road Maintenance and Rehabilitation Account to fund aging infrastructure, road conditions, active transportation, and health and safety benefits projects. LPP funds are distributed through a 50% statewide competitive component and a 50% formulaic component. Both programs are eligible to jurisdictions with voter approved taxes, tolls, and fees dedicated solely to transportation and the competitive program

ATP Funding

The Active Transportation Program was created by Senate Bill 99 to encourage increased use of active modes of transportation such as walking and biking. The goals of the ATP include, but are not limited to,

increasing the proportion of trips accomplished by walking and biking, increasing the safety and mobility of non-motorized users, advancing efforts of regional agencies to achieve greenhouse gas reduction goals, enhancing public health, and providing a broad spectrum of projects to benefit many types of users, including disadvantaged communities. SB 1 directs $100 million annually from SB 1 to the ATP, with more than 400 of the funded projects being Safe Routes to School projects and programs that encourage a healthy and active lifestyle throughout students' lives.

Caltrans Sustainable Transportation Planning Grant

The Sustainable Transportation Planning Grants include two parts: Sustainable Communities Grants and Strategic Partnerships Grants. The Sustainable Communities Grants have $29.5 million set aside to encourage local and regional planning goals and best practices cited in the Regional Transportation Plan Guidelines. The Strategic Partnerships Grants set aside $4.5 million to identify and address statewide, interregional, or regional transportation deficiencies on the state highway system in partnership with Caltrans. These grants were released for Fiscal Year 2020-21 and applications were due October 17, 2019. Grant announcements are anticipated in spring 2020. There may be another grant on the horizon, but Caltrans has not released any new information yet.

Safe Routes to School (SRTS) Funding

Safe Routes to School (SRTS) is a program promoting walking and bicycling to school through infrastructure improvements, tools, safety education, and incentives to encourage these modes of travel. Nationally, 10 to 14 percent of car trips during the morning rush hour are for school travel.

SRTS can be implemented at the state, community, or local school district level. Competitive federal funding is available through the Fixing America's Surface Transportation Act (FAST Act). Depending on the existing infrastructure, SRTS may require that education, transportation, public safety, and city planning agencies coordinate their effort.

Valley Air District

The Valley Air District develops and administers incentive programs targeted at reducing harmful emissions throughout the Valley. The District is consistently working to ensure the Valley receives available federal, state, and local funding for these projects and has invested more than $2 billion through a combined public-private partnership.

The District has set money aside for bicycle infrastructure projects, including Class I, Class II, or Class III bike routes. The program provides funding to assist with the development or expansion of a comprehensive bicycle-transportation network which will provide a viable transportation option for travel to school, work, and commercial sites.

Measure L

Measure L is a 25-year ½ cent sales tax approved by Stanislaus County voters in November 2016. This funding is for local transportation improvements including, but not limited to, fixing potholes and maintaining streets; improving emergency response; providing bike and pedestrian improvements for local connectivity between communities, local schools, trails. and recreation facilities; providing point-to-point shuttle services for seniors, veterans, and persons with disabilities; funding for transit operations, maintenance, and infrastructure improvements; and improving safety and reducing traffic congestion on Highway 99 and major streets. The passage of Measure L designates Stanislaus County as a "Self-Help" County, making it more successful in competing for funding and leveraging a share of state and federal funding.

Modesto gets the largest allocation of Measure L funding at $21,640,434 (35.8%) for Stanislaus County. TRIP, a national research group, stated that the Modesto-Metro Area currently has the 20th worst roads in the United States. The City has broken down the allocations by expenditure category to be 83.4% funded for local streets and roads, 9.1% going to traffic management, and 7.5% going to bike and pedestrian improvements.

5

Back Matter

- *Conclusion*
- *Appendix A: Countermeasure Toolbox*
- *Appendix B: Walking Audit Schedule*

CONCLUSION

The Modesto SSAR lays the groundwork and provides the resources necessary for the preparation of successful Highway Safety Improvement Program (HSIP) grant applications by the City of Modesto. By taking a more proactive approach in identifying safety improvement projects, this report completes a system-wide, data-driven analysis of collisions across all modes of travel. Over the next several months, City Engineers will continue to identify specific hotspot locations, match them with appropriate Countermeasures, and identify further sources of funding to complete the project identified in the report.

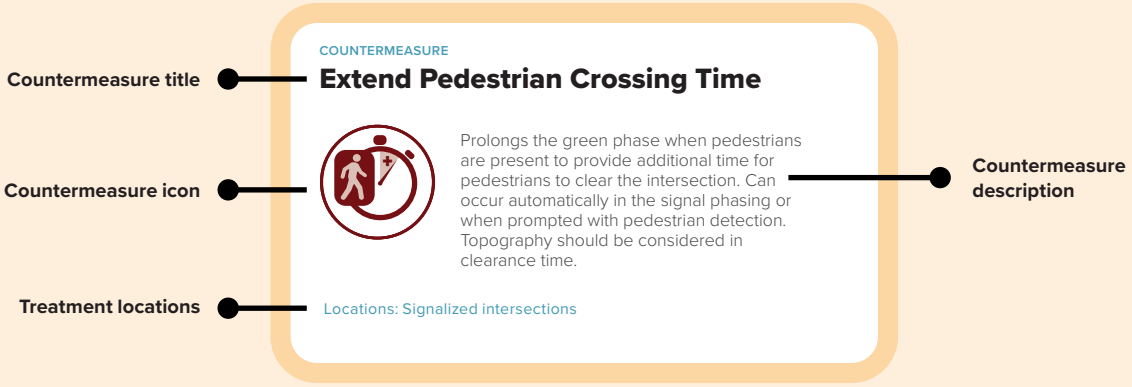
In January 2020, Caltrans awarded the City of Modesto a Local Roadway Safety Program (LRSP) grant. The next step of this Plan will be to incorporate the objectives of the LRSP into this Plan by looking beyond engineering projects to incorporate the other “Es” of safety, including education, enforcement, and emergency services, and focusing on equitable community engagement and investment.

APPENDIX A COUNTERMEASURE TOOLBOX

This toolbox presents a collection of 56 potential roadway safety countermeasures that may be applicable in various contexts around Modesto. Many of these countermeasures are recommended for addressing the 13 systemic profiles identified in this report, as well as for the ten priority projects.

As noted in the figure below, for each countermeasure, a description and the recommended treatment locations are noted. A full list of countermeasures is presented on the facing page.

What You'll See in This Toolbox:



Summary of Countermeasures

A. SIGNAL TIMING & PHASING

Additional Signal Heads
Extend Pedestrian Crossing Time
Flashing Yellow Arrow
Leading Pedestrian Interval
Pedestrian Phase Recall
Permissive Lefts To Protected
Pedestrian Scramble
Reduce Cycle Lengths
Coordinated Signal Operation
Extend Green Time for Bikes
Extend Yellow and All-Red Time

B. INTERSECTION & ROADWAY DESIGN

Close Slip Lane
Raised Intersection
Convert Two-Way Stop to All-Way Stop
Install Sidewalk
Protected Intersection
Raised Median
Lane Narrowing
Road Diet
Widen Shoulder
Roundabout
Signal Head Improvements
Traffic Circle
Programmable Signals, Visors, or Louvers
Edge Line/Center Line Rumble Strips

C. BIKEWAY DESIGN

Bicycle Crossing (Solid Green Paint)
Bicycle Signal/Exclusive Bike Phase
Bike Detection
Bike Box
Class I Bicycle Path or Mixed-Use Trail
Class II Bike Lane
Class IV Separated Bikeway
Green Bike Lane Conflict Zone Markings
Two-Stage Turn Queue Bike Box

D. PEDESTRIAN CROSSINGS

Install Pedestrian Countdown Timer
Pedestrian Hybrid Beacon (PHB)
Curb Extensions
High-Visibility Crosswalk
Pedestrian Median Barrier
Raised Crosswalk
Pedestrian Refuge Island
Rectangular Rapid Flashing Beacon (RRFB)
Reduce Curb Radius

E. SIGNS & MARKINGS

Advance Stop Markings
Advance Yield Markings
Prohibit Right-Turn-On-Red
Bicycle Wrong Way Signs
Pedestrian Signage

F. OTHER

Access Management/Close Driveway
Intersection, Street-Scale Lighting
Remove Obstructions for SIghtlines

A. SIGNAL TIMING & PHASING

COUNTERMEASURE

Additional Signal Heads

Additional signal heads allow drivers to anticipate signal changes farther away from intersections, decreasing the likelihood of driver error resulting in a collision with a pedestrian.

Locations: Signalized Intersections

COUNTERMEASURE

Pedestrian Phase Recall

Signals can be put in “recall” full time or for key time periods of day such as peak business hours or school drop-off/pick-up times. During these periods the “WALK” signal would be displayed every signal cycle without prompting by a pedestrian push button.

Locations: Signalized intersections

COUNTERMEASURE

Extend Pedestrian Crossing Time

Increases time for pedestrian walk phases, especially to accommodate vulnerable populations, such as children and the elderly.

Locations: Signalized intersections

COUNTERMEASURE

Permissive Lefts to Protected

Provides a protected green arrow phase for left turning vehicles while showing a red light for both on-coming traffic and parallel pedestrian crossings. Eliminates conflicts between pedestrians and left-turning vehicles.

Locations: Signalized Intersections

COUNTERMEASURE

Flashing Yellow Arrow

Flashing yellow arrows can be used to replace permissive left green ball indicators for signal heads over left turn lanes. The flashing yellow arrow has shown to be more effective in warning motorists to yield right-of-way to on-coming motorists. With protected-permissive phasing, the use of a flashing yellow arrow presents an opportunity to not allow the permissive left if an opposing pedestrian call is placed.

Locations: Signalized Intersections

COUNTERMEASURE

Pedestrian Scramble

A form of pedestrian "WALK" phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians to safely cross through the intersection in any direction, including diagonally.

Locations: Signalized Intersections

COUNTERMEASURE

Leading Pedestrian Interval

Gives people walking a head start, making them more visible to drivers turning right or left. “WALK” signal comes on a few seconds before the cars get their green light. May be used in combination with No Right Turn on Red restrictions.

Locations: Signalized Intersections

COUNTERMEASURE

Reduce Cycle Lengths

Long traffic signal cycles (e.g., 120 seconds or greater) result in higher levels of pedestrian delay. When delay is significant, pedestrians are more inclined to ignore signal indications.

Locations: Signalized Intersections

COUNTERMEASURE

Coordinated Signal Operation

Interconnected signal systems provide coordination between adjacent signals to better facilitate travel through a corridor. When implemented, the number of stops is reduced, and therefore the opportunity to run red lights is also reduced.

Locations: Signalized Intersections

COUNTERMEASURE

Extend Green Time For Bikes

Prolongs the green phase when bicyclists are present to provide additional time for bicyclists to clear the intersection. Can occur automatically in the signal phasing or when prompted with bicycle detection. Topography should be considered in clearance time.

Locations: Signalized Intersections

COUNTERMEASURE

Extend Yellow and All Red Time

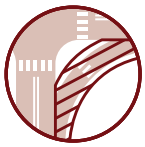
Extending yellow and all red time allows drivers and bicyclists to safely cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection.

Locations: Signalized Intersections

B. INTERSECTION & ROADWAY DESIGN

COUNTERMEASURE

Close Slip Lane

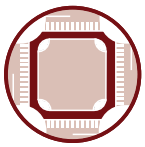


Modifies the corner of an intersection to remove the sweeping right turn lane for vehicles. Results in shorter crossings for pedestrians, reduced speed for turning vehicles, better sight lines, and space for landscaping and other amenities.

Locations: Signalized Intersections

COUNTERMEASURE

Protected Intersection

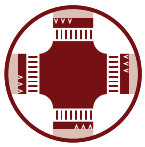


Protected intersections use corner islands, curb extensions, and colored paint to delineate bicycle and pedestrian movements across an intersection. Slower driving speeds and shorter crossing distance increase safety for pedestrians. Separates bicycles from pedestrians.

Locations: Signalized Intersections

COUNTERMEASURE

Raised Intersection



Elevates the intersection to bring vehicles to the sidewalk level and increases the visibility of pedestrians. Serves as a traffic calming measure by extending the sidewalk context across the road.

Locations: Unsignalized Street Crossings

COUNTERMEASURE

Raised Median

A concrete or landscaped area between the two directions of travel. Increases safety by reducing vehicular speeding and reducing pedestrian crossing distance.

Locations: Unsignalized Street Crossings

COUNTERMEASURE

Convert Two-Way Stop to All-Way Stop

Converting two-way stops to all-way stops prevents motorists, bicyclists, and pedestrians from having to cross free-flowing lanes of traffic at a side-street stop-controlled intersection and reduces the risk of collision.

Locations: Unsignalized Street Crossings

COUNTERMEASURE

Lane Narrowing

A reduction in lane width produces a traffic calming effect by encouraging motorists to travel at slower speeds, lowering the risk of collision with bicyclists, pedestrians, and other motorists.

Locations: Along the Road

COUNTERMEASURE

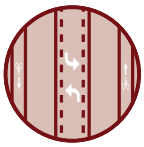
Install Sidewalk

Sidewalks and walkways are “pedestrian lanes” that provide people with space to travel within the public right-of-way that is separated from roadway vehicles. They are associated with reduced crashes where pedestrians were walking along the roadway.

Locations: Along the Road

COUNTERMEASURE

Road Diet

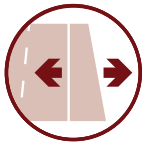


Depending on the street, road diets may change the number of lanes, turn lanes, center turn lanes, bike lanes, parking lanes, and/or sidewalks. Road diets optimize street space to benefit all users by improving the safety and comfort of pedestrians and bicyclists, and reducing vehicle speeds and the potential for rear end collisions.

Locations: Along the Road

COUNTERMEASURE

Widen Shoulder

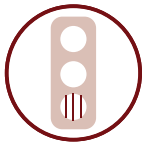


Widened shoulders create greater separation between vehicles and pedestrians and also provide motor vehicle safety benefits, such as space for inoperable vehicles to pull out of the travel lane.

Locations: Along the Road

COUNTERMEASURE

Programmable Signals/Visors/Louvers



These may be installed at traffic signals to limit the field of view of a particular signal head. They are applicable in cases when where the road user could be misdirected, particularly at skewed or closely-spaced intersections when the road user sees the signal indications intended for other approaches before seeing the signal indications for their own approach.

Locations: Signalized Intersections

COUNTERMEASURE

Roundabout

Roundabouts are circular intersections designed to eliminate left turns by requiring traffic to travel in a counter-clockwise direction and exit to the right. Installed to manage vehicular speeds, reduce pedestrian exposure, improve safety at intersections through eliminating angle collisions, and help traffic flow more efficiently.

Locations: Signalized Intersections, Unsignalized Street Crossings, Roundabouts

COUNTERMEASURE

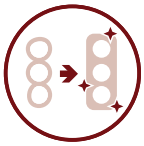
Edge Line/Center Line Rumble Strips

Rumble strips can be installed along the edge line or center line to address roadway departure and head-on crashes caused by distracted, drowsy, or otherwise inattentive drivers who drift from their lane.

Locations: Along the Road

COUNTERMEASURE

Signal Head Improvements



Improving signal head visibility reduces the likelihood of crashes caused by traffic signal violations. Installing backplates, increasing the size of signal displays, and installing LED lenses should all be considered as potential countermeasures.

Locations: Signalized Intersections

COUNTERMEASURE

Traffic Circles

Installed at stop-controlled intersections to facilitate a circular flow at an intersection, which result in slower speeds through the intersection.

Locations: Along the Road, Unsignalized Intersections

C. BIKEWAY DESIGN

COUNTERMEASURE

Bicycle Crossing (Solid Green Paint)

Solid green paint across an intersection that signifies the path of the bicycle crossing. Increases visibility and safety of bicyclists traveling through an intersection.

Locations:

COUNTERMEASURE

Bike Box

A designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.

Locations: Signalized Intersections

COUNTERMEASURE

Bicycle Signal/Exclusive Bike Phase

A traffic signal directing bicycle traffic across an intersection. Separates bicycle movements from conflicting motor vehicle, streetcar, light rail, or pedestrian movements. May be applicable for Class IV facilities when the bikeway is brought up to the intersection.

Locations: Signalized Intersections

COUNTERMEASURE

Class II Bike Lane

Using designated lane markings, pavement legends, and signage, bike lanes provide dedicated street space for bicyclists, typically adjacent to the outer vehicle travel lane.

Locations: Along the Road

COUNTERMEASURE

Bike Detection

Bike detection is used at signalized intersections, either through use of push-buttons, in-pavement loops, or by video or infrared cameras, to call a green light for bicyclists and reduce delay for bicycle travel. Discourages red light running by bicyclists and increases convenience of bicycling.

Locations: Signalized Intersections

COUNTERMEASURE

Class IV Separated Bikeway

Space on the roadway set aside for the exclusive use of bicycles and physically separated from vehicle traffic. Types of separation may include, but are not limited to, grade separation, flexible posts, physical barriers, or on-street parking.

Locations: Along the Road

COUNTERMEASURE

Class I Bicycle Path or Mixed Use Trail

Provides a completely separate right of way that is designated for the exclusive use of people riding bicycles and walking with minimal cross-flow traffic. Paths and trails offer opportunities for the lowest stress bicycle travel.

Locations: Along the Road

COUNTERMEASURE

Green Bike Lane Conflict Zone Markings

Green pavement within a bicycle lane to increase visibility of bicyclists and to reinforce bicycle priority. The green pavement can be either as a corridor treatment or as a spot treatment in conflict areas such as frequently used driveways.

Locations: Along the Road

COUNTERMEASURE

Two-Stage Turn Queue Bike Box

This roadway treatment provides bicyclists with a means of safely making a left turn at a multi-lane signalized intersection from a bike lane or cycle track on the far right side of the roadway. In this way, bicyclists are protected from the flow of traffic while waiting to turn. Usage could be mirrored for right-turns from a one-way street with a left-side bikeway.

Locations: Signalized Intersections

D. PEDESTRIAN CROSSINGS

COUNTERMEASURE

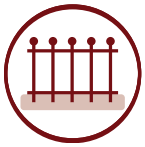
Install Pedestrian Countdown Timer

Displays “countdown” of seconds remaining on the pedestrian signal. Countdown indications improve safety for all road users, and are required for all newly installed traffic signals where pedestrian signals are installed.

Locations: Signalized Intersections

COUNTERMEASURE

Pedestrian Median Barrier



Pedestrian median barriers restrict pedestrians from crossing the median at locations where nearby crossings are available and midblock crossings may have poor sight distance or insufficient crossing enhancements for the conditions.

Locations: Along the Road

COUNTERMEASURE

Pedestrian Hybrid Beacon (PHB)

Pedestrian-activated beacon used at mid-block crosswalks and side-street stop-controlled intersections to notify oncoming motorists to stop with a series of red and yellow lights. Also known as a High-Intensity Activated crossWalK (HAWK) beacon

Locations: Unsignalized Street Crossings, Roundabouts

COUNTERMEASURE

Raised Crosswalk

The crosswalk is elevated to match the sidewalk to make pedestrians more visible to approaching vehicles. Typically located at midblock crossings or across free right turns, they encourage motorists to yield to pedestrians and reduce vehicle speed. An entire intersection may be raised similarly.

Locations: Unsignalized Street Crossings, Roundabouts

COUNTERMEASURE

Curb Extensions

Widens the sidewalk at intersections or midblock crossings to shorten the pedestrian crossing distance, to make pedestrians more visible to vehicles, and to reduce the speed of turning vehicles.

Locations: Intersection Geometry, Unsignalized Street Crossings

COUNTERMEASURE

Pedestrian Refuge Island

Pedestrian refuge islands provide a protected area for pedestrians at the center of the roadway. They reduce the exposure time for pedestrians crossing the intersection. They simplify crossings by allowing pedestrians to focus on one direction of traffic at a time.

Locations: Signalized Intersections, Unsignalized Street Crossings

COUNTERMEASURE

High-Visibility Crosswalk

A crosswalk that is designed to be more visible to approaching drivers. Crosswalks should be designed with continental markings and use high-visibility material, such as inlay tape or thermoplastic tape instead of paint.

Locations: Signalized Intersections, Unsignalized Street Crossings

COUNTERMEASURE

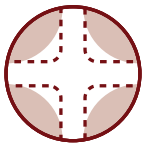
Rectangular Rapid Flashing Beacon

Pedestrian-activated flashing lights and additional signage enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings.

Locations: Unsignalized Street Crossings, Roundabouts

COUNTERMEASURE

Reduce Curb Radius



Decreasing curb radii can improve safety for bicyclists and pedestrians by requiring motorists to reduce vehicle speeds by marking sharper turns. Smaller radii provide larger pedestrian waiting areas at corners, improve sight distances, and shorten crossing distances.

Locations: Intersection Geometry, Unsignalized Street Crossings

E. SIGNS & MARKINGS

COUNTERMEASURE

Advance Stop Markings

A stop bar placed ahead of the crosswalk at stop signs and signals reduces conflict with pedestrians from vehicles encroaching on the crosswalk.

Locations: Signalized Intersections, Unsignalized Street Crossings

COUNTERMEASURE

Pedestrian Signage

Pedestrian signage uses bright color and reflective properties to attract the attention of motorists. It provides advance warning of the potential of pedestrians in the roadway and alerts them to modify their speed.

Locations: Unsignalized Street Crossings

COUNTERMEASURE

Advance Yield Markings

Yield lines are placed 20 to 50 feet in advance of multi-lane pedestrian crossings to increase visibility of pedestrians. Used in conjunction with Yield to Pedestrian signage. Can reduce the likelihood of a multiple-threat crash.

Locations: Unsignalized Street Crossings

COUNTERMEASURE

Prohibit Right-Turn-on-Red

Prohibiting right-run-on-red movements should be considered at skewed intersections, or where exclusive pedestrian "WALK" phases, Leading Pedestrian Intervals (LPIs), sight distance issues, or high bike/ped volumes are present. Can help prevent crashes between vehicles turning right on red from one street and through vehicles on the cross street, and crashes involving bicyclists and pedestrians.

Locations: Signalized Intersections

COUNTERMEASURE

Bicycle Wrong Way SIgns

Bicycle "Wrong Way" signs can be installed on sidewalks or the left side of the roadway to discourage bicyclists from traveling the wrong way in the road or on the crosswalk.

Locations: Along the Road

F. OTHER

COUNTERMEASURE

Access Management

Vehicles entering and exiting driveways may conflict with pedestrians and with vehicles on the main road, especially at driveways within 250 feet of intersections. Consolidating driveways near intersections with high crash rates related to driveways may reduce potential conflicts.

Locations: Along the Road

COUNTERMEASURE

Intersection & Street-Scale Lighting

Street and intersection lighting helps make pedestrians and other road users or hazards more visible to motorists at night, improving driver perception and reaction time and reducing the risk of collision.

Locations: Unsignalized Street Crossings, Roundabouts

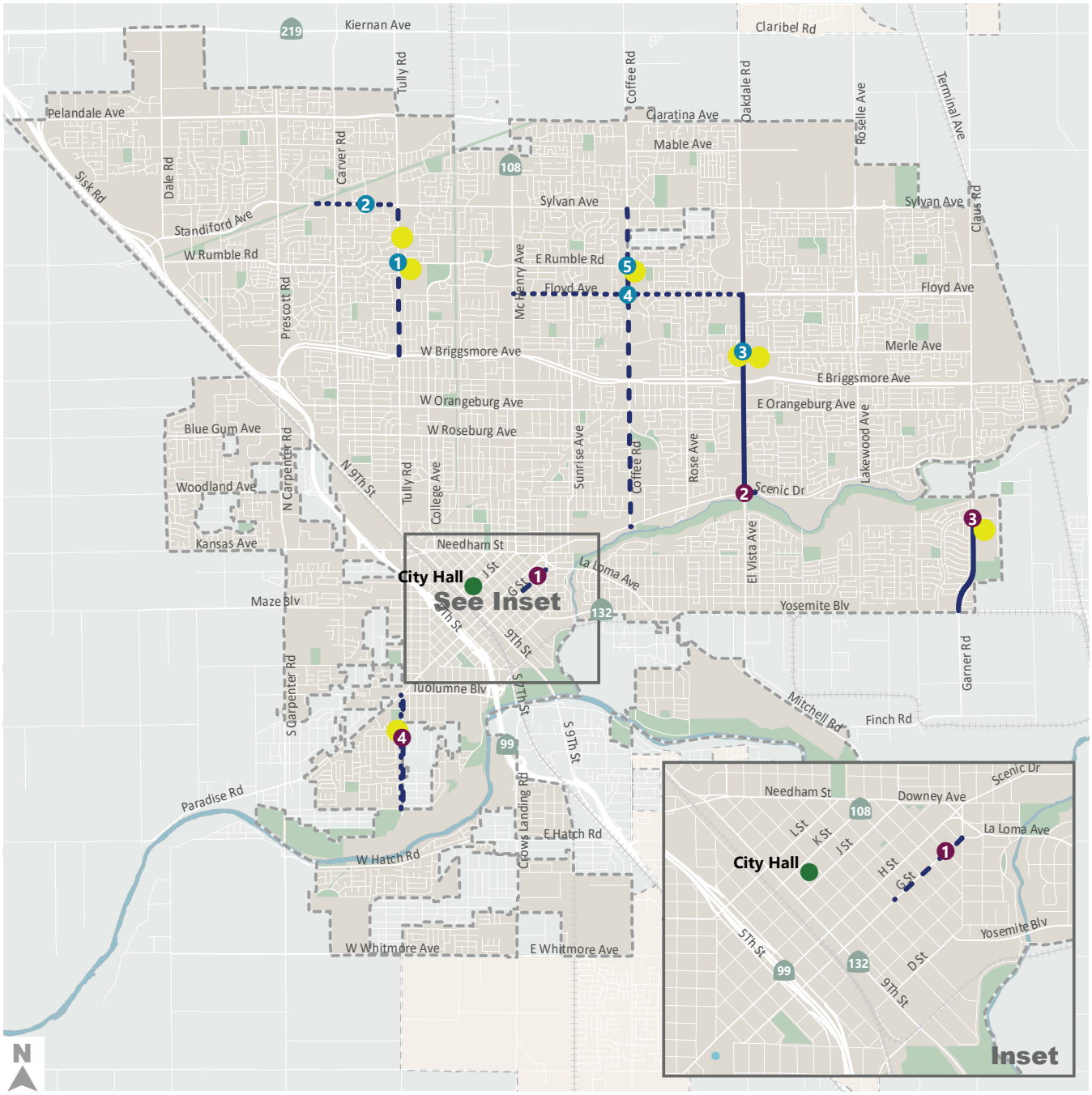
COUNTERMEASURE

Remove Obstructions For Sightlines

Remove objects that may prevent drivers and pedestrians from having a clear sightline. May include installing red curb at intersection approaches to remove parked vehicles (also called “daylighting”), trimming or removing landscaping, or removing or relocating large signs.

Locations: Along the Road, Signalized Intersections, Unsignalized Street Crossings, Roundabouts

APPENDIX B
WALKING AUDIT MAP




AHEAD