May 2020

Montclair

Systemic Safety Analysis Report



FEHR & PEERS

Executive Summary

The purpose of the Montclair Systemic Safety Analysis Report (SSAR) is to develop a citywide safety framework that supports reductions in the number and severity of collisions in the City of Montclair.

By employing a systemic approach to safety, the City of Montclair recognizes collisions alone are not always enough to identify and prioritize relevant safety projects. In addition to responding to collision hot spots, using a systemic safety approach proactively identifies high-risk locations and to intervene before collisions occur. A systemic approach to safety uses historical collision data and contextual roadway and land use information to identify the collision risk factors throughout the City's roadway network.

This SSAR was funded through a Systemic Safety Analysis Report Program grant provided by the California Department of Transportation (Caltrans).

The SSAR program was initiated by Caltrans to help local agencies perform a collision analysis, identify safety issues on their roadways, and develop a list of systemic countermeasures that can be used to prepare future Highway Safety Improvement Program (HSIP) and other safety program applications. While SSAR programs typically focus on one of the "5 E's" of safety, Engineering, the Montclair SSAR includes safety strategies that address the other "4 Es" – Education, Enforcement, Emergency Services, and Emerging Technology – and recommendations for additional funding sources.

The Montclair SSAR presents recommended projects resulting from the systemic safety analysis, countermeasure and funding recommendations that can be applied for future safety projects and grant applications. Following the Chapter 1 introduction, the remainder of the report is organized as follows:

Chapter 2 summarizes the collision and contextual data used in the analysis portion of the SSAR. Five years of the most recent collision data (2013-2017) were extracted from UC Berkeley SafeTREC's Transportation Injury Mapping System (TIMS). Contextual data, such as proximity to signalized intersections and pedestrian crossing facilities, were analyzed along with the characteristics of each collision.

Chapter 3 presents findings from the collision analysis process, which involved creating a collision database to identify locations with a history of collisions and examine the collision type patterns and contributing factors at these locations. In addition to identifying locations with a history of collisions, collisions were evaluated systemically, focusing not only on where collisions have occurred, but on contextual factors contributing to a disproportionate number of collisions or fatal and severe injury collisions. From this systemic analysis process, five collision profiles were identified, mapped, and paired with potential safety countermeasures.

Chapter 4 presents a Safety Countermeasure Toolbox to address the safety patterns identified in the collision analysis. The toolbox includes a set of infrastructure improvement projects that can be used in HSIP funding applications. Each countermeasure description consists of key information from the California Local Roadway Safety Manual, including crash reduction factors and opportunities for systemic implementation. These countermeasures are applied to the safety projects listed inin Chapter 5 and can be a resource to the City for future planning and safety improvements. The toolbox also includes policy and program countermeasures, such as education and enforcement, to inform a holistic approach to improving safety.

Chapter 5 includes the recommended priority projects and locations. Through the collision analysis process, ten intersections, segments, or groups of intersections were identified as priority project locations. These locations represent a variety of roadway contexts in Montclair, and the projects recommended for each location can also be considered for locations with similar characteristics or similar collision patterns. To aid in the preparation of HSIP grant applications, each project is accompanied by a cost estimate, the benefit/cost ratio, and planning-level graphics that illustrate the proposed improvements.

Chapter 6 presents a summary of available funding sources that can be used to finance safety projects in addition to HSIP funding. This list includes regional, state, and federal funding programs, a description of the program's purpose, and the date of the next funding opportunity. ■

Engineer's Seal

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Date

SIGNED FOR APPROVAL

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Date

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 provisions 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.

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 of Montclair should conduct a more detailed analysis and make sure that the design or construction documents reflect specific, detailed, local and field conditions.

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.

The **2020 City of Montclair 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 Montclair and partner public agencies. Fehr & Peers assisted the City of Montclair in preparing the Plan.

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Table of Contents



1
CHAPTER 1
Introduction

5
CHAPTER 2
Summary of Safety Data

9
CHAPTER 3
Safety Analysis & Results

35
CHAPTER 4
Countermeasure Toolbox

61
CHAPTER 5
Project Recommendations

89
CHAPTER 6
Funding Recommendations



The Montclair Systemic Safety Analysis Report (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 Montclair.

Chapter 1
Introduction

The Montclair Systemic Safety Analysis Report (SSAR) lays the groundwork and provides the resources necessary for the preparation of successful Highway Safety Improvement Program (HSIP) grant applications by the City. The report applies a data-driven process to:

- address fatal and severe injuries for people who are walking, biking, or driving;
- identify high risk roadway characteristics;
- recommend countermeasures to address these collisions and characteristics; and,
- devise a traffic safety program to eliminate traffic related deaths and severe injuries.

In addition to historical collision and contextual roadway and land use data, the report references other relevant plans to encourage consistency across all planning efforts in the City.

Relevant Planning Efforts

There are several concurrent planning processes in the City that inform, and are informed by, the SSAR. The City is developing an Active Transportation Plan and Safe Routes to School Plan. Both plans are focused on improving transportation options for people who walk, bike, and take transit in Montclair. The Active Transportation Plan will recommend citywide improvements and the Safe Routes to School Plan will recommend improvements around schools. The City is also updating the General Plan. Several of the key concepts in the Mobility Element include Complete Streets, Vision Zero, and connectivity for all transportation modes. Portions of the four main corridors (Central Avenue, Holt Avenue, Arrow Highway, and Mission Boulevard) are analyzed in the SSAR. Portions of several roadways called out for Complete Streets investments, such as Central Avenue, Holt Boulevard, Moreno Street, Arrow Highway, and Fremont Avenue are also analyzed in the SSAR.

The North Montclair Downtown Specific Plan, updated in 2017, established a framework and development strategy for a pedestrian-oriented commercial and residential district. The Plan identifies Arrow Highway, which is one of the SSAR priority locations, as a priority corridor. Arrow Highway is proposed to have a road diet that widens sidewalks and adds a median. Curb extensions at intersections are also proposed to reduce pedestrian crossing distance and time. Overall, the Plan applies a "pedestrian first" approach to its standards and guidelines for streets and open spaces, with narrower streets to slow down vehicles and improved connections to encourage different modes of transportation.

Monte Vista & Palo Verde ↘



Statewide Traffic Safety Data

The California Office of Traffic Safety (OTS) publishes OTS Rankings to help cities compare their traffic safety statistics to other cities with similar-sized populations. The OTS Rankings compare cities for the total number of fatal and injury collisions and include metrics on the people involved in a crash (e.g. pedestrians or bicyclists), the type of crash (e.g. speed related or hit and run), and the type of arrest (e.g. Driving Under the Influence). A lower number ranking (e.g. 1, 2, 3) indicates a high number of collisions for a specific metric, which means a city has room for improvements on that particular metric. Montclair is ranked among the 94 cities with populations between 25,001 and 50,000 residents. In 2017, which is the most recent data available, Montclair ranked third for the total number of fatal and injury collisions. For specific modes, the City ranked in the top quarter for the number of victims who were walking or biking; and therefore many of the proposed safety improvements in the SSAR are focused on improving safety for people who walk and bike. For behavioral factors, the City is ranked second for the number of victims in collisions involving alcohol but is ranked 80th for the number of DUI arrests. Despite the high number of DUI arrests in Montclair, the number of victims in collisions involving alcohol indicates there is more work to be done to encourage safe travel behavior in the City. The City of Montclair continues to work with OTS to validate the data used for the rankings. ■

Monte Vista & Bandera ↗





Citywide Collisions

2013-2017

- 7 FATAL COLLISIONS
- 38 SEVERE INJURY COLLISIONS
- 1,036 ALL OTHER INJURY COLLISIONS

Chapter 2

Summary of Safety Data

Collision Data Overview

Between 2013 and 2017, 1,089 collisions involving people driving, biking and walking occurred in Montclair.

Source: TIMS/SWITRS

For this SSAR, five years of the most current collision data available (2013-2017) was extracted from UC Berkeley SafeTREC's Transportation Injury Mapping System (TIMS) database. TIMS contains geocoded collision data from the California Statewide Integrated Traffic Records System (SWITRS), which is a collision database maintained by the California Highway Patrol. Each collision has extensive details, such as collision location, type, severity, parties involved, and contributing factors.

The full collision dataset includes collisions of all severity levels but does not include property damage-only collisions. All collisions (those involving people driving, biking, and walking) were considered in our analysis. The collision analysis includes information about:

- the collisions (e.g. severity, time of day, lighting conditions)
- the people involved (e.g. age, mode)
- the context (e.g. intersection/midblock, signal/no signal, surrounding land uses)



Caltrans' Local Roadway Safety Manual (LRSM)

Chapter 2 of Caltrans' LRSM states that safety practitioners should "consider a wide range of data sources to get an overall picture of the safety needs" (p. 14).

Both collision data and contextual data were collected and analyzed as part of this plan.

Contextual Data Overview

To better understand systemic collision patterns in Montclair, several contextual factors were analyzed with the characteristics of each collision, such as proximity to:

- streetlights
- transit stops
- schools
- signalized intersections
- pedestrian crossing facilities
- CalEnviroScreen Disadvantaged Communities

Collisions were also matched with nearby roadway characteristics based on proximity, such as roadway classification and speed limit. The distances used to link a collision to a contextual factor vary. For example, a school has a larger area of influence than a streetlight. The distances to collisions used for each factor are summarized in the table to the right. ■

Contextual Factors	Distance
Sidewalk	100'
Streetlights	Outside 50'
Pedestrian Crossing Facilities	100'
Bicycle Facilities	100'
Transit Stops	250' Bus Stops 1,000' Rail Station
Number of Lanes	100'
Signalized Intersection with and without protected left turn	50' Minor Roadway 250' Major Roadway
Unsignalized Intersection	50' Minor Roadway 250' Major Roadway
Posted Roadway Speeds	100'
Roadway Type	100'

Land Use Type	Distance
Schools	1,000'
Parks	1,000'
Senior and Community Centers	1,000'

[1] Disadvantaged Communities defined by SB 535 and CalEnviroScreen 3.0

Central & San Bernardino ↘









↗

From Top to Bottom

Central & Benito

Monte Vista & Holt

↖ **Central & Costco Dwy**

Collision Landscape Summary

From 2013 to 2017, 1,089 injury collisions occurred in Montclair. While people walking and biking account for 15% of all collisions, they disproportionately make up 51% of collisions where someone was killed or severely injured (KSI).

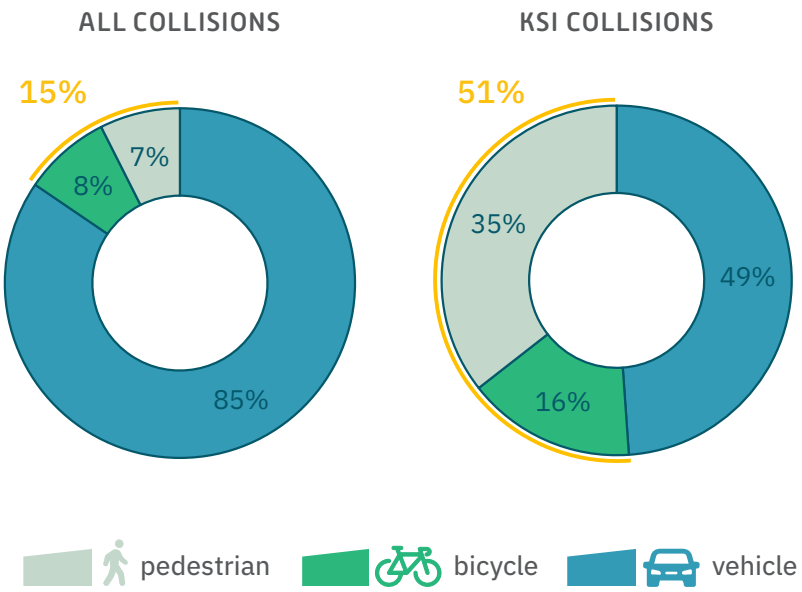
Chapter 3

Safety Analysis & Results

Collisions by Mode

From 2013 to 2017, 1,089 injury collisions occurred in Montclair. Of the total number of collisions, 88 collisions (8 percent) involved a person biking and 81 collisions (7 percent) involved a person walking. The total number of collisions per year increased an average of 6 percent from 2013 to 2017; the greatest change occurred from 2013 to 2014 when the number of collisions increased by 23 percent. Over the same time, the number of collisions involving people bicycling was consistent, on average, and the number of collisions involving people walking increased an average of 3 percent.

Collisions by Mode
2013-2017



Killed or Severly Injured in a Collision

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

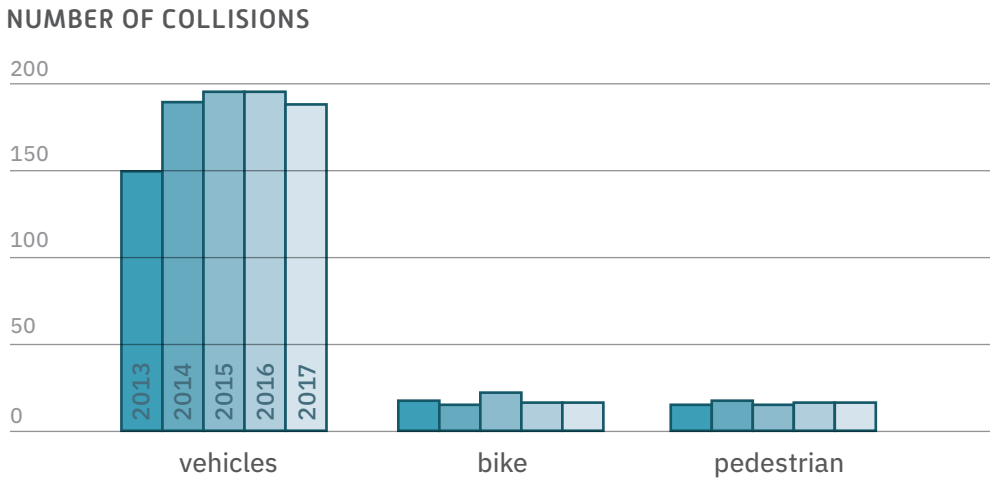
- *Broken or fractured bones*
- *Dislocated or distorted limbs*
- *Severe lacerations*
- *Severe burns*
- *Skull, spinal, chest or abdominal injuries*
- *Unconsciousness at or when taken from the collision scene*

Throughout this plan, the acronym KSI is used to denote collisions where someone was killed or severely injured.

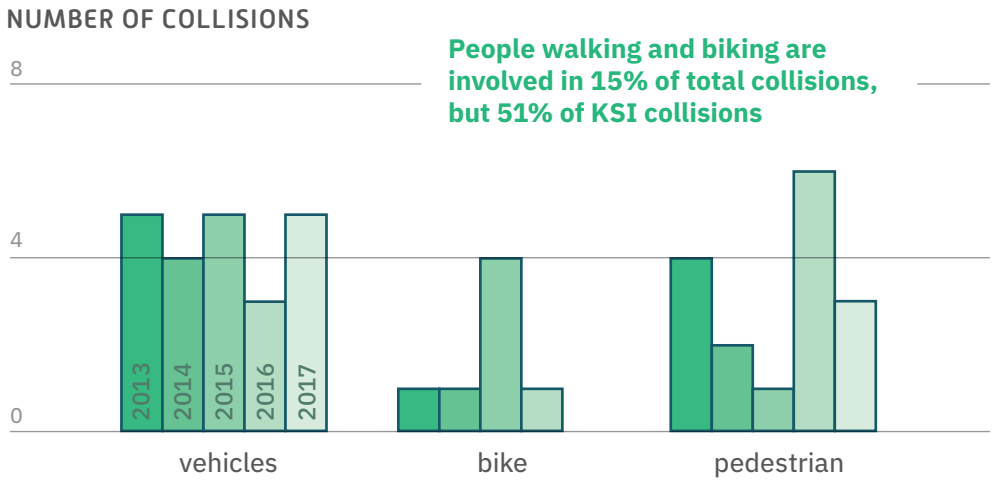
KSI Collisions by Mode

From 2013 to 2017, 45 collisions (4 percent of the total number of collisions) involved a person who was killed or severely injured (KSI). People walking and biking are involved in 15 percent of all collision in Montclair, but are disproportionately involved in 51 percent of all KSI collisions. Pedestrian collisions resulting in severe injuries or fatalities remained constant from 2013 to 2017 with an average of 3 collisions per year. There was typically one bicycle severe injury or fatality collision per year, except for in 2015 (4 KSI collisions) and in 2017 (0 KSI collisions).

All Collisions
2013-2017



KSI Collisions
2013-2017

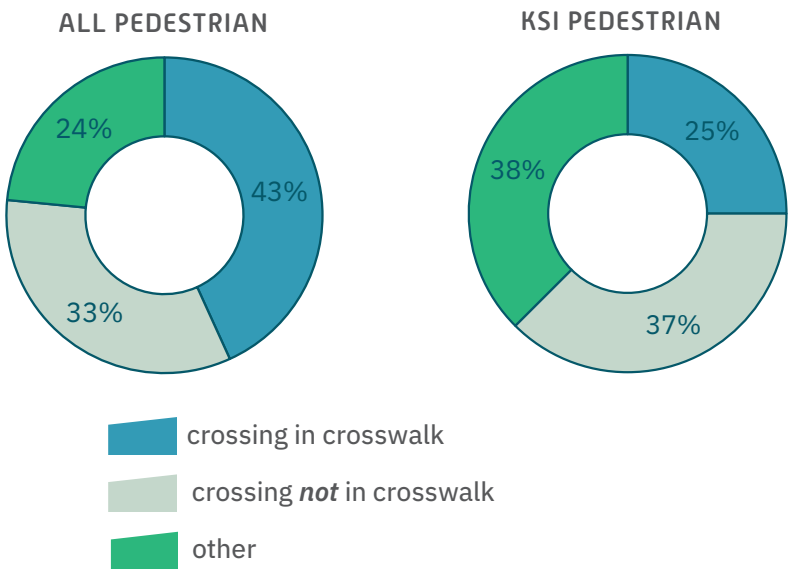


Behavior

PEDESTRIAN LOCATION

Although crosswalks are designated locations for pedestrians to safely cross streets, most collisions (43 percent) occurred when people were in a crosswalk. The remaining collisions occurred outside of a crosswalk, which include mid-block locations without marked crosswalks (33 percent), and in the road, including the shoulder, or not stated (24 percent). In collisions where someone walking was severely injured or killed, most collisions occurred in an "other" location (38 percent) or not in a crosswalk (37 percent). The remaining 25 percent of KSI pedestrian collisions occurred in a crosswalk.

Pedestrian Location, 2013-2017

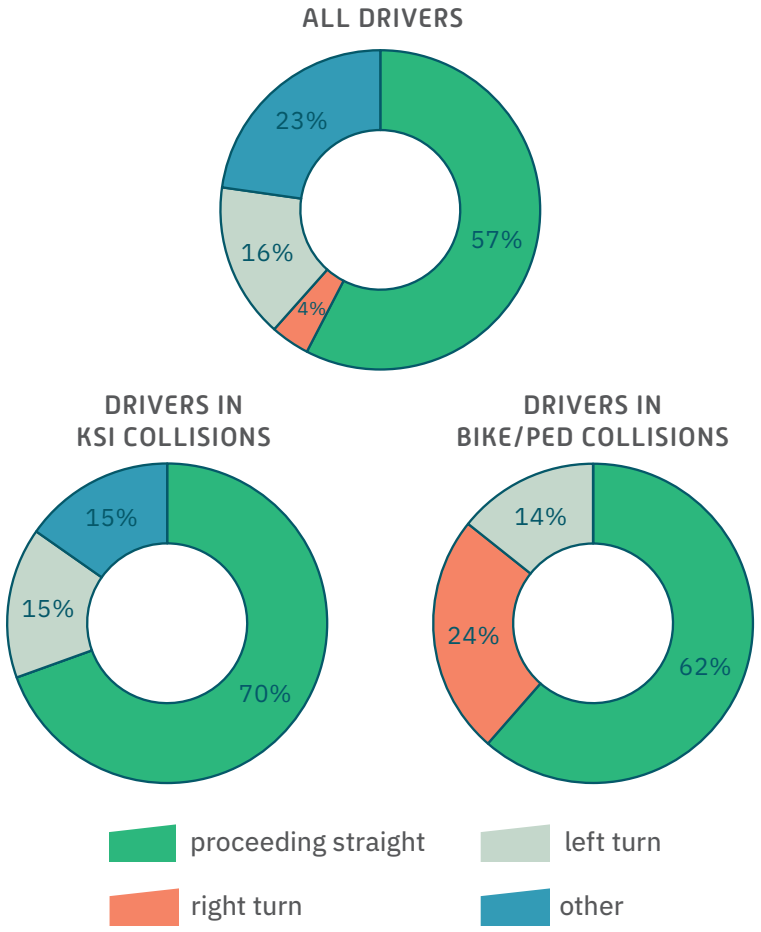


Note: "Crossing Not in Crosswalk" includes mid-block locations without marked crosswalks, and may sometimes be misapplied at unmarked crosswalks at intersections. "Other" includes "In Road, Including Shoulder," "Not in Road," and "Not Stated."

DRIVER MOVEMENT

The driver movement preceding a collision can influence the severity of the collision. While 57 percent of drivers were proceeding straight in all collisions, an overwhelming 70 percent of drivers were proceeding straight in KSI collisions. Drivers are generally moving at higher speeds when proceeding straight, which is reflected in the distribution of preceding movements for KSI collisions. In all collisions, 4 percent of drivers were making a right turn, but a relatively large proportion (24 percent) of drivers were making a right turn in collisions with people biking and walking. This is likely due to drivers not checking for people biking or walking coming from behind.

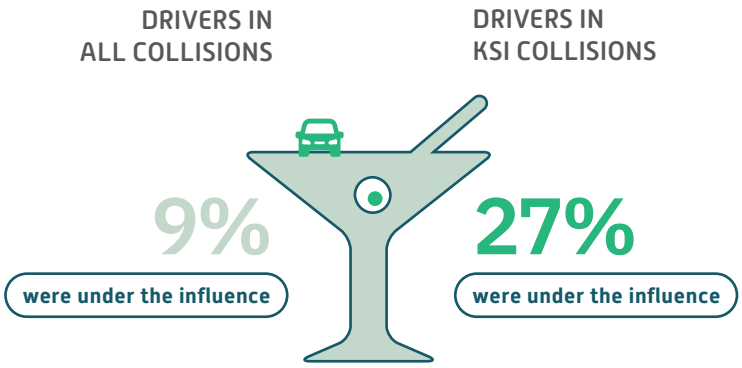
Driver Movement, 2013-2017



DRIVING UNDER THE INFLUENCE

A driver under the influence of alcohol and/or drugs increases the likelihood of a collision resulting in severe injury or a fatality. From 2013 to 2017, 9 percent of collisions involved a driver under the influence. That percentage triples to 27 percent for KSI collisions.

Drivers Under the Influence, 2013-2017

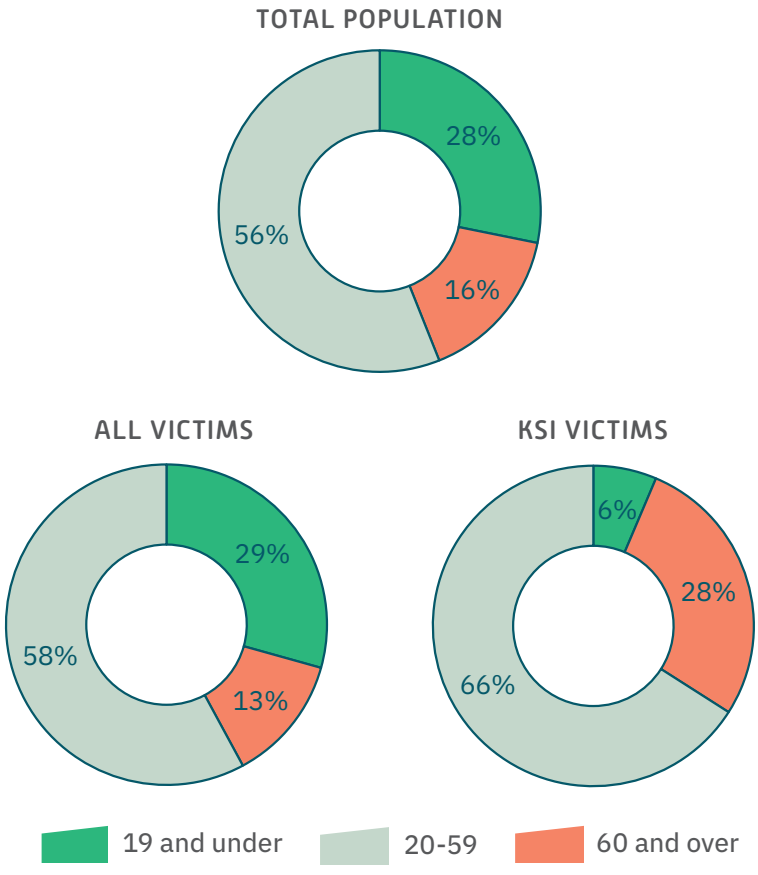


Who

VICTIM AGE

The age distribution of victims in all collisions roughly reflected the age distribution of the total population in Montclair with people ages 20-59 involved in the majority of collisions followed by people 19 years and under and then people 60 years and over. For KSI collisions, however, people 60 years and over were overrepresented as they accounted for 28 percent of KSI victims while only accounting for 16 percent of the total population. Older people are likely overrepresented in KSI collisions because they are more likely to rely on walking, which also includes walking to and from transit, making them more vulnerable to being killed or severely injured in a collision than someone driving a vehicle.

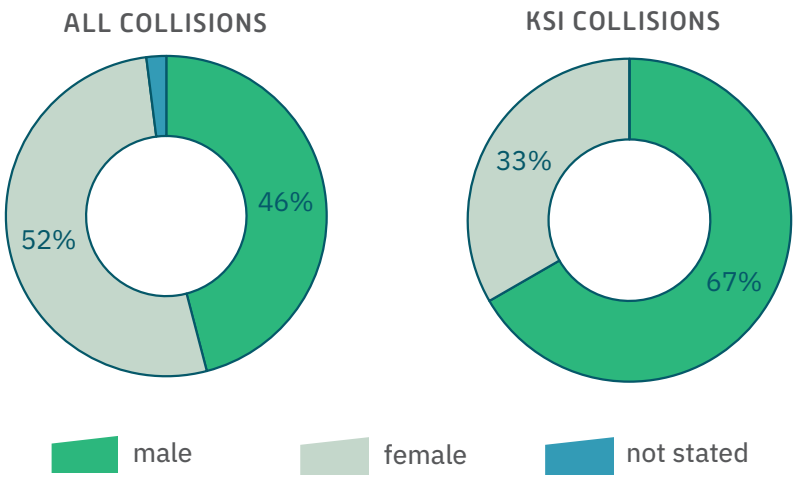
Victim Age, 2013-2017



VICTIM GENDER

In all collisions, the victim gender breakdown is roughly evenly distributed with 52 percent male victims, 46 percent female victims, and 2 percent not stated. In KSI collisions, however, male victims are overrepresented and account for 67 percent of people who were killed or severely injured.

Victim Gender, 2013-2017

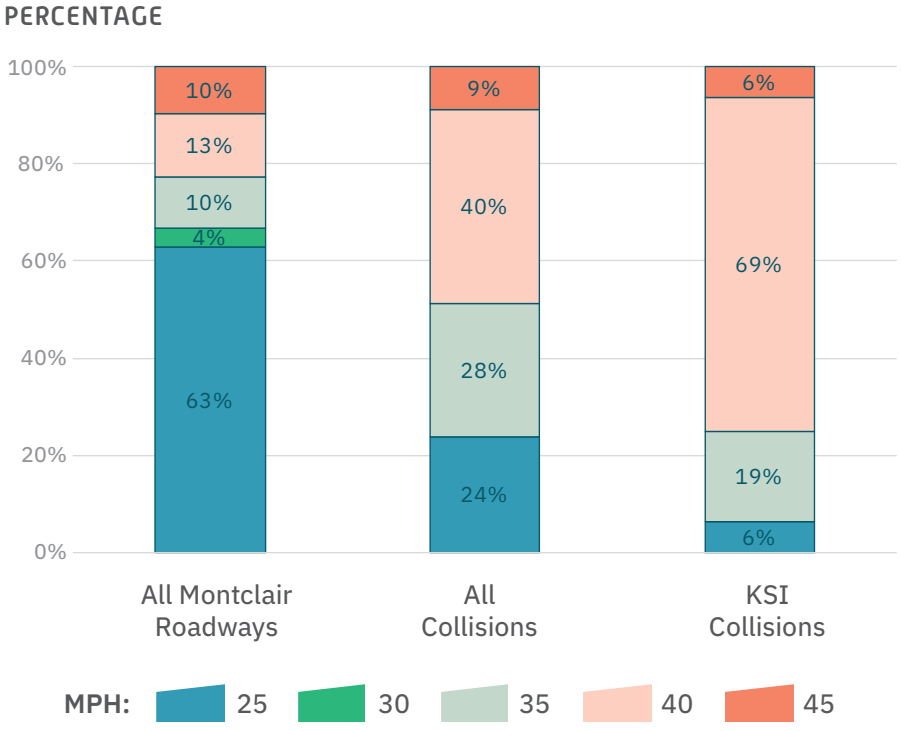


Where

ROADWAY SPEED

Speed is the primary factor in determining the severity of a collision. Most collisions occurred on higher speed roadways. Over two times the proportion of all collisions and over three times the proportion of KSI collisions occurred on roadways with 40 and 45 miles per hour speed limits compared to the proportion of roadways with these speed limits.

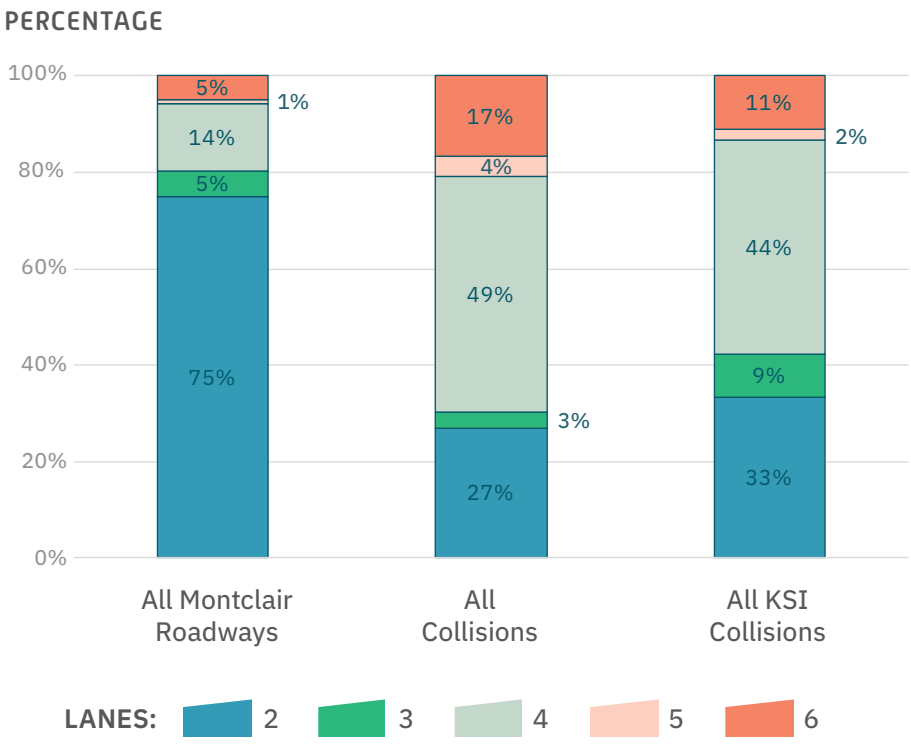
Roadway Speed All Modes, 2013-2017



NUMBER OF LANES

The number of lanes on a roadway is a proxy for roadway speed. Collisions may occur on multi-lane roads due to varying speeds among different road users, such as motorists, bicyclists, and pedestrians, and increased conflict points due to vehicles changing lanes. Based on collision type and number of lanes on a roadway, certain safety improvements, such as pedestrian refuge islands or curb extensions, are proposed to address location-specific collision factors. While roadways with four or more lanes make up 20 percent of all roadways in Montclair, roadways with four or more lanes disproportionately make up 70 percent of all collisions and 57 percent of KSI collisions.

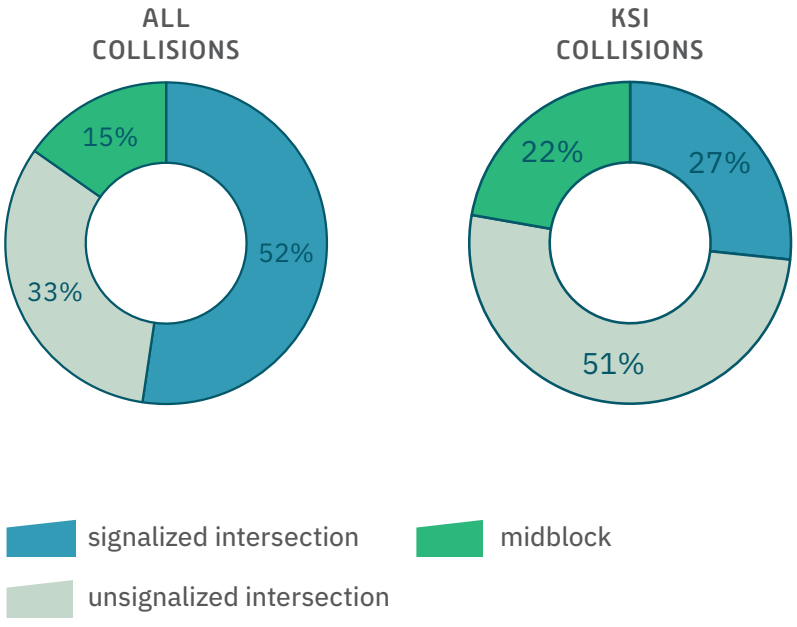
Number of Lanes All Modes, 2013-2017

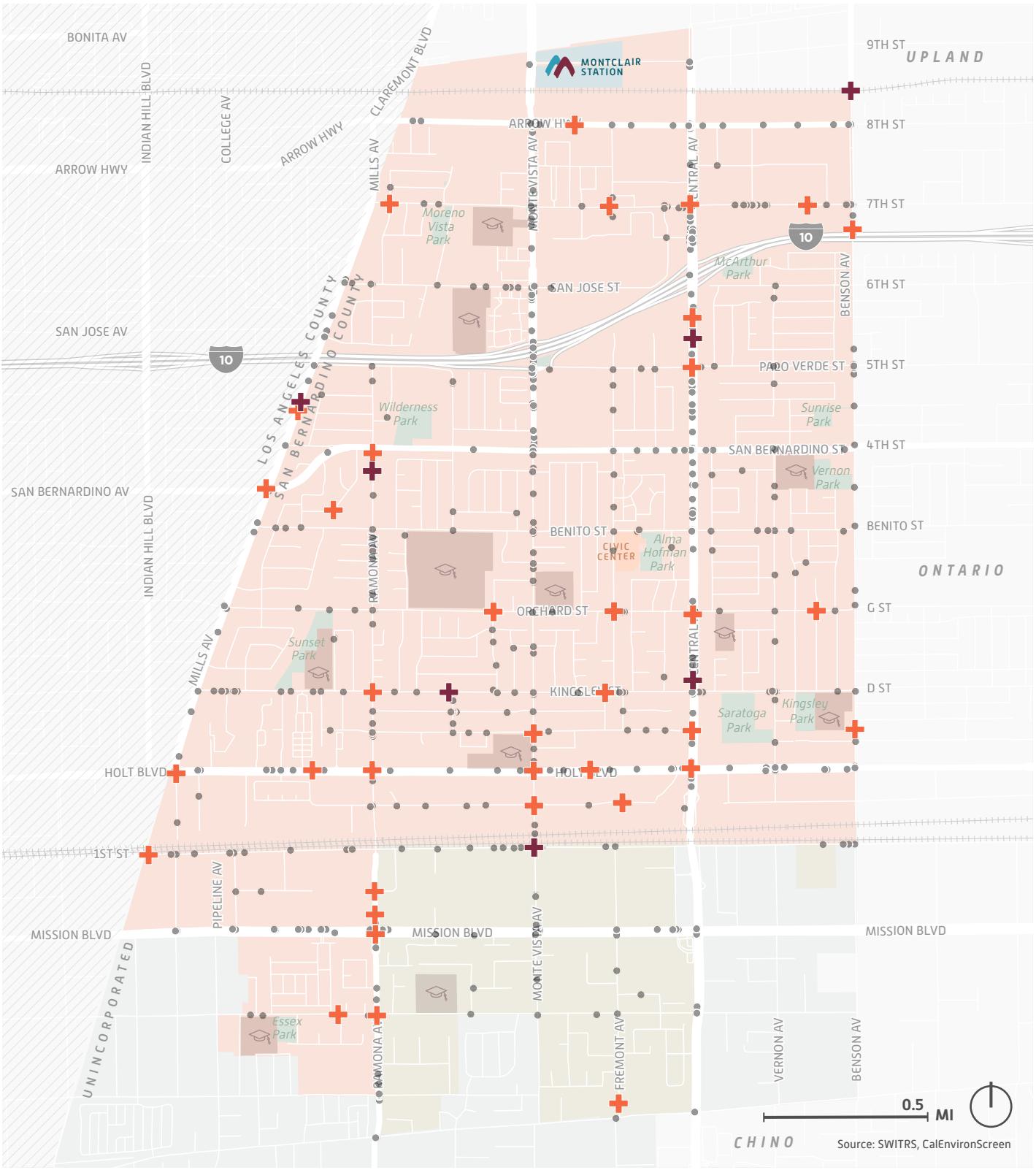


LOCATION TYPE

While most collisions take place at signalized intersections (52 percent), the majority of KSI collisions take place at unsignalized intersections (51 percent). Midblock collisions account for the smallest share of collisions, but midblock collisions account for a larger share of KSI collisions than they do for all collisions (22 percent versus 15 percent). Collisions are more likely to occur at intersections rather than midblock because people walking, biking, and driving are interacting with others, changing directions, and making decisions.

Location Type, 2013-2017





DISADVANTAGED COMMUNITIES

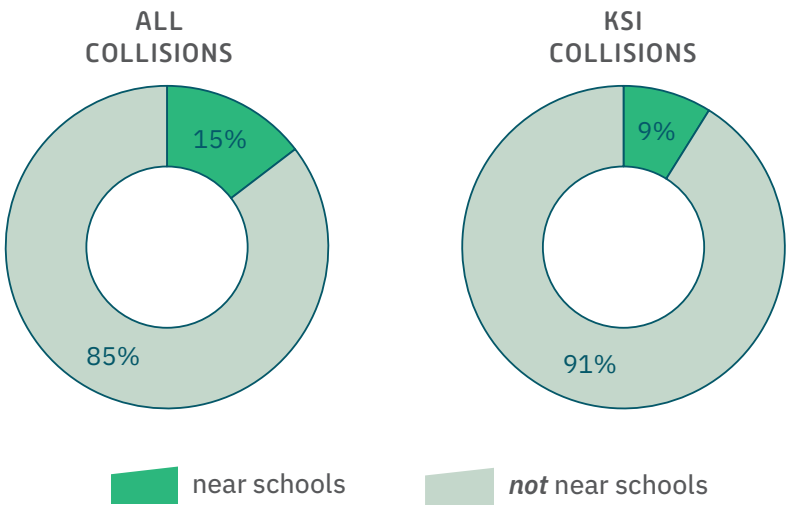
The majority of Montclair is in Disadvantaged Communities as defined by CalEnviroScreen and SB 535. Nearly all (89 percent) of collisions and KSI collisions (93 percent) occurred in Disadvantaged Communities.

- DISADVANTAGED COMMUNITY
- **7** FATAL COLLISIONS
- **38** SEVERE INJURY COLLISIONS
- **1,036** ALL OTHER INJURY COLLISIONS

NEAR SCHOOLS

Schools are areas of concentrated activity during arrival and dismissal times. 15 percent of all collisions occurred within 1,000 feet of a school. Most collisions near a school involved another vehicle (12 percent) and the remaining 3 percent were split evenly between collisions involving a bicycle and pedestrian. Compared to the distribution of all collisions, a smaller share of KSI collisions (9 percent) occurred within 1,000 feet of a school. Approximately 7 percent and 2 percent of KSI collisions near schools involved a pedestrian and another vehicle, respectively; there were no bicycles involved in a KSI collision near a school.

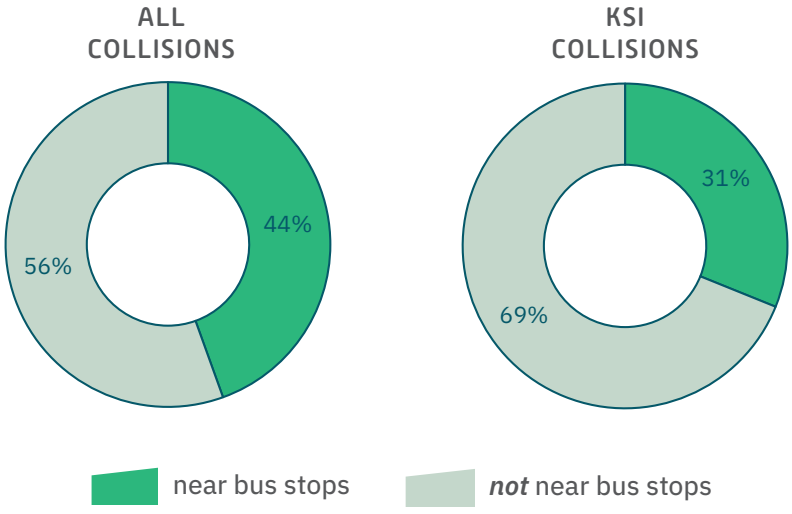
Near Schools (within 1,000 feet), 2013-2017



NEAR BUS STOPS

Bus stops typically have high pedestrian and bicyclist activity as people are traveling to and from transit. 44 percent of all collisions occurred within 500 feet of a bus stop. Most collisions near a bus stop involved another vehicle (39 percent) and the remaining 5 percent were split between collisions involving a bicycle (3 percent) and pedestrian (2 percent). Compared to the distribution of all collisions, a smaller share of KSI collisions (31 percent) occurred within 500 feet of a bus stop. Of that 31 percent of KSI collisions, 16 percent of collisions involved another vehicle, 11 percent involved a pedestrian, and 4 percent involved a bicyclist.

Near Bus Stops (within 500 feet), 2013-2017

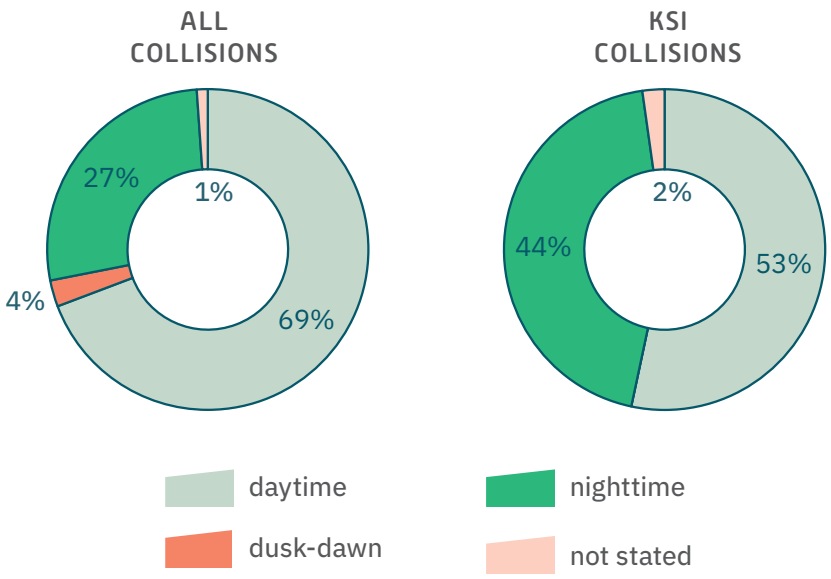


When

LIGHTING CONDITIONS

The lighting conditions can influence the visibility of road users, especially pedestrians and bicyclists, and road infrastructure. While 27 percent of all collisions occurred during nighttime, the share of nighttime collisions increase to 44 percent for KSI collisions.

Lighting Conditions, 2013-2017



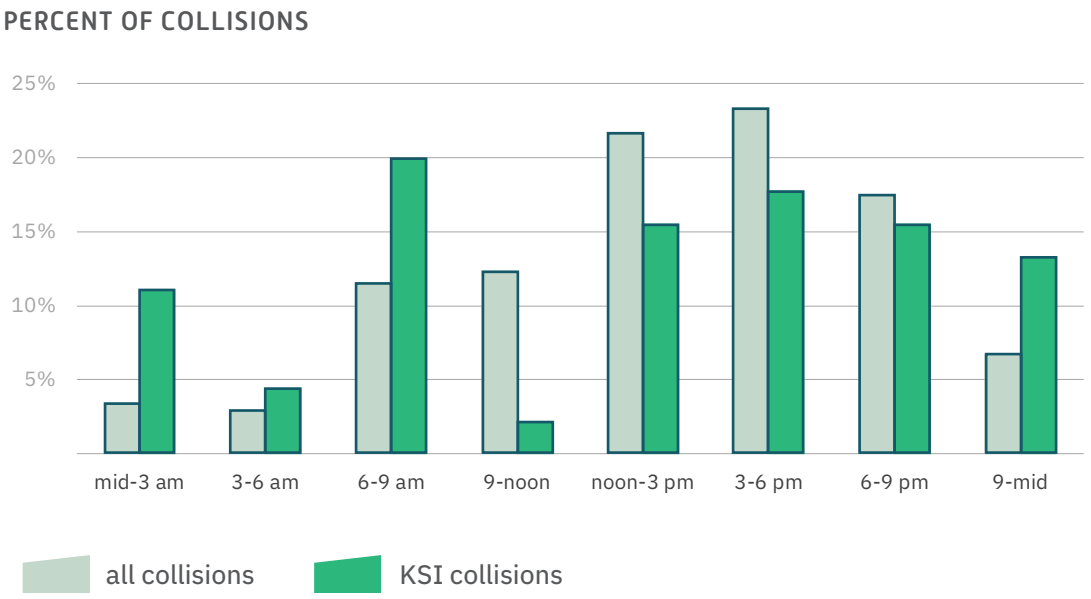
Mills & American



TIME OF DAY

Studying the timing of collisions can provide context about the surrounding traffic and lighting conditions, which informs the selection of countermeasures. Most collisions take place when more people are likely to be on the road – between 6 AM and 9 PM. The highest share of collisions occurs between 3 PM and 6 PM, which is when many people are returning from work and school. The number of collisions occurring between 3 PM and 6 PM may also be affected by seasonal changes, such as Daylight Savings Time, which can influence visibility as people's commutes shift from being before to after sunset. While the distribution of KSI collisions is relatively evenly distributed from 12 PM to 9 PM, the share of KSI collisions is heavily concentrated during the morning commute period, from 6 AM to 9 AM. This imbalance is likely due to most people having similar start times for work and school and more varied departure times from work and school. The percent of KSI collisions slightly decreases to approximately 10 – 15 percent between 9 PM and 3 AM; this pattern indicates that there may still be a relatively high number of people traveling in the late night and/or there are night-related issues, such as visibility and speeding when fewer cars are on the road.

Time of Day, 2013-2017



Systemic Analysis

Systemic analysis is a proactive safety approach that focuses on evaluating an entire roadway network using a defined set of criteria. It looks at collision history on an aggregate basis to identify high-risk roadway characteristics in addition to looking at high-collision concentration locations. By merging adjacent road and intersection features with collision data, relationships can be uncovered between contextual factors and the risk of frequent and severe collisions. This systemic process relied on a twofold approach to identify key safety issues and locations to prioritize:

Hot Spot Analysis

Following conventional collision mapping processes, the top intersections and corridors that account for a disproportionate share of collisions were identified. The location of fatal and severe injury (KSI) collisions were overlaid to see where the most severe collisions occurred and if there was overlap with the collision hotspots.

Collision Typing

In developing systemic analysis, it is important to understand the relationship between collision characteristics and the contextual characteristics of the collision location. A systemic matrix illustrating the number of collisions at the intersection of a collision characteristic (e.g. location of pedestrian) and a contextual characteristic (e.g. posted speed of roadway) was identified. Each combination of a collision characteristic and a contextual characteristic represents a collision type. The highest occurring collision types and collision types with the largest share of severe collisions were mapped and considered for further study. This process evaluates risk across the entire roadway system, rather than only managing risk at certain locations where collisions have occurred.

SYSTEMIC SAFETY ANALYSIS

Hot Spot Analysis

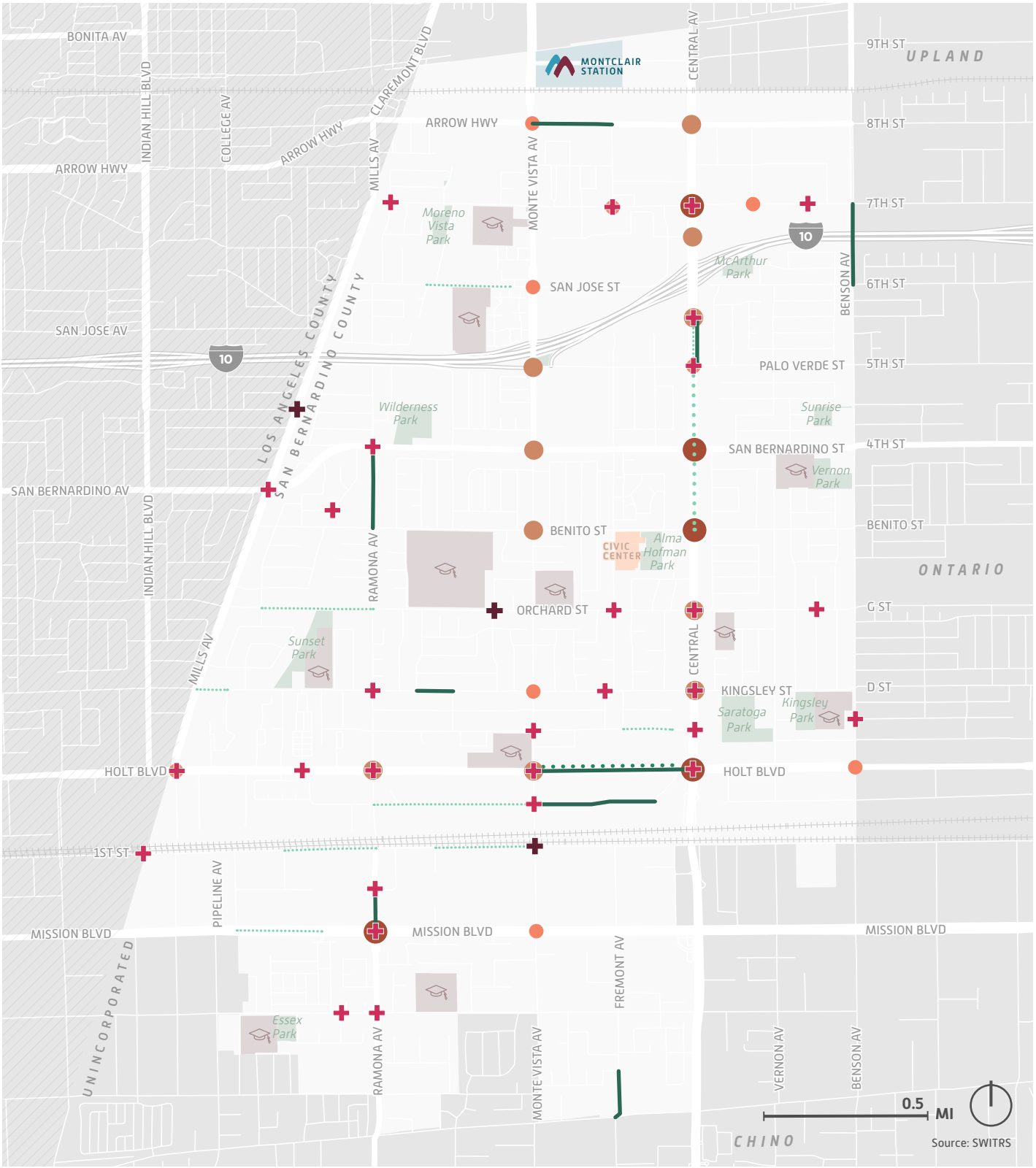
To summarize the total number of collisions by intersection, a set of non-overlapping areas of influence were generated based on a 50-foot radius around minor intersections and a 250-foot radius around major intersections. To summarize the total number of collisions by roadway, collisions were matched to roadways based on the primary road name and a 50-foot search area. Not all collisions are associated with an intersection, but all collisions are associated with a roadway. The map on the following page identifies intersections and corridors with a concentration of collisions; fatal and severe injury (KSI) collisions were overlaid to identify the locations of the most severe collisions. The top intersection and segment locations are listed on corresponding tables.

Priority Location Options, Intersections

			Collisions			
Option	North/South Street	East/West Street	Total	KSI	Bike	Ped
1	Monte Vista Avenue	State Street	36	2	1	0
2	Ramona Avenue	West Mission Boulevard	34	1	1	1
3	Central Avenue	San Bernardino Street	30	0	3	1
4	Monte Vista Avenue	Holt Boulevard	25	1	5	1
5	Central Avenue	Costco Drive	25	1	4	0
6	Monte Vista Avenue	Palo Verde Street	24	0	0	0
7	Central Avenue	East Montclair Plaza Lane	22	0	0	0
8	Central Avenue	Kingsley Street	21	1	1	2
9	Central Avenue	Arrow Highway	20	0	2	1
10	Monte Vista Avenue	Kingsley Street	13	0	1	3
11	Ramona Avenue	Howard Street	9	1	1	2
12	Monte Vista Avenue	Bandera Street	9	1	0	1
13	Ramona Avenue	Bandera Street	7	0	0	1
14	Tudor Avenue	Orchard Street	7	2	0	4
15	Central Avenue	Richton Street	6	0	0	0
16	Ramona Avenue	Orchard Street	5	0	2	0
17	Mills Avenue	Palo Verde Street	4	0	3	1
18	Mills Avenue	East American Avenue	2	2	0	1

Priority Location Options, Segments

				Collisions			
Option	Segment	North/East Extent	South/West Extent	Total	KSI	Bike	Ped
1	Holt Boulevard	Central Avenue	Monte Vista Avenue	36	2	1	0
2	Central Avenue	Palo Verde Street	San Bernardino Street	34	1	1	1
3	Central Avenue	San Bernardino Street	Bento Street	30	0	3	1
4	West Mission Boulevard	Vista Real	Silicon Avenue	25	1	5	1
5	Bandera Street	Poulsen Court	Marion Avenue	25	1	4	0
6	State Street	Monte Vista Avenue	Topline Business Park Driveway	24	0	0	0
7	San Jose Street	Cimarron Oaks Drive	San Antonio Creek Channel	22	0	0	0
8	Central Avenue	Costco Driveway	Palo Verde Street	21	1	1	2
9	Brooks Street	Monte Vista Avenue	Ramona Avenue	20	0	2	1
10	Ramona Avenue	Bandera Street	Yosemite Drive	13	0	1	3



Hot Spot Collisions

2013-2017

Collisions By Intersection

- 11 - 15 (9 INTS.)
- 16 - 25 (10 INTS.)
- 26 - 34 (5 INTS.)

KSI Collisions By Intersection

- 1 (29 INTS.)
- 2 (3 INTS.)

Collisions By Segment

- 3 - 5 (9 SEGMENTS)
- 6 - 8 (2 SEGMENTS)
- 9 - 10 (1 SEGMENTS)

KSI Collisions By Segment

- 1 (10 SEGMENTS)

SYSTEMIC SAFETY ANALYSIS

Collision Typing

Collision data was paired with geographic roadway and other contextual data to develop collision types. Outputs from this analysis were used to populate a set of matrices that allow us to look at crosstabs (collision data in rows and geographic data in columns) for collisions across the entire roadway network. The matrices allowed for identification of the combinations of factors that contributed to a high number of all collisions, and combinations that led to a high number of fatal and severe collisions. Collision types were considered for selection if two criteria were met: 5+ KSI collisions and 25% or more of all collisions were KSI. A matrix for all collisions is shown on the following page and matrices by mode and severity are included in **APPENDIX A.**

From the systemic matrix, the City developed profiles to highlight five of the most common and severe patterns among collisions in Montclair. Profiles #1 and #2 look at vehicle and bicycle broadside collisions at intersections with permissive lefts and no signal, respectively. These collisions are generally concentrated along a few corridors. Profiles #3 and #4 focus on pedestrian collisions. While the pedestrian collisions are not as numerous and concentrated as the collisions in Profiles #1 and #2, these pedestrian collisions represent locations where the most vulnerable roadway users are involved in collisions. Profile #5 focuses on midblock collisions on wide roads with higher speed limits; these roads account for a high share of collisions as seen in the collision matrix.

Every profile highlights a collision pattern that the City has identified as a priority concern. The collision attributes and contextual factors that define each profile are showing in the maps starting on **PAGE 24**. ■

Collision Typing By The Numbers, 2013-2017

This table compares the percentage of different roadway and location types in Montclair with the percentage of collisions that occur on each roadway and location type.

For example, while roads with 4 or 5 lanes and speed limits of 40 - 45 MPH make up 12 percent of roadways in Montclair, 46 percent of collisions occur on those roads, which suggests that roads with more lanes and higher speed limits are conducive to collisions.

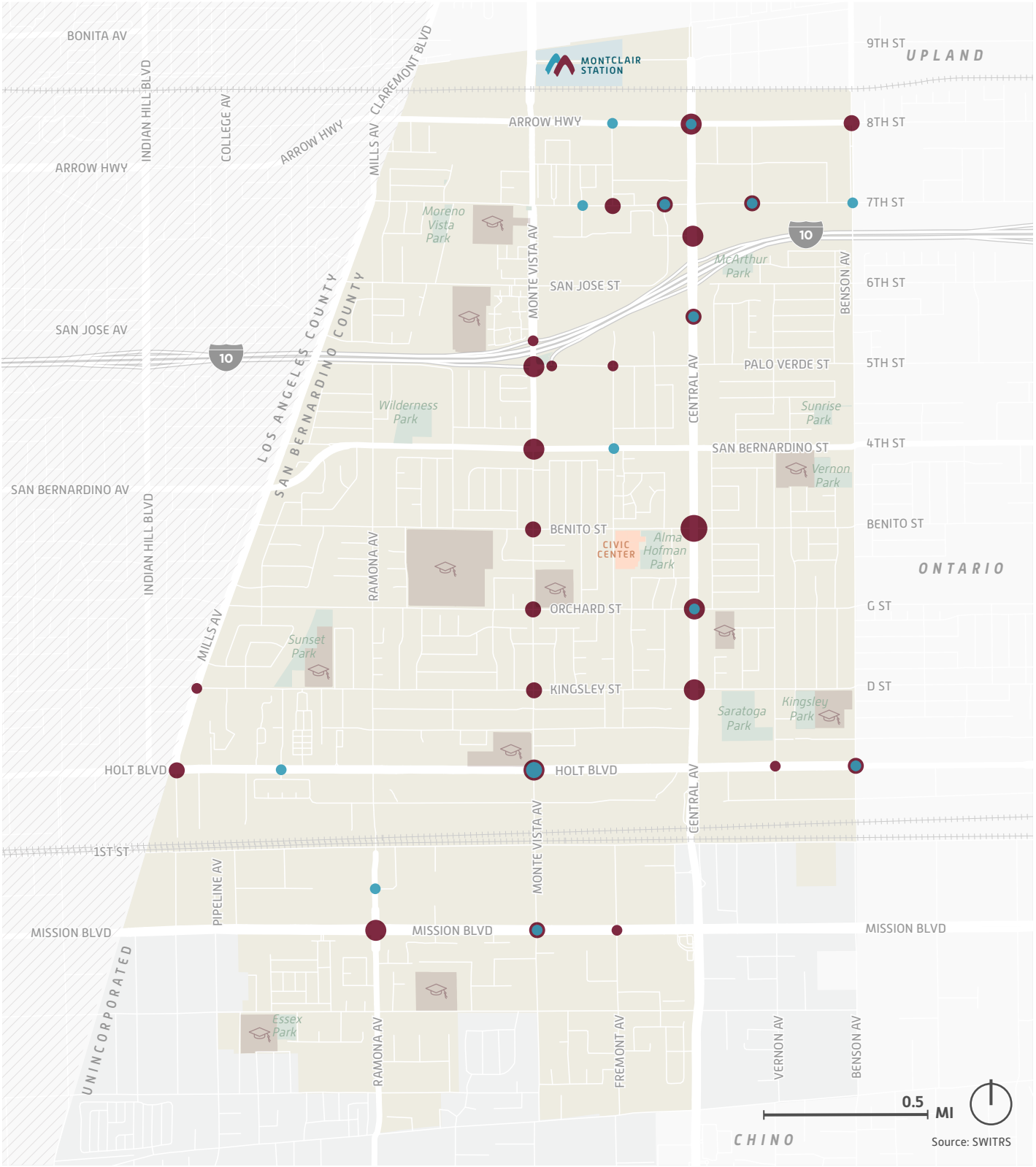
	Roadway Type						Location Type			
Lanes	3 Lanes or Less			4 or 5 Lanes		6 Lanes	Signal		Unsignalized Intersection	
Speed (mph)	15-25	30-35	40-45	30-35	40-45	40-45	All Protected Lefts	Not All Protected	Non-Local	Local
Share of Roadway/ Intersections	62%	12%	6%	2%	12%	5%	29%	71%	22%	78%
Share of Collisions	8%	15%	7%	7%	46%	17%	29%	71%	69%	31%
Collisions Per Mile	1.2	10.7	10.2	24.9	32.2	29.5				

Collision Typing By Context, 2013-2017

This table shows the number of different types of collisions that occur on each roadway and location type. Cells with a high number of collisions are highlighted to call out collision trends in Montclair.

For example, there are many broadside collisions that occur on roadways with 4 or 5 lanes with speed limits of 40 - 45 MPH, at signals with unprotected lefts, and near parks. This matrix informed the developed of the collision profiles.

		Roadway Type						Location Type								
	Lanes	3 Lanes or Less			4 or 5 Lanes		6 Lanes	Signal		Unsignalized Intersection		Mid-block	Near School	Near Park	Near Civic Center	TOTAL
	Speed (mph)	15-25	30-35	40-45	30-35	40-45	40-45	All Protected Lefts	Not All Protected	Non-Local	Local					
Violation	Driving Under Influence	13	10	9	6	35	7	12	21	18	6	23	13	33	3	80
	Unsafe Speed	12	26	9	12	77	48	44	50	46	15	29	25	54	7	184
	Improper Turning	16	25	12	6	48	17	14	31	25	16	38	18	51	6	124
	Automobile Right of Way	15	45	14	18	135	33	32	93	66	34	35	38	84	7	260
	Traffic Signs and Signals	5	19	9	11	107	31	22	123	24	12	1	29	67	12	182
Type	Head-On	13	17	9	4	39	14	14	42	10	16	14	14	33	5	96
	Sideswipe	9	11	7	6	30	11	9	22	12	8	23	13	25	3	74
	Rear End	11	38	18	22	110	67	58	74	73	17	44	41	84	9	266
	Broadside	29	66	23	33	244	66	63	209	97	50	42	64	155	22	461
	Hit Object	7	4	9	0	24	3	6	10	10	5	16	6	19	0	47
Time of Day	12 am -3 am	6	3	6	3	17	2	5	9	9	3	11	7	9	0	37
	3 am - 6 am	5	6	1	4	13	1	2	12	10	2	4	6	11	0	30
	6 am - 9 am	18	23	14	11	46	9	12	39	32	18	20	18	38	8	121
	9 am - 12 pm	10	16	4	8	70	21	21	53	31	11	13	18	50	4	129
	12 pm - 3 pm	6	38	11	12	121	45	44	96	37	20	36	37	78	7	233
	3 pm - 6 pm	21	35	19	19	115	49	42	81	63	32	41	37	87	14	259
	6 pm - 9 pm	17	34	12	13	75	38	30	74	40	16	29	23	61	8	189
	9 pm - 12 am	7	7	7	7	39	16	10	36	18	8	11	12	26	3	83
Driver at Fault Movement	Proceeding Straight	11	14	13	7	71	25	16	45	39	13	28	13	42	9	141
	Making Right Turn	2	1	2	1	5	0	1	6	1	1	2	2	5	1	11
	Making Left Turn	9	8	3	6	24	6	8	24	7	7	10	9	19	2	56
Age	Under 19	37	41	20	15	106	37	33	88	59	37	39	40	84	14	256
	60+	5	25	10	11	87	35	25	71	40	11	26	21	62	9	173
TOTAL		90	162	74	77	496	181	166	400	240	110	165	158	360	44	



Profile 1

Vehicle & Bicycle Broadside Collisions

at Signals with Permissive Lefts

VEHICLE COLLISIONS
- 1 - 3
- 4 - 7
- 8 - 13
- 14 - 17

BIKE COLLISIONS
- 1 - 3
- 4 - 5

Profile 1

Vehicle and Bicycle Broadside Collisions

at Signals with Permissive Lefts

Profile 1 collisions involve vehicles and bicycles involved in broadside collisions, which are also referred to as right-angle or T-bone collisions. These collisions take place at signals with permissive lefts, which require vehicles to yield to oncoming traffic in order to make a left-turn. Profile 1 collisions are generally concentrated along a few corridors.

SAFETY COUNTERMEASURE OPTIONS

The following countermeasures address Profile 1 collisions by removing the need for vehicles to yield to oncoming traffic and by increasing the amount of time for vehicles to clear an intersection during a signal phase.



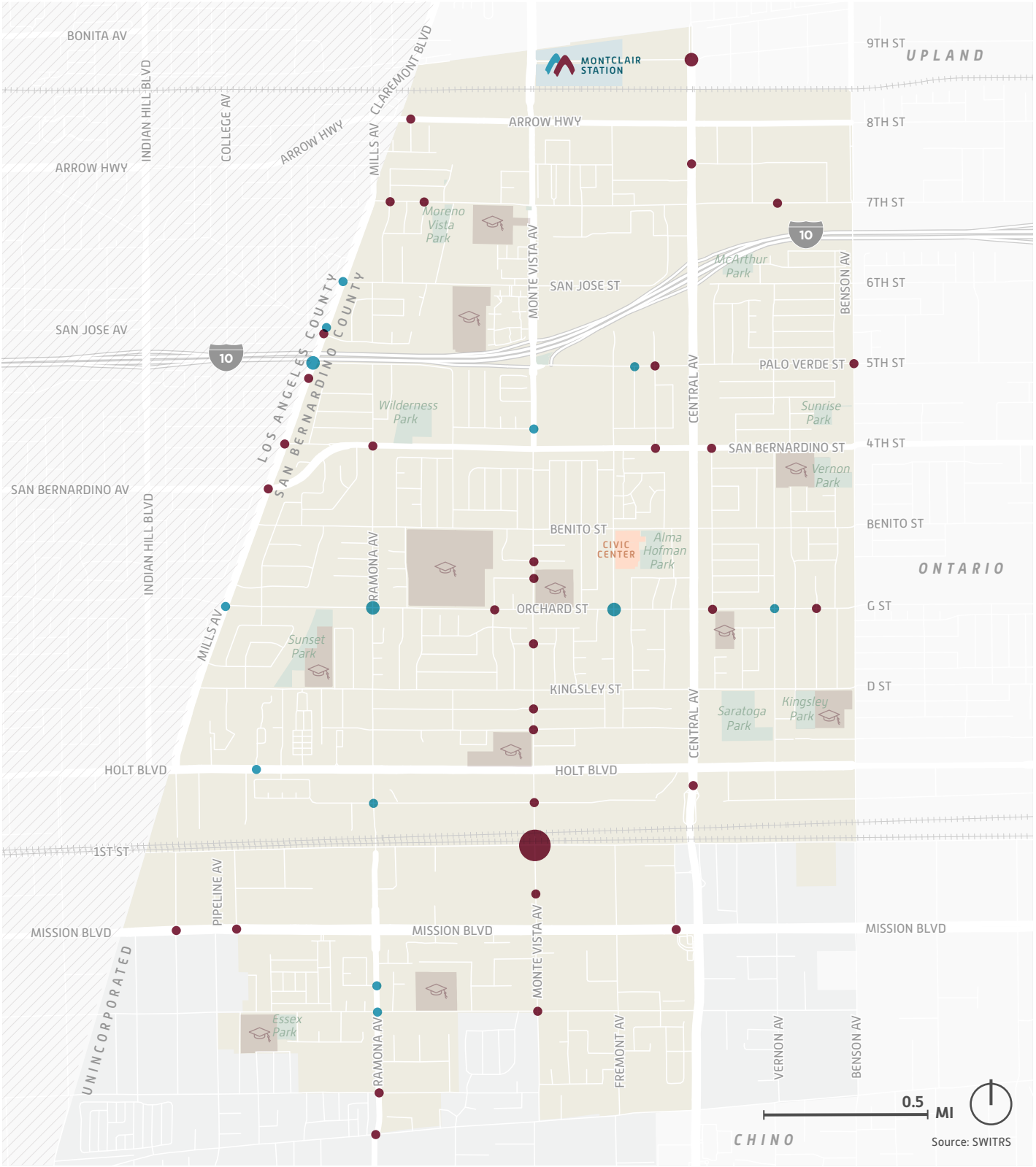
Protected Left-Turn Phase

A Protected Left Turn Phase provides an exclusive phase for left-turning vehicles to enter an intersection. A Protected Left Turn Phase improves safety by removing potential vehicle-vehicle and vehicle-pedestrian conflicts.



Extend Yellow and All-Red Time

Extending yellow and all-red time increases the time allotted for the yellow and red lights during a signal phase. Extending yellow and red time improves safety by allowing drivers and bicyclists to safely cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection. **Extending all-red time to 2 seconds for all traffic signals is recommended for Montclair.**



Profile 2

Vehicle & Bicycle Broadside Collisions

at Unsignalized Intersections with More Than 2 Lanes on At Least One Approach

VEHICLE COLLISIONS
- 1 - 3
- 4 - 7
- 8 - 13
- 14 - 17
- 18 - 25

BIKE COLLISIONS
- 1
- 2

Profile 2

Vehicle and Bicycle Broadside Collisions

at Unsignalized Intersections with More Than 2 Lanes on At Least One Approach

Profile 2 collisions involve vehicles and bicycles in broadside collisions, which are also referred to as right-angle or T-bone collisions. These collisions take place at unsignalized intersections where at least one of the approaches has more than two lanes. In some cases, vehicles turning from a minor to a major street wait for extended periods of time for a gap in oncoming traffic to make a turn. In these cases, drivers may attempt to make turns in smaller gaps of oncoming traffic, which may result in a broadside collision. Profile 2 collisions are generally concentrated along a few corridors.

SAFETY COUNTERMEASURE OPTIONS

The following countermeasures address Profile 2 collisions by improving the visibility of turning drivers and oncoming traffic and by restricting turns that pose a high collision risk.



Daylight Intersection

Daylighting an Intersection restricts parking at curbs in front of intersection crosswalks. Daylighting an intersection improves safety by clearing sight lines between pedestrian and motorists.



Directional Median Openings to Restrict Left Turns

A **Directional Median Opening** restricts specific turning movements, such as allowing a left-turn from a major street but not from a minor street. A directional median opening to restrict left turn improves safety by reducing the number of conflict points.



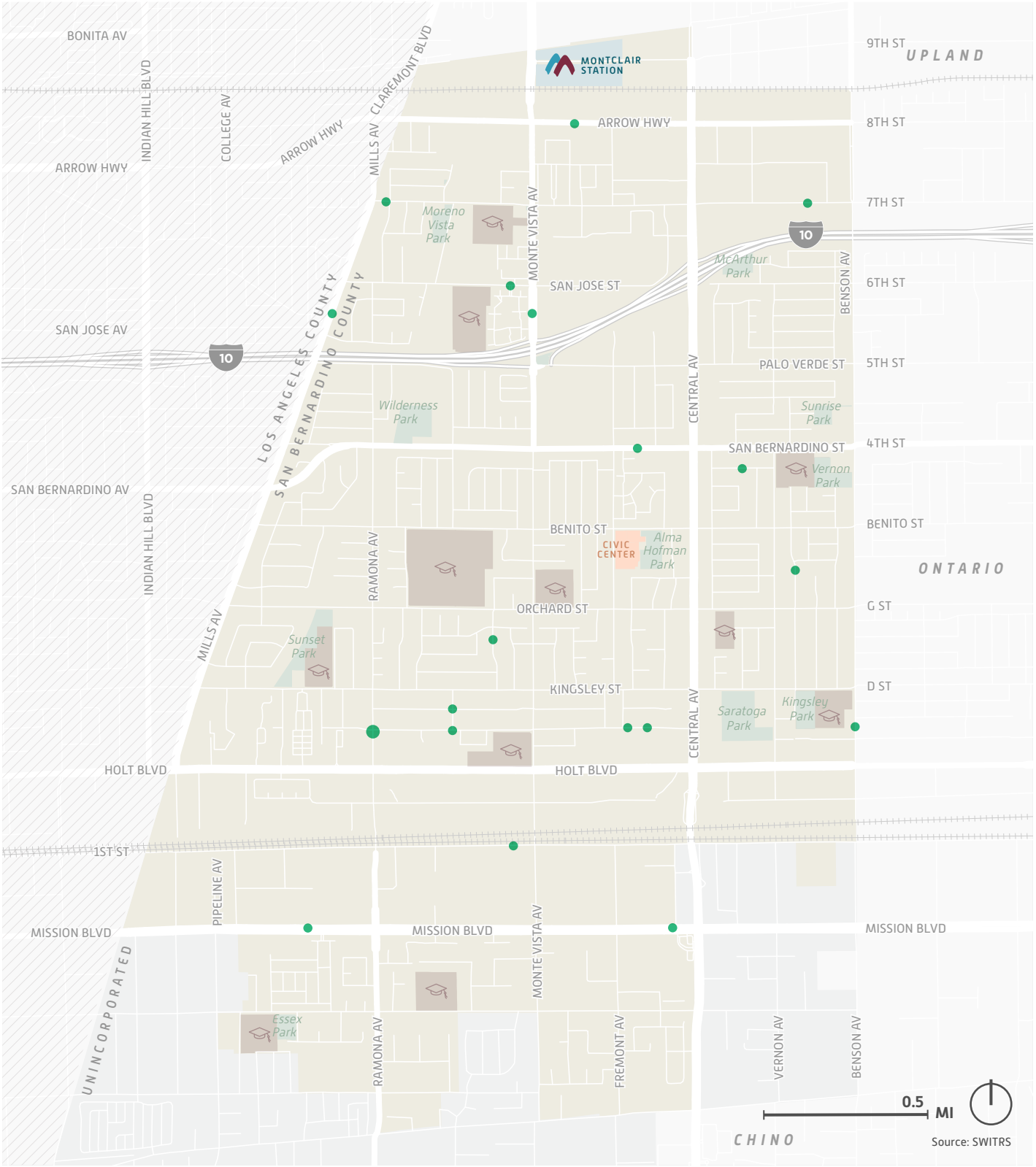
Improve Sight Distance

Improving Sight Distance removes objects, such as overgrown trees, that may prevent drivers and pedestrians from being able to clearly see oncoming and cross traffic. Improving sight distance improves safety by increasing all road users' awareness of their surroundings and time to react to changes in the road, such as intersections and midblock crosswalks.



Roundabout

A **Roundabout** is a large circular island, placed in the middle of an intersection, which direct flow in a continuous circular direction around the intersection. Roundabouts improve safety by reducing the number of conflict points and decreasing vehicle speeds.



Profile 3

Pedestrian Violations

Away from Crosswalk

PEDESTRIAN COLLISIONS

- 1
- 2

Profile 3

Pedestrian Violations

Away from Crosswalk

Profile 3 collisions involve pedestrian violations, or instances where a pedestrian does not yield to the right of way of vehicles. These collisions take place away from a crosswalk.

SAFETY COUNTERMEASURE OPTIONS

The following countermeasures address Profile 3 collisions by installing crosswalks where pedestrians want to cross, increase pedestrian visibility, and shorten the time pedestrians need to wait to cross an intersection.



High-Visibility Crosswalk

A **High-Visibility Crosswalk** has a striped pattern with markings made of high-visibility material, such as thermoplastic tape, instead of paint. A high-visibility crosswalk improves safety with a clearly marked pedestrian crossing so motorists exercise caution and yield to pedestrians.



Raised Crosswalk

A **Raised Crosswalk** is a pedestrian crosswalk that is typically elevated 3-6 inches above the road or at sidewalk level. A raised crosswalk improves safety by increasing crosswalk and pedestrian visibility and slowing down motorists.



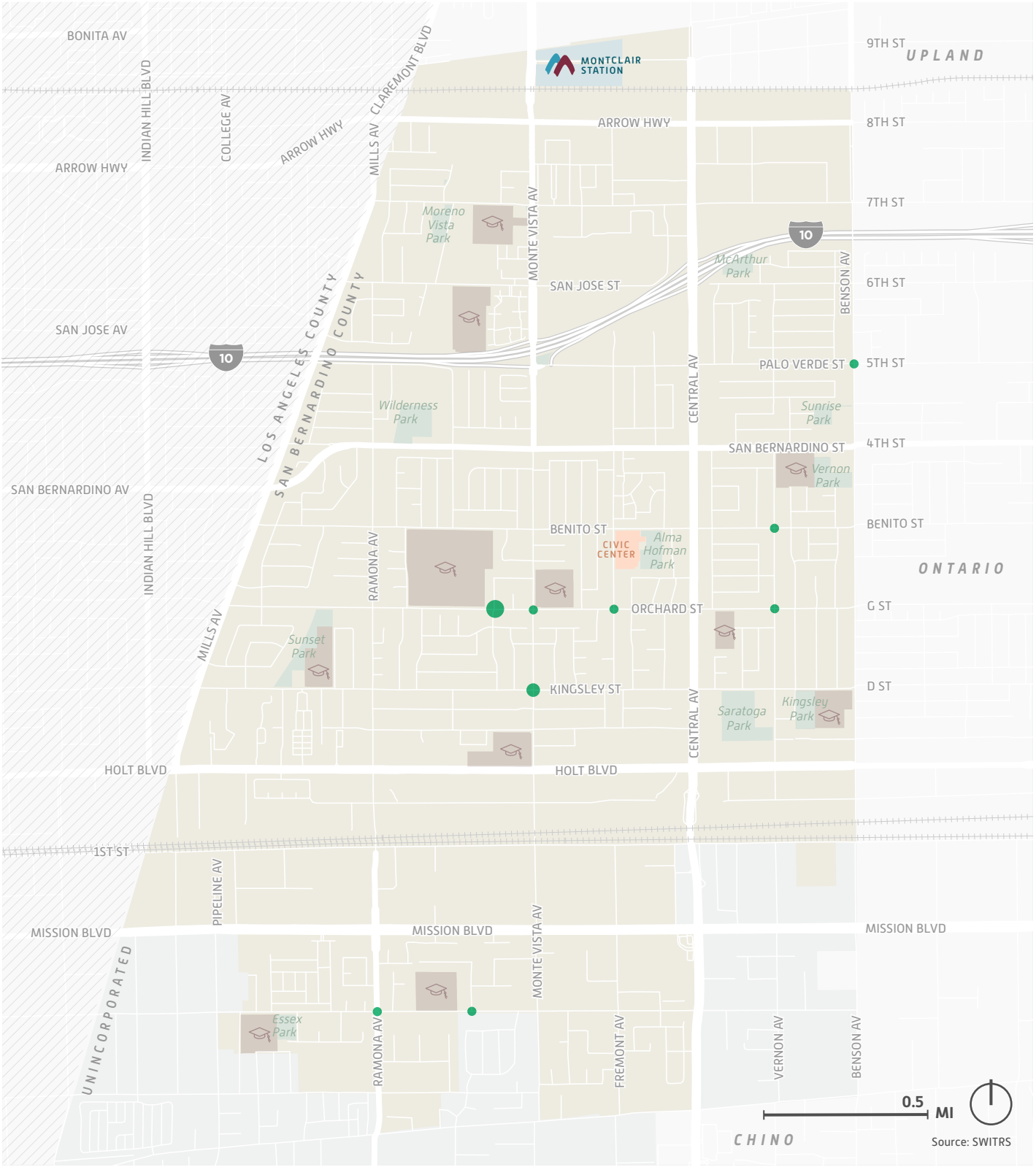
Rectangular Rapid Flashing Beacon

A **Rectangular Rapid Flashing Beacon (RRFB)** is a pedestrian-activated flashing light with additional signage to alert motorists of a pedestrian crossing. A RRFB improves safety by increasing the visibility of marked crosswalks and provides motorists a cue to slow down and yield to pedestrians.



Shorten Cycle Length

Shortening the Cycle Length decreases the time dedicated to each phase of a signal cycle, which in turn reduces the time motorists, bicyclists, and pedestrians wait to cross the intersection. Shortening the cycle length improves safety by reducing the likelihood that road users ignore signal indications.



Profile 4

Pedestrian Collisions

Near School Crosswalks During AM Peak

PEDESTRIAN COLLISIONS

- 1
- 2
- 4

Profile 4

Pedestrian Collisions

Near School Crosswalks During AM Peak

Profile 4 collisions involve pedestrian collisions near school crosswalks during the AM peak. Collisions are more likely to occur during the AM peak compared to the PM peak because schools typically start classes within a narrow time span while students may leave school at different times due to differing class schedules and after school activities.

SAFETY COUNTERMEASURE OPTIONS

The following countermeasures address Profile 4 collisions by increasing visibility of pedestrians and alerting drivers of upcoming pedestrian crosswalks.



Advance Yield Markings

Advance Yield Markings are a row of triangles painted 20 to 50 feet in advance of multi-lane pedestrian crossings to increase visibility of pedestrians. Advance yield markings improve safety by reducing the likelihood of a multiple-threat collision* at unsignalized midblock crossings.



High-Visibility Crosswalk

A **High-Visibility Crosswalk** has a striped pattern with markings made of high-visibility material, such as thermoplastic tape, instead of paint. A high-visibility crosswalk improves safety with a clearly marked pedestrian crossing so motorists exercise caution and yield to pedestrians.



Curb Extensions

A **Curb Extension** uses concrete, landscaping, or paint and plastic materials to widens the sidewalk at intersections and is designed to accommodate emergency vehicles. Curb extensions improve safety by shortening pedestrian crossing distances, improving sight lines, and reducing the speed of turning vehicles.



Raised Crosswalk

A **Raised Crosswalk** is a pedestrian crosswalk that is typically elevated 3-6 inches above the road or at sidewalk level. A raised crosswalk improves safety by increasing crosswalk and pedestrian visibility and slowing down motorists.



Pedestrian Hybrid Beacon

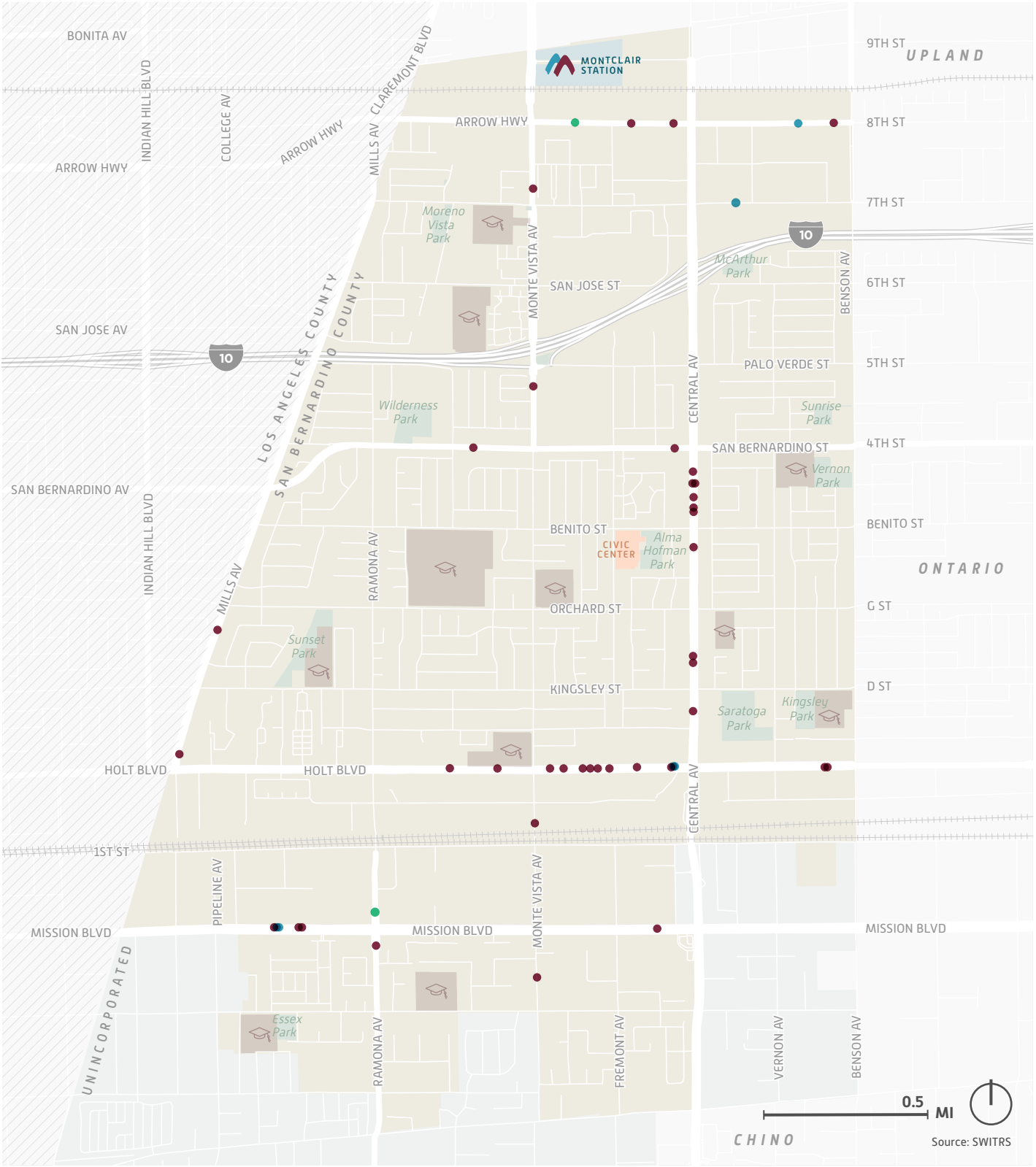
A **Pedestrian Hybrid Beacon (PHB)**, also known as a HAWK, is a flashing light that is activated by a pedestrian pushing a button or some other form of detection. A PHB functions as a pedestrian-activated signal by requiring vehicles to stop and wait for a signal to proceed. A PHB improves safety by providing a pedestrian a designated time to cross the street in locations that do not qualify for the installation of a traffic signal.



Rectangular Rapid Flashing Beacon

A **Rectangular Rapid Flashing Beacon (RRFB)** is a pedestrian-activated flashing light with additional signage to alert motorists of a pedestrian crossing. An RRFB improves safety by increasing the visibility of marked crosswalks and provides motorists a cue to slow down and yield to pedestrians.

*A multiple-threat crash occurs on a multi-lane road when a driver in one lane stops to let a person cross the crosswalk but another driver in the adjacent lane does not stop and hits the person in the crosswalk.



Profile 5

Midblock Collisions

on Roads with 4+ Lanes & 40+ mph Speed Limit

- 39 VEHICLE COLLISIONS
- 6 BIKE COLLISIONS
- 2 PEDESTRIAN COLLISIONS

Profile 5

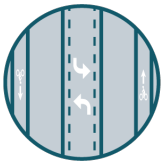
Midblock Collisions

on Roads with 4+ Lanes and 40+ mph Speed Limit

Profile 5 collisions occur midblock on roads with four or more lanes and 40+ mph speed limit. Drivers changing lanes and/or traveling at higher speeds have less time to respond to people crossing the street.

SAFETY COUNTERMEASURE OPTIONS

The following countermeasures address Profile 5 collisions by slowing drivers down with a reduction in the number of lanes and visual cues.



Road Diet

A **Road Diet** reduces roadway space dedicated to vehicle travel lanes to create room for bicycle facilities, wider sidewalks, or center turn lanes. A road diet improves safety by reducing vehicle speeds and creating designated space for all road users.



Lane Narrowing

Lane Narrowing reduces lane widths to encourage motorists to travel at slower speeds. Lane narrowing improves safety by lowering the risk of collision among bicyclists, pedestrians, and other motorists.



Speed Feedback Sign

A **Speed Feedback Sign** notifies drivers of their current speed, usually followed by a reminder of the posted speed limit. A speed feedback sign improves safety by providing a cue for drivers to check their speed and slow down, if necessary.

The following toolbox presents countermeasures that cover the 5 E's of traffic safety: Engineering, Education, Enforcement, Emergency Services, and Emerging Technologies.

The engineering countermeasures are applicable for different roadway contexts in Montclair and include additional information, such as the Caltrans-approved Crash Reduction Factor (CRF). The other E's are presented as policy and program countermeasures and include case studies of where specific countermeasures have been implemented.

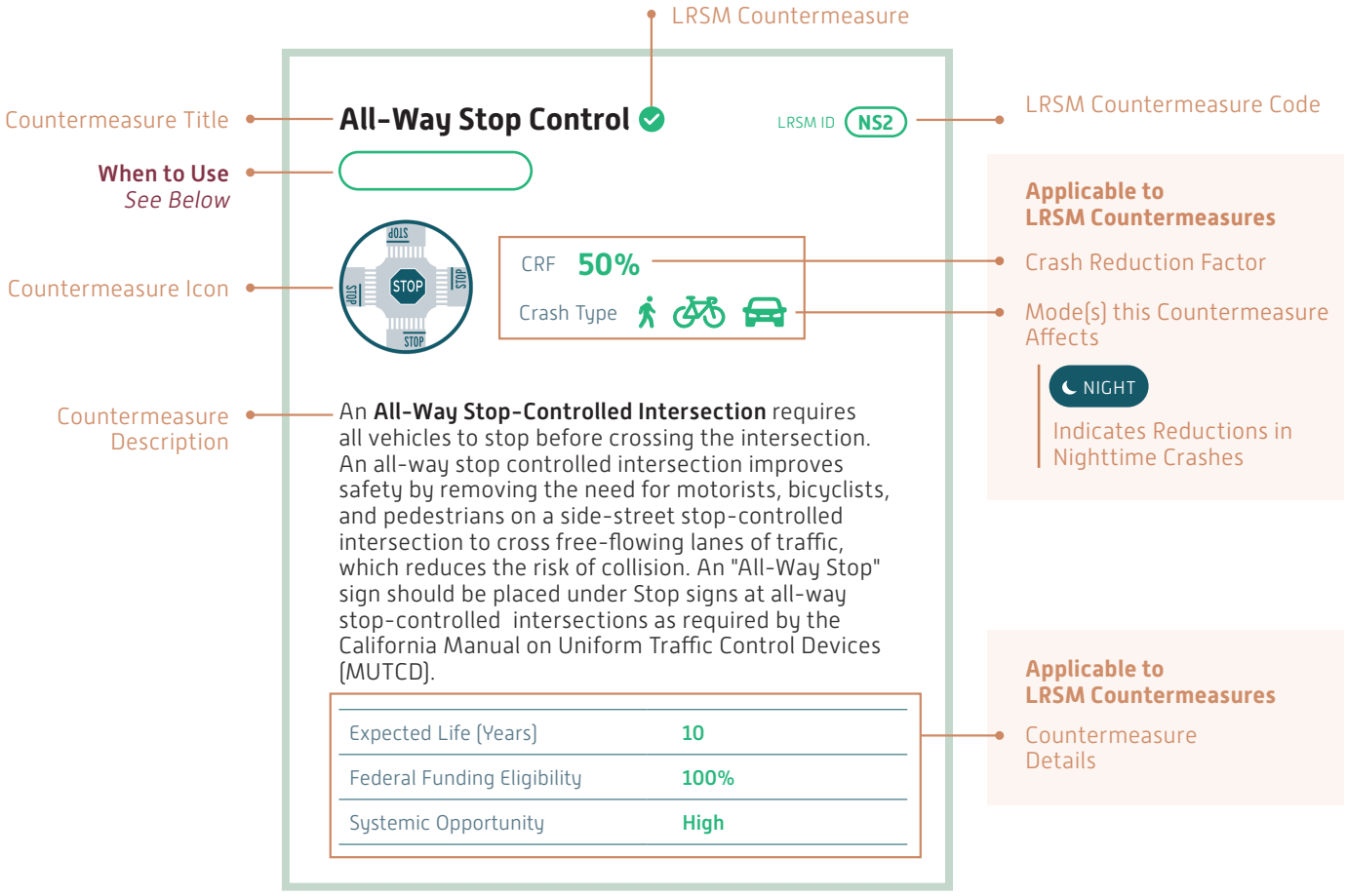
Chapter 4

Countermeasure Toolbox

This toolbox presents 35 safety engineering countermeasures applicable in different roadway contexts across Montclair.

Many of these countermeasures are recommended for the 18 priority location project recommendations included in this report. Most of the countermeasures are included in the 2020 Caltrans Local Roadway Safety Manual (LRSM) and can be advantageous for use in Caltrans Highway Safety Improvement Program (HSIP) grant funding applications. In the toolbox, these countermeasures include additional information, including a Caltrans-approved Crash Reduction Factor (CRF), the expected life of the project, the federal funding eligibility, the systemic opportunity for countermeasure implementation, and applicable collision type (e.g., all modes, bicycle and pedestrian collisions only, etc.) as outlined in the LRSM. The higher the CRF, the greater the expected reduction in collisions. There are many effective safety countermeasures beyond those listed in the LRSM, and several are included in this toolbox.

What You'll See in This Toolbox



When to Use Each countermeasure is tagged with information of where the countermeasure can be applied.

GLOBAL

These countermeasures are broad safety improvements that can be implemented throughout the City as needed

SYSTEMIC

These countermeasures can be implemented along a corridor with shared characteristics

LOCATION-SPECIFIC

These countermeasures are applicable for individual locations that have a unique set of roadway characteristics and risk factors

Summary of Countermeasures

✓ LRSM Countermeasure

Intersection & Roadway Design

- ADA-Compliant Curb Ramp
- All-Way Stop Control ✓
- Curb Extension
- Directional Median Opening to Restrict Left Turns ✓
- Green Conflict Striping
- Lane Narrowing
- Raised Crosswalk ✓
- Raised Median/Refuge Island ✓
- Right Turn Lane and Phase
- Road Diet ✓
- Roundabout ✓
- Speed Hump

Signals

- Extend Ped Crossing Time ✓
- Extend Yellow and All Red Time ✓
- Leading Pedestrian Interval ✓
- Pedestrian Hybrid Beacon ✓
- Pedestrian Countdown ✓
- Protected Left Turn Phase ✓
- Shorten Cycle Length ✓
- Upgrade Signal Head ✓

Signing & Striping

- Advance Stop Bar ✓
- Advance Yield Markings ✓
- Daylight Intersection ✓
- High-Visibility Crosswalk ✓
- LED-Enhanced Sign ✓
- Rectangular Rapid Flashing Beacon ✓
- Speed Feedback Sign ✓
- Upgrade Signs with Fluorescent Sheeting ✓
- Upgrade to Larger Warning Signs ✓
- Yield to Pedestrian Sign ✓

Other Enhancements

- Add Lighting ✓
- Back-In Angled Parking
- Bike Lanes ✓
- Improve Sight Distance ✓
- Upgrade Lighting to LED

Intersection & Roadway Design

LRSM Countermeasure

ADA-Compliant Curb Ramp

GLOBAL



An **ADA-Compliant Curb Ramp** is a short ramp with tactile warning devices, such as truncated domes, to help people using wheelchairs or other mobility-assistance devices (e.g. walkers) and people with visual impairments to safely transition between the road and the sidewalk. ADA-compliant curb ramps improve safety by assisting people with difficulties walking or seeing to safely travel across sidewalks and roadways. Curb ramps must comply with the Americans with Disabilities Act (ADA) standards for accessibility.

All-Way Stop Control

LRSM ID NS2

LOCATION-SPECIFIC



CRF **50%**

Crash Type

An **All-Way Stop-Controlled Intersection** requires all vehicles to stop before crossing the intersection. An all-way stop-controlled intersection improves safety by removing the need for motorists, bicyclists, and pedestrians on a side-street stop-controlled intersection to cross free-flowing lanes of traffic, which reduces the risk of collision. An "All-Way Stop" sign should be placed under stop signs at all-way stop-controlled intersections as required by the California Manual on Uniform Traffic Control Devices (MUTCD).

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	High

Curb Extension

LOCATION-SPECIFIC



A **Curb Extension** uses concrete, landscaping, or paint and plastic materials to widen the sidewalk at intersections and is designed to accommodate emergency vehicles. Curb extensions improve safety by shortening pedestrian crossing distances, improving sight lines, and reducing the speed of turning vehicles.

Directional Median Opening to Restrict Left Turns

LRSM ID S14

LOCATION-SPECIFIC



CRF **50%**

Crash Type

A **Directional Median Opening** restricts specific turning movements, such as allowing a left-turn from a major street but not from a minor street. A directional median opening to restrict left turns improves safety by reducing the number of conflict points.

Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Opportunity	Medium

Intersection & Roadway Design

LRSM Countermeasure

Green Conflict Striping

LOCATION-SPECIFIC



Green Conflict Striping is green markings painted in a dashed pattern on bike lanes approaching an intersection and/or going through an intersection. Green conflict striping improves safety by increasing the visibility of bicyclists and identifying potential conflict points so bicyclists and motorists use caution when traveling toward and through an intersection.

Lane Narrowing

SYSTEMIC



Lane Narrowing reduces lane widths to encourage motorists to travel at slower speeds. Lane narrowing improves safety by lowering the risk of collision among bicyclists, pedestrians, and other motorists.

Raised Crosswalk

LRSM ID R36

LOCATION-SPECIFIC



CRF 35%

Crash Type

A **Raised Crosswalk** is a pedestrian crosswalk that is typically elevated 3-6 inches above the road or at sidewalk level. A raised crosswalk improves safety by increasing crosswalk and pedestrian visibility and slowing down motorists.

Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Opportunity	Medium

Raised Median/ Refuge Island

LRSM ID NS19

LOCATION-SPECIFIC



CRF 45%

Crash Type

A **Raised Median**, or **Refuge Island**, is a raised barrier in the center of the roadway that can restrict certain turning movements and provide a place for pedestrians to wait if they are unable to finish crossing the intersection. A raised median improves safety by reducing the number of potential conflict points with turning vehicles, and a pedestrian refuge island improves safety by reducing the exposure time for pedestrians crossing the intersection.

Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Opportunity	Medium

Intersection & Roadway Design

LRSM Countermeasure

Right Turn Lane and Phase

LOCATION-SPECIFIC



A **Right-Turn Only Lane and Phase** provides a green arrow phase for right-turning vehicles. A right-turn only lane and phase improves safety by removing conflicts between right-turning vehicles and bicyclists or pedestrians crossing the intersection.

Road Diet

LRSM ID R14

SYSTEMIC



CRF **30%**

Crash Type

A **Road Diet** reduces roadway space dedicated to vehicle travel lanes to create room for bicycle facilities, wider sidewalks, or center turn lanes. A road diet improves safety by reducing vehicle speeds and creating designated space for all road users.

Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Opportunity	Medium

Roundabout

LRSM ID NS04/NS05

LOCATION-SPECIFIC



CRF **Varies**

Crash Type

A **Roundabout** is a large circular island, placed in the middle of an intersection, which direct flow in a continuous circular direction around the intersection. Roundabouts improve safety by reducing the number of conflict points and decreasing vehicle speeds. Documented crash reduction factors range from 12% to 78%, and depend on ADT, project location, and number of lanes.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	Low

Speed Hump

LOCATION-SPECIFIC



A **Speed Hump** is a raised area of the road intended to encourage motorists to slow down on long stretches of local streets. A speed hump improves safety at intersections by preventing motorists from driving too fast on roadways with minimal intersection stop controls.

Signals

LRSM Countermeasure

Extend Pedestrian Crossing Time

LRSM ID S3

LOCATION-SPECIFIC



CRF 15%

Crash Type

Extending Pedestrian Crossing Time increases the time allotted for pedestrians to cross an intersection. Extending pedestrian crossing time improves safety by providing vulnerable populations, such as children and the elderly, more time to cross and by decreasing the likelihood that vehicles with a green light will need to wait for a pedestrian to finish crossing the intersection.

Expected Life (Years)	10
Federal Funding Eligibility	50%
Systemic Opportunity	Very High

Extend Yellow and All Red Time

LRSM ID S3

GLOBAL



CRF 15%

Crash Type

Extending Yellow and All Red Time increases the time allotted for the yellow and all red lights during a signal phase. Extending yellow and red time improves safety by allowing drivers and bicyclists to safely cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection. **Extending all-red time to 2 seconds for all traffic signals is recommended for Montclair.**

Expected Life (Years)	10
Federal Funding Eligibility	50%
Systemic Opportunity	Very High

Leading Pedestrian Interval

LRSM ID S21

SYSTEMIC



CRF 60%

Crash Type

A **Leading Pedestrian Interval (LPI)** adjusts a traffic signal to allow pedestrians a 3-7 second head start in crossing an intersection before vehicles are given a green light. An LPI improves safety by minimizing conflicts between pedestrians and vehicles and increasing pedestrian visibility.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Pedestrian Hybrid Beacon

LRSM ID NS23

LOCATION-SPECIFIC



CRF 55%

Crash Type

A **Pedestrian Hybrid Beacon (PHB)**, also known as a HAWK, is a flashing light that is activated by a pedestrian pushing a button or some other form of detection. A PHB functions as a pedestrian-activated signal by requiring vehicles to stop and wait for a signal to proceed. A PHB improves pedestrian safety by providing a pedestrian a designated time to cross the street in locations that do not qualify for the installation of a traffic signal.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	Low

Signals

Pedestrian Countdown

LRSM ID S17

GLOBAL



CRF 25%

Crash Type

A **Pedestrian Countdown** signal displays the number of seconds remaining for a pedestrian to cross the intersection. Pedestrian countdowns improve safety by providing pedestrians the information needed to determine if there is enough time to cross the street.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Protected Left Turn Phase

LRSM ID S7

SYSTEMIC



CRF 30%

Crash Type

A **Protected Left Turn Phase** provides an exclusive phase for left-turning vehicles to enter an intersection. A protected left turn phase improves safety by removing potential vehicle-vehicle, vehicle-bicycle and vehicle-pedestrian conflicts.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	High

Shorten Cycle Length

LRSM ID S3

LOCATION-SPECIFIC



CRF 15%

Crash Type

Shortening the Cycle Length decreases the time dedicated to each phase of a signal cycle, which in turn reduces the time motorists, bicyclists, and pedestrians wait to cross the intersection. Shortening the cycle length improves safety by reducing the likelihood that road users ignore signal indications.

Expected Life (Years)	10
Federal Funding Eligibility	50%
Systemic Opportunity	Very High

Signal

LRSM ID NS3

LOCATION-SPECIFIC



CRF 30%

Crash Type

A **Traffic Signal** organizes travel of all modes at an intersection by limiting interactions between vehicles, pedestrians, and bicyclists with conflicting movements. A traffic signal improves safety by having a traffic calming effect on long, high-speed straightaways and protecting the conflicting through movements of vehicles, bicycles and pedestrians.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	Low

Signals

LRSM Countermeasure

Upgrade Signal Head

LRSM ID S2

LOCATION-SPECIFIC

CRF **15%**

Crash Type

Upgrading Signal Heads replaces existing 8-inch signal heads with 12-inch signal heads to comply with the California MUTCD's 2014 guidelines. Upgrading signal heads improves safety by providing better visibility of intersecion signals and by aiding drivers' advanced perception of upcoming intersections.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Pedestrian Hybrid Beacon



Signing & Striping

LRSM Countermeasure

Advance Stop Bar

LRSM ID S20

GLOBAL



CRF 15%

Crash Type

An **Advanced Stop Bar** is a horizontal stripe painted ahead of the crosswalk at stop signs and signals to indicate where drivers should stop. An advanced stop bar improves safety by reducing instances of vehicles encroaching on the crosswalk. Creating a wider stop bar or setting the stop bar further back may be appropriate for locations with known crosswalk encroachment issues.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Advance Yield Markings

LRSM ID NS7

SYSTEMIC



CRF 25%

Crash Type

Advance Yield Markings are a row of triangles ("shark's teeth") painted 20 to 50 feet in advance of multi-lane pedestrian crossings to increase visibility of pedestrians. Advance yield markings improve safety by reducing the likelihood of a multiple-threat collision* at unsignalized midblock crossings.

*A multiple-threat crash occurs on a multi-lane road when a driver in one lane stops to let a person cross the crosswalk but another driver in the adjacent lane does not stop and hits the person in the crosswalk.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Daylight Intersection

LRSM ID NS11

SYSTEMIC



CRF 20%

Crash Type

Daylighting an Intersection restricts parking at curbs in front of intersection crosswalks. Daylighting an intersection improves safety by clearing sight lines between pedestrian and motorists.

Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Opportunity	High

High-Visibility Crosswalk

LRSM ID S18

GLOBAL



CRF 25%

Crash Type

A **High-Visibility Crosswalk** has a striped pattern with markings made of high-visibility material, such as thermoplastic tape, instead of paint. A high-visibility crosswalk improves safety with a clearly marked pedestrian crossing so motorists exercise caution and yield to pedestrians.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	High

Signing & Striping

LRSM Countermeasure

LED-Enhanced Sign

LRSM ID NS8

SYSTEMIC



CRF 15%

Crash Type

An **LED-Enhanced Sign** has LED lights embedded in the sign to outline the sign itself or the words and symbols on the sign. The LEDs may be set to flash or operate in a steady mode. An LED-enhanced sign improves safety by improving the visibility of signs at locations with visibility limitations or with a documented history of drivers failing to see or obey the sign (e.g. at STOP signs).

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Rectangular Rapid Flashing Beacon

LRSM ID NS22

LOCATION-SPECIFIC



CRF 35%

Crash Type

A **Rectangular Rapid Flashing Beacon (RRFB)** is a pedestrian-activated flashing light with additional signage to alert motorists of a pedestrian crossing. A RRFB improves safety by increasing the visibility of marked crosswalks and provides motorists a cue to slow down and yield to pedestrians.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	Medium

Speed Feedback Sign

LRSM ID R26

LOCATION-SPECIFIC



CRF 30%

Crash Type

A **Speed Feedback Sign** notifies drivers of their current speed, usually followed by a reminder of the posted speed limits. A speed feedback sign improves safety by providing a cue for drivers to check their speed and slow down, if necessary.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	High

Upgrade Signs with Fluorescent Sheeting

LRSM ID R22

SYSTEMIC



CRF 15%

Crash Type

Upgrading Signs with Fluorescent Sheeting replaces existing signs with new signs that can clearly display warnings by reflecting headlamp light back to vehicles. Upgrading signs with fluorescent sheeting improves safety by increasing visibility of signs to drivers at night.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Signing & Striping

LRSM Countermeasure

Upgrade to Larger Warning Signs

LRSM ID NS6

LOCATION-SPECIFIC



CRF 15%

Crash Type

Upgrading to Larger Warning Signs replaces existing signs with physically larger signs with larger warning information. Upgrading to larger warning signs improves safety by increasing visibility of the information provided, particularly for older drivers.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High

Yield to Pedestrian Sign

LRSM ID NS6

SYSTEMIC



CRF 15%

Crash Type

The **"Yield to Pedestrians" Sign** alerts drivers about the potential presence of pedestrians. The "Yield to Pedestrians" sign improves safety by providing motorists with advance notice to slow down for an upcoming crosswalk and yield to pedestrians if they are crossing the roadway.

Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Opportunity	Very High



Yield to Pedestrian Sign with High Visibility Crosswalks, Advance Yield Markings, and Fluorescent Pedestrian Signs

Other Enhancements

LRSM Countermeasure

Add Lighting

LRSM ID S2 NS1

GLOBAL



CRF 40%

Crash Type NIGHT

Lighting is added at an intersection or along roadways. Adding intersection and/or pedestrian-scale lighting at intersections and along roadways improves safety by increasing the visibility of all road users.

Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Opportunity	Medium

Back-In Angled Parking

LOCATION-SPECIFIC



Back-In Angled Parking requires motorists to back into an angled on-street parking spot and to drive forward when exiting a parking spot. Back-in angled parking improves safety by increasing visibility of passing vehicles and bicycles while exiting a spot, particularly if large adjacent vehicles obstruct sight, and allows trunk unloading to happen on the curb instead of in the street.



Back-In Angled Parking with Bike Lanes

Other Enhancements

LRSM Countermeasure

Bike Lanes

LRSM ID R32/R33

SYSTEMIC



CRF 35%/45%

Crash Type

A **Bike Lane** provides dedicated street space, typically adjacent to outer vehicle travel lanes, with designated lane markings, pavement legends, and signage. Bike lanes improve safety by reducing conflicts between bicycles and vehicles on the road and by creating a road-narrowing effect with buffers or vertical barriers, which may reduce vehicle speeds.

Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Opportunity	High

Improve Sight Distance

LRSM ID NS11

SYSTEMIC



CRF 20%

Crash Type

Improving Sight Distance removes objects, such as parked vehicles or overgrown trees, that may prevent drivers and pedestrians from being able to clearly see oncoming and cross traffic. Improving sight distance improves safety by increasing all road users' awareness of their surroundings and time to react to changes in the road, such as intersections and midblock crosswalks.

Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Opportunity	High

Upgrade Lighting to LED

GLOBAL



Upgrading Lighting to LED replaces high-pressure sodium light bulbs with LED light bulbs in street lights. Upgrading lighting to LED improves safety by increasing the visibility of pedestrians in crosswalks through greater color contrast and larger areas of light distribution.

Policy and Program Countermeasures

Changing roadway user behavior is an integral part of promoting safer streets. Streets are safest when a variety of approaches are used to shift user behavior. Caltrans' guidance on Local Road Safety Plans identifies four E's: Engineering, Education, Enforcement, and Emergency Services. While the majority of the SSAR focuses on engineering countermeasures, the other three E's are discussed as policy and program examples on the following pages.

From Top to Bottom
PedPDX, Let's Bike Oakland & Los Angeles Vision Zero DICE







Education

Traffic safety education plays an important role in shaping and shifting behavior. Many cities, such as Seattle, Oakland, and Los Angeles, are including community engagement and education to make streets safer for all. Education on traffic safety requires a collaborative process among many stakeholders to achieve the goal of increased safety. Targeted education can be directed at vulnerable populations, with the help of local partners, and at certain behaviors of drivers, pedestrian, and bicyclists to deter specific collision types.

CASE STUDIES

PORTLAND, OREGON

The Portland Bureau of Transportation (PBOT) released PedPDX (2019), which is a pedestrian plan with recommendations for promoting walking and safety. The plan frames outreach and educational programs as complementary to infrastructure design as countermeasures to improve Portlanders' safety, especially for people who may be vulnerable while walking. PedPDX recommends collaborations with community partners, such as Parks and Recreation Centers and AARP to gather feedback from seniors and local schools to promote safety with youth.

OAKLAND, CALIFORNIA

The Oakland Department of Transportation (OakDOT) released Let's Bike Oakland (2019), which recommends providing residents with culturally-competent bike education programs that address the unique needs of low-income people and community members of color. The plan recommends collaborating with local community-based organizations (CBOs) that serve youth and people of color. Let's Bike Oakland highlights that marginalized groups, like women and gender non-conforming individuals, generally experience more harassment on the street and may feel hesitant to ride a bike. Men of color, especially black men, may also be more deterred from riding a bike because of disproportionate policing driven by racial profiling. The plan aims to address these concerns by partnering with nonprofits and supporting their ongoing programs to expand the bicycle network, promote physical activity, reduce the cost of owning a bicycle, and build trust between the City and different communities.

LOS ANGELES, CALIFORNIA

The Los Angeles Department of Transportation (LADOT) Vision Zero Division launched the Dignity-Infused Community Engagement (DICE) strategy in 2019, which aims to center community members in the Vision Zero planning process from the beginning and weave all perspectives and lived experiences into the technical planning process. The DICE approach includes collaboration with local community-based organizations (CBOs); the provision of childcare, transportation, interpretation, and food at all engagement events; and the development of unique, culturally relevant engagement approaches that weave in community identity and markers. Beyond promoting the initiative, the dignity-infused planning process is an expansive approach to community engagement that seeks to heal and atone for the negative impacts of systems and practices within Los Angeles as well as the broader field of transportation planning. Most recently, LADOT Vision Zero engaged residents for thirty-five continuous days on Avalon Boulevard in Los Angeles to gain community feedback on upcoming improvements on the corridor.

EDUCATION

ROAD USER EDUCATIONAL MATERIALS FOR NEW SAFETY COUNTERMEASURES

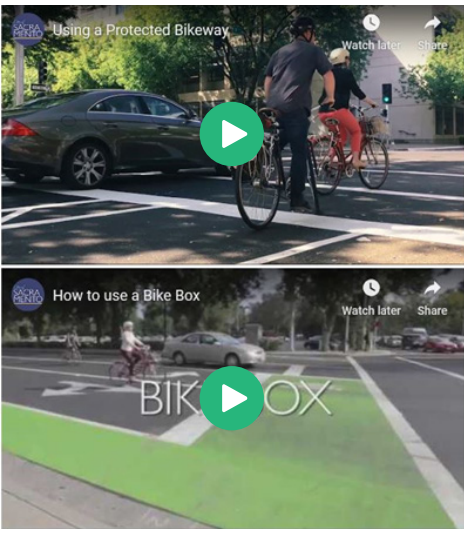
In addition to using educational programming for behavioral change, educational materials can be used to teach people how to use new safety countermeasures, such as a leading pedestrian interval (LPI) or roundabout. The following examples illustrate various approaches local agencies used to show people how to use a new safety countermeasure.

POP-UP INSTALLATIONS

As part of Bike to Work Day in 2019, LADOT used temporary pop-up installations to introduce safety improvements in specific neighborhoods. One pop-up was a redesign of Little Street in the Westlake/MacArthur Park neighborhood, to help families to more safely access an elementary school. Paint, signage, and cones were used to convert a two-way street into a one-way street and add a median and high-visibility crosswalk. Another pop-up was a roundabout at 4th Street & New Hampshire Avenue in Koreatown. Hay bales, straw wattles, and plants were used to test the roundabout design and educate drivers on how to use the traffic circle countermeasure. In addition to introducing safety improvements, pop-up installations can bring out emergency vehicles to ensure the vehicles can navigate around roundabouts or curb extensions.



LADOT Pop-Up Installation
All images: LA Streetsblog



DEMONSTRATION VIDEOS

The City of Sacramento has used demonstration videos to engage residents in bicycling safety procedures. The videos on their website feature a series of safety improvements such as protected bike lanes, bike boxes, and bike signals, and inform residents how to use these new roadway features, both as a bicyclist and a driver.

INFORMATIONAL SIGNS

The San Francisco Municipal Transportation Agency (SFMTA) posted signs with a brief explanation next to a newly installed protected bike lane in multiple languages as part of their Vision Zero SF initiative. This approach was also applied to educate people about pedestrian scrambles and bus bulb outs.

City of Sacramento Bicycle Education Videos
https://www.cityofsacramento.org/Public-Works/Transportation/Programs-and-Services/Bicycling-Program/Bicycle-Videos



SFMTA Vision Zero Informational Signs
Left Image: Jamison Wieser, Twitter
Bottom Image: Vision Zero SF, Twitter



EDUCATION CASE STUDY

Language Matters

Recent news stories about pedestrian and bicyclist deaths illustrate how issues with language pertaining to traffic violence persist in media and public discourse. The way deaths and injuries are described matters, and bias often comes into play. Researches from the University of South Florida and MacEwan University (Alberta, Canada) have recently found that media coverage of pedestrian and cyclist deaths consistently suggests substantial bias in several areas:

- **Use of passive voice** *("a pedestrian was hit by a car")*
- **Lack of agency for the motorist** *(accounts refer to the "vehicle," and not the "driver" as the actor in collision)*
- **Withholding the victim's identity**
- **Treating traffic deaths as unconnected incidents**
- **Victims implicitly blamed for their own deaths** (with a connection to the socioeconomic status of the victim), including language describing pedestrians "darting out" or bicyclists "swerving" into traffic, when those claims are refuted with video evidence

Responses from the public about traffic collisions have generally been influenced by media coverage. Safety advocates have highlighted the importance of journalists to include:

REPHRASING "TRAFFIC ACCIDENTS" TO "TRAFFIC COLLISION"

- The use of "accident" suggests that nothing could've been done to prevent the incident. Additionally, the use of the term causes a juxtaposition between public agencies like the LAPD who continue to use the term in media interviews, and LADOT's Vision Zero philosophy which states collisions are preventable.

DEGREE OF INTENTION

- Motorists driving above the speed limit is an intentional choice that largely contributes to the death of non-motorists (pedestrians and bicyclists involved in traffic collisions with cars).
- Historic neglect of infrastructure needs for vulnerable communities is often ignored.

SHIFTING AWAY FROM "WINDSHIELD JOURNALISM"

- Collision reporting is most often framed in terms of the impact to drivers and fails to address the dangers for Vulnerable Road Users (VRU).

TRAFFIC DEATHS ARE HEALTH EPIDEMICS

- Vulnerable Road Users (VRU) are disproportionately killed in traffic collisions, but leading factors and preventative measures are often left out of the discourse.

Since media coverage determines what and how issues are highlighted, being aware of these trends is important to identify context, framing, and blaming when reading about traffic deaths.

Additionally, individualized marketing campaigns to increase the awareness and practice of traffic safety could be targeted at the following populations who are over-represented in fatal and severe collisions:

Pedestrians

AGES **> 45**
especially those > 75

Bicyclists

AGES **40-59**

Drivers

AGES **20-39**

EDUCATION

Recommendations

The following recommendations center on implementing context and community-driven engagement and educational programming and materials to improve roadway safety for all people.

CULTURALLY RELEVANT ENGAGEMENT

Community engagement is not a one-size-fits-all model as different communities have different needs. By developing culturally relevant engagement strategies, all participants are invited into conversations about safety. Culturally relevant engagement strategies and meeting people where they are can help education and programming around traffic safety reach a larger audience and be more impactful. For example, including cultural markers of a local community, such as contracting with popular local food vendors to cater engagement activities, can be a creative and welcoming way of engaging residents. Meeting people where they are, such as having a pop-up to gather input on safety issues at local parks can more effectively engage parents and children rather than expecting families to attend a meeting at a government building.

PARTNER WITH COMMUNITY EXPERTS

Local partners can serve as community liaisons between the City and the public. Working with community partners and public institutions, such as the Montclair Public Library or Montclair Community Foundation, that have relationships with residents strengthens the engagement process by building trust and engaging an established base of stakeholders. Hiring City staff that reflect the diversity of communities being served is important when building these partnerships and may foster more trust between the agency and community members. Local partners can help tailor the engagement process or help incorporate engagement into existing programs and resources to more effectively educate people about roadway safety.

MEASURE AND EVALUATE

Conduct pre- and post- surveys with community members to measure how their actions and views have shifted after engagement around traffic safety. Local partners can be tasked with disseminating the pre- and post-surveys to residents. Surveys should evaluate whether respondents express a shift in behavior after having participated in traffic safety programming. The metrics for evaluation can also be developed in partnership with local partners to ensure accessibility for the public.

PUBLIC EDUCATION MEDIA CAMPAIGN

A public education media campaign focused on discouraging drinking and driving and encouraging increased awareness of pedestrians and bicyclists at night can help promote behavior change. Messages about safe and responsible driving, awareness of bicyclists and pedestrians, and increasing visibility at night can help promote behaviors that prevent fatal and severe collisions. As an example, collaborating with local radio stations can help spread the message to drivers.

PARTNER WITH TAXIS/ TRANSPORTATION NETWORK COMPANIES (TNCS) TO REDUCE DRINKING AND DRIVING

A collaboration between the City and taxis/TNCs (e.g. Lyft or Uber) to eliminate drinking and driving can help promote safety on the road and prevent fatal and severe collisions. Public education ads can be targeted in TNC phone apps and as promotions inside taxis.

PARTNER WITH LOCAL SCHOOLS ON TRAFFIC SAFETY

Local schools can be partners in promoting safe driver behavior during school pick-up and drop offs. Education campaigns can involve students promoting safer driving to their parents, such as holding signs during pick-up and drop offs that encourage safer driving. Educational campaigns that involve both students and parents can be more impactful as they involve parents, who are actually driving, and students, who may not only remind their parents but also retain safe driving behavior if they eventually drive.

Enforcement

Enforcement of traffic laws is a common strategy to increase street safety, but historical enforcement techniques and strategies have raised concerns about racial profiling, police violence, and the impacts of policing on communities of color. Research shows that people of color are more likely to be stopped by the police for traffic violations and more likely to be searched. In addition, low-income communities and communities of color are disproportionately burdened by traffic-related injuries and fatalities. To ensure that efforts to improve safety recognize that all people have the right to move about their communities safely, cities have shifted to equity-based strategies that target specific reckless behaviors that pose the highest safety risk. The following case studies show how cities are more equitably enforcing traffic laws.

CASE STUDIES

PORTLAND, OREGON

Portland's Vision Zero Action Plan was guided by the Vision Zero Task Force, which had representation from government agencies and community stakeholders from diverse communities. The task force had early discussions around equity, which shaped their guiding principles to be equitable, data-driven and accountable. The Vision Zero plan explicitly states that "enforcement actions are limited in order to reduce the possibility of racial profiling and disparate economic impacts." In addition, since nearly half of the thirty-four people who died on Portland streets in 2018 were pedestrians, the plan focuses enforcement on reducing speeding by lowering speed limits and enforcing the new speed limits. Portland's Vision Zero Action Plan tries to take a more equitable approach to enforcement by focusing enforcement on specific violations, such as speeding, rather than vaguely targeting unsafe or dangerous behavior.

CHICAGO, ILLINOIS

In 2017, Chicago released its two-year Vision Zero Action Plan. The plan approaches equitable enforcement through the establishment of a citywide policy to "police traffic fairly, focusing on educational and the dangerous driving behaviors that cause most severe collisions." The plan notes that increased citations are not an indicator of success and commits to prioritizing education over fines by working with Cook County Courts to minimize the excessive burden that fines have on low-income individuals. The plan identifies speed as a major factor in fatal collisions and aims for the City to collaborate with communities to determine ways to prevent speeding. The report further outlines roles for each agency, such as stating that the role of the Chicago Police Department is to "educate Chicagoans on safe driving and traffic laws to prevent dangerous behaviors that lead to death and injury from traffic collisions."

NEW YORK, NEW YORK

The New York City Council passed the Reckless Driver Accountability Act (RDAA) in 2020 to target enforcement on people with a history of dangerous driving behavior. The RDAA establishes a three-year program that will require drivers with five red light violations or 15 school speed zone violations within a one-year period to take a free, in-person safe driving course, offered through the New York City Department of Transportation (NYCDOT). If the drivers don't complete the driving course, then the City will impound their vehicles. This program is projected to cover approximately 5,000 drivers, which represents 0.25 percent of drivers in New York City. The RDAA take a restorative justice approach by combining enforcement and education to identify the people who are posing the biggest threat on the roadway and giving them an opportunity to change their behavior.

ENFORCEMENT

Driving Under the Influence

In addition to speeding, driving under the influence is another major factor in fatal and severe collisions that is most effectively addressed through education and enforcement. Three types of policy instruments have been used to reduce rates of driving under the influence: deterrence, prevention, and limited access. Each method works most effectively when implemented in tandem with each other.

Deterrence policies focus on raising the actual and perceived risk of detection of driving under the influence. These policies should be highly visible to increase awareness of the risks of driving under the influence.

- Sobriety, or DUI, checkpoints are often used around areas with a concentration of bars and during key events, such as Super Bowl Sunday, St. Patrick's Day, and Independence Day. While sobriety checkpoints are a common enforcement strategy, this strategy raises equity concerns as the checkpoints have historically been disproportionately placed in lower income communities and communities of color.
- Ignition interlocks require previous DUI offenders to use a breathalyzer in order to start their cars.
- Lower the legal Blood Alcohol Concentration (BAC) level for risky drivers, such as people who drive commercial or heavy vehicles and young and new drivers, to below the legal limit or to zero.

Prevention & education policies focus on mobilizing and educating the community through groups like Students Against Destructive Decisions (SADD) and Mothers Against Drunk Driving (MADD). Montclair can form coalitions within the community, such as across schools and youth programs, to disseminate information concerning the dangers of driving under the influence. Furthermore, spreading correct data on the social norms surrounding safe driving can dispel held beliefs that driving under the influence is "normal" within the community.

Limited access policies focus on making underage access to alcohol and drugs more difficult and limiting excessive alcohol consumption.

- Training programs for retailers to recognize underage alcohol purchasing and random/frequent compliance checks encourage alcohol retailers to be more vigilant against illegal alcohol purchases.
- The following policies may decrease general alcohol consumption: rezoning retail to lower the density of alcohol distributers; taxing alcohol to increase the overall price of purchasing alcohol; reducing the type of establishments that can sell alcohol (e.g. excluding grocery stores); and reducing the hours when alcohol can be sold.
- Server intervention programs can train servers (e.g. bar, restaurant, arena, etc.) to recognize underage or intoxicated patrons and respond by slowing or curtailing service and discouraging the intoxicated patrons from driving.

Tailored recovery programs focus on providing DUI offenders, especially repeat DUI offenders, more effective support and rehabilitation programs as research by the California Department of Motor Vehicles found jail or community service and fines are not effective at discouraging driving under the influence.

- Pharmaceutical treatment can help reduce the opioid response to alcohol that causes alcoholics to drink in excess.
- House arrest in lieu of jail is a cost-effective countermeasure as jail time has found to be ineffective and very costly. House arrest through electronic monitoring is significantly lower cost than jail and the offender can be required to cover the cost of electronic monitoring. House arrest can allow offenders to work during the daytime hours, which allows them to cover the costs of monitoring, and be required to stay at home at night, which is when most DUI offenses occur.
- Encouraging or requiring repeat offenders to join a support group can provide the support, accountability and resources needed to address excessive drinking.

ENFORCEMENT

Recommendations

The following recommendations center on implementing equitable and data-driven enforcement that targets the most risky behaviors for the most benefit to overall safety.

AUTOMATED ENFORCEMENT

Automated enforcement, such as red-light cameras or speed cameras, target the specific drivers who are behaving dangerously. A strictly data-driven approach to automated enforcement might place red-light or speed cameras in locations with the highest number of collisions. However, given that many low-income neighborhoods have historically received less infrastructure investments, which often results in a higher rate of collisions, a strictly data-driven approach would lead to a disproportionate burden of enforcement. Therefore, automated enforcement should be implemented evenly across a jurisdiction at problem locations. In addition, cities should pair automated enforcement with updated fine structures so that low-income communities don't bear a disproportionate burden of traffic fines.

UPDATED FINE STRUCTURES

Although traffic violation fines are intended to discourage people from driving recklessly, these fines have varying impacts on people depending on their financial resources. Updating fine structures to focus on encouraging people to drive more safely is a more effective strategy than just handing out fines that may have no behavioral effect for some drivers. For example, introducing a sliding scale for traffic fines based on a driver's income or giving first offenders the opportunity to take a safety class focuses enforcement on behavior change rather than simply handing out fines. This is supported by California Senate Bill 185, signed into law in 2017. This bill allows courts to reduce traffic fines based on income and establish personalized payment plans to ease the financial burden of citations.

UPDATED SPEED LIMITS

The California Zero Traffic Fatalities Task Force conducted a year-long study to assess the existing speed limit setting methodology in California. The Task Force found that the existing methodology, which sets speed limits as the 85th percentile of speed and traffic surveys, is not flexible enough to meet the needs of urban areas, and recommends the development of a new context-sensitive approach that sets speed limits to prioritize safety for all users. As a near-term action, the Task Force recommends allowing speed limits to be lowered below the 85th percentile for special areas, such as schools, business areas, and cities' High Injury Networks.



↗ **Lower Speed Limits in School Zones**
Tim Berger/Burbank Leader

Emergency Services

Traffic collision victims have a higher chance of survival the less time that passes between being in a collision and receiving medical care. In many cases, law enforcement officers and fire department staff are the first responders to arrive at a collision location. In addition to equipping all first responders with the appropriate training, improving response times for Emergency Medical Services will help improve collision victims' chances of survival. Strategies to improve response time include designing emergency vehicles to be highly visible (e.g. retroreflective striping and chevrons, high-visibility paint, and built-in passive light) and implementing emergency vehicle signal preemption, which allows emergency vehicles to break a normal signal cycle and proceed through an intersection. Lastly, emergency responders can use data collected on historical medical care in the City to improve care and use best practices.

The examples below illustrate how emergency vehicle visibility and emergency medical services were improved to increase roadway safety.

CASE STUDIES

UNITED KINGDOM

To improve the ability for drivers to recognize emergency vehicles from further distances during day and night, the United Kingdom implemented florescent and retroreflective colors in a Battenburg (checkered) pattern to emergency vehicle design. There are no national standards in the United States, but several law enforcement agencies, such as the Arizona Department of Public Safety, are applying retro-reflective treatments to their vehicles.

GEORGIA, UNITED STATES

A private ambulance service, Community Ambulance, recorded data of how emergency care providers responded to different patients and then used this data to better educate providers on how they could improve their practices.



Emergency Vehicles with Battenburg Patterns, United Kindgon
Wikimedia Commons

Emerging Technology

Recent advancements in transportation technology have not only introduced new transportation modes and travel patterns but have also presented opportunities to better understand travel behavior and encourage safe behavior. Artificial intelligence allows for more detailed data collection and the proliferation of autonomous vehicle (AV) usage. Detailed intersection data would allow Montclair to better understand how people are using the roadway and develop tailored countermeasures to improve safety. AVs have potential to reduce human error and improve street safety, but AVs also incur different challenges. AV technology is still developing, and there will be an adoption period where people will need time to grow accustomed to interacting with AVs. Cities will be faced with making decisions if AVs will be allowed to operate on local streets and will need to create policies and programs to respond to the proliferation of AVs.

The following examples show how local jurisdictions are implementing and responding to emerging technologies.

CASE STUDIES

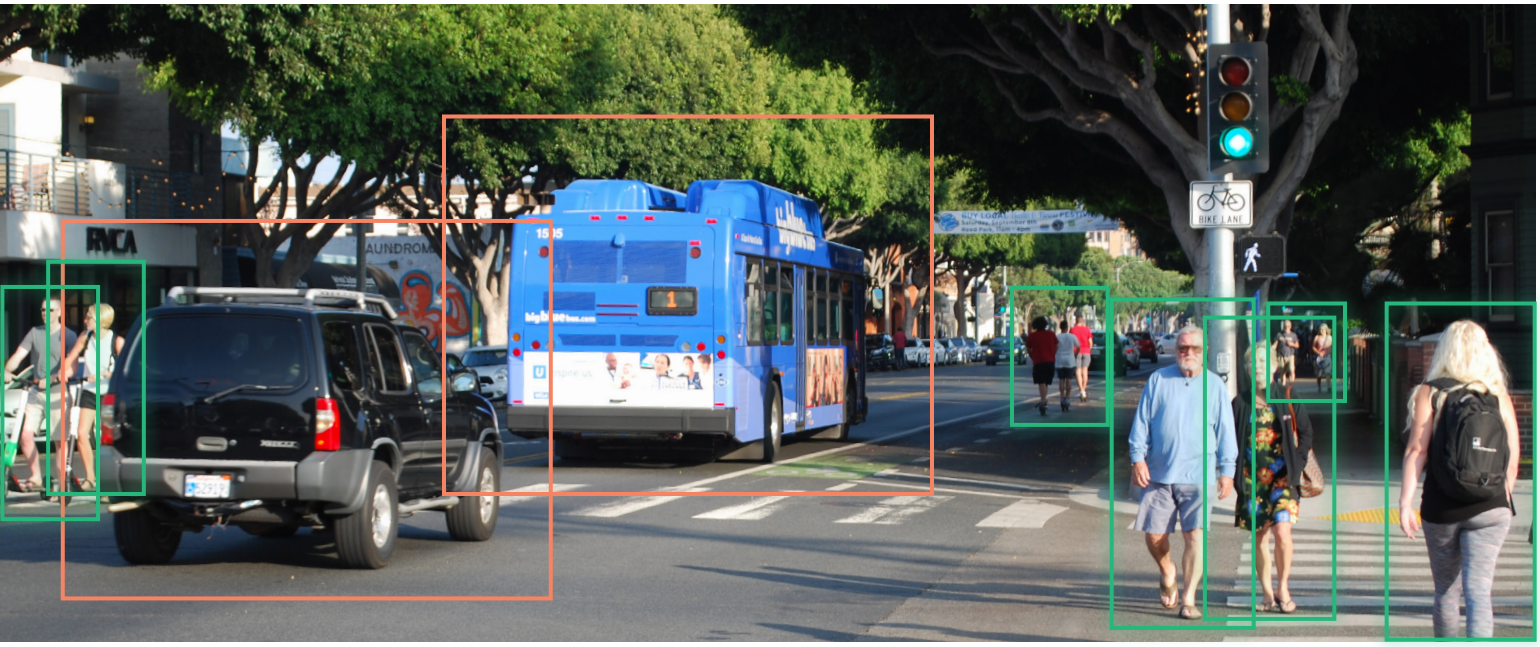
SANTA MONICA, CALIFORNIA

The City of Santa Monica hired Brisk Synergies, which is a data provider that uses artificial intelligence/computer vision to analyze video recordings and detect near misses at intersections. The video analysis identifies conflicting movements at an intersection, which informs the selection of the riskiest interactions. These statistics can then be used to identify context-specific engineering and policy interventions.

LAS VEGAS, NEVADA

The City of Las Vegas has limited transit options in The Strip, which not only has many tourists but many employees who are trying to travel in the area. As a result, The Strip has a lot of congestion with vehicles in gridlock. The City created an innovation district in Downtown Las Vegas where they partnered with NAVYA (manufacturer) and Keolis (operator) to pilot an autonomous, fully electric shuttle as a potential transportation option. ■

Santa Monica, CA



10 priority location project recommendations are summarized in this chapter, showcasing key safety grant funding opportunities.

Chapter 5

Project Recommendations

Recommended Safety Projects

The following projects include location-specific recommendations and systemic recommendations, which can be applied at multiple locations with similar collision histories and contextual factors. These projects are intended to be implemented in the mid to long-term time frameEach project sheet summarizes the existing conditions and project recommendations for each location.

Each project summary includes project cost estimates, the expected project benefit, and the resulting benefit/cost (B/C) ratio, developed using the Cycle 9 HSIP Analyzer. The B/C ratio accounts for collision history, countermeasure crash reduction factors, project costs, and expected life of countermeasure. The B/C ratio is the primary basis for funding selection under the HSIP grant process. Per unit construction costs are based on the most recent available estimates for Southern California and include contingency (20 percent) and other soft cost assumptions. In some cases, though the cut-sheet data reflects intersection collision data, collisions along a full corridor were used to calculate the B/C ratio for projects such as road diets and bike facilities. Collisions classified as "property-damage only" were not part of the collision database for this report, and therefore have been conservatively estimated for the purposes of the B/C ratio calculation.

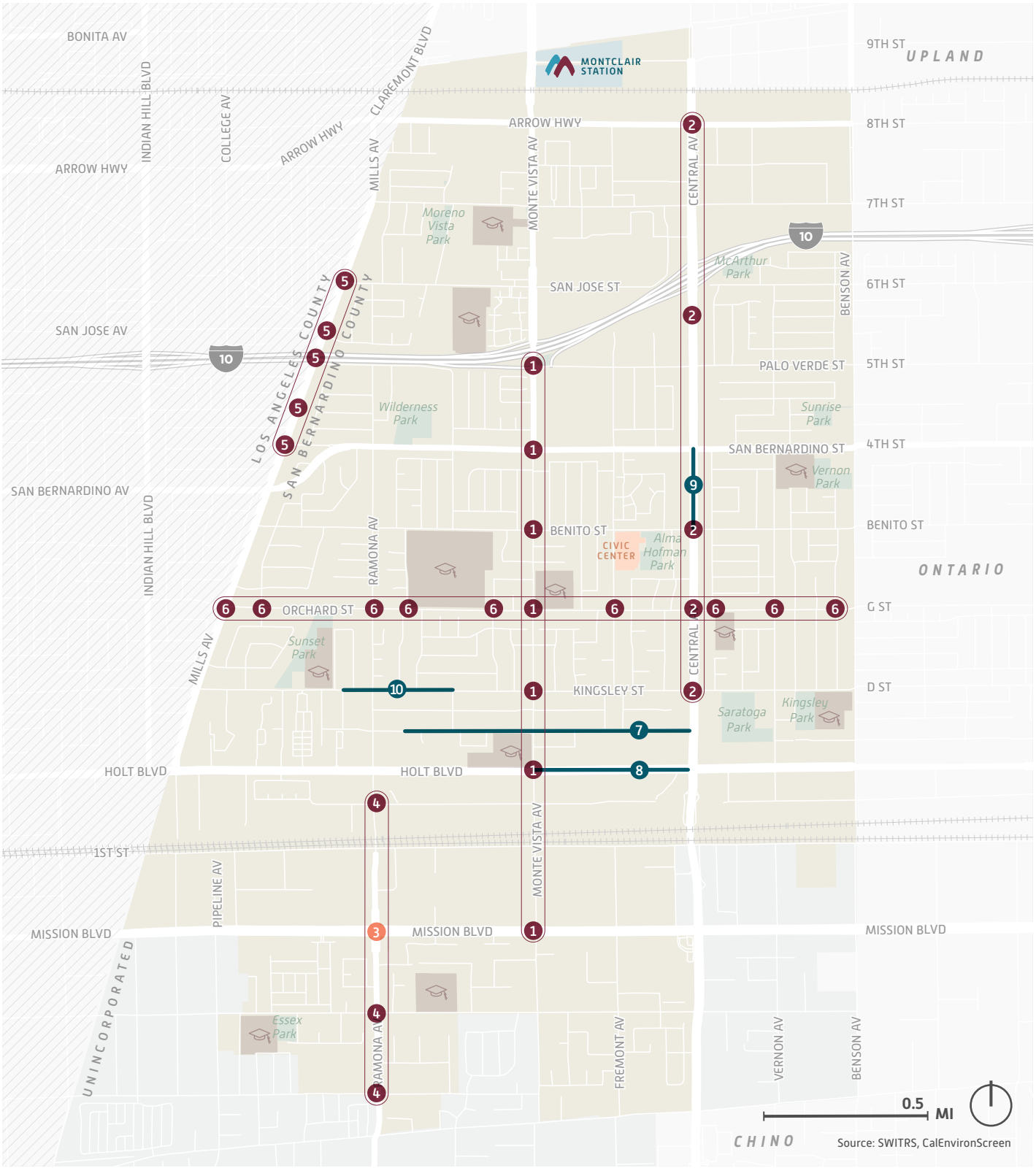
The City can use these project summaries in future grant funding applications. Information has been summarized here primarily for use in HSIP grant applications. However, some proposed projects may also compete well under the Active Transportation Program (ATP) grant funding process, and information, such as location within a Disadvantaged Community, has been provided to support future ATP efforts. The City may make project modifications in order to fulfill new ATP or HSIP grant guidelines, expected to be released later this year. Grant applications should be developed with the most recent collision and cost information available at the time of submission.

Priority Locations

These 10 priority locations were chosen to represent several different elements of the collision analysis:

- Locations with a history of severe and fatal collisions
- Locations that represent the five collision profiles
- Locations that reflect a variety of the roadway and land use contexts present throughout the City
- Locations with shared roadway characteristics and risk factors that are appropriate for systemic application of safety countermeasures

1. **Monte Vista Avenue Intersections with Permissive Lefts**
   Mission Boulevard, Holt Boulevard, Kingsley Street, Orchard Street, Benito Street, San Bernardino Street, and Palo Verde Street
2. **Central Avenue Intersections with Permissive Lefts**
   Kingsley Street, Orchard Street, Benito Street, Costco Driveway, and Arrow Highway
3. **Ramona Avenue & Mission Boulevard**
4. **Ramona Avenue Multi-Lane Stop-Controlled Intersections**
   Howard Street, Grand Avenue, and Brooks Street
5. **Mills Avenue Stop-Controlled and Offset Intersections**
   San Bernardino Court, East American Avenue, Palo Verde Street, Bonnie Brae Street, and San Jose Street
6. **Orchard Street Stop-Controlled Intersections**
   All-way: Mills Avenue, Ramona Avenue, Fremont Avenue, and Vernon Avenue.
   Side-street: Pradera Avenue, Camulos Avenue, Tudor Avenue, Rose Avenue, and Del Mar Avenue
7. **Bandera Street, between Ramona Avenue and Central Avenue**
   Bandera Street & Ramona Avenue, Bandera Street & Monte Vista Avenue, and Bandera Street & Central Avenue Intersections
8. **Holt Boulevard, East of Monte Vista Avenue to Central Avenue**
   Holt Boulevard & Central Avenue Intersection
9. **Central Avenue, North of Benito Street to San Bernardino Street**
   Central Avenue & San Bernardino Street Intersection
10. **Kingsley Street, between Amherst Avenue and Helena Avenue**
    Kingsley Street & Amherst Avenue, Kingsley Street & Ramona Avenue, and Kingsley Street & Helena Avenue Intersections

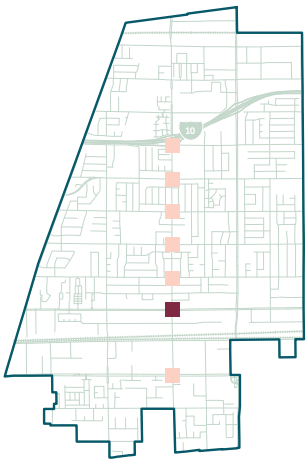


10 Priority Locations

Montclair SSAR

- SYSTEMIC LOCATIONS
- SPOT LOCATIONS
- SEGMENT LOCATIONS

1 Monte Vista Avenue Intersections with Permissive Lefts



SYSTEMIC

- Palo Verde
- San Bernardino
- Benito
- Orchard
- Kingsley
- **Holt**
- Mission

Notes

The recommendations shown on the facing page are representative of systemic countermeasures applied on Monte Vista Avenue from Mission Boulevard to Palo Verde Street.

LOCATION SUMMARY

Along Monte Vista Avenue, these seven intersections have several characteristics in common, including permissive left-turns on at least one approach, and a high number of broadside collisions. Each intersection would see signal upgrades to provide protected left-turns on all approaches and clearance timing changes to mitigate broadside collisions, as well as upgrading striping, ramps, and signal timing to improve pedestrian safety. Enhanced lighting will improve safety at night. A road diet is also proposed for Monte Vista, to discourage vehicle speeding and provide space for safe bicycle travel (full extents to be determined through General Plan Update).

EXISTING CONDITIONS

Posted Speed Limit

45 MPH (MONTE VISTA)

Average Daily Traffic

13,600 (MONTE VISTA)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

CORRIDOR COLLISION CHARACTERISTICS

Collision Type

Profile 1 **60 Collisions**

Behavioral Factors

- **Drivers and bicyclists**
- **Broadside collision type**

Contextual Factors

- **Signalized intersection**
- **Signals with permissive left turn**

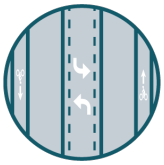
115 TOTAL COLLISIONS

1 KSI COLLISIONS

6 PEDESTRIAN COLLISIONS

7 BICYCLE COLLISIONS

CORRIDOR-SPECIFIC COUNTERMEASURES

TYPE	Protected Left Turn Phase	Extend Yellow and All Red Time	Road Diet
			
ADDRESSES	Broadside Collisions	Broadside Collisions	Speeding

GLOBAL COUNTERMEASURES

- ✓ ADA - Compliant Curb Access Ramp
- ✓ Advance Stop Bar
- ✓ High-Visibility Crosswalk
- ✓ Lighting
- Upgrade Lighting to LED
- Pedestrian Countdown

✓ Denotes countermeasures applicable at this location

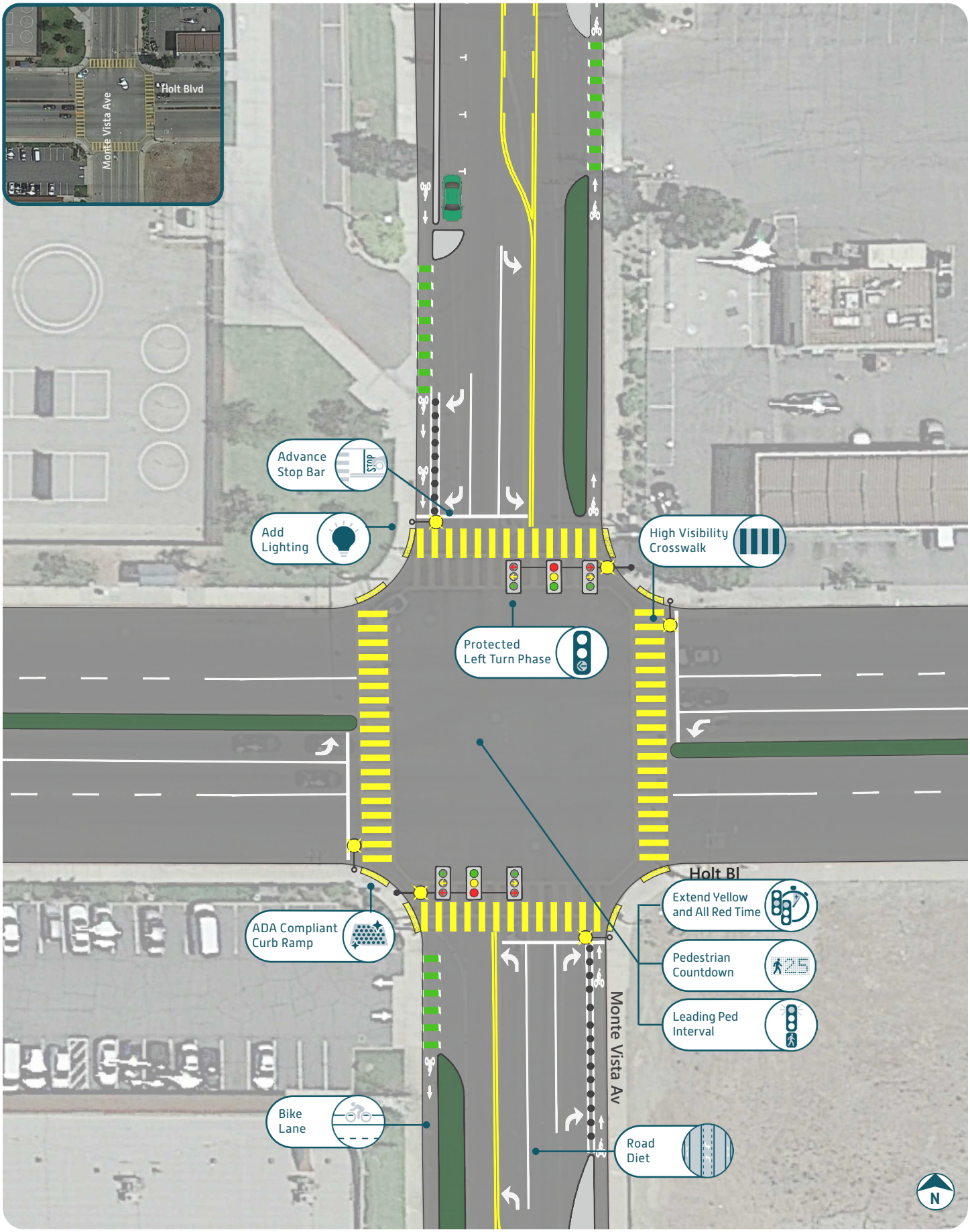
PLANNING-LEVEL COST ESTIMATE

Signal Modification for Protected Left-Turns	$2,850,000
Road Diet with Class IV Bicycle Facility	$937,500
New Street Lights	$280,000
Upgraded Curb Ramps	$196,000
High-Visibility Crosswalks	$88,200
Other Safety Improvements	$46,900
Contingency and Non-construction Costs	$3,914,884
TOTAL COST	**$8,313,500**

BENEFITS $40,616,572

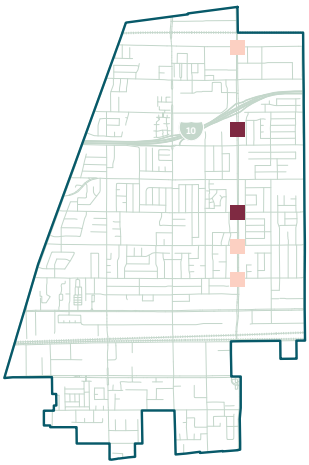
B/C RATIO 4.9

SAMPLE LOCATION: MONTE VISTA AVE & HOLT AVE



Conceptual, not for construction. Detailed analysis and engineering design required.

2 Central Avenue Intersections with Permissive Lefts



SYSTEMIC

- Arrow Hwy
- **Costco Dwy**
- **Benito**
- Orchard
- Kingsley

Notes

The recommendations shown on the facing page are representative of systemic countermeasures applied on Central Avenue from Kingsley Street to Arrow Highway.

LOCATION SUMMARY

Along Central Avenue, these six intersections have permissive left-turns on at least one approach, and a high number of broadside collisions and pedestrian collisions. Each intersection would see signal upgrades to provide protected left-turns on all approaches and clearance timing changes to mitigate broadside collisions, as well as upgrading striping, ramps, and signal timing to improve pedestrian safety. Enhanced lighting will improve safety at night. A road diet is also proposed for Central, to discourage vehicle speeding and provide space for safe bicycle travel (full extents to be determined through General Plan Update). Unique improvements to the Costco driveway location are shown on the facing page, and would include extending the green time for southbound vehicles at Palo Verde, to avoid heavy vehicle queuing.

EXISTING CONDITIONS

Posted Speed Limit

40/35 MPH (CENTRAL/BENITO)

Average Daily Traffic

34,000/6,200 (CENTRAL/BENITO)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

CORRIDOR COLLISION CHARACTERISTICS

Collision Type

Profile 1 **44 Collisions**

Behavioral Factors

- **Drivers and bicyclists**
- **Broadside collision type**

Contextual Factors

- **Signalized intersection**
- **Signals with permissive left turn**

116 TOTAL COLLISIONS

3 KSI COLLISIONS

8 PEDESTRIAN COLLISIONS

9 BICYCLE COLLISIONS

CORRIDOR-SPECIFIC COUNTERMEASURES

TYPE	Protected Left Turn Phase	Leading Pedestrian Interval	Bike Lanes
			
ADDRESSES	Broadside Collisions	Multimodal Travel Visibility	Multimodal Travel

GLOBAL COUNTERMEASURES

- ADA - Compliant Curb Access Ramp
- Advance Stop Bar
- High-Visibility Crosswalk
- Lighting
- Upgrade Lighting to LED
- Pedestrian Countdown

Denotes countermeasures applicable at this location

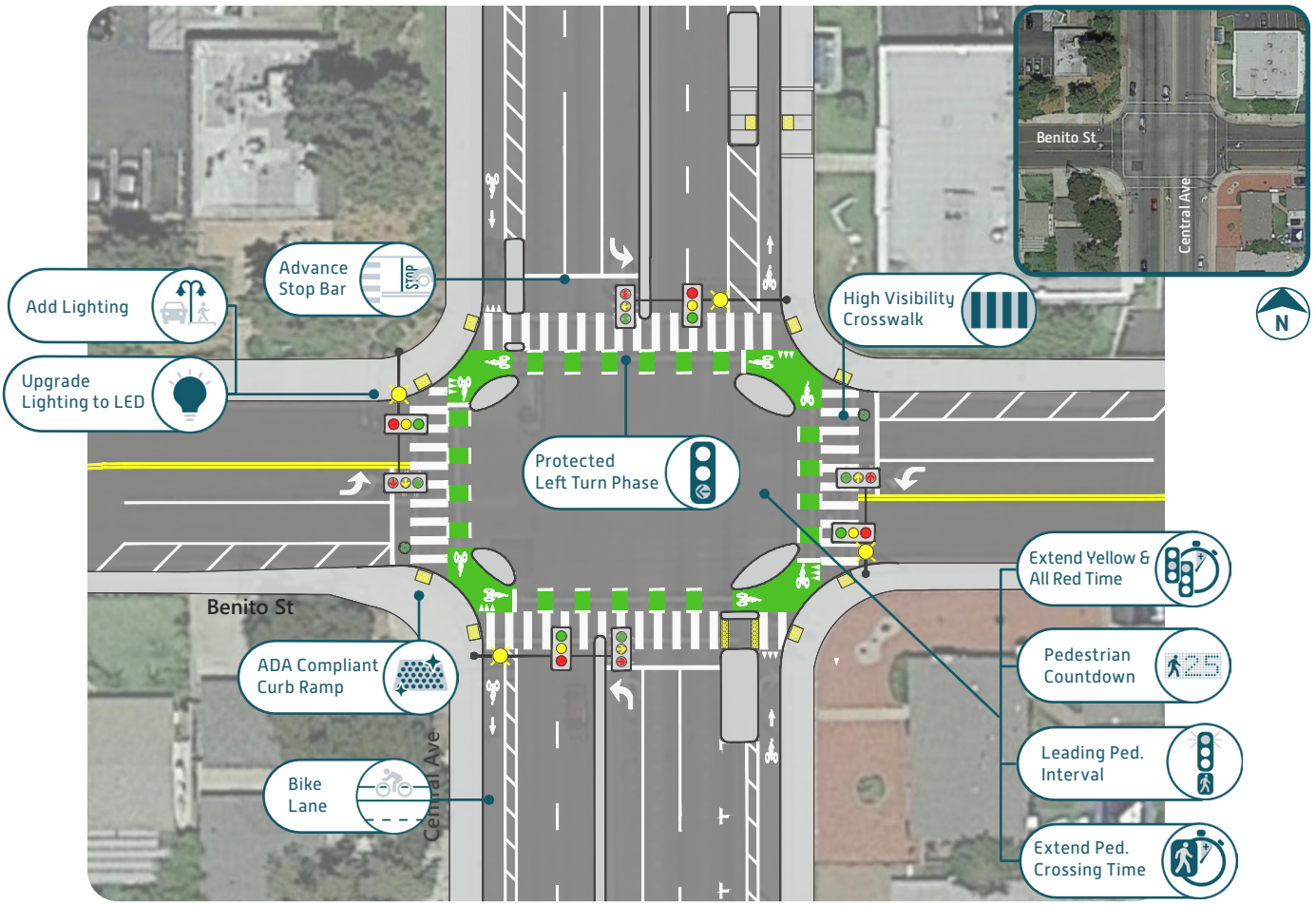
PLANNING-LEVEL COST ESTIMATE

Signal Modification for Protected Left-Turns	$1,110,000
Road Diet with Class IV Bicycle Facility	$1,875,000
New Street Lights	$100,000
Upgraded Curb Ramps	$140,000
Protected Intersection Medians	$108,000
Other Safety Improvements	$105,400
Contingency and Non-construction Costs	$3,060,396
TOTAL COST	**$6,498,800**

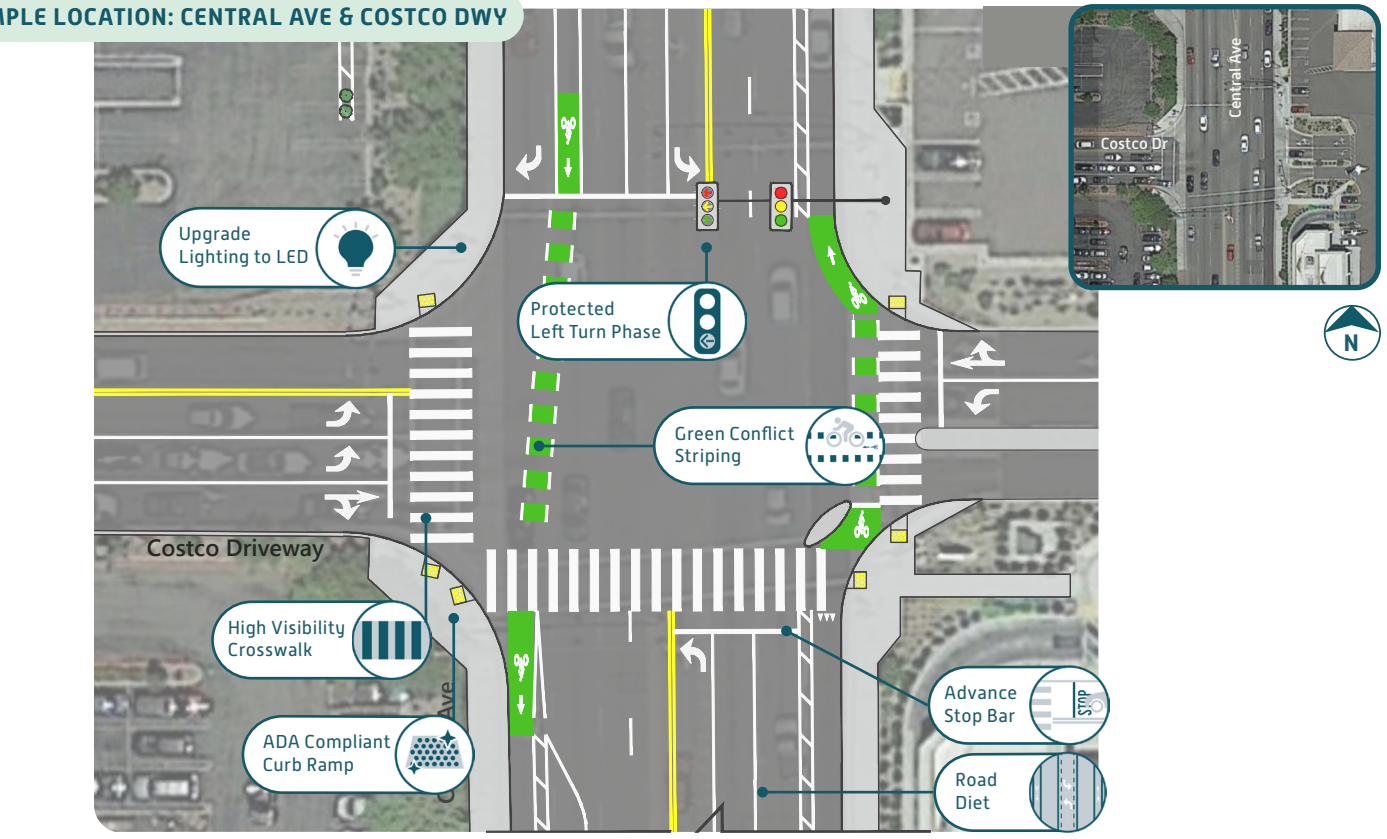
BENEFITS **$47,598,673**

B/C RATIO **7.3**

SAMPLE LOCATION: CENTRAL AVE & BENITO ST

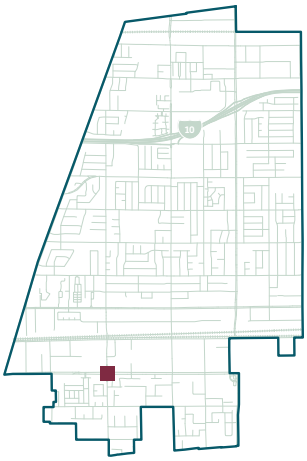


SAMPLE LOCATION: CENTRAL AVE & COSTCO DWY



Conceptual, not for construction. Detailed analysis and engineering design required.

3 Ramona Avenue and Mission Boulevard



INTERSECTION

LOCATION SUMMARY

Aside from Monte Vista & State, where safety improvements are currently under construction, this intersection has the highest number of collisions in the City. This intersection would see signal upgrades to provide protected left-turns on all approaches and clearance timing changes to mitigate broadside collisions, as well as upgrading striping, ramps, and signal timing to improve pedestrian safety. Enhanced lighting will improve safety at night. A road diet is also proposed for Mission, to discourage vehicle speeding and provide space for safe bicycle travel (full extents to be determined through General Plan Update).

EXISTING CONDITIONS

Posted Speed Limit

40 MPH (RAMONA)

Average Daily Traffic

17,100 (RAMONA)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

COLLISION CHARACTERISTICS

Collision Type

Profile 1 | 13 Collisions

Behavioral Factors

- Drivers and bicyclists
- Broadside collision type

Contextual Factors

- Signalized intersection
- Signals with permissive left turn

34 TOTAL COLLISIONS

1 KSI COLLISIONS

1 PEDESTRIAN COLLISIONS

1 BICYCLE COLLISIONS

LOCATION-SPECIFIC COUNTERMEASURES

TYPE	Protected Left Turn Phase	Bike Lane	Extend Yellow and All Red Time
			
ADDRESSES	Broadside Collisions	Multimodal Travel	Broadside Collisions

GLOBAL COUNTERMEASURES

- ADA - Compliant Curb Access Ramp
- Advance Stop Bar
- High-Visibility Crosswalk
- Lighting
- Upgrade Lighting to LED
- Pedestrian Countdown

Denotes countermeasures applicable at this location

PLANNING-LEVEL COST ESTIMATE

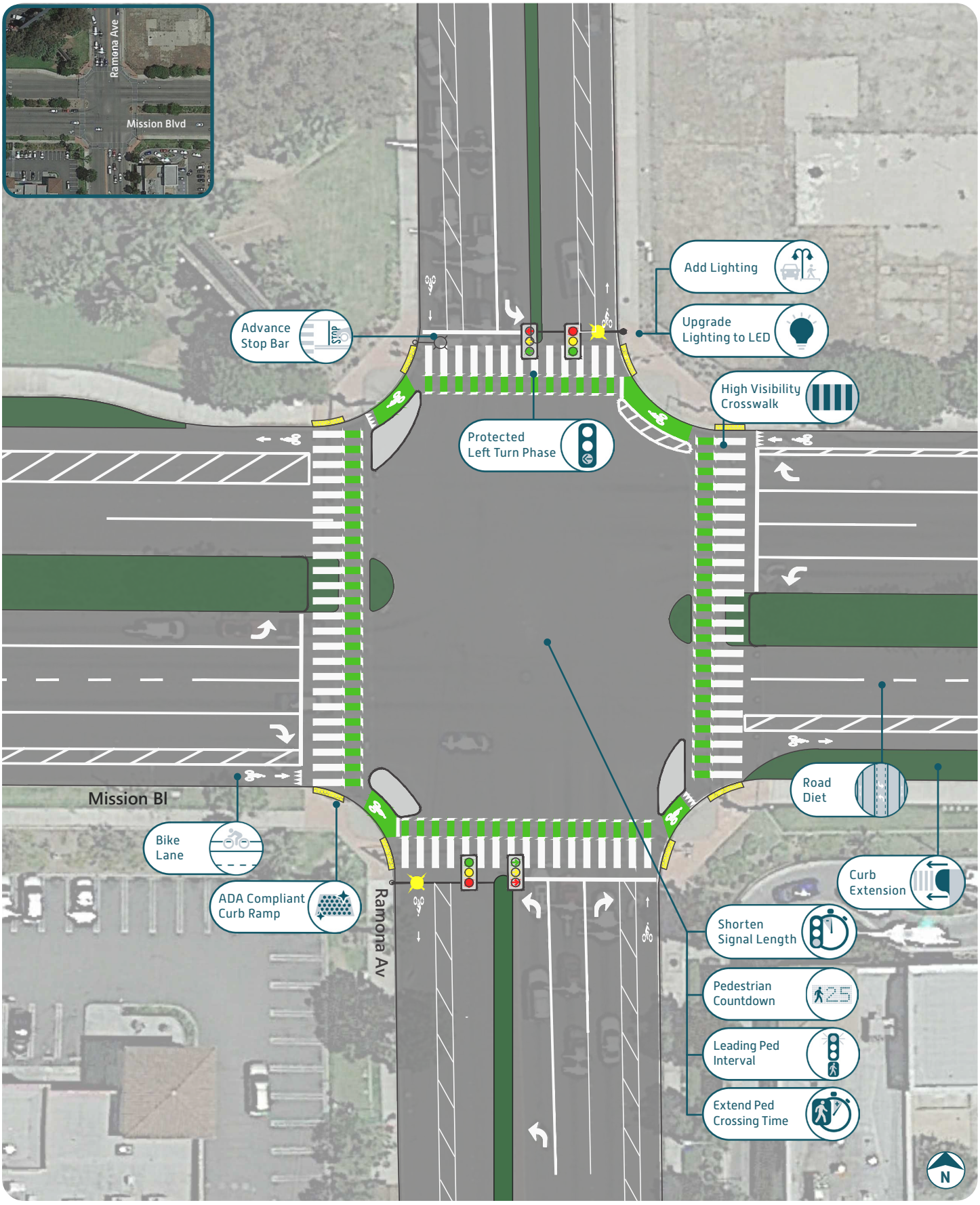
Signal Modification for Protected Left-Turns	$300,000
Upgraded Curb Ramps	$28,000
New Street Lights	$20,000
Protected Intersection Medians	$16,200
Other Safety Improvements	$23,700
Contingency and Non-construction Costs	$345,276
TOTAL COST	**$733,200**

Note: The Mission Boulevard and Ramona Avenue road diets and bike facilities are not included in this cost estimate.

BENEFITS $7,562,465

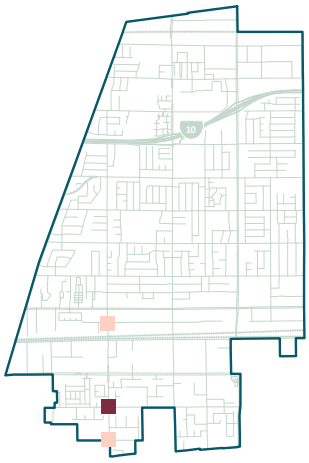
B/C RATIO 10.3

RAMONA AVE & MISSION BLVD



Conceptual, not for construction. Detailed analysis and engineering design required.

4 Ramona Avenue Multi-Lane Stop-Controlled Intersections



SYSTEMIC

- Brooks
- **Howard**
- Grand

Notes

The recommendations shown on the facing page are representative of systemic countermeasures applied on Ramona Avenue at Brooks, Howard and Grand. This location was requested for review by the City and was analyzed for a signal warrant.

LOCATION SUMMARY

These three intersections along Ramona Avenue see a high number of collisions at multi-lane stop-controlled approaches, where drivers' stop sign compliance may be lower due to visibility or roadway width issues. Single-lane roundabouts are proposed at each of the three intersections to help mitigate these issues. A road diet is proposed along Ramona Avenue between Phillips Boulevard and Holt Boulevard, to discourage vehicle speeding and provide space for safe bicycle travel.

EXISTING CONDITIONS

Posted Speed Limit

40 MPH (RAMONA)

Average Daily Traffic

17,100 (RAMONA)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

CORRIDOR COLLISION CHARACTERISTICS

Collision Type

Profile 2 **8 Collisions**

Behavioral Factors

- **Drivers and bicyclists**
- **Broadside collision type**

Contextual Factors

- **Stop-Controlled intersection**
- **2+ lanes on at least one approach**

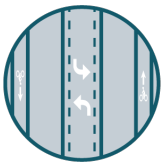
22 TOTAL COLLISIONS

1 KSI COLLISIONS

3 PEDESTRIAN COLLISIONS

2 BICYCLE COLLISIONS

CORRIDOR-SPECIFIC COUNTERMEASURES

TYPE	Road Diet	Roundabout	Bike Lane
			
ADDRESSES	Speeding	Speeding Broadside Collisions	Visibility, Speeding

GLOBAL COUNTERMEASURES

- ✓ ADA - Compliant Curb Access Ramp
- ✓ Advance Stop Bar
- ✓ High-Visibility Crosswalk
- ✓ Lighting
- ✓ Upgrade Lighting to LED
- Pedestrian Countdown

✓ Denotes countermeasures applicable at this location

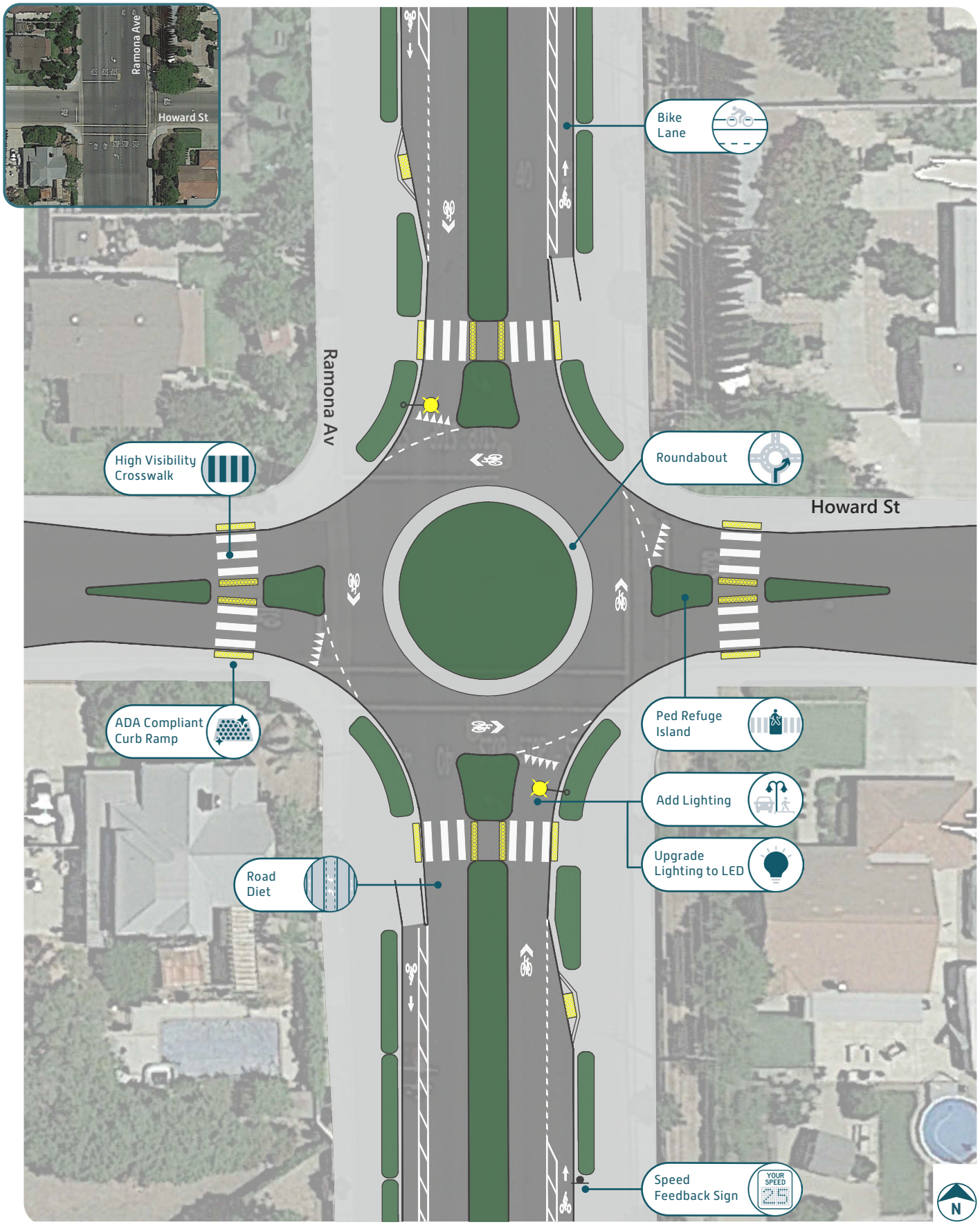
PLANNING-LEVEL COST ESTIMATE

Roundabouts	$1,200,000
Widened Sidewalk	$522,000
Curb Ramps	$189,000
Road Diet with Buffered Bike Lane	$88,000
New Street Lights	$60,000
Other Safety Improvements	$15,600
Contingency and Non-construction Costs	$1,846,600
TOTAL COST	**$3,921,200**

BENEFITS **$28,470,201**

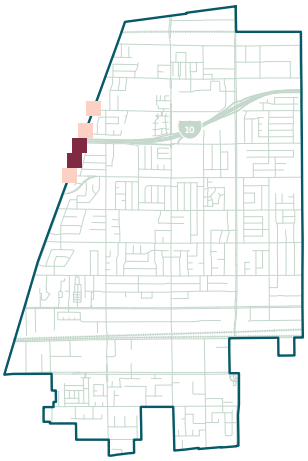
B/C RATIO **7.3**

SAMPLE LOCATION: RAMONA AVE & HOWARD ST



Conceptual, not for construction. Detailed analysis and engineering design required.

5 Mills Avenue Stop-Controlled & Offset Intersections



SYSTEMIC

- San Jose St
- Bonnie Brae
- **Palo Verde**
- **East American**
- San Bernardino Ct

Notes

The recommendations shown on the facing page are representative of systemic countermeasures applied on Mills Avenue from San Bernardino Court to San Jose Street.

LOCATION SUMMARY

A pattern of both broadside and bicycle collisions is present along Mills Avenue, particularly at stop-controlled offset and t-intersection locations. The addition of a painted buffer along the bicycle lane is proposed for the corridor. Additionally, the recommendations for all five intersections include green striping to denote bicycle conflict zones, high-visibility crosswalks across the side streets, and enhanced street lighting. Additional recommendations specific to East American Avenue and Palo Verde Street are shown on the facing page.

EXISTING CONDITIONS

Posted Speed Limit

40

Average Daily Traffic

NOT AVAILABLE

IN DISADVANTAGED COMMUNITY

CORRIDOR COLLISION CHARACTERISTICS

Collision Type

Profile 2 **5 Collisions**

Behavioral Factors

- **Drivers and bicyclists**
- **Broadside collision type**

Contextual Factors

- **Stop-Controlled intersection**
- **2+ lanes on at least one approach**

12 TOTAL COLLISIONS

2 KSI COLLISIONS

2 PEDESTRIAN COLLISIONS

4 BICYCLE COLLISIONS

CORRIDOR-SPECIFIC COUNTERMEASURES

TYPE	Curb Extension	Green Conflict Striping	Add Lighting
			
ADDRESSES	Speeding Visibility	Multimodal Travel Visibility	Visibility

GLOBAL COUNTERMEASURES

- ✓ ADA - Compliant Curb Access Ramp
- ✓ Advance Stop Bar
- High-Visibility Crosswalk
- ✓ Lighting
- ✓ Upgrade Lighting to LED
- Pedestrian Countdown

✓ Denotes countermeasures applicable at this location

PLANNING-LEVEL COST ESTIMATE

Add Buffer to Bike Lanes	$150,400
Curb Extensions	$81,000
New Sidewalk (for Existing Gap)	$67,500
New Street Lights	$50,000
New Curb Ramps	$35,000
Other Safety Improvements	$12,500
Contingency and Non-construction Costs	$353,100
TOTAL COST	**$749,500**

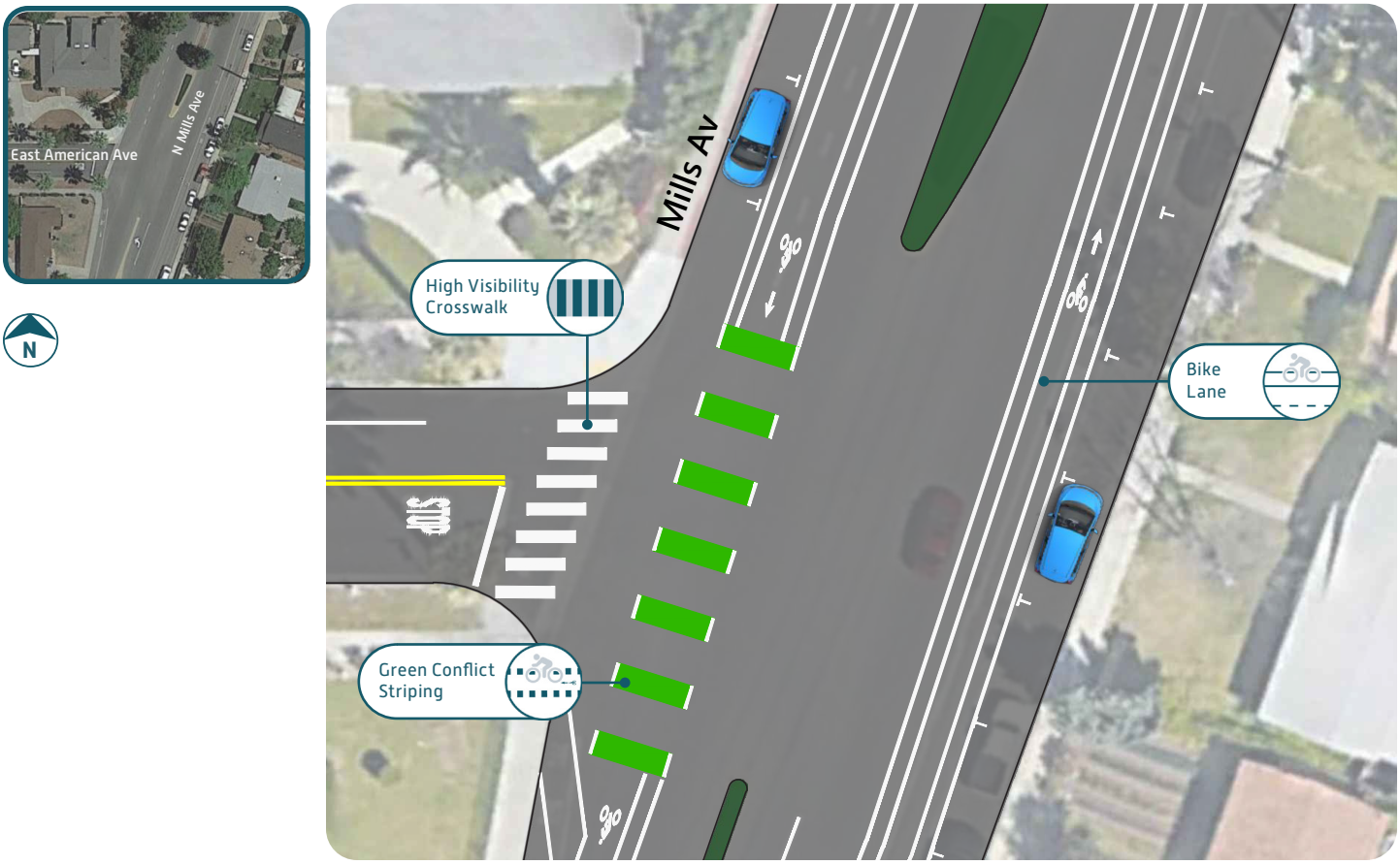
BENEFITS $12,471,870

B/C RATIO 16.6

SAMPLE LOCATION: MILLS AVE & PALO VERDE ST

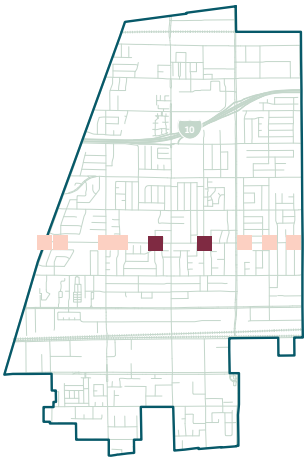


SAMPLE LOCATION: MILLS AVE & EAST AMERICAN AVE



Conceptual, not for construction. Detailed analysis and engineering design required.

6 Orchard Street Stop-Controlled Intersections



SYSTEMIC

All-way:
- Mills
- Ramona
- **Fremont**
- Vernon

Side Street:
- Pradera
- Camulos
- **Tudor**
- Rose
- Del Mar

Notes
The recommendations shown on the facing page are representative of systemic countermeasures applied on Orchard Street from Mills Avenue to Del Mar Avenue.

LOCATION SUMMARY

The trends along Orchard Street, which provides key connections to Montclair High School and Monte Vista Elementary School, highlight a history of biking and walking collisions, including a high number of fatal and severe incidents. As a road diet project has been implemented along Orchard Street, the recommendations at these nine intersections focus on opportunities for further safety enhancements. Examples of the proposed improvements at each all-way stop location (Fremont) and each two-way stop location (Tudor) are shown on the facing page.

EXISTING CONDITIONS

Posted Speed Limit

40 MPH (ORCHARD)

Average Daily Traffic

4,500 (ORCHARD)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

CORRIDOR COLLISION CHARACTERISTICS

Collision Type

Profile 2 & 4 | **11 & 6 Collisions**

Behavioral Factors
- **Drivers and bicyclists (Profile 2)**
- **Broadside collision type (Profile 2)**
- **Pedestrians**

Contextual Factors
- **Stop-Controlled intersection (Profile 2)**
- **2+ lanes on at least one approach (Profile 2)**
- **Near school crosswalks (Profile 4)**
- **AM peak period (Profile 4)**

24 TOTAL COLLISIONS

3 KSI COLLISIONS

7 PEDESTRIAN COLLISIONS

6 BICYCLE COLLISIONS

CORRIDOR-SPECIFIC COUNTERMEASURES

TYPE	Rectangular Rapid Flashing Beacon	Narrow Lanes	Curb Extension
			
ADDRESSES	Multimodal Travel Visibility	Speeding Broadside Collisions	Visibility, Speeding

GLOBAL COUNTERMEASURES

	ADA - Compliant Curb Access Ramp
✓	Advance Stop Bar
✓	High-Visibility Crosswalk
✓	Lighting
✓	Upgrade Lighting to LED
	Pedestrian Countdown

✓ Denotes countermeasures applicable at this location

PLANNING-LEVEL COST ESTIMATE

New Street Lights	$260,000
Upgraded Curb Ramps	$217,000
Rectangular Rapid Flashing Beacons	$200,000
Median Islands	$180,000
Curb Extensions	$135,000
Other Safety Improvements	$39,360
Contingency and Non-construction Costs	$918,240
TOTAL COST	**$1,949,600**

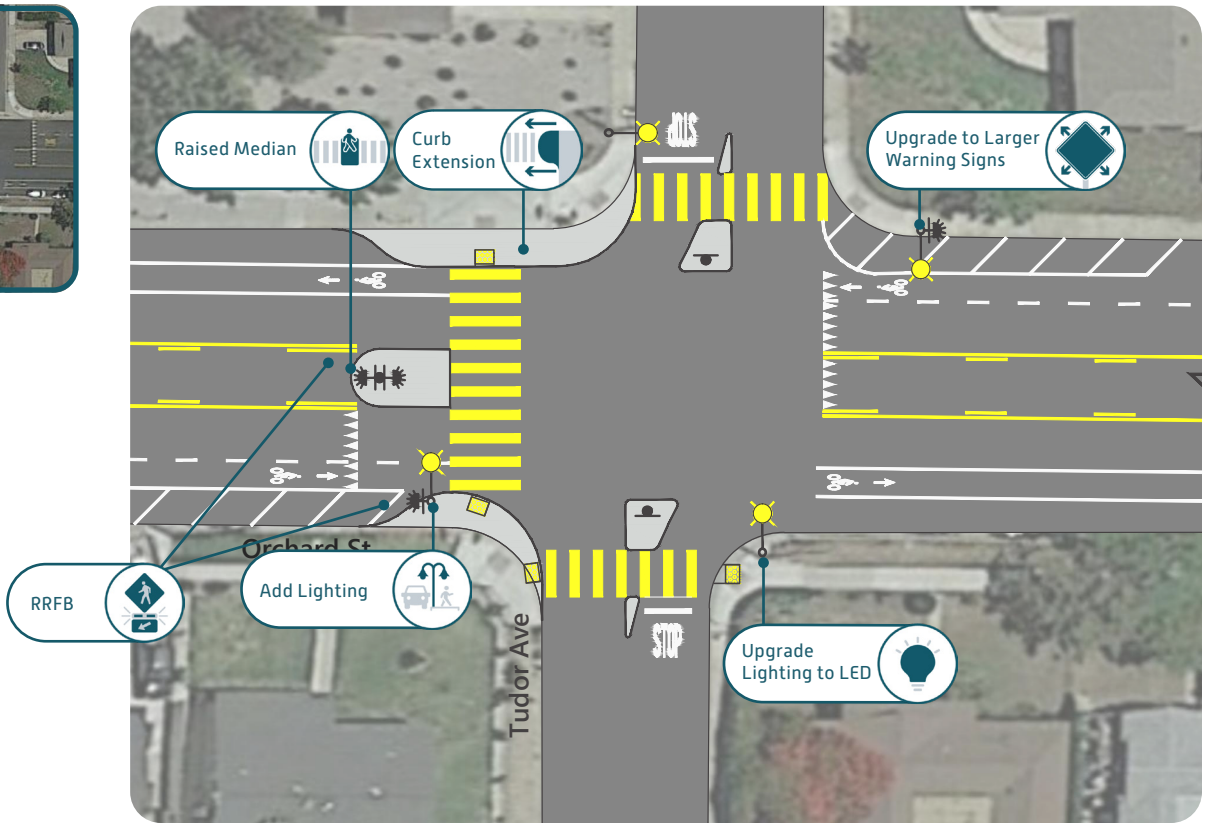
BENEFITS $19,639,211

B/C RATIO 10.1

SAMPLE LOCATION: ORCHARD ST & TUDOR AVE



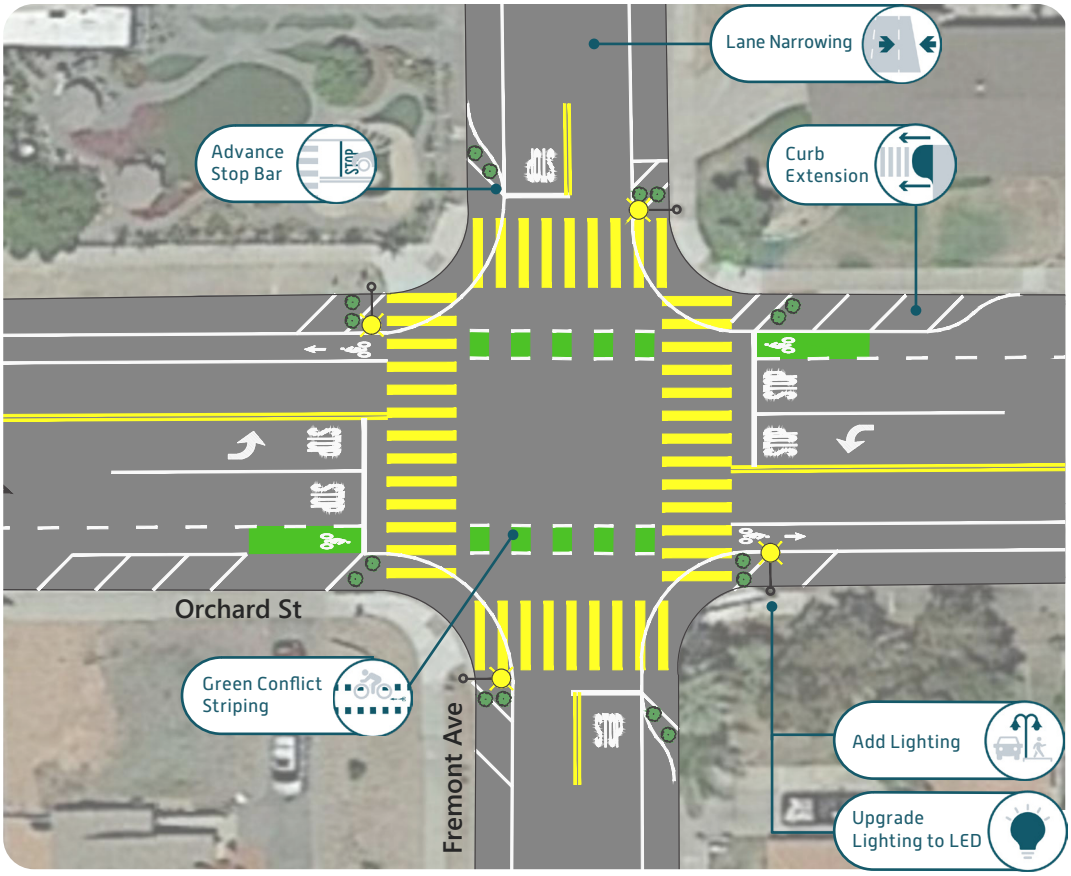




SAMPLE LOCATION: ORCHARD ST & FREMONT AVE

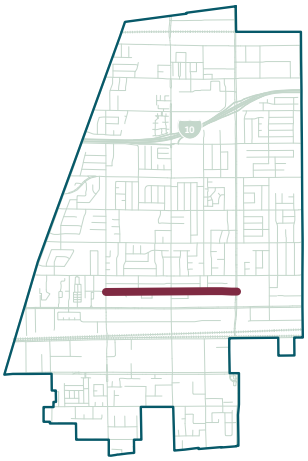






Conceptual, not for construction. Detailed analysis and engineering design required.

7 Bandera Street, between Ramona Avenue and Central Avenue



SEGMENT

- Ramona
- **Monte Vista**
- **Central**

LOCATION SUMMARY

This section of Bandera Street has seen a high number of collisions, particularly for a street of this size. This includes several pedestrian collisions where pedestrians were crossing outside of a crosswalk. Recommendations along Bandera are focused on enhancing pedestrian crossing locations at intersections, shown on the facing page. At Ramona Ave, an all-way stopped with high-visibility crosswalks, and additional lighting on three corners is proposed. Additional recommendations for Bandera corridor are focused on improving visibility and slowing vehicles traveling in this residential neighborhood: install speed humps, daylight (red curb) intersections throughout the corridor, upgrade lighting to LED, and add curb extensions at minor intersections to help slow turning vehicles.

EXISTING CONDITIONS

Posted Speed Limit

40/35 MPH (CENTRAL/MONTE VISTA)

Average Daily Traffic

28,800/13,600 (CENTRAL/MONTE VISTA)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

SEGMENT COLLISION CHARACTERISTICS

Collision Type

Profile 3 **5 Collisions**

Behavioral Factors

- **Pedestrians**

Contextual Factors

- **Away from crosswalk**

29 TOTAL COLLISIONS

2 KSI COLLISIONS

6 PEDESTRIAN COLLISIONS

1 BICYCLE COLLISIONS

SEGMENT-SPECIFIC COUNTERMEASURES

TYPE	Daylight Intersection	Pedestrian Hybrid Beacon	Curb Extension
			
ADDRESSES	Visibility	Multimodal Travel Visibility	Visibility Speeding

GLOBAL COUNTERMEASURES

- ✓ ADA - Compliant Curb Access Ramp
- ✓ Advance Stop Bar
- ✓ High-Visibility Crosswalk
- ✓ Lighting
- ✓ Upgrade Lighting to LED
- Pedestrian Countdown

✓ Denotes countermeasures applicable at this location

PLANNING-LEVEL COST ESTIMATE

Curb Extensions	$236,250
Pedestrian Hybrid Beacon	$150,000
New Street Lights	$110,000
Curb Ramps	$119,000
Speed Humps	$40,000
Other Safety Improvements	$44,270
Contingency and Non-construction Costs	$622,880
TOTAL COST	**$1,322,400**

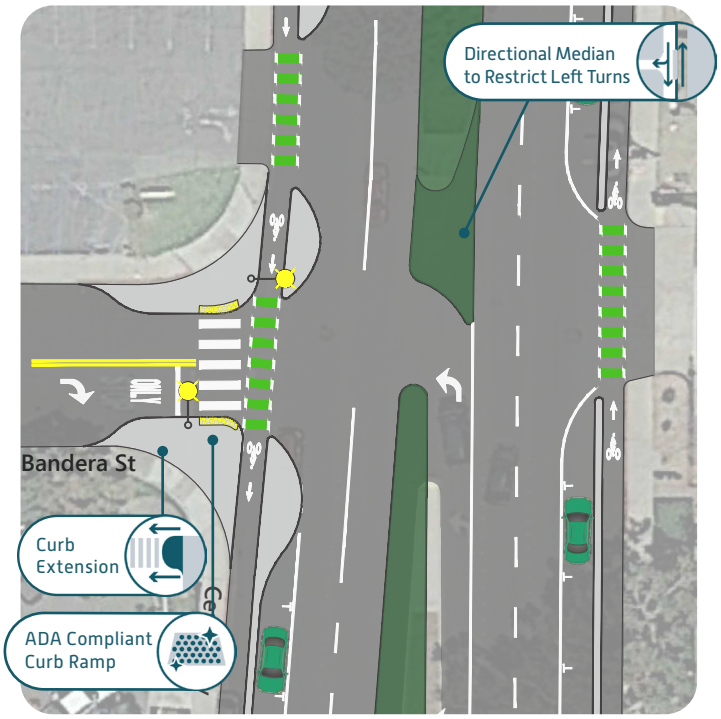
Note: Monte Vista and Central project costs accounted for in Projects #1 and #2.

BENEFITS $12,151,242

B/C RATIO 9.2

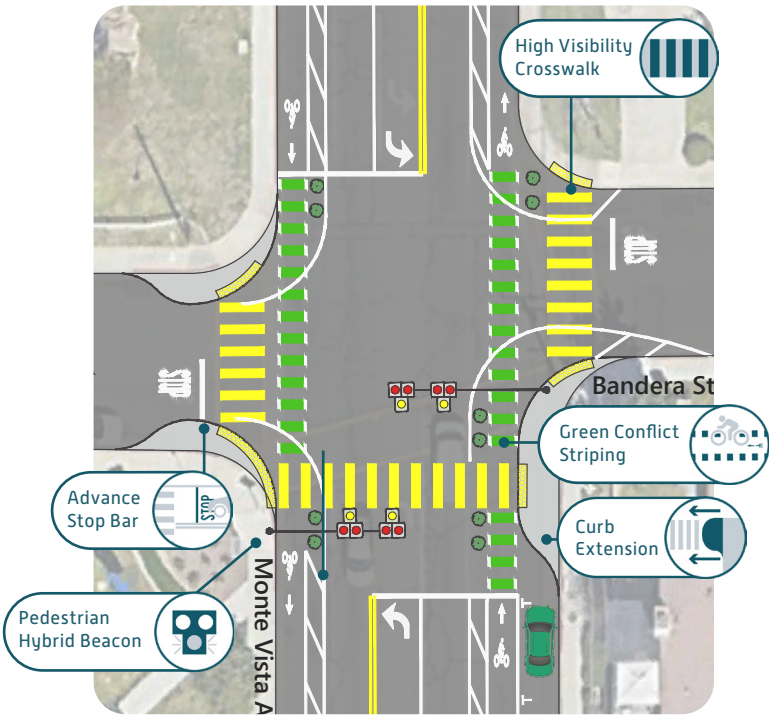
SAMPLE LOCATION: BANDERA ST & CENTRAL AVE



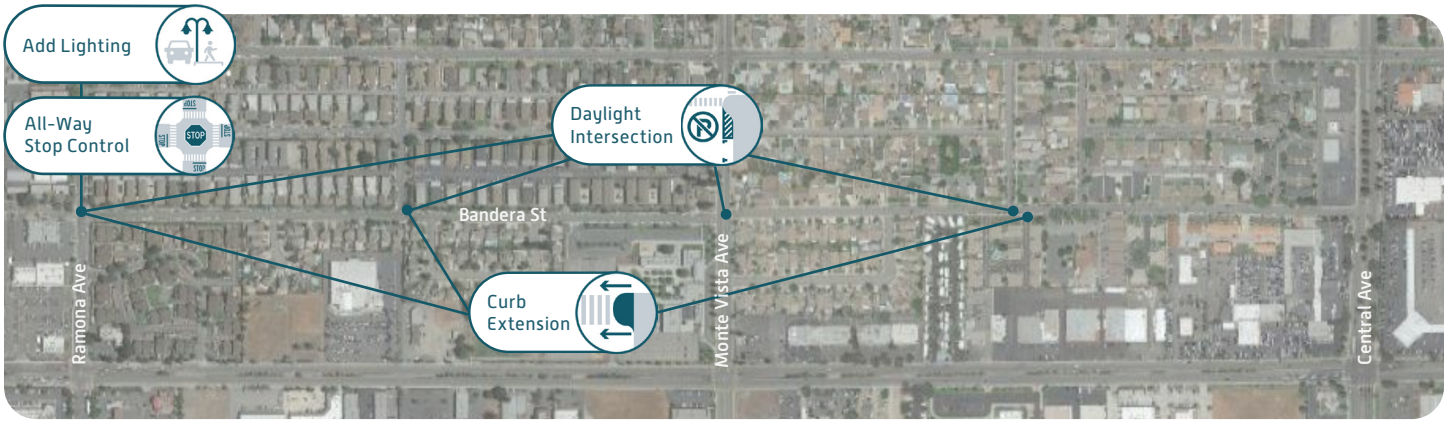


SAMPLE LOCATION: BANDERA ST & MONTE VISTA AVE

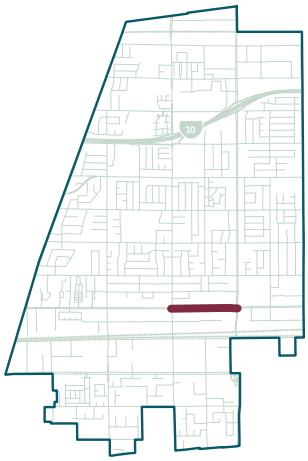




BANDERA ST: RAMONA AVE TO CENTRAL AVE



8 Holt Boulevard, East of Monte Vista Avenue to Central Avenue



SEGMENT

LOCATION SUMMARY

This section of Holt Boulevard has a history of high number of collisions both at the intersection of Holt & Central, and in the midblock section just west of Central. Intersection enhancements are shown on the facing page and focus on upgrades to signal timing and signal hardware, as well as high-visibility crosswalks. Along Holt Boulevard, lane narrowing and speed feedback signs are proposed to help address midblock safety issues.

EXISTING CONDITIONS

Posted Speed Limit

40/45 MPH (CENTRAL/HOLT)

Average Daily Traffic

28,000/21,600 (CENTRAL/HOLT)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

SEGMENT COLLISION CHARACTERISTICS

Collision Type

Profile 5 | 9 Collisions

Behavioral Factors

- Drivers, Bicyclists or Pedestrians

Contextual Factors

- Midblock
- Four or more lanes
- 40+ MPH speed limit

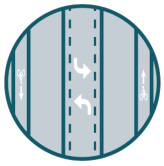
36 TOTAL COLLISIONS

2 KSI COLLISIONS

0 PEDESTRIAN COLLISIONS

3 BICYCLE COLLISIONS

SEGMENT-SPECIFIC COUNTERMEASURES

TYPE	Road Diet	Speed Feedback Sign	Green Conflict Striping
			
ADDRESSES	Speeding	Speeding	Multi-Modal Travel Visibility

GLOBAL COUNTERMEASURES

- ✓ ADA - Compliant Curb Access Ramp
- ✓ Advance Stop Bar
- ✓ High-Visibility Crosswalk
- ✓ Lighting
- ✓ Upgrade Lighting to LED
- Pedestrian Countdown

✓ Denotes countermeasures applicable at this location

PLANNING-LEVEL COST ESTIMATE

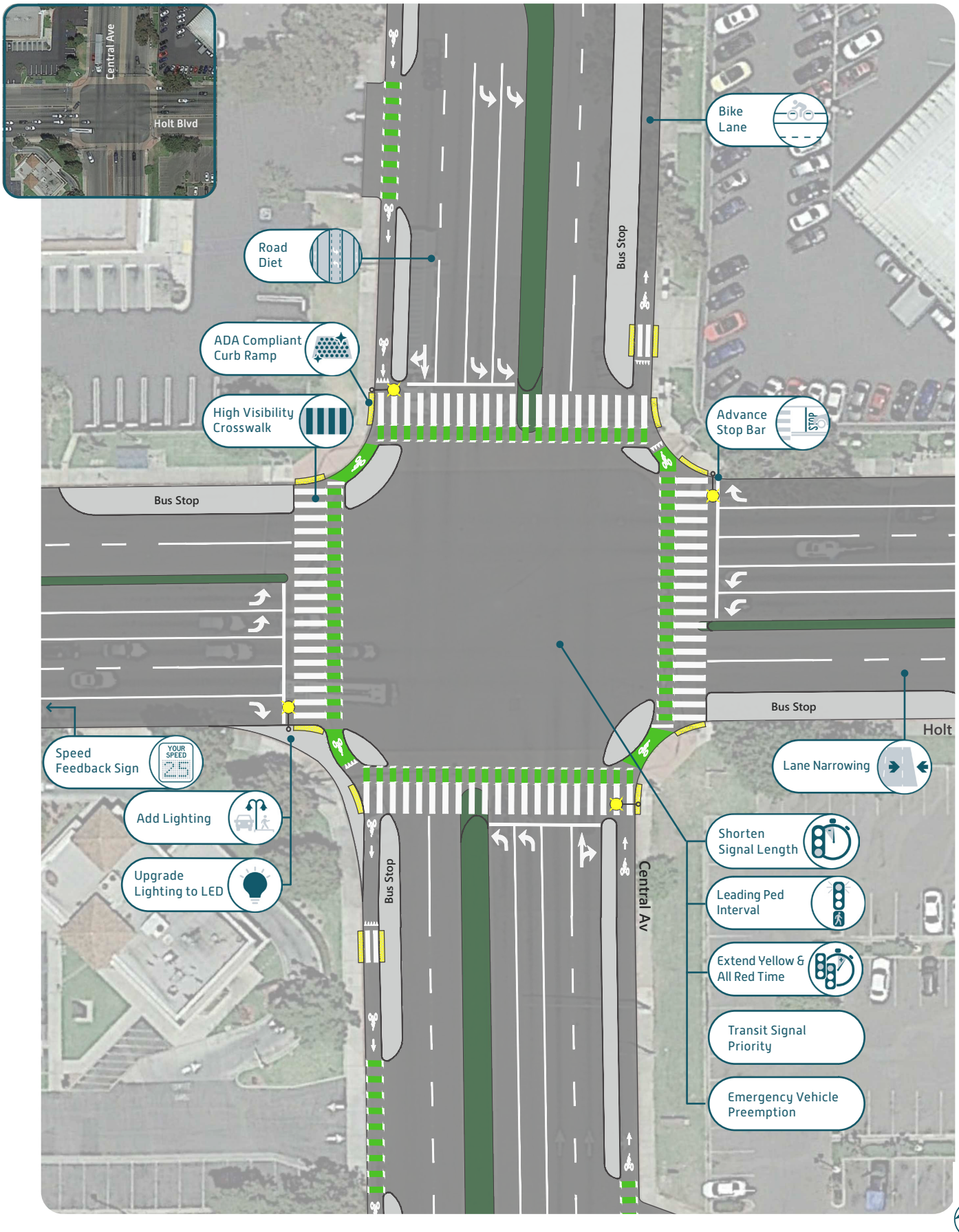
Curb Extensions	$54,000
New Street Lights	$40,000
Protected Intersection Medians	$36,000
Upgraded Curb Ramps	$28,000
Speed Feedback Signs	$20,000
Intersection Safety Improvements	$26,620
Contingency and Non-construction Costs	$182,280
TOTAL COST	**$386,900**

Note: Central Avenue bike facility project costs accounted for in Project #2.

BENEFITS $6,347,342

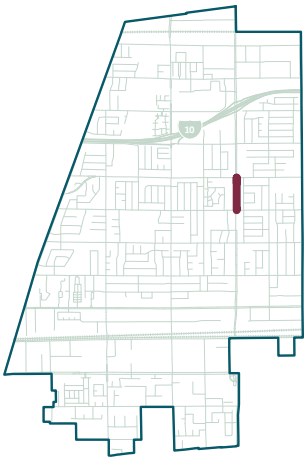
B/C RATIO 16.4

SAMPLE LOCATION: HOLT BLVD & CENTRAL AVE



Conceptual, not for construction. Detailed analysis and engineering design required.

9 Central Avenue, North of Benito Street to San Bernardino Avenue



SEGMENT

LOCATION SUMMARY

The collision patterns on this section of Central Avenue include a high number of broadside collisions, as well as mid-block collisions occurring between Benito and San Bernardino. Road diets are proposed on both Central Avenue and San Bernardino Street, to discourage vehicle speeding and provide space for safe bicycle travel (full extents to be determined through General Plan Update). Intersection upgrades at Central & San Bernardino are reflected on the facing page.

EXISTING CONDITIONS

Posted Speed Limit

40/40 MPH (CENTRAL/SAN BERNARDINO)

Average Daily Traffic

35,100/8,900 (CENTRAL/SAN BERNARDINO)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

SEGMENT COLLISION CHARACTERISTICS

Collision Type

Profile 1 & 4 | 17 & 7 Collisions

Behavioral Factors

- Drivers and bicyclists (Profile 1)
- Broadside collision type (Profile 1)
- Pedestrians (Profile 4)

Contextual Factors

- Signalized intersection (Profile 1)
- Signals with permissive left turn (Profile 1)
- Near school crosswalks (Profile 4)
- AM peak period (Profile 4)

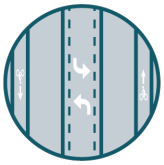
37 TOTAL COLLISIONS

0 KSI COLLISIONS

1 PEDESTRIAN COLLISIONS

3 BICYCLE COLLISIONS

SEGMENT-SPECIFIC COUNTERMEASURES

TYPE	Bike Lane	Green Conflict Striping	Road Diet
			
ADDRESSES	Multimodal Travel	Multimodal Travel Visibility	Speeding

GLOBAL COUNTERMEASURES

- ADA - Compliant Curb Access Ramp
- Advance Stop Bar
- High-Visibility Crosswalk
- Lighting
- Upgrade Lighting to LED
- Pedestrian Countdown

Denotes countermeasures applicable at this location

PLANNING-LEVEL COST ESTIMATE

Protected Intersection Medians	$48,000
Curb Ramps	$28,000
High-Visibility Crosswalks	$12,600
Pedestrian Countdown Signal Heads	$6,800
Other Safety Improvements	$3,220
Contingency and Non-construction Costs	$87,893
TOTAL COST	**$186,600**

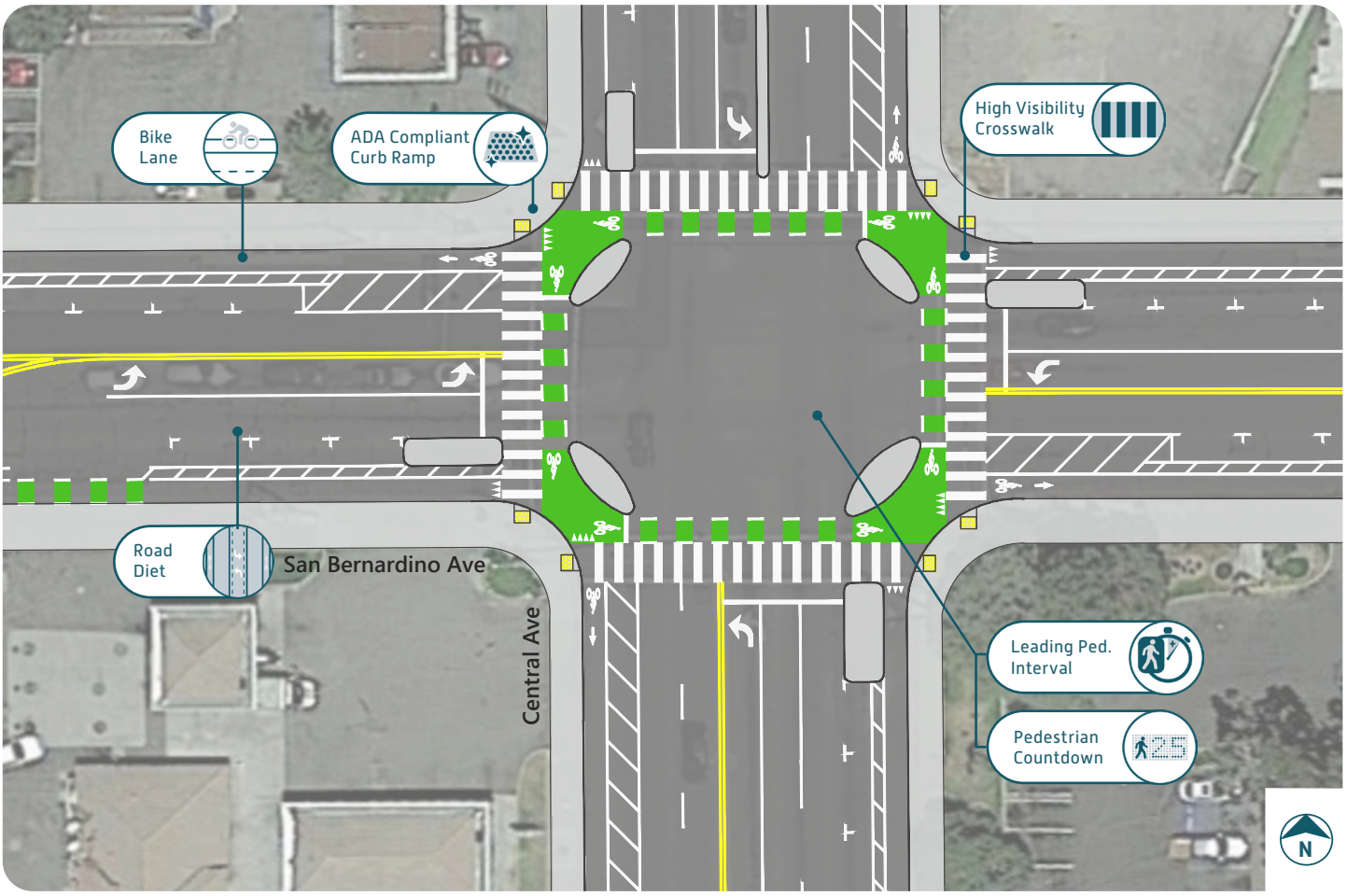
Note: Central Avenue bike facility project costs accounted for in Project #2. Estimate shown here does not include costs for the San Bernardino road diet and bike facility.

BENEFITS $3,362,350

B/C RATIO 18

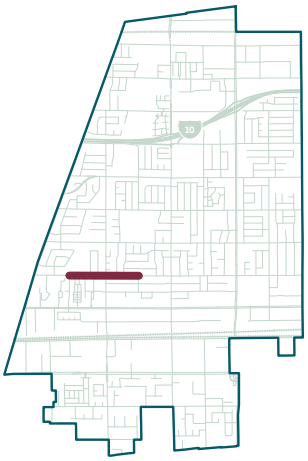
SAMPLE LOCATION: CENTRAL AVE & SAN BERNARDINO AVE





Conceptual, not for construction. Detailed analysis and engineering design required.

10 Kingsley Street, between Amherst Avenue and Helena Avenue



LOCATION SUMMARY

This segment of Kinglsey Street serves Lehigh Elementary School and the adjacent park, but has seen a high number of collisions, including three bicycle collisions. Recommendations proposed at Amherst Avenue are shown on the facing page, and focus on projects to help provide safe pedestrian crossings to the park while using elements such as back-in angled parking, a striped parking lane to define an edgeline, curb extensions that mirror the parking lane, and the raised crosswalk to help discourage vehicle speeding. A speed feedback sign is proposed to further focus on vehicle speeds and help provide comfortable shared space for bicyclists. An additional marked crosswalk at Helena, enhanced with yield markings and signs, provides an additional crossing opportunity where crosswalks are currently spaced far apart. If funding is secured for the San Antonio Creek trail at this location, the enhanced crossing could be relocated as part of the future trail development.

EXISTING CONDITIONS

Posted Speed Limit

35 MPH (KINGSLEY)

Average Daily Traffic

6,400 (KINGSLEY)

NEAR SCHOOL

IN DISADVANTAGED COMMUNITY

SEGMENT COLLISION CHARACTERISTICS

20 TOTAL COLLISIONS

2 KSI COLLISIONS

0 PEDESTRIAN COLLISIONS

3 BICYCLE COLLISIONS

SEGMENT-SPECIFIC COUNTERMEASURES

TYPE	Back-in Angled Parking	Rectangular Rapid Flashing Beacon	Raised Crosswalk
			
ADDRESSES	Visibility	Multimodal Travel	Visibility

GLOBAL COUNTERMEASURES

- ✓ ADA - Compliant Curb Access Ramp
- Advance Stop Bar
- ✓ High-Visibility Crosswalk
- ✓ Lighting
- Upgrade Lighting to LED
- Pedestrian Countdown

✓ Denotes countermeasures applicable at this location

PLANNING-LEVEL COST ESTIMATE

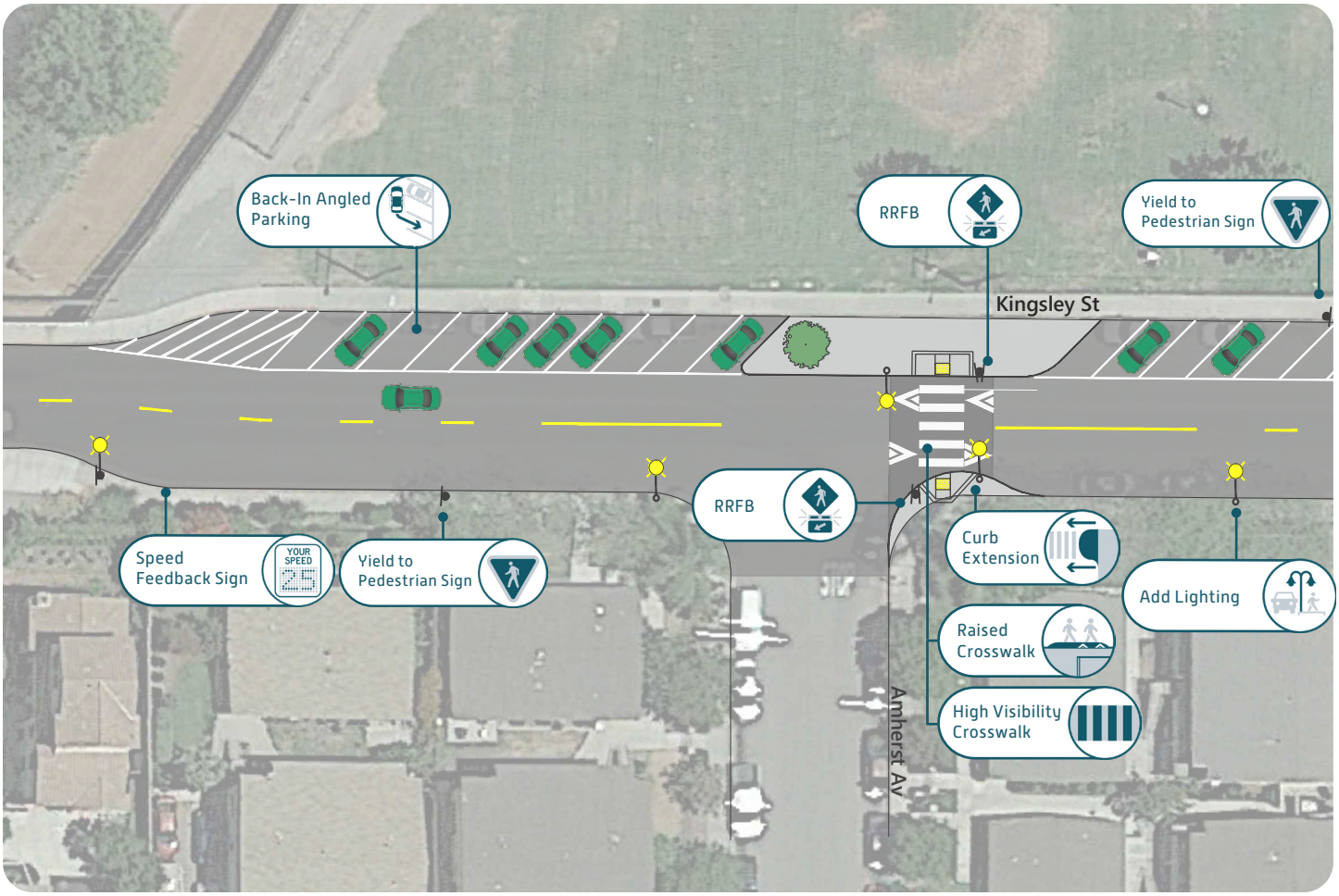
Curb Extensions	$171,000
Street Lights	$100,000
Speed Feedback Signs	$40,000
Rectangular Rapid Flashing Beacon	$40,000
Raised Crosswalk	$30,000
Other Safety Improvements	$40,560
Contingency and Non-construction Costs	$375,440
TOTAL COST	**$797,000**

BENEFITS $10,439,095

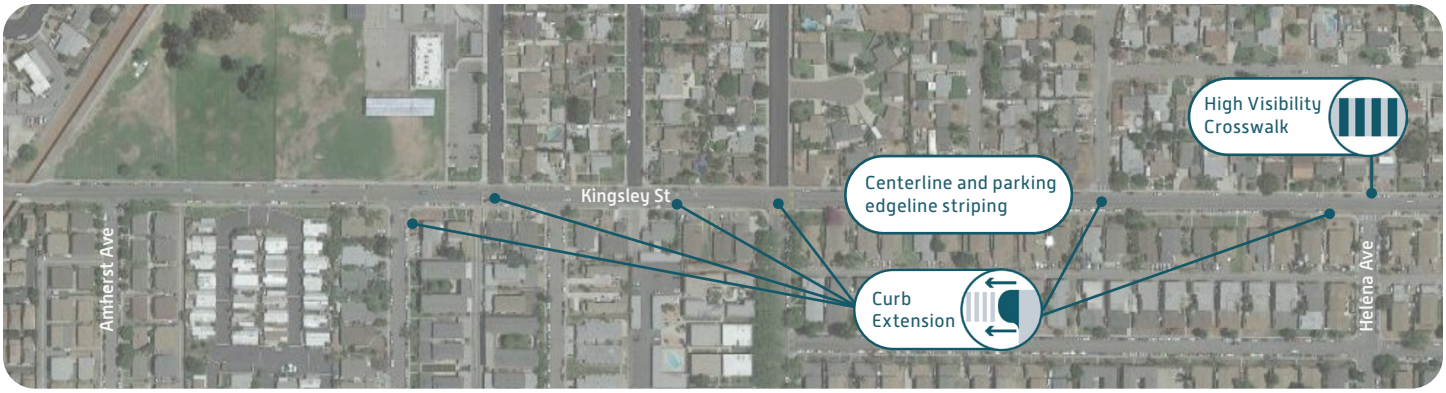
B/C RATIO 13.1

SAMPLE LOCATION: KINGSLEY ST & AMHERST AVE





KINGSLEY ST: AMHERST AVE TO HELENA AVE



Conceptual, not for construction. Detailed analysis and engineering design required.

Montclair SSAR: Interim and Quick Build Countermeasures

Several quick-build and interim countermeasures have been identified for near term implementation as the full proposed projects at priority locations are designed to be implemented in the mid- to long-term time frame. Quick-build countermeasures are part of the proposed projects for priority locations, but are lower cost and can be implemented relatively quickly. These countermeasures are typically signal timing modifications and striping. Interim countermeasures are not specified in the proposed projects for priority locations, but they use low cost materials, such as striping, paint, and plastic posts, to create temporary placeholders for the mid- to long-term countermeasures identified for the priority locations.

Location		Quick-Build	Interim
1	**Monte Vista Avenue Intersections with Permissive Lefts**	**Striping** › Advance Stop Bar › High-Visibility Crosswalk **Modify Signal Timing** › Extend Yellow and All Red Time › Leading Pedestrian Interval	› Hardened Centerline (for Protected Left-Turn Phase) › Paint and Plastic Separated Bikeway (for bike lane and road diet)
2	**Central Avenue Intersections with Permissive Lefts**	**Striping** › High Visibility Crosswalk › Green Conflict Striping **Modify Signal Timing** › Extend Yellow and All Red Time › Leading Pedestrian Interval › Extend Pedestrian Crossing Time	› Hardened Centerline (for Protected Left-Turn Phase) › Paint and Plastic Separated Bikeway (for bike lane and road diet)
3	**Ramona Avenue and Mission Boulevard**	**Striping** › High-Visibility Crosswalk › Advance Stop Bar › Modify Signal Timing **Shorten Cycle Length** › Extend Yellow and All Red Time › Leading Pedestrian Interval › Extend Pedestrian Crossing Time	› Hardened Centerline (for Protected Left-Turn Phase) › Paint and Plastic Curb Extension (for curb extension)
4	**Ramona Avenue Multi-Lane Stop-Controlled Intersections**	**Striping** › High-Visibility Crosswalk	Option 1: Retain all-way stop controlled Intersection › LED-enhanced STOP Sign Option 2: Begin transition to roundabout › Paint and Plastic Mini Circle (for roundabout)
5	**Mills Avenue Stop-Controlled & Offset Intersections**	**Striping** › High-Visibility Crosswalk › Green Conflict Striping	› LED-enhanced STOP signs › Hardened Centerline › Paint and Plastic Curb Extension (for curb extension)

Location		Quick-Build	Interim
6	**Orchard Street Stop-Controlled Intersections**	**Striping** › Advance Stop Bar › High-Visibility Crosswalk › Lane Narrowing › Green Conflict Striping	› LED-enhanced STOP signs › Hardened Centerline › Paint and Plastic Curb Extension (for curb extension) › Paint and Plastic Median (for raised median)
7	**Bandera Street, between Ramona Avenue and Central Avenue**	**Daylight Intersection** **All-Way Stop Control** **Striping** › Advance Stop Bar › High-Visibility Crosswalk › Green Conflict Striping	› Paint and Plastic Median (for directional median) › Paint and Plastic Curb Extension (for curb extension)
8	**Holt Boulevard, East of Monte Vista to Central Avenue**	**Modify Signal Timing** › Shorten Cycle Length › Leading Pedestrian Interval › Extend Yellow and All Red Time **Striping** › Advance Stop Bar › High-Visibility Crosswalk › Green Conflict Striping	› Paint and Plastic Curb Extension (for bus stop and tightening intersection)
9	**Central Avenue, North of Benito Street to San Bernardino Avenue**	**Modify Signal Timing** › Leading Pedestrian Interval **Striping** › Advance Stop Bar › High-Visibility Crosswalk › Green Conflict Striping	› Hardened Centerline › Paint and Plastic Curb Extension (for intersection tightening)
10	**Kingsley Street, between Amherst Avenue and Helena Avenue**	**Striping** › Back-In Angled Parking › High-Visibility Crosswalk › Centerline and parking edgeline striping	› Paint and Plastic Curb Extension (for curb extension)

Quick-Build Countermeasures

MINI TOOLBOX

- Advance Stop Bar
- Green Conflict Striping
- Lane Narrowing
- Back-In Angled Parking
- Shorten Cycle Length
- High-Visibility Crosswalk
- Extend Yellow and All Red Time
- Leading Pedestrian Interval
- Extend Pedestrian Crossing Time
- Daylight Intersection
- All-Way Stop Control



Source: Minnesota Department of Transportation

Paint & Plastic Interim Countermeasures

MINI TOOLBOX

Paint & Plastic countermeasures use painted pavement and plastic posts for short-term installations that serve as pilot projects or placeholders for countermeasures that may take longer and cost more to implement. The following countermeasures can be quickly and temporarily installed using painted pavement and plastic posts.


Source: NACTO


Curb Extension


Median


Mini Circle


Pedestrian Refuge Area


Separated Bikeway

Other Interim Countermeasures

LED-Enhanced Sign

An LED-Enhanced Sign has LED lights embedded in the sign to outline the sign itself or the words and symbols on the sign. The LEDs may be set to flash or operate in a steady mode. An LED-enhanced sign improves safety by improving the visibility of signs at locations with visibility limitations or with a documented history of drivers failing to see or obey the sign (e.g. at STOP signs).

Hardened Centerline

A hardened centerline places a rubber curb and plastic bollards on the centerline so that left-turns are made more slowly due to a smaller (tighter) effective turning radiusA hardened centerline improves safety by expanding the field of vision for drivers turning left and increasing the visibility of pedestrians crossing the road. This is an interim countermeasure for intersections with a recommendation for protected left turn signals.



LED-Enhanced Sign


Hardened Centerline



Source: SA-SO


Source: NYC DOT

SSAR projects can be funded through a wide range of additional sources at the regional, state, and federal levels.

Chapter 6

Funding Recommendations

While the primary purpose of this study is to prepare the City of Montclair to submit successful Highway Safety Improvement Program (HSIP) applications, safety projects can be funded through a wide range of additional sources at the regional, state, and federal levels.

HSIP funds are largely awarded based on a benefit/cost analysis using a set of Caltrans-approved countermeasures with documented collision reduction factors and historic collision data. While many safety projects will perform well in the HSIP process, others may be successfully funded through other sources that consider additional factors, such as the Active Transportation Program (ATP).

The sources in this chapter may be used to fund a broad scope of projects targeting air quality and sustainability, affordable housing, and transportation. Successful projects often entail creative solutions that address impact areas beyond transportation safety alone.

Local and Regional Sources

San Bernardino County Transportation Authority (SBCTA) Transportation Development Act (TDA)

Transportation Development Act provides funding for public transportation, projects include bicycle/pedestrian facilities, and transit stop access improvement.

NEXT FUNDING OPPORTUNITY
The last call for projects was May 3, 2019

State Sources

California Strategic Growth Council (SGC) Transformative Climate Communities (TCC) Program

The Transformative Climate Communities (TCC) Program empowers the communities most impacted by pollution to choose their own goals, strategies, and projects to reduce greenhouse gas emissions and local air pollution.

NEXT FUNDING OPPORTUNITY
Round 3 applications were due February 28, 2020

SGC Affordable Housing and Sustainable Communities (AHSC) Program

The Affordable Housing and Sustainable Communities (AHSC) Program makes it easier for Californians to drive less by making sure housing, jobs, and key destinations are accessible by walking, biking, and transit.

NEXT FUNDING OPPORTUNITY
Round 5 applications were due February 11, 2020

Active Transportation Program (ATP)

ATP is a statewide competitive grant application process with the goal of encouraging increased use of active modes of transportation. The ATP consolidates existing federal and state transportation programs, including the Transportation Alternatives Program (TAP), Bicycle Transportation Account (BTA), and State Safe Routes to School (SR2S), into a single program with a focus to make California a national leader in active transportation. The ATP administered by the Division of Local Assistance, Office of State Programs.

NEXT FUNDING OPPORTUNITY
Cycle 5 Call for Projects Anticipated Spring 2020

SB 1 Local Streets and Roads Program (LSRP)

SB 1 dedicated approximately $1.5 billion per year in new formula revenues apportioned by the State Controller to cities and counties for basic road maintenance, rehabilitation, and critical safety projects on the local streets and roads system.

NEXT FUNDING OPPORTUNITY
Project Lists due to California Transportation Commission May 1, 2020

Caltrans Sustainable Communities Grants

To encourage local and regional planning that furthers state goals, including, but not limited to, the goals and best practices cited in the Regional Transportation Plan Guidelines adopted by the California Transportation Commission.

NEXT FUNDING OPPORTUNITY
The FY 2020-21 grant application closed October 2019

Highway Safety Improvement Program (HSIP)

California's Local HSIP focuses on infrastructure projects with nationally recognized crash reduction factors (CRFs). Local HSIP projects must be identified on the basis of collision experience, collision potential, collision rate, or other data-supported means.

NEXT FUNDING OPPORTUNITY
Call for Projects (Cycle 10) will be announced around April/May 2020

California Office of Traffic Safety (OTS) Grant Programs

OTS administers traffic safety grants in the following areas: Alcohol Impaired Driving, Distracted Driving, Drug-Impaired Driving, Emergency Medical Services, Motorcycle Safety, Occupant Protection, Pedestrian and Bicycle Safety, Police Traffic Services, Public Relations, Advertising, and Roadway Safety and Traffic Records.

NEXT FUNDING OPPORTUNITY
FY 2021 applications were due January 30, 2020

SB 1 Solutions for Congested Corridors Program (SCCP)

The Solutions for Congested Corridors Program funds projects designed to reduce congestion in highly traveled and highly congested corridors. This statewide, competitive program makes $250 million available annually for projects that implement specific transportation performance improvements and are part of a comprehensive corridor plan by providing more transportation choices while preserving the character of local communities and creating opportunities for neighborhood enhancement.

NEXT FUNDING OPPORTUNITY
Applications due June 1, 2020

SB1 Local Partnership Program (LPP)

The purpose of this program is to provide local and regional transportation agencies that have passed sales tax measures, developer fees, or other imposed transportation fees with a continuous appropriation of $200 million annually from the Road Maintenance and Rehabilitation Account to fund road maintenance and rehabilitation, sound walls, and active transportation projects. There is also a competitive grant portion of this project.

NEXT FUNDING OPPORTUNITY
Applications due June 12, 2020

SB 1 State Transportation Improvement Program (STIP)

The State Transportation Improvement Program (STIP) is the biennial five-year plan for future allocations of certain state transportation funds for state highway improvements, intercity rail, and regional highway and transit improvements.

NEXT FUNDING OPPORTUNITY
Proposed fund estimate will likely be released July 2021

Caltrans Strategic Partnerships Grants

To identify and address statewide, interregional, or regional transportation deficiencies on the State highway system in partnership with Caltrans. The transit component that will fund planning projects that address multimodal transportation deficiencies with a focus on transit.

NEXT FUNDING OPPORTUNITY
The FY 2020-21 grant application closed October 2019

Caltrans Adaptation Planning Grants

To support planning actions at local and regional levels that advance climate change efforts on the transportation system.

NEXT FUNDING OPPORTUNITY
The final cycle of the Adaptation Planning grant was FY 2019-2020

California Natural Resources Agency Environmental Enhancement and Mitigation Program

This program supports projects that "contribute to mitigation of the environmental effects of transportation facilities." According to the program guidelines, projects that fall under the following category can apply: "Mitigation Projects Beyond the Scope of the Lead Agency responsible for assessing the environmental impact of the proposed transportation improvement."

NEXT FUNDING OPPORTUNITY
2020 EEM Program Solicitation anticipated April 2020

California Natural Resources Agency Urban Greening Program

This program supports projects that "use natural systems or systems that mimic natural systems to achieve multiple benefits." Eligible projects include "Non-motorized urban trails that provide safe routes for travel between residences, workplaces, commercial centers, and schools."

NEXT FUNDING OPPORTUNITY
Round 4 is anticipated March 2020

Federal Sources

Community Development Block Grant (CDBG) Program

The Community Development Block Grant (CDBG) program is a flexible program that provides communities with resources to address a wide range of unique community development needs. Communities often use CDBG funds to construct and repair streets and sidewalks.

NEXT FUNDING OPPORTUNITY
Housing and Community Development program application due April 15, 2020 (competitive) and September 30, 2020 (OTC)

Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grant Program

This program supports projects that are "road or bridge projects eligible under title 23, United States Code;" and "intermodal projects." This program replaces the TIGER program.

NEXT FUNDING OPPORTUNITY
The application for FY 2019 was due July 15, 2019

Congestion Mitigation and Air Quality (CMAQ) Improvement Program

The FAST Act continued the CMAQ program to provide a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas).

NEXT FUNDING OPPORTUNITY
Funding is distributed through SCAG based on a formula ■