Pasadena Focused Local Roadway Safety Action Plan

October 2025

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A MESSAGE FROM OUR MAYOR

The City of Pasadena is a premier destination that attracts people of all backgrounds from around the world. Over 250,000 residents and visitors travel into and around Pasadena by car, train, bus, foot, or bike for tourism, education, employment, or entertainment on a daily basis.

We have a duty to ensure the safe mobility and enhanced quality of life for residents, employees and visitors as they traverse our great city. To keep people moving safely and efficiently through our 100-plus year-old transportation network, the City must continue to solve complex transportation issues. This can only be done through the continual cooperation between our proud community, engaged stakeholders, and our tireless City staff.

This document is another step towards memorializing the City's collective goal of a safer transportation infrastructure that prioritizes public health and safety by eliminating traffic fatalities. The projects described in this report, combined with our efforts to advance safety education, roadway design, and emergency response, will help the City achieve this lofty goal.

Let's work together, unified in our resolve, to eliminate the tragedy of traffic fatalities and serious injuries on our streets.

Victor M. Gordo
MAYOR

DEDICATION

Pasadena's Goal of Zero Traffic Fatalities by 2035

The City of Pasadena's foremost Transportation objective as memorialized in the 2015 General Plan is to "Enhance livability through street design to achieve safe interactions for all modes of travel." For Pasadena to work for everyone, every person must be safe as they travel within it.

Safety has been a priority in every Pasadena transportation plan, from the most recent 2023 Pedestrian Transportation Action Plan back to the 1994 General Plan. These planning efforts have resulted in improvements in ways for people to travel safely, whether it be the introduction of the Pasadena Area Rapid Transit System (now Pasadena Transit) and Metro Gold Line (now A Line) Light Rail in the 1990s, buildout of the bike network, safety education, or continual investment in our sidewalks, crosswalks, and traffic signals. This document, the Focused Local Roadway Safety Action Plan, is yet another demonstration of the City's commitment to advancing safety. Front and center in this Plan is the goal of zero traffic fatalities by the year 2035.

In order to reach this ambitious goal, the City is applying the Safe System Approach to roadway safety. This approach acknowledges that death and serious injuries are unacceptable, humans make mistakes, humans are vulnerable, responsibility is shared, safety is proactive, and redundancy is crucial.

In acknowledging that death and serious injuries must be eliminated to the extent possible, we must be proactive and thoughtful in delivering projects that advance safety in our great City.

The City of Pasadena is committing itself to the goal of eliminating the tragedy of traffic deaths on our streets. It will take a multi-departmental effort with support from our residents, businesses, and institutions. We look forward to having you join us!

Miguel Márquez
CITY MANAGER

WE SUPPORT THE GOAL OF ZERO TRAFFIC FATALITIES BY 2035

Joaquin T. Siques
TRANSPORTATION

Eugene Harris
CHIEF OF POLICE

Greg de Vinck
PUBLIC WORKS

Chad Augustin
FIRE CHIEF

Manuel Carmona
PUBLIC HEALTH

David Reyes
WATER & POWER

James Wong
HOUSING

Koko Panossian
PARKS, RECREATION, AND COMMUNITY SERVICES

Michele Beal Bagneris
CITY ATTORNEY

Philip Leclair
INFORMATION TECHNOLOGY

Tiffany Jacobs-Quinn
HUMAN RESOURCES

Jennifer Page
PLANNING AND COMMUNITY DEVELOPMENT

Tim McDonald
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RENT STABILIZATIONS

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FINANCE DEPARTMENT

Lisa Derderian
CHIEF COMMUNICATION OFFICER

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Section 1

INTRODUCTION

The Focused Local Roadway Safety Action Plan builds upon Pasadena's previous safety planning efforts, like the 2022 Pasadena Local Roadway Safety Plan (LRSP), to establish a Safe Streets and Roads for All (SS4A)-compliant action plan that will unlock new funding opportunities for improving safety for all road users in Pasadena. This Action Plan reaffirms Pasadena's commitment to prioritizing multimodal safety improvements and working towards eliminating fatalities and serious injuries from our roadways.

VISION & GOALS

The Focused Local Roadway Safety Action Plan builds on the 2022 LRSP and carries forward the vision and goals established in the City's adopted 2015 General Plan Mobility Element, including enhancing livability and encouraging walking, biking, transit, and other alternatives to motor vehicles. The Focused LRSAP is one component of the Safe System Approach to roadway safety utilized by the City. Specifically, this is a plan that follows the SS4A program criteria to unlock SS4A and similar state funding for safety improvements.

The vision, goals, and objectives of this Action Plan are consistent with the LRSP, but now with a new commitment to achieving zero traffic fatalities and serious injuries on Pasadena roadways by 2035.

VISION

Improve roadway safety for all road users on public roads in Pasadena.

GOAL

Achieve zero traffic fatalities and serious injuries on Pasadena roadways by 2035.

The Focused LRSP established four objectives that will continue to guide our efforts through 2035:

OBJECTIVE 1 — Improve safety for pedestrians, bicyclists, and other vulnerable road users

OBJECTIVE 2 — Deliver safer infrastructure, install clearer signage, and implement improvements at top collision locations

OBJECTIVE 3 — Facilitate and promote engagement with local stakeholders to promote the road safety message

OBJECTIVE 4 — Continue to collaborate with stakeholders to deliver a strong road safety message

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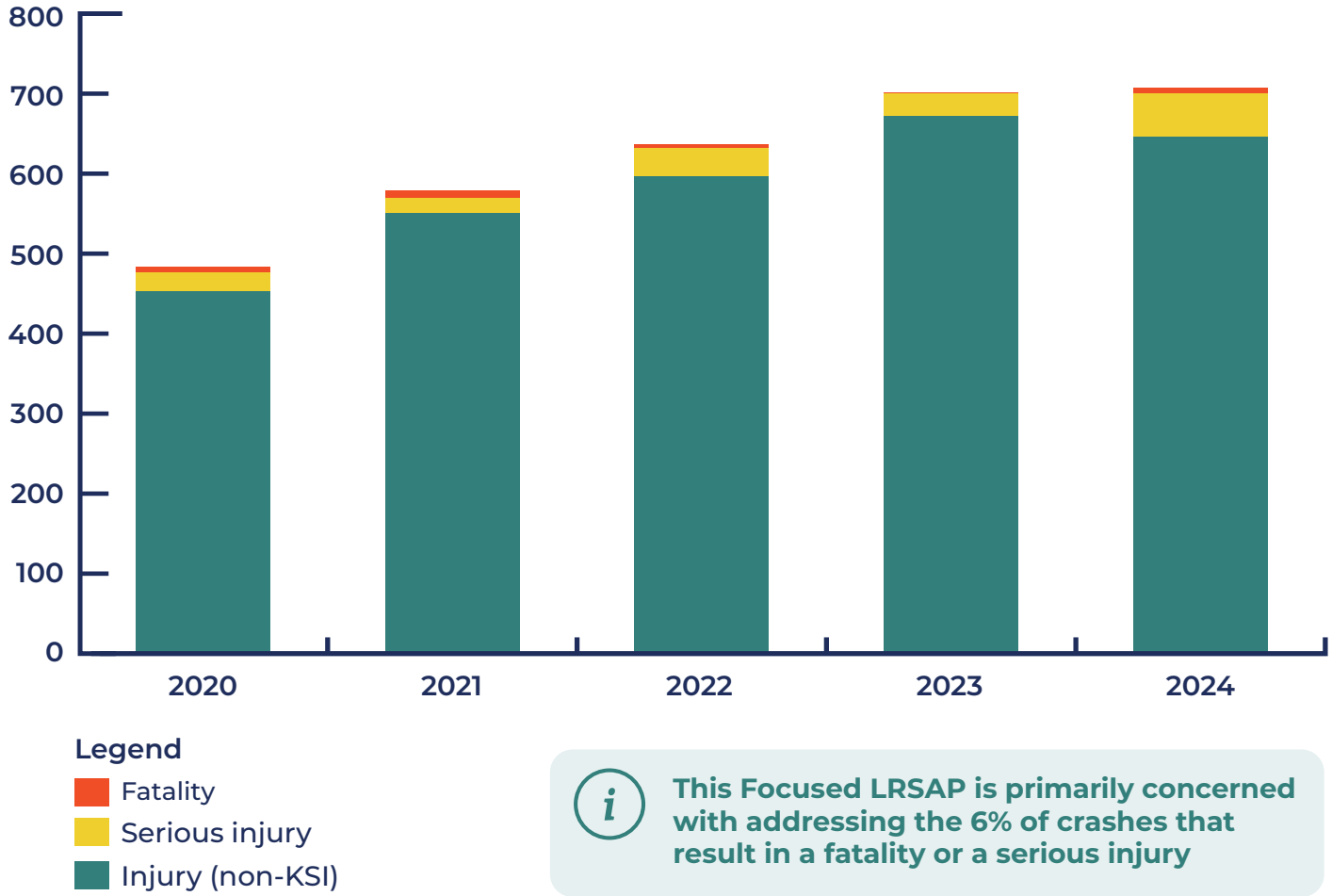
ROADWAY SAFETY IN PASADENA

Collision History

3,051 crashes resulted in an injury between 2020 and 2024 on Pasadena's roadways. 6% of those crashes involved someone being killed or seriously injured, which is referred to as a KSI collision.

Pasadena Injury Collisions, 2020-2024



This Focused LRSAP is primarily concerned with addressing the 6% of crashes that result in a fatality or a serious injury

This Action Plan updates the in-depth safety analysis conducted for the 2022 LRSP with the most recent five years of available RoadSafe collision data (2020-2024). The 2022 LRSP collision data analysis is documented in greater detail in **Appendix F.**

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Safety Emphasis Areas

The following safety emphasis areas were identified in the 2022 LRSP and reconfirmed by this Action Plan through the updated collision analysis. The priority projects in this Action Plan are designed to address all four emphasis areas.

Signalized Intersections

Speeding

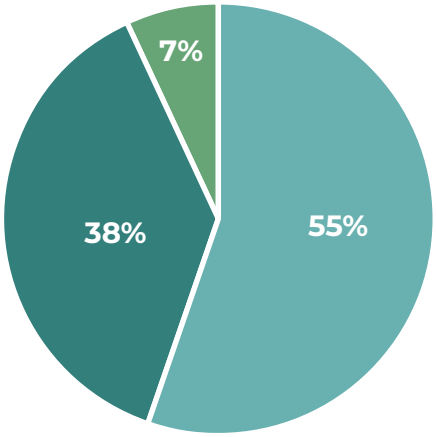
Bicycle and Pedestrian Safety

Nighttime Collisions

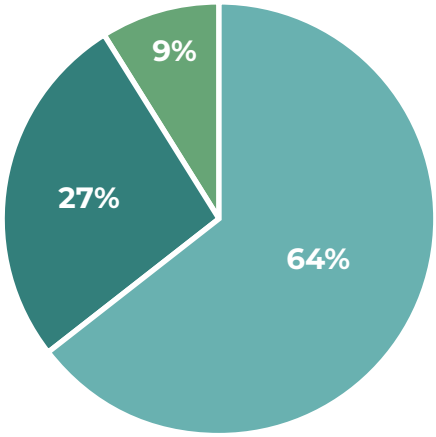
Signalized Intersections

The most recent collision analysis indicates 65% of injury collisions in Pasadena occurred at signalized intersections, up from 52% between 2015 and 2019. Bicycle and pedestrian-related injury collisions account for a higher percentage of collisions at signalized intersections than at other facility types (non-signalized intersections and midblock locations), accounting for 60% of bicycle and pedestrian injury collisions.

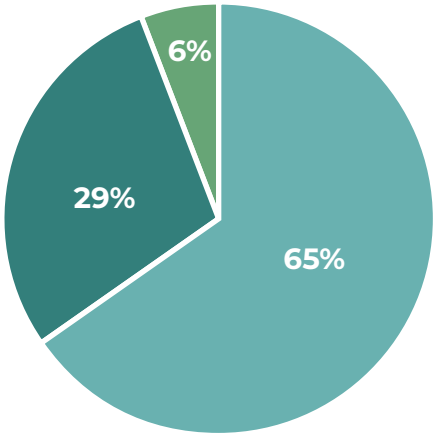
Bicycle Crash Location



Pedestrian Crash Location



Vehicle Crash Location



Legend

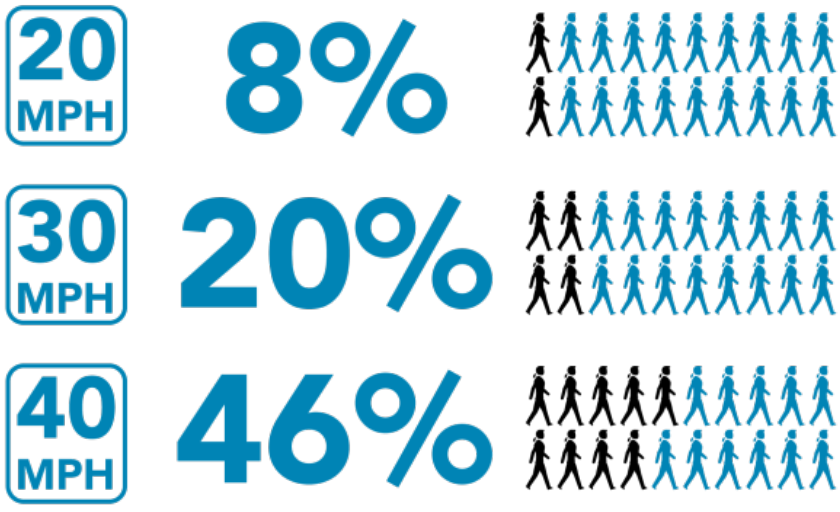
Mid-block | Signalized intersection | Non-signalized intersection

Speeding

Unsafe speeds is one of the most frequent primary collision factors in the City of Pasadena, accounting for 20% of injury collisions and 25% of KSI collisions between 2020 and 2024.

Vehicle speed is the most important factor influencing crash severity.

The higher the vehicle speed, the less likely someone is to survive when they are involved in a crash.



Source: Safety Over Speed, Vision Zero Network (2025); AAA Foundation, Tefft, B.C. (2011)

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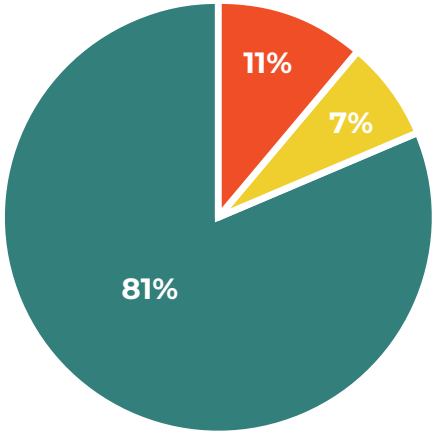
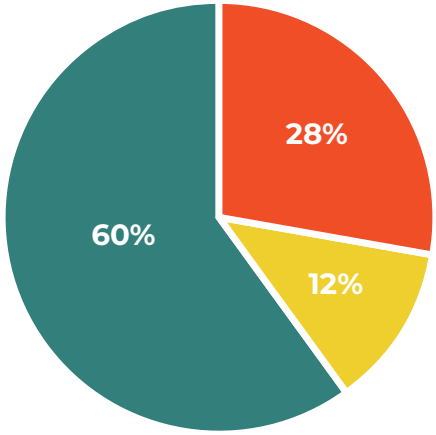
Bicycle and Pedestrian Safety

Both bicycle and pedestrian collisions are over-represented in fatal and severe injury collisions. While pedestrian collisions account for 11% of all injury collisions, pedestrian collisions account for 28% of KSI collisions. Similarly, bicycle collisions account for 7% of injury collisions, but 12% of KSI collisions.

Injury Collisions, 2020-2024



KSI Injury Collisions, 2020-2024

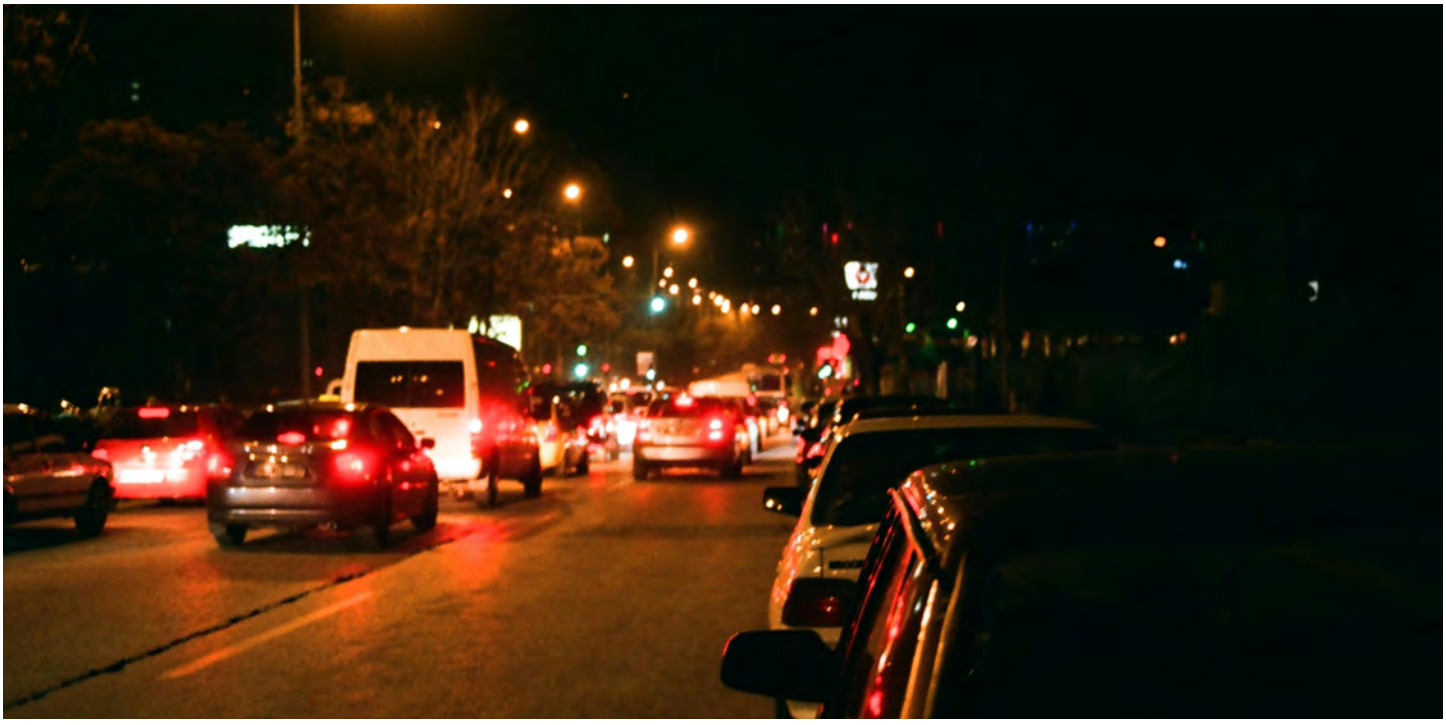


Legend

- Vehicle Only
- Bicyclist
- Pedestrian

Nighttime Collisions

29% of injury collisions in the City between 2020 and 2024 were reported as occurring at night. While Pasadena has excellent coverage of street lighting across the City, opportunities remain to address visibility and other issues that contribute to nighttime collisions, such as driving under the influence.



BUILDING ON PREVIOUS EFFORTS AND BEST PRACTICE

Federal, State and Local Policy and Guidance

This Action Plan is built on significant advancements in transportation safety policy and guidance at the federal, state, and local levels. Recent developments in safety guidance began with the Federal Highway Administration (FHWA) guidance on Local Roadway Safety Plans (LRSP) in 2012.

2012

FHWA Local Roadway Safety Plans

In 2012, the FHWA released a manual to support local agencies in the development of Local Road Safety Plans (LRSP). The manual provided guidance on data-driven analyses to identify and address roadway safety issues.

2020

Caltrans "Pivot"

In 2020, Caltrans pivoted to the Safe System Framework in the Strategic Highway Safety Plan (released 2022).

Caltrans Adopts a Vision Zero Goal

In 2020, Caltrans adopted a Vision Zero goal to eliminate severe and fatal crashes by 2050.

2021

California AB 43

Passed in 2021, this bill allows for increased flexibility in speed limit setting and allows local authorities to consider factors like pedestrian and bicycle safety when setting speed limits.

USDOT Safe Streets and Roads for All

Passed in 2021, this bill dedicated $5 billion to safe streets projects over five years.

Safe System Approach

The LRSP and this Action Plan are consistent with the FHWA's Safe System approach, which has also been adopted at the state level by Caltrans. The Safe System approach is a framework created by FHWA for designing and managing our roadways that accounts for human error and vulnerability. It is built upon five core elements (within the circle) and guided by six key principles (outside the circle). Establishing a roadway system that incorporates all five core elements creates redundancy, ensuring that if one component fails, the entire system remains functional. This Safe System approach represents a shift in thinking on improving roadway safety. Instead of an over-reliance on changing behavior through education campaigns or enforcement, it encourages roads, vehicles, and policies intentionally designed to prioritize safety.

Source: California Office of Traffic Safety

Section 2

DEVELOPING THE ACTION PLAN

This Action Plan builds upon recent local planning initiatives to improve transportation safety throughout Pasadena and presents updated, prioritized list of safety projects. The Action Plan and supporting analyses represent a collaborative effort between City Departments. Input from Pasadena community members directly informed the final priority project list and was invaluable to the Action Plan's development.

OVERVIEW OF ACTION PLAN DEVELOPMENT

This Action Plan puts forth an updated, prioritized list of safety projects, representing the next phase of the City's safety efforts. The safety projects in the Action Plan were informed by a comprehensive review of the City's existing plans, multiple rounds of community engagement, and a project prioritization exercise.

Additional details about the approach and results from each phase of work are described in Appendices A, B, and C.

Cont. on next page

The Plan Development Process Visualized

The following pages outline the development of the Action Plan in chronological order. Each key milestone is described to help illustrate the process.

Note on data: Safety corridors were developed using 2015 to 2019 collision data for consistency with the 2022 LRSP. However, citywide and individual crash statistics were updated with the most recently available data (2020-2024).

REVIEW OF EXISTING CITY PLANS

Assessed 80 existing transportation projects across the following plans:

LOCAL ROADWAY SAFETY PLAN (2022)

The LSRP created a prioritized list of safety improvements and identified locations where each type of countermeasure should be implemented.

PEDESTRIAN TRANSPORTATION ACTION PLAN (2024)

The PTAP included descriptions of enhancements along eleven major streets with specific improvements for the area surrounding each intersection.

GREENWAYS FEASIBILITY STUDY (2021)

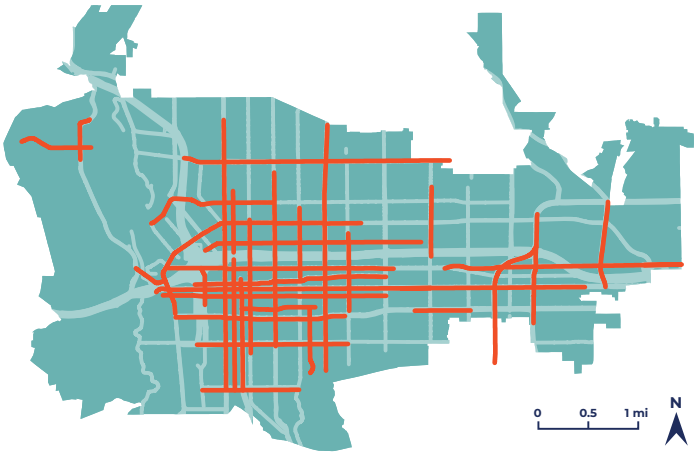
The GFS proposed planning-level concepts for four north-south greenways.

CAPITAL IMPROVEMENT PROGRAM – TRANSPORTATION (FY 25-29)

The list of transportation projects in the FY25-29 CIP includes 46 prioritized projects, with varying levels of allocated funding.

SAFETY CORRIDORS DEVELOPMENT

Developed a network of corridors with the highest incidence of injury collisions across all modes. The methodology for developing the Safety Corridors is described in more detail in **Appendix A.**



Safety Corridors

A larger version of this map is available on page 20 of this plan!

PRIORITIZATION OF EXISTING PROJECTS

Identified 20 existing transportation projects that from the LRSP, PTAP, GFS, and CIP had the greatest expected safety and equity benefits. Projects were scored based on the collision history at their proposed location, the crash reduction factors of their proposed engineering countermeasures, their proximity to historically disadvantaged communities, the number of existing City plans that include their project, the number of travel modes they would benefit, and their climate and resiliency benefit. These criteria and scoring were guided by the SS4A program criteria that is similar to those of other state and regional traffic safety funding programs. This process is described in more detail in **Appendix B.**

Priority Project Scoring Matrix

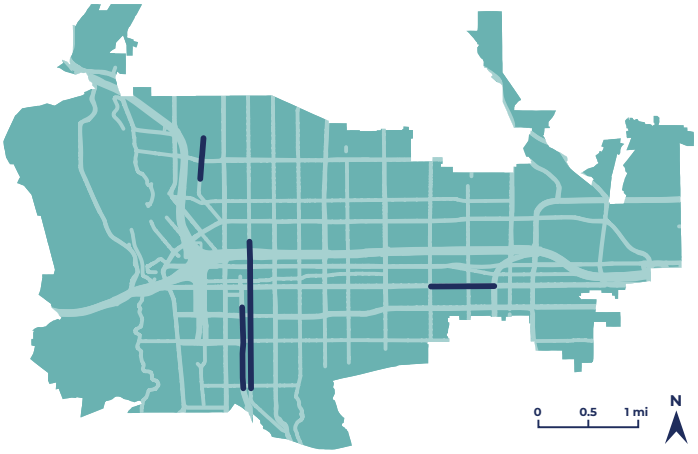
Category	Criteria	Score
Safety Benefit	Overlaps with Safety Corridors	0-5
Crash Reduction Factor	Countermeasure crash reduction factor provided in 2024 California Local Road Safety Manual	0-5
Community Impact	Within an area of the city with higher rates of people living in poverty and/or disproportionately burdened by pollution.	0-5
Plan Concurrence	Number of existing plans that include the project	0-3
Complete Streets Benefit	Number of modes benefited (walk, bike/ micromobility, transit, vehicle)	0-5
Climate & Resiliency Benefits	Incorporates green infrastructure Reduces vehicle miles traveled	0-2

ROUND ONE COMMUNITY ENGAGEMENT

Collected public feedback on the top 20 projects. Participants ranked their highest priority projects through an in-person and online project prioritization exercise. Community members also identified other areas where they had transportation safety concerns through an interactive mapping exercise.

IDENTIFICATION OF PRIORITY PROJECTS

Recommended four community-generated projects—Arroyo Parkway, Marengo Avenue, Colorado Boulevard, and Sunset Avenue—along with eleven of the existing safety projects for inclusion in this Action Plan based on the prioritization exercise and community input.



Four New Community Generated Projects for Focused LRSAP

A larger version of this map is available on page 27 of this plan!

ROUND TWO COMMUNITY ENGAGEMENT

Collected feedback on the top safety issues along the four community-generated safety project locations along Arroyo Parkway, Colorado Boulevard, Marengo Avenue, and Sunset Avenue. Used community feedback to develop project descriptions for these community-generated projects.

ACTION PLAN DEVELOPMENT AND ADOPTION

Reviewed and refined the project descriptions for the 15 priority projects to reflect community feedback and the latest safety best practices. Developed an implementation plan with approximate cost and timeline estimates.

City staff presented the Action Plan to local advisory and governing bodies of the Transportation Advisory Committee, Municipal Services Committee, and City Council for additional feedback and eventual approval.

Final Selected Priority Project Sites

Project Type

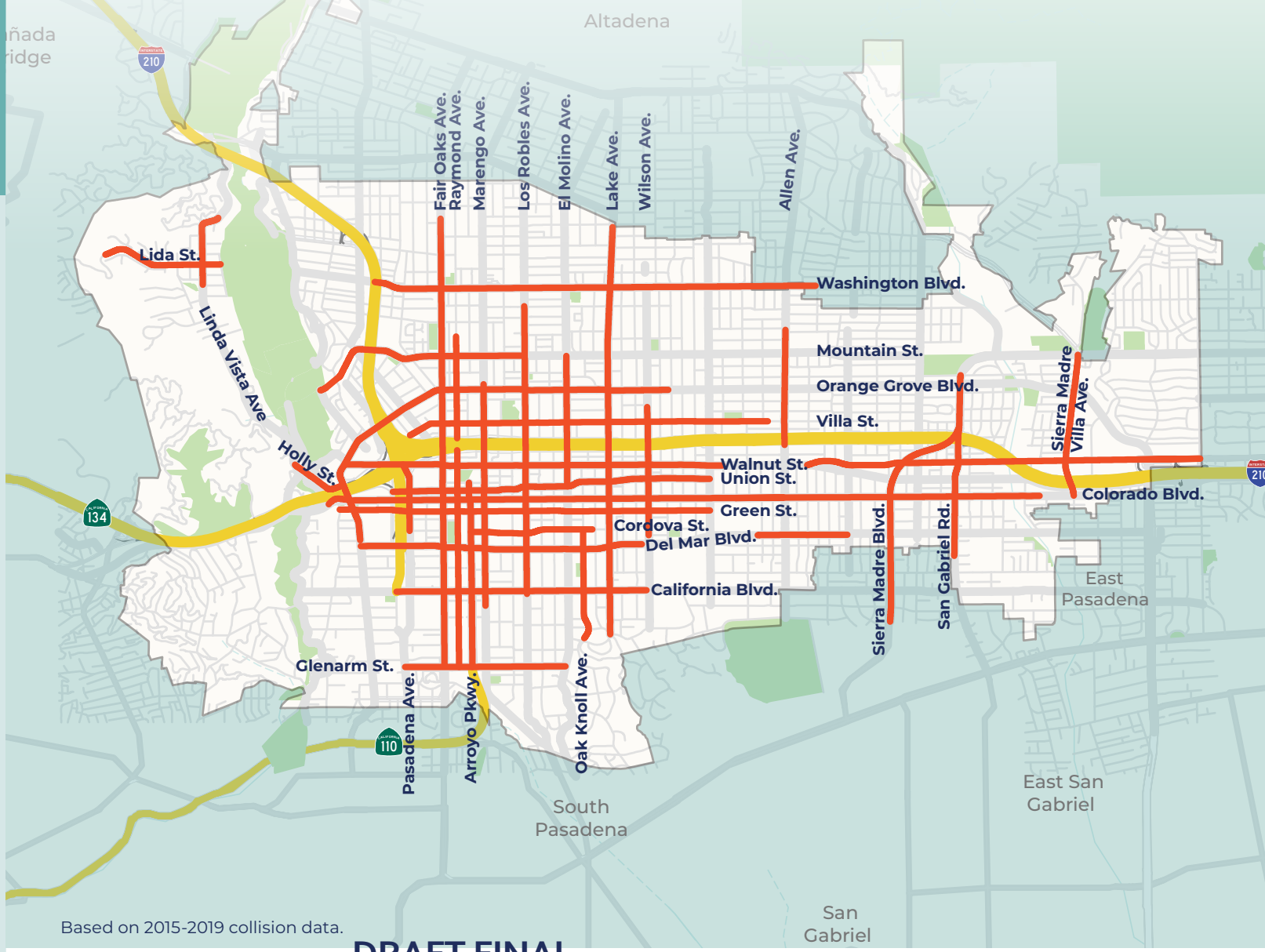
- Corridor
- Intersection

A larger version of this map is available on page 27 of this plan!

SAFETY CORRIDORS

The Pasadena Safety Corridors represent streets with the greatest number and severity of collisions based on injury collision data. The Safety Corridors form a network of roadways that can be targeted for future safety improvements across the City. The network can also support efforts to reduce speed limits, as allowed by AB 43. More detail on the development of the Safety Corridors and each segment's extent is provided in **Appendix A.**

80 percent of KSI collisions occurred on just **13 percent** of Pasadena's roadways, represented by the Safety Corridors.



Based on 2015-2019 collision data.

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COMMUNITY FEEDBACK

Community engagement played an essential role in the development of the Action Plan. Community members shared feedback on their safety project priorities and broader transportation safety concerns over the course of two rounds of in-person and online engagement.

ENGAGEMENT EVENTS

ROUND ONE OF ENGAGEMENT

October 16, 2024
Victory Park Community Center Workshop

October 17, 2024
Villa Park Community Center Workshop

October 22, 2024
Robinson Park Recreation Center Workshop

October 24, 2024
City Hall Training Room Workshop

ROUND TWO OF ENGAGEMENT

April 5, 2025
Victory Park Farmer's Market Pop-Up

April 12, 2025
Victory Park Farmer's Market Pop-Up

April 12, 2025
Rose Bowl Aquatic Center Pop-Up

April 15, 2025
La Pintoresca Library Pop-Up

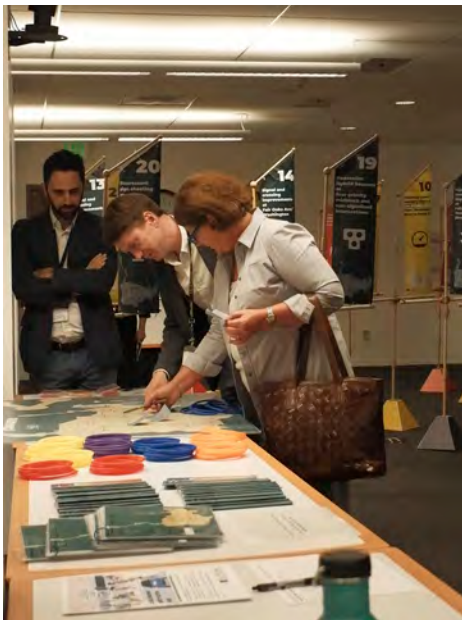
Round One

Fall 2024

Four in-person workshops were held where attendees could rank their top safety projects and highlight any other areas in the City where they had transportation safety concerns. Community members could also provide feedback via the project website, which included a project ranking survey and interactive mapping exercise.

4
In-Person Workshops

201
Contributors

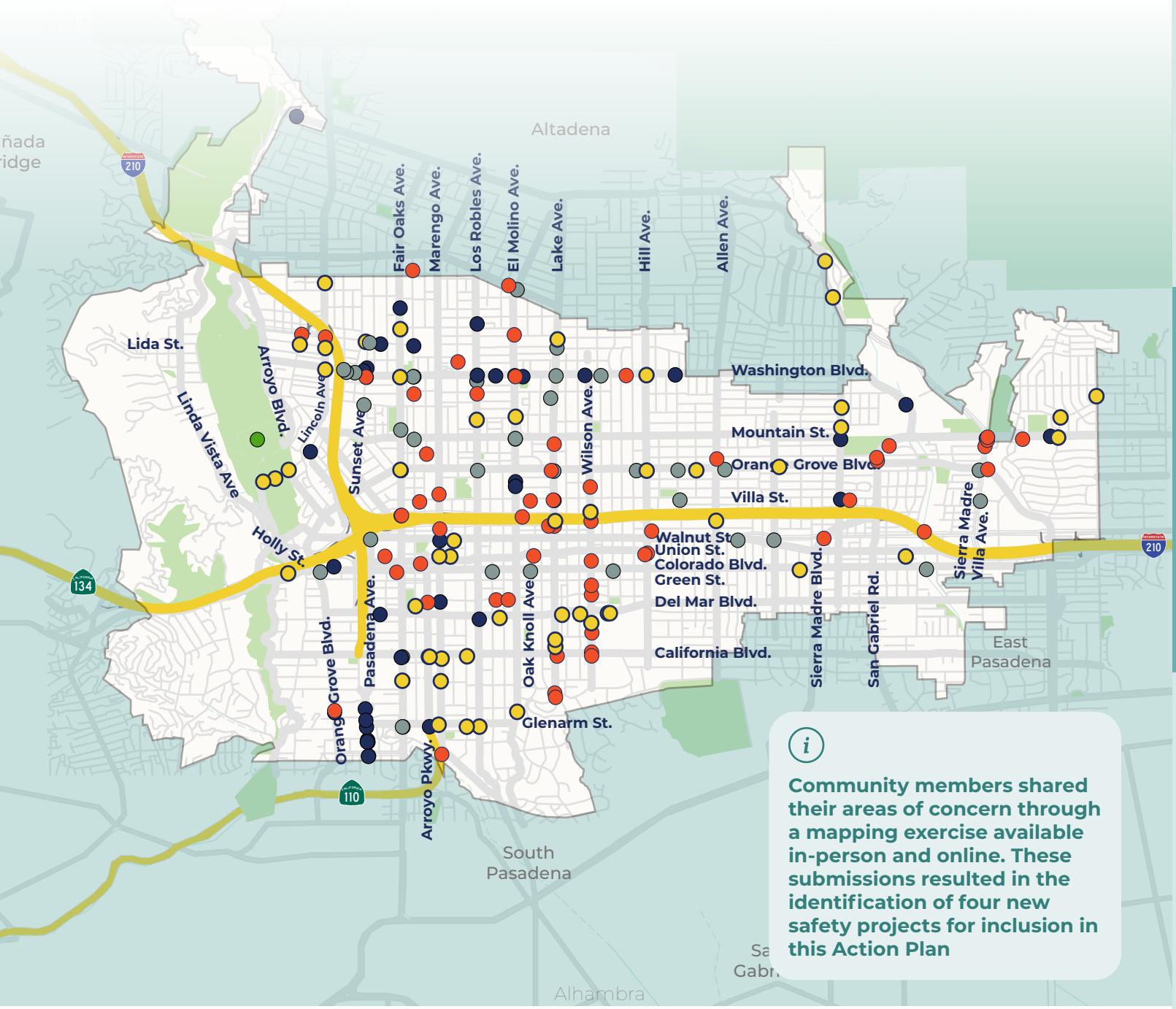


CITIZEN ADVISORY COMMITTEE

The project development process was overseen by a Citizen Advisory Committee consisting of local stakeholders and Council District representatives.

The advisory committee met monthly to discuss project development progress with City staff and provided feedback and guidance on the selection process and project details.

194
Safety Concern Pins Submitted



Community Safety Concern Submissions

Safety Concern Mode

- Driving
- Biking
- Walking
- Biking/Walking
- Other/No Mode

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Round One Key Takeaways

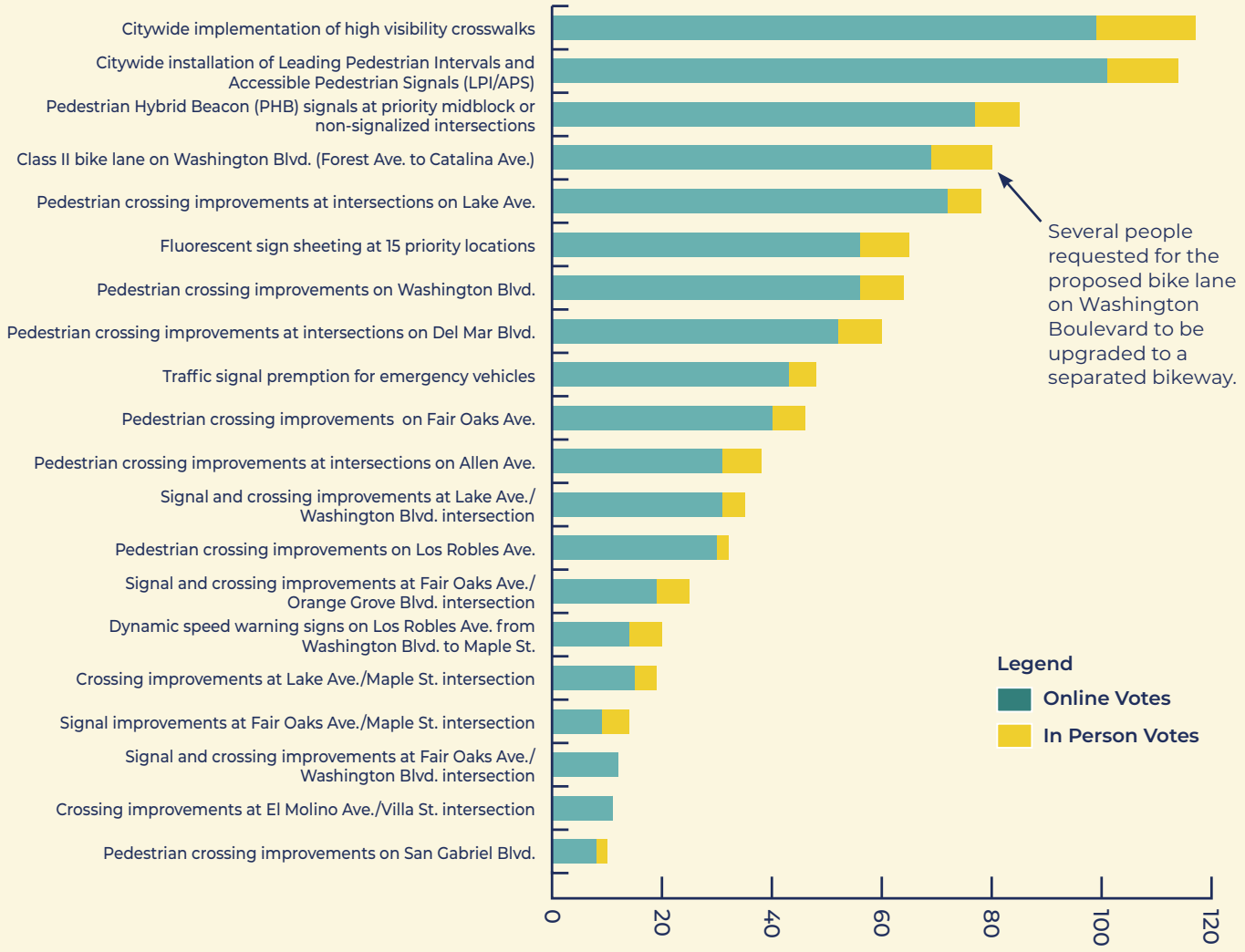
In-person and online participants generally expressed a preference for citywide projects and projects along major corridors.

The most common safety concerns were speeding and the ability of pedestrians and bicyclists to cross intersections safely. High traffic speeds, high-speed turns, and a lack of pedestrian infrastructure were also noted.

Participants preferred separated bikeways over bike lanes and bike routes, sharing that more separation would make bicyclists feel safer and encourage more residents to bike.

The findings and lessons learned from this first outreach process directly informed the prioritization of existing City projects and the identification of community-generated projects for inclusion in the Action Plan.

Top 20 Existing Safety Projects by Community Votes



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Round Two

Spring 2025

Four pop-up events were held around the city to collect feedback about the top safety issues at the four community-generated safety project corridors along:

- Arroyo Parkway
- Colorado Boulevard
- Marengo Avenue
- Sunset Avenue

These projects were generated based on the results of the first round of engagement in Fall 2024. Visitors could vote on their top safety concerns along each of the four corridors.

4
Pop-Up Events

293
Contributors

483
Safety Concerns Submitted

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Round Two Key Takeaways

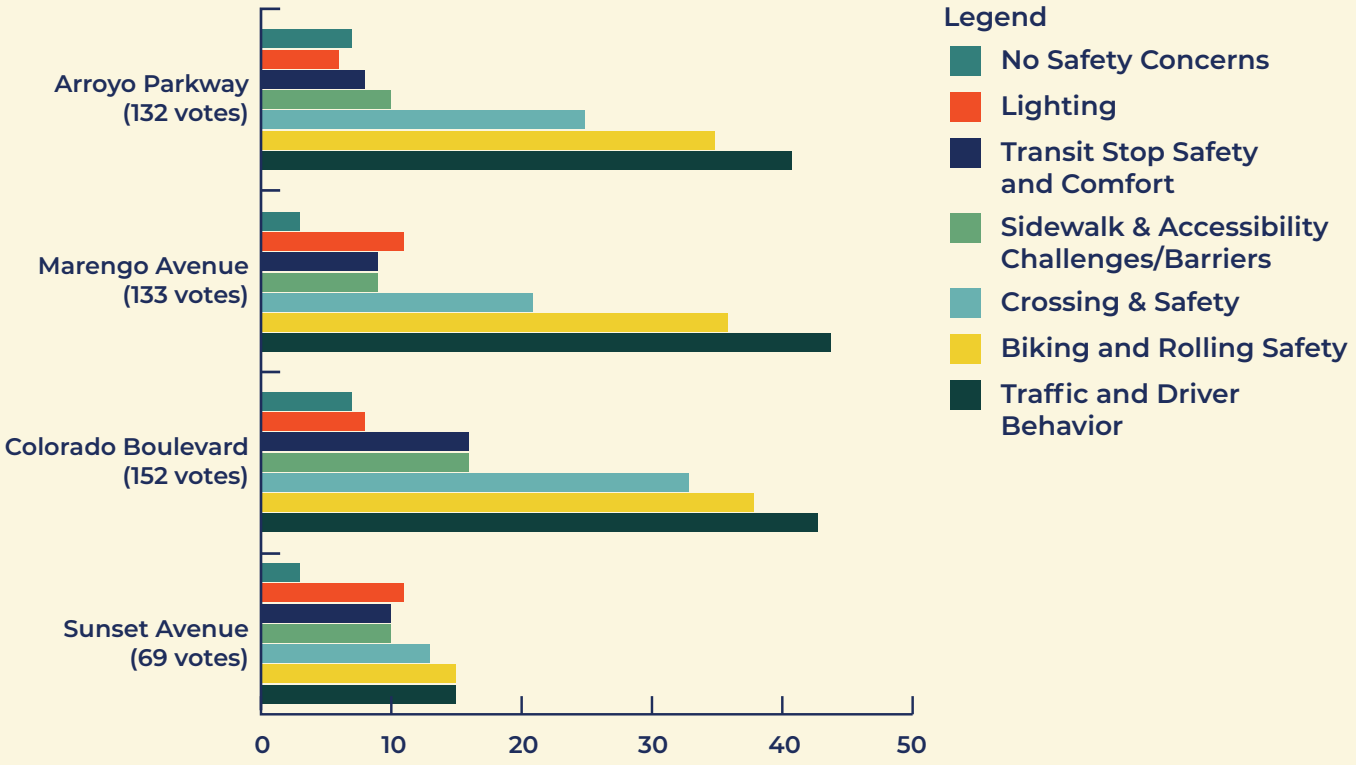
The greatest areas of concern across all four corridors were traffic and driver behavior, biking and rolling safety, and crossing safety. These three concerns accounted for 75% of the total safety concerns shared by the community during the second round of engagement.

Sidewalk, accessibility challenges, and lighting were also noted but ranked lower than driver behavior, crossing safety, and biking safety across all four projects.

Community members were more familiar with projects along the City's major corridors. Arroyo Parkway, Colorado Boulevard, and Marengo Avenue all received well over 100 safety concern contributions. Fewer community members were familiar with Sunset Avenue, a residential street, though this corridor still received 69 contributions.

The findings from this outreach process informed the development of the project description and potential countermeasures for the four community-generated safety projects, which are included in the Action Plan.

Top Safety Concern Along Community-Generated Project Corridors



PLAN ADOPTION

The City of Pasadena government has several advisory commissions and governing bodies that are responsible for reviewing, approving, and adopting this Action Plan.

Transportation Advisory Commission

The Transportation Advisory Commission (TAC) is made up of City Council appointees. City staff presented the Final Draft of this Action Plan to TAC on September 25, 2025.

Following a discussion of the Action Plan, TAC unanimously supported the LRSAP and the establishment of a goal to eliminate traffic fatalities and reduce serious injuries within the City by 2035 and recommended adoption of the LRSAP by City Council.

Municipal Services Committee

City staff presented the Final Draft LRSAP to the Municipal Services Committee (MSC) on October 14, 2025.

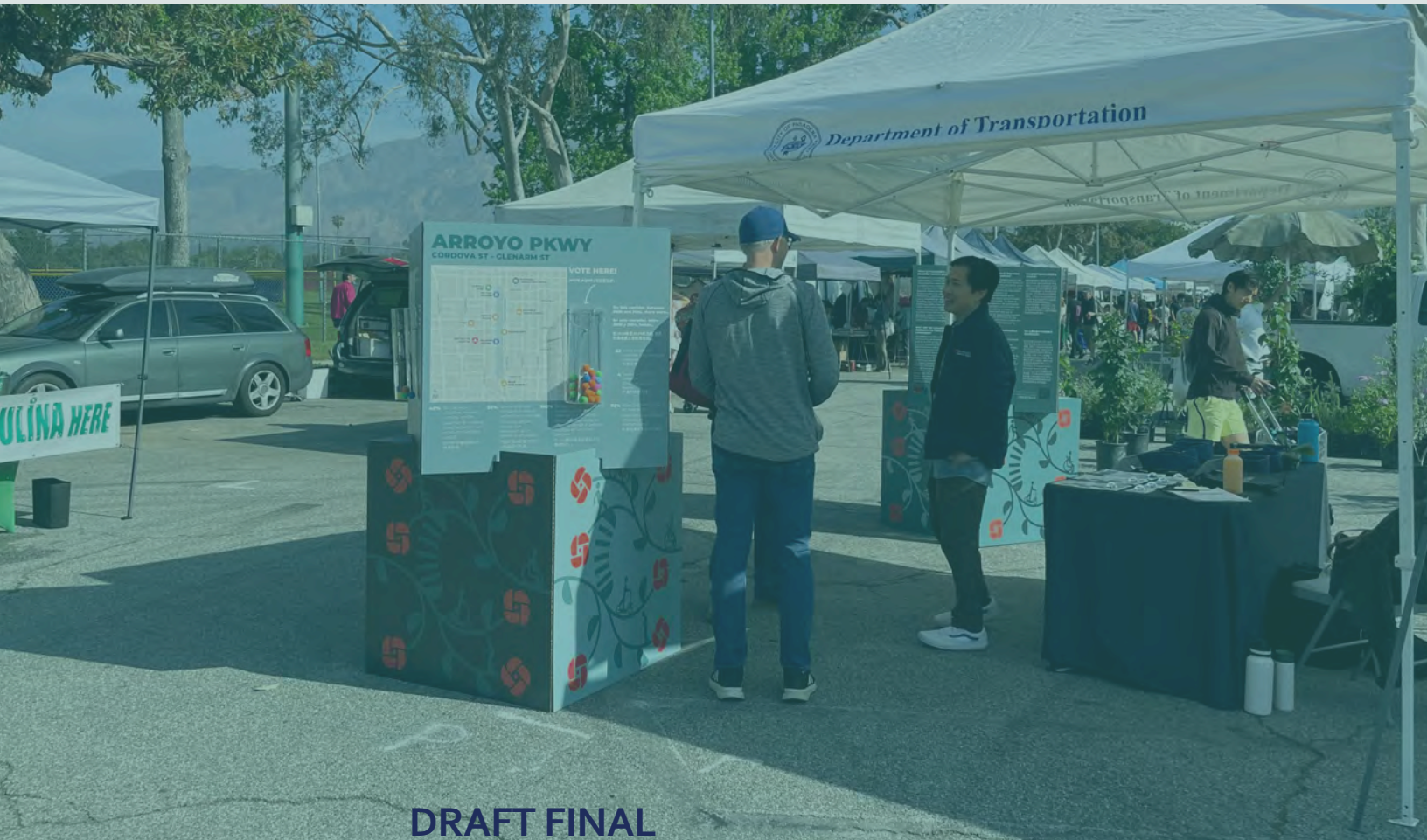
Committee members expressed concerns about the LRSAP setting a citywide project prioritization framework; however, the LRSAP is intended to prioritize projects specifically for the Safe Streets and Roads for All (SS4A) or similar grant opportunities, as identified projects in this plan are unfunded. As a result, it was recommended to revise the title from LRSAP to Focused LRSAP to reflect the purpose of the grant-specific requirement and not replace other City transportation safety priorities, such as the Capital Improvement Program.

Additionally, committee members recommended to expand the project limits of these previously adopted projects on Washington Boulevard to include the full extent of the corridor. These recommended changes are reflected in the Focused LRSAP.

Section 3

ACTION PLAN

Pasadena is committed to eliminating fatalities and serious injuries on its roadways by 2035. The 15 priority projects identified in this Action Plan will help bring us closer to making this vision for a safer multimodal future a reality.



PRIORITY SAFETY PROJECTS

The 15 priority projects in this Action Plan represent projects in existing City plans with the greatest expected safety benefit, as well as areas that community members identified as needing more investment from a multimodal safety perspective.

We reviewed and updated each of these priority projects to align with the latest safety best practices and to ensure they address the safety emphasis areas identified in previous local planning efforts. The project cutsheets describe the potential countermeasures that could address collision trends and community concerns in project areas as well as preliminary cost and time estimates for implementing each project.

#	Project Description	Location and/or Extent
1	Pedestrian improvements at intersections	**Lake Ave.** from north City limit to Arden Rd.
2		**Los Robles Ave.** from north City limit to Walnut St.
3		**Fair Oaks Ave.** within City limits
4		**Washington Blvd.** from Arroyo Blvd. to Bellford Ave.
5	Pedestrian Hybrid Beacon (HAWK) signals at non-signalized intersections	**Lincoln Ave. at Toolen Pl.** **Atchinson St. at Lake Ave.** **Elizabeth St. at Lake Ave.** **Bresee Ave. at Washington Blvd.**
6	Signal and crossing improvements	**Fair Oaks Ave. at Orange Grove Blvd.**
7		**Fair Oaks Ave. at Washington Blvd.**
8	High-visibility crosswalks	**Citywide**
9	Traffic signal preemption for emergency vehicles	**Citywide**
10	Leading pedestrian intervals and accessible pedestrian signals	**Citywide**
11	Corridor-wide traffic calming measures	**Sunset Ave.** from Howard St. to Hammond St.
12	Corridor-wide bicycle improvements	**Washington Blvd.:** Class III bike route from Arroyo Blvd. to Lincoln Ave. Class IV bike lane from Lincoln Ave. to Catalina Ave To be determined bike facility from Catalina Ave. to Bellford Ave.
13	Corridor-wide pedestrian improvements	**Colorado Blvd.** from Allen Ave. to Sierra Madre Blvd.
14	Corridor-wide pedestrian and bicycle improvements	**Arroyo Pkwy.** from Glenarm St. to Cordova St.
15		**Marengo Ave.** from Glenarm St. to Villa St.

Priority Projects

Priority Project	Original Plan	Pasadena Safety Emphasis Areas	Timeline	Cost
Near-Term Projects				
Pedestrian improvements on Lake Avenue	PTAP			$$$
Pedestrian improvements on Los Robles Avenue	PTAP			$$$
Pedestrian Hybrid Beacon (PHB) signals at priority midblock or non-signalized intersections	LRSP			$$
Signal and crossing improvements at Fair Oaks Avenue/Orange Grove Boulevard	LRSP			$
Signal and crossing improvements at Fair Oaks Avenue/Washington Boulevard	LRSP			$
Citywide high-visibility crosswalks	CIP			$$
Citywide traffic signal preemption for emergency vehicles	CIP			$
Citywide installation of Leading Pedestrian Intervals and Accessible Pedestrian Signals (LPI/APS) at signalized intersections	CIP			$$
Mid-Term Projects				
Pedestrian improvements on Fair Oaks Avenue	PTAP			$$$
Pedestrian improvements on Washington Boulevard	PTAP			$$$
Traffic calming measures on Sunset Avenue	New project			$$

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Priority Project Table (Cont.)

Priority Project	Original Plan	Pasadena Safety Emphasis Areas	Timeline	Cost
Long-Term Projects				
Upgraded bicycle facilities on Washington Boulevard from Arroyo Boulevard to Bellford Avenue	LRSP			$$$
Multimodal improvements on Arroyo Parkway	New project			$$$
Pedestrian crossing improvements on Colorado Boulevard	New project			$$$
Multimodal improvements on Marengo Avenue	New project			$$$

TABLE LEGEND

Pasadena Safety Emphasis Areas

 **Signalized Intersections**

 **Bicyclist and Pedestrian Safety**

 **Unsafe Speed**

 **Visibility**

Cost

Preliminary assessment of project cost

$ Less than $1 Million
Potential to be funded at local/regional level

$$ $1 - $5 Million
Primarily state or federal grant funding

$$$ More than $5 Million
Would likely require state/federal competitive grant funding

Timeline

Approximate timeframe for implementing the project

Near-Term
1-3 Years

Mid-Term
3-5 Years

Long-Term
6+ Years

Note: Collision statistics on the following pages for projects originating in the PTAP represent collisions at signalized intersections along the project corridor.

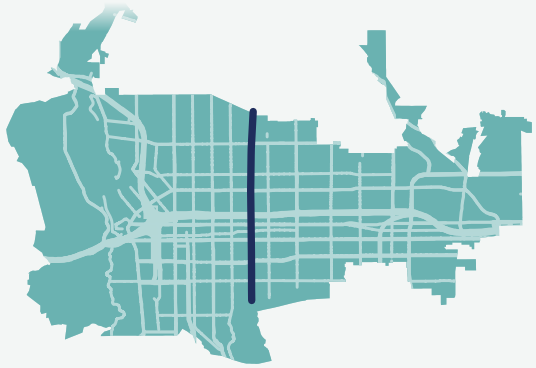
CORRIDOR PROJECT

LAKE AVENUE

NORTH PASADENA CITY LIMIT TO ARDEN ROAD

Pedestrian improvements with a focus on crossing safety

The Project Site



CORRIDOR CHARACTERISTICS

LENGTH	3.1 MI
ROADWAY WIDTH	60 FT
POSTED SPEED	25-35 MPH
NUMBER OF LANES	3-6 LANES
NUMBER OF SIGNALIZED CROSSINGS	21
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	2,350 FT (10-12 MIN WALK)

COLLISION STATISTICS (2020-2024)

208 TOTAL INJURY COLLISIONS

12 KSI* COLLISIONS

5 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

23% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

63% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

81% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

33% KSI* COLLISIONS WERE BROADSIDES (T-BONE)

DRAFT FINAL

The Project

ORIGINATING PLAN

Pedestrian Transportation Action Plan (2024)

PROJECT DESCRIPTION

This project proposes multi-modal improvements with a focus on pedestrian crossing safety at 19 intersections along Lake Avenue. Proposed countermeasures include high-visibility crosswalks, RRFBs and PHBs, curb extensions, curb ramp improvements, signal improvements like leading pedestrian intervals, and roadway reconfiguration.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Near-Term

COST
$$$

PROJECT COUNTERMEASURES

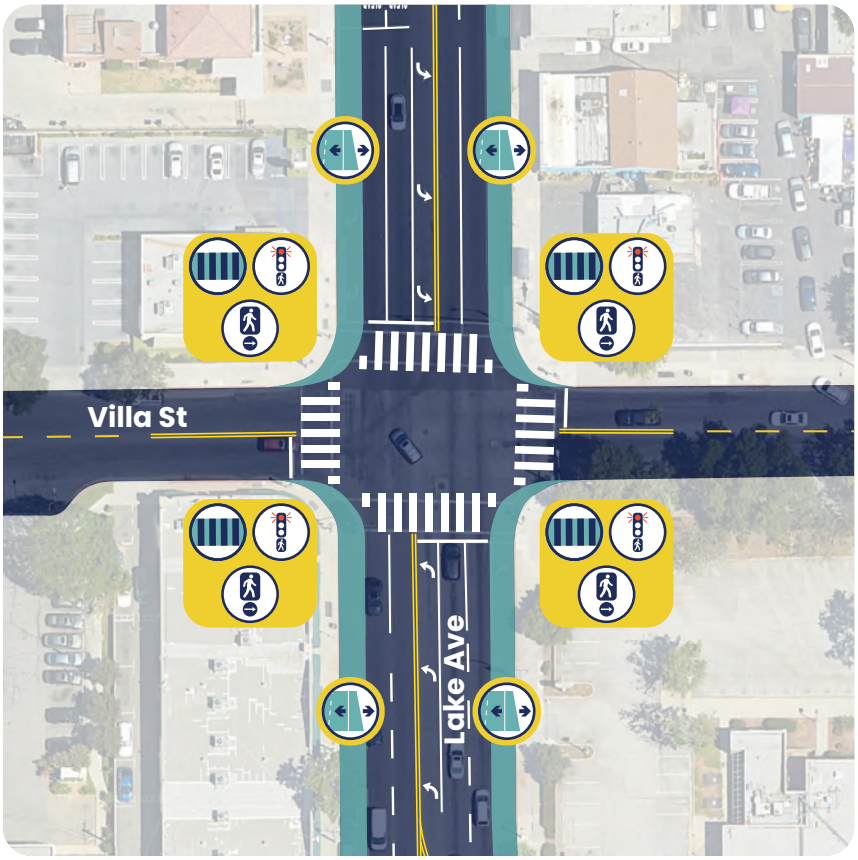
See **countermeasure toolbox in Appendix D** for more details.

- ACCESSIBLE PEDESTRIAN SIGNALS
- CURB EXTENSIONS
- EXCLUSIVE PEDESTRIAN PHASE
- HIGH-VISIBILITY CROSSWALKS
- LEADING PEDESTRIAN INTERVALS
- RAPID FLASHING BEACONS OR PEDESTRIAN HYBRID BEACONS
- PROTECTED LEFT TURN PHASING
- SIDEWALK WIDENING
- LOWER SPEED LIMIT

* KSI (Killed or Severely Injured)

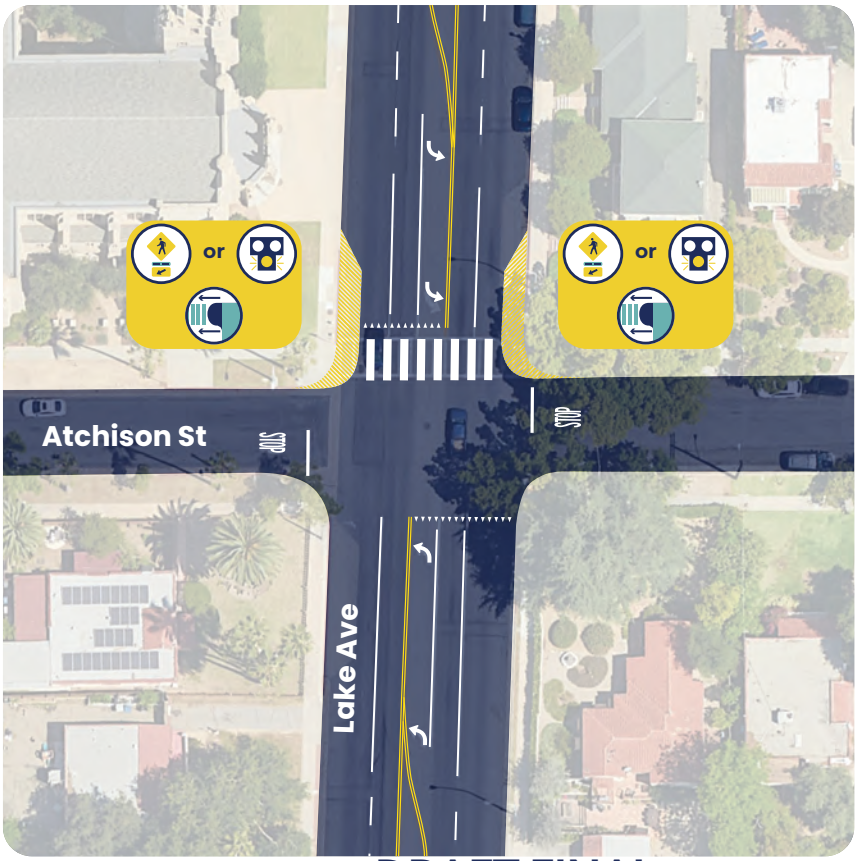
Site Visualization & Potential Countermeasures

SIGNALIZED INTERSECTION CONCEPT



New Sidewalk Extent Curb Extensions

SIDE STREET STOP-CONTROLLED INTERSECTION CONCEPT



Curb Extensions

FOCUSED INTERSECTION COUNTERMEASURES

This project would also consider the following countermeasures at a subset of signalized intersections along the corridor as appropriate.

Exclusive Pedestrian Phase

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

Protected Left Turn Phasing

A protected left turn is a traffic signal configuration that provides dedicated time for vehicles to make left turns, minimizing conflicts with oncoming traffic, bicyclists, and pedestrians.

Images: City of Pasadena, CA

CORRIDOR PROJECT

LOS ROBLES AVENUE

NORTH PASADENA CITY LIMIT TO WALNUT STREET

Pedestrian improvements with a focus on crossing safety

The Project Site

CORRIDOR CHARACTERISTICS

LENGTH	2.2 MI
ROADWAY WIDTH	50-60 FT
POSTED SPEED	30-35 MPH
NUMBER OF LANES	3-4 LANES
NUMBER OF SIGNALIZED CROSSINGS	10
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	3,190 FT (14-16 MIN WALK)

COLLISION STATISTICS (2020-2024)

94 TOTAL INJURY COLLISIONS

2 KSI* COLLISIONS

1 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

63% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

63% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

75% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

50% KSI* COLLISIONS WERE BROADSIDES (T-BONE)

The Project

ORIGINATING PLAN

Pedestrian Transportation Action Plan (2024)

PROJECT DESCRIPTION

This project proposes multi-modal improvements with a focus on pedestrian crossing safety at 14 intersections along Los Robles Avenue. Proposed countermeasures include high-visibility crosswalks, RRFBs and PHBs signals, curb extensions, curb ramp improvements, and signal improvements like leading pedestrian interval.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Near-Term

COST
$$$

PROJECT COUNTERMEASURES

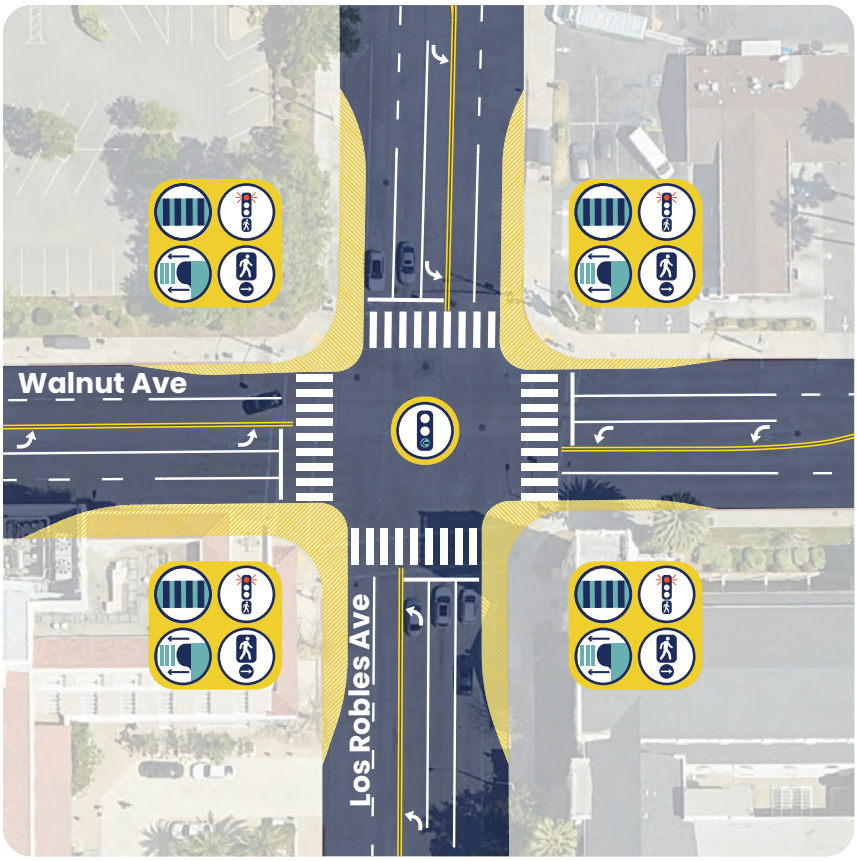
See **countermeasure toolbox in Appendix D** for more details.

- ACCESSIBLE PEDESTRIAN SIGNALS
- CURB EXTENSIONS
- EXCLUSIVE PEDESTRIAN PHASE
- HIGH-VISIBILITY CROSSWALKS
- LEADING PEDESTRIAN INTERVALS
- LOWER SPEED LIMIT
- PEDESTRIAN REFUGE ISLAND
- PROTECTED LEFT TURN PHASING
- RAPID FLASHING BEACONS OR PEDESTRIAN HYBRID BEACONS
- SIDEWALK WIDENING

* KSI (Killed or Severely Injured)

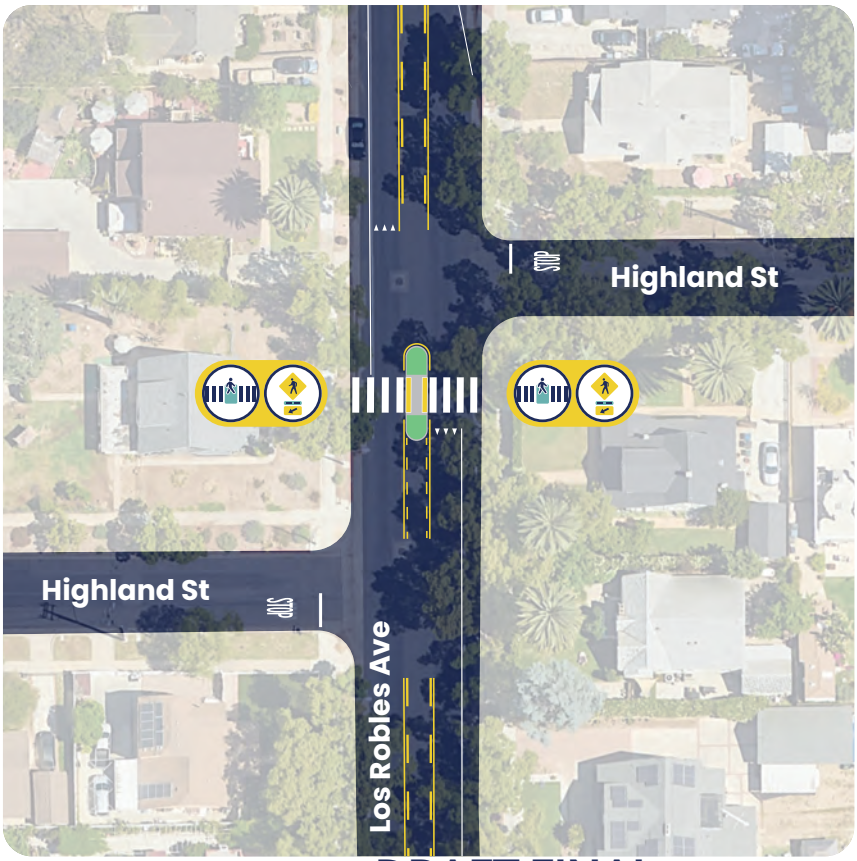
Site Visualization & Potential Countermeasures

SIGNALIZED INTERSECTION CONCEPT



Curb Extensions

SIDE STREET STOP-CONTROLLED INTERSECTION CONCEPT



MIDBLOCK COUNTERMEASURES

This project would also consider the following countermeasures along the corridor.

Sidewalk Widening[1]

Widened sidewalks provide a more comfortable space for pedestrians, particularly in locations with high volumes of pedestrians, and provide space to accommodate people in wheelchairs.

[1]Image: NACTO

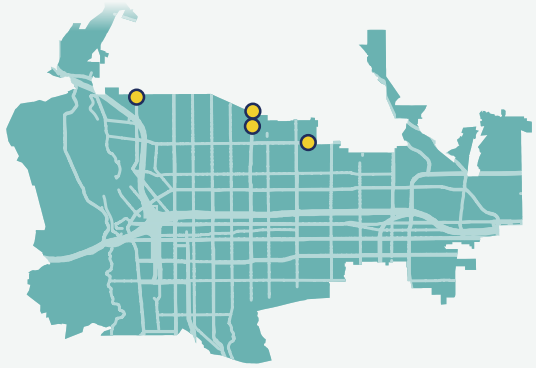
INTERSECTIONS PROJECT

PEDESTRIAN HYBRID BEACONS (PHBs)

PRIORITY MIDBLOCK OR NON-SIGNALIZED INTERSECTIONS

Pedestrian Hybrid Beacons (sometimes referred to as HAWK signals) at priority non-signalized intersections

The Project Site



PROJECT CHARACTERISTICS

INTERSECTIONS ON CORRIDOR

- LINCOLN AVENUE/ TOOLEN PLACE
- ATCHINSON STREET/LAKE AVENUE
- ELIZABETH STREET/ LAKE AVENUE
- BRESEE AVENUE/WASHINGTON BOULEVARD

COLLISION STATISTICS (2020-2024)

10
TOTAL INJURY COLLISIONS

100%
INTERSECTION COLLISIONS

0
KSI* COLLISIONS

100%
PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

The Project

ORIGINATING PLAN

Local Roadway Safety Plan *(2022)*

PROJECT DESCRIPTION

This project includes installation of Pedestrian Hybrid Beacons (PHBs) signals at midblock or non-signalized intersections with designated pedestrian crossings. These signals allow pedestrians to cross the road safely operating in a Yellow-Red-Flashing Red sequence to alert motorists that pedestrians need to cross the road.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Near-Term

COST
$$

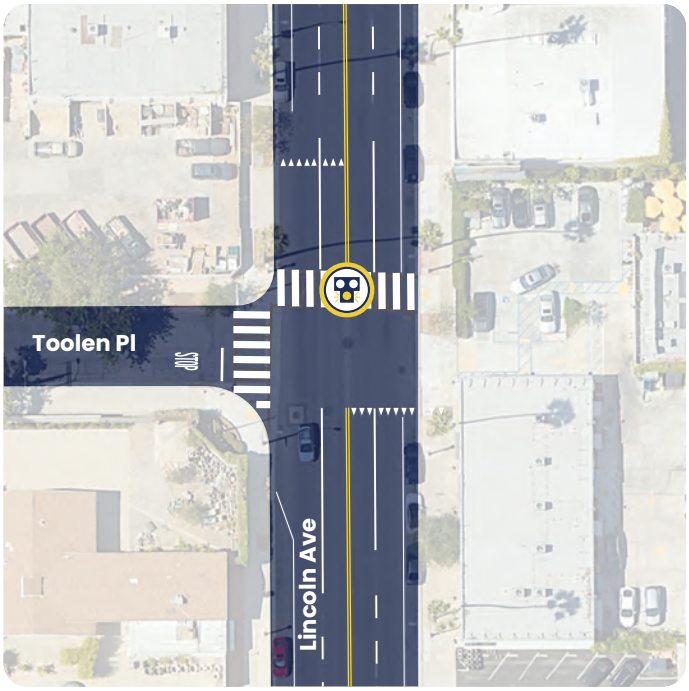
PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.

PEDESTRIAN HYBRID BEACON (PHB)

Site Visualization & Potential Countermeasures

SIDE STREET STOP-CONTROLLED INTERSECTION CONCEPT



* KSI (Killed or Severely Injured)

DRAFT FINAL

INTERSECTION PROJECT

FAIR OAKS AVENUE/ ORANGE GROVE BOULEVARD

Signal and crossing improvements at Fair Oaks Avenue/Orange Grove Boulevard

The Project Site

INTERSECTION CHARACTERISTICS

ROADWAY WIDTH	50 FT AND 70 FT
POSTED SPEED	35 MPH
NUMBER OF LANES	5 LANES
NUMBER OF SIGNALIZED CROSSINGS	1

COLLISION STATISTICS (2020-2024)

14 TOTAL INJURY COLLISIONS

50% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

1 KSI* COLLISIONS

50% INJURY COLLISIONS INVOLVED A TURNING VEHICLE

1 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

* KSI (Killed or Severely Injured)

The Project

ORIGINATING PLAN

Local Roadway Safety Plan (2022)

PROJECT DESCRIPTION

This project proposes multi-modal improvements to the intersection of Fair Oaks Avenue and Orange Grove Boulevard. Improvements include a flashing yellow arrow to signals in all directions and install curb extensions at the northwest corner of Orange Grove Boulevard.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Near-Term

COST
$

PROJECT COUNTERMEASURES

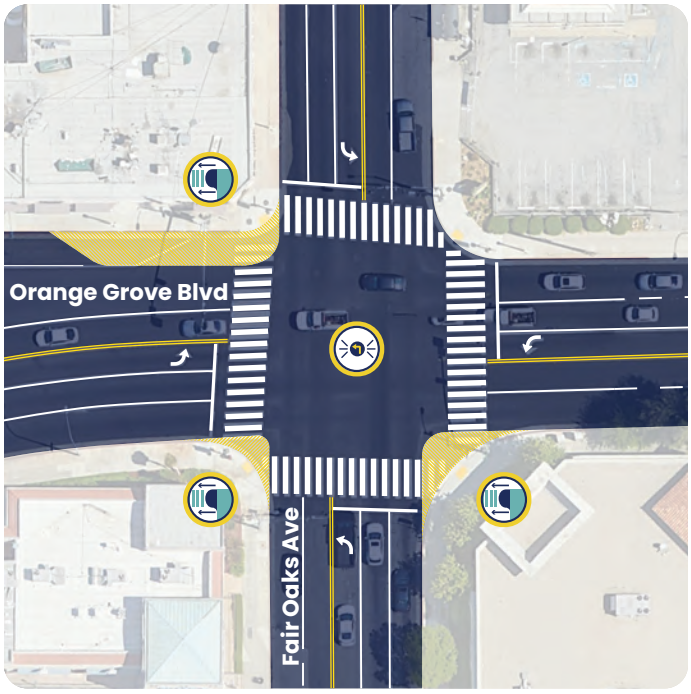
See **countermeasure toolbox in Appendix D** for more details.

CURB EXTENSIONS

FLASHING YELLOW LEFT TURN SIGNAL

Site Visualization & Potential Countermeasures

INTERSECTION CONCEPT



Curb Extensions

DRAFT FINAL

INTERSECTION PROJECT

FAIR OAKS AVENUE/ WASHINGTON BOULEVARD

Signal and crossing improvements at Fair Oaks Avenue/Washington Boulevard

The Project Site

INTERSECTION CHARACTERISTICS

ROADWAY WIDTH	60 FT
POSTED SPEED	35 MPH
NUMBER OF LANES	5 LANES

COLLISION STATISTICS (2020-2024)

22 TOTAL INJURY COLLISIONS

50% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

1 KSI* COLLISIONS

63% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

1 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

63% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

The Project

ORIGINATING PLAN

Local Roadway Safety Plan (2022)

PROJECT DESCRIPTION

This project proposes multi-modal improvements to the intersection of Fair Oaks Avenue and Washington Boulevard. Improvements include adding a flashing yellow arrow to signals in all directions and installing high-visibility crosswalks.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Near-Term

COST
$

PROJECT COUNTERMEASURES

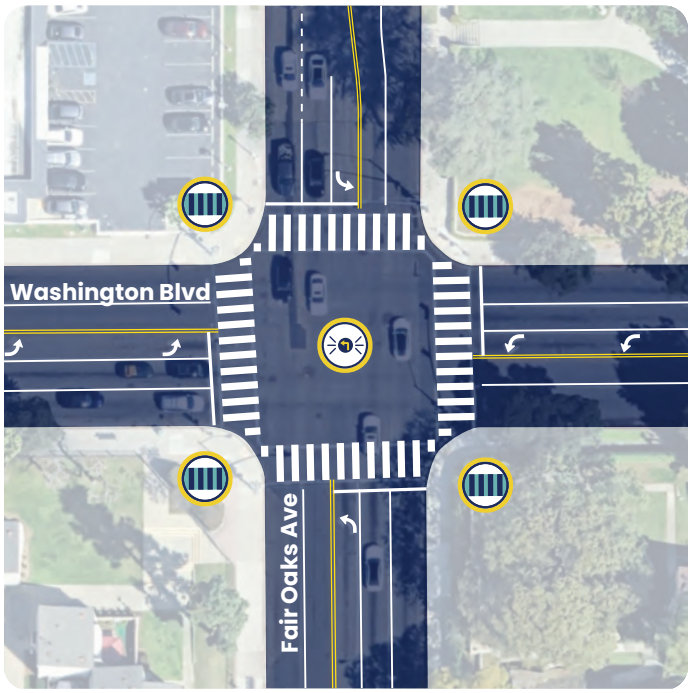
See **countermeasure toolbox in Appendix D** for more details.

HIGH-VISIBILITY CROSSWALKS

FLASHING YELLOW LEFT TURN SIGNAL

Site Visualization & Potential Countermeasures

INTERSECTION CONCEPT



* KSI (Killed or Severely Injured)

DRAFT FINAL

CITYWIDE PROJECT

HIGH-VISIBILITY CROSSWALKS

City of Pasadena

Citywide implementation of continental-style crosswalks (high-visibility crosswalks)

Citywide

COLLISION STATISTICS (2020-2024)

3051
TOTAL INJURY COLLISIONS

58%
PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

187
KSI* COLLISIONS

52%
PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

52
PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

346
PEDESTRIAN COLLISIONS

The Project

ORIGINATING PLAN

Capital Improvement Program - Transportation (FY 2025-2029)

PROJECT DESCRIPTION

This project would systematically replace all existing marked crosswalk striping with continental-style crosswalks at approximately 310 signalized intersections and 35 marked uncontrolled crosswalks citywide.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Near-Term

COST
$$

PROJECT COUNTERMEASURE

See **countermeasure toolbox in Appendix D** for more details.

High-Visibility Crosswalks

A high-visibility crosswalk uses ladder-style stripes made of reflective material, improving safety by increasing visibility and prompting drivers to slow down and yield to pedestrians.

* KSI (Killed or Severely Injured)

Image: City of Pasadena, CA

CITYWIDE PROJECT

TRAFFIC SIGNAL PREEMPTION FOR EMERGENCY VEHICLES

City of Pasadena

Emergency vehicle green light priority at select traffic signals

Citywide

COLLISION STATISTICS (2020-2024)

3051
TOTAL INJURY COLLISIONS

58%
TURNING VEHICLE-INVOLVED KSI* COLLISIONS

187
KSI* COLLISIONS

52%
INTERSECTION COLLISIONS

52
PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

346
VEHICLE KSI* COLLISIONS

The Project

ORIGINATING PLAN

Capital Improvement Program - Transportation (FY 2025-2029)

PROJECT DESCRIPTION

This project provides for the installation of preemption equipment at approxumately ten traffic signals along arterial streets in Pasadena. Transmitters will also be installed on all Fire Department emergency vehicles to control traffic signals during emergency responses. The transmitters will be consistent with regional standards to ensure region-wide compatibility.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE	COST
Near-Term	$

PROJECT COUNTERMEASURE

See **countermeasure toolbox in Appendix D** for more details.

Traffic Signal Preemption[1]

Traffic signal preemption for emergency vehicles allows the emergency vehicle to receive a green light when they are approaching the traffic signal.

* KSI (Killed or Severely Injured)

[1]Image: City of Minneapolis, MN

CITYWIDE PROJECT

LEADING PEDESTRIAN INTERVALS AND ACCESSIBLE PEDESTRIAN SIGNALS

City of Pasadena

Citywide installation of Leading Pedestrian Intervals and Accessible Pedestrian Signals (LPI/APS) at signalized intersections

Citywide

COLLISION STATISTICS (2020-2024)

3051
TOTAL INJURY COLLISIONS

58%
PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

187
KSI* COLLISIONS

52%
PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

52
PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

346
PEDESTRIAN COLLISIONS

* KSI (Killed or Severely Injured)

The Project

ORIGINATING PLAN

Capital Improvement Program - Transportation (FY 2025-2029)

PROJECT DESCRIPTION

This project proposes pedestrian crossing safety improvements through the implementation of Leading Pedestrian Intervals (LPI) and Accessible Pedestrian Signals (APS) at all eligible intersections across the city.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Near-Term

COST
$$

PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.

Leading Pedestrian Intervals

At intersection locations that have a high volume of turning vehicle and have high pedestrian/vehicle conflicts, a leading pedestrian interval gives pedestrians the opportunity to enter an intersection three to seven seconds before vehicles are given a green indication.

Accessible Pedestrian Signals

Includes audible push buttons that improve access for pedestrians who are blind or have low vision. Push buttons comply with the Americans with Disability Act (ADA) standards for accessibility.

DRAFT FINAL

Images: City of Pasadena, CA

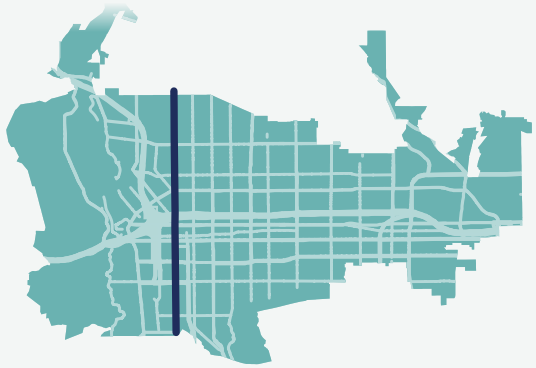
CORRIDOR PROJECT

FAIR OAKS AVENUE

PASADENA CITY LIMITS

Pedestrian improvements with a focus on crossing safety

The Project Site



CORRIDOR CHARACTERISTICS

LENGTH	4.0 MI
ROADWAY WIDTH	55-60 FT
POSTED SPEED	30-35 MPH
NUMBER OF LANES	4 LANES
NUMBER OF SIGNALIZED CROSSINGS	27
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	1,570 FT (6-7 MIN WALK)

COLLISION STATISTICS (2020-2024)

234 TOTAL INJURY COLLISIONS

67% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

9 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

61% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

16 KSI* COLLISIONS

71% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

38% KSI* COLLISIONS WERE BROADSIDES (T-BONE)

The Project

ORIGINATING PLAN

Pedestrian Transportation Action Plan (2024)

PROJECT DESCRIPTION

This project proposes multi-modal improvements with a focus on pedestrian crossing safety at 21 intersections along Fair Oaks Avenue. Proposed countermeasures include high-visibility crosswalks, RRFBs and PHBs, curb extensions, curb ramp improvements, signal improvements like leading pedestrian intervals, and roadway reconfiguration.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Mid-Term

COST
$$$

PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.


ACCESSIBLE PEDESTRIAN SIGNALS


CURB EXTENSIONS


DIRECTIONAL CURB RAMPS


HIGH-VISIBILITY CROSSWALKS


LEADING PEDESTRIAN INTERVALS

LOWER SPEED LIMIT


PROTECTED LEFT TURN PHASING


RAPID FLASHING BEACONS OR PEDESTRIAN HYBRID BEACONS


ROADWAY RECONFIGURATION

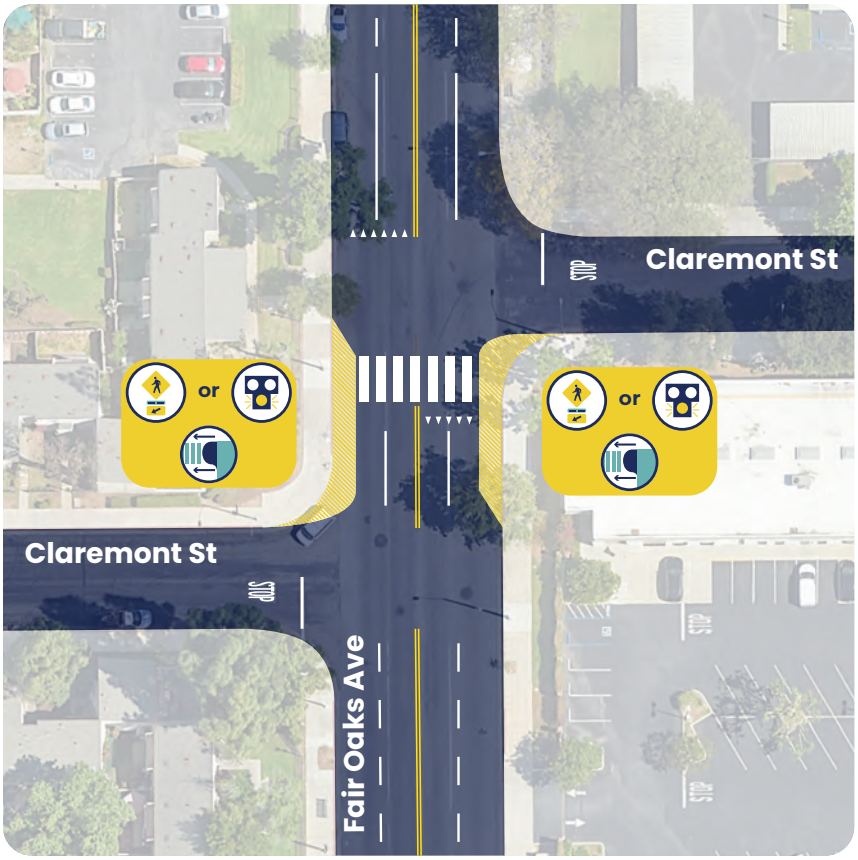

SIDEWALK WIDENING

* KSI (Killed or Severely Injured)

Site Visualization & Potential Countermeasures

SIGNALIZED INTERSECTION CONCEPT

SIDE STREET STOP-CONTROLLED INTERSECTION CONCEPT



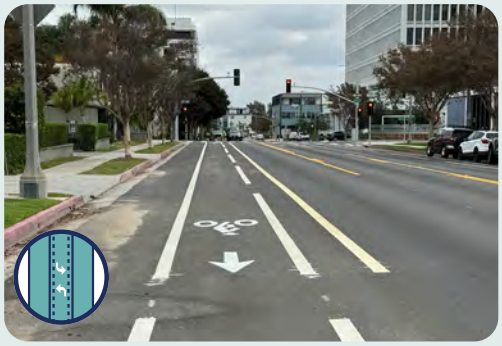
Curb Extensions

MIDBLOCK COUNTERMEASURES

This project would also consider the following countermeasures along the corridor.

Sidewalk Widening[1]

Widened sidewalks provide a more comfortable space for pedestrians, particularly in locations with high volumes of pedestrians, and they provide space to accommodate people in wheelchairs.



Roadway Reconfiguration[2]

Reduces space for vehicle lanes to create room for wider sidewalks, center turn lanes, and pedestrian refuge islands. This enhances safety by lowering vehicle speeds and and providing designated space for all road users.

DRAFT FINAL

[1]Image: NACTO
[2]Image: City of Pasadena, CA

CORRIDOR PROJECT

WASHINGTON BOULEVARD

ARROYO BOULEVARD TO BELLFORD AVENUE

Pedestrian improvements with a focus on crossing safety

The Project Site

CORRIDOR CHARACTERISTICS

LENGTH	3.2 MI
ROADWAY WIDTH	30-60 FT
POSTED SPEED	30-35 MPH
NUMBER OF LANES	2-4 LANES
NUMBER OF SIGNALIZED CROSSINGS	12
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	2,428 FT (10-12 MIN WALK)

COLLISION STATISTICS (2020-2024)

148 TOTAL INJURY COLLISIONS

60% KSI* COLLISIONS WERE BROADSIDES (T-BONE)

5 KSI* COLLISIONS

72% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

2 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

78% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

The Project**

ORIGINATING PLAN

Pedestrian Transportation Action Plan (2024)

PROJECT DESCRIPTION

Improvements would be made at signalized and side street stop-controlled intersections along Washington Boulevard. Typical improvements would include high-visibility crosswalks, RRFBs and PHBs, curb extensions, curb ramp improvements, signal improvements like leading pedestrian intervals, and bus stop improvements. This project would also consider a roadway reconfiguration.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Mid-Term

COST
$$$

PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.


ACCESSIBLE PEDESTRIAN SIGNALS


CURB EXTENSIONS


DIRECTIONAL CURB RAMPS


HIGH-VISIBILITY CROSSWALKS


INSTALL NEW SIGNAL


LEADING PEDESTRIAN INTERVALS

LOWER SPEED LIMIT


PROTECTED LEFT TURN PHASING


RAPID FLASHING BEACONS OR PEDESTRIAN HYBRID BEACONS


ROADWAY RECONFIGURATION


SIDEWALK WIDENING

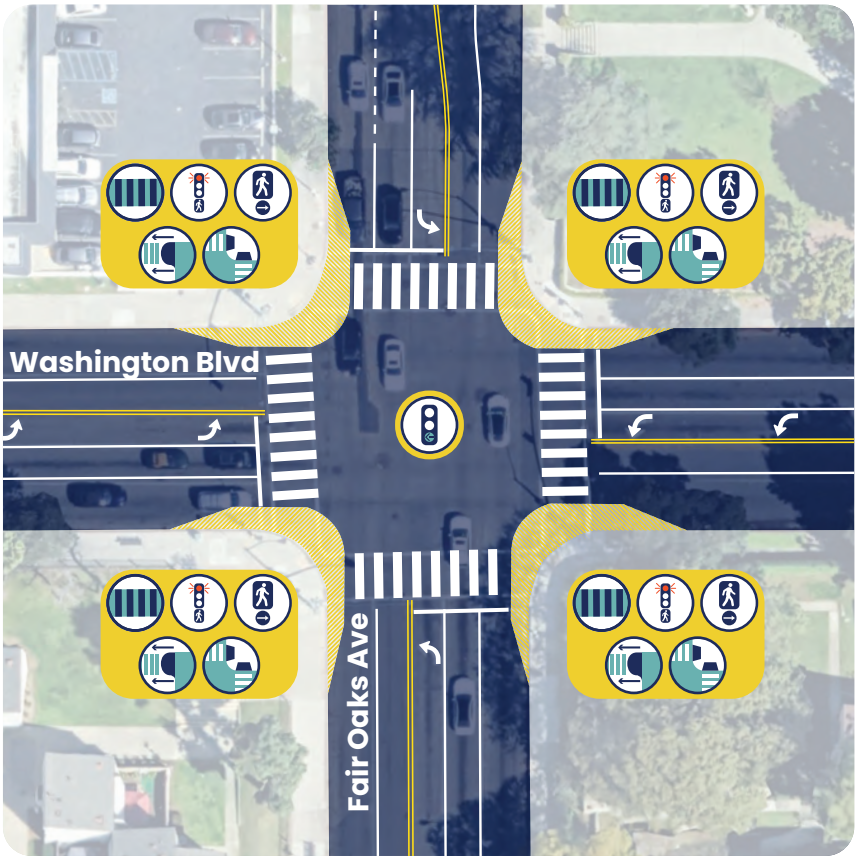
* KSI (Killed or Severely Injured)

** Boundaries as adopted in the 2024 Pedestrian Transportation Action Plan and assessed by the public as part of this effort consisted of Lincoln Avenue to Sierra Bonita Avenue. Revised and extended boundaries were requested by the Municipal Services Committee in October 2025.

DRAFT FINAL

Site Visualization & Potential Countermeasures

SIGNALIZED INTERSECTION CONCEPT



Curb Extensions

SIDE STREET STOP-CONTROLLED INTERSECTION CONCEPT

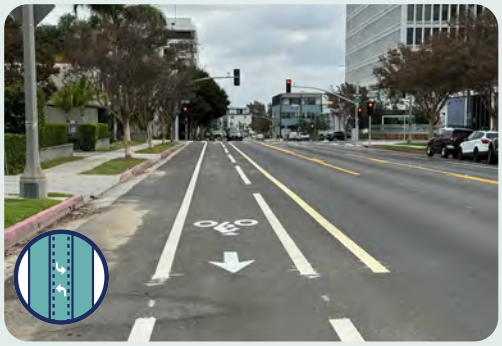
Curb Extensions

MIDBLOCK COUNTERMEASURES

This project would also consider the following countermeasures along the corridor.

Sidewalk Widening[1]

Widened sidewalks provide a more comfortable space for pedestrians, particularly in locations with high volumes of pedestrians, and they provide space to accommodate people in wheelchairs.



Roadway Reconfiguration[2]

Reduces space for vehicle lanes to create room for wider sidewalks, center turn lanes, and pedestrian refuge islands. This enhances safety by lowering vehicle speeds and and providing designated space for all road users.

[1]Image: NACTO
[2]Image: City of Pasadena, CA

DRAFT FINAL

CORRIDOR PROJECT

SUNSET AVENUE

HOWARD STREET TO HAMMOND STREET

Traffic calming measures along corridor

The Project Site

CORRIDOR CHARACTERISTICS

LENGTH	0.5 MI
ROADWAY WIDTH	30 FT
POSTED SPEED	25 MPH
NUMBER OF LANES	2 LANES
NUMBER OF SIGNALIZED CROSSINGS	0

COLLISION STATISTICS (2020-2024)

13
TOTAL INJURY COLLISIONS

100%
INTERSECTION COLLISIONS

3
KSI* COLLISIONS

The Project

ORIGINATING PLAN

New, community-generated project

PROJECT DESCRIPTION

The Sunset Avenue project proposes traffic calming measures and pedestrian improvements at intersections along the residential street.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Mid-Term

COST
$$

PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.


CURB EXTENSIONS


CHICANES


HIGH-VISIBILITY CROSSWALKS


INTERSECTION TIGHTENING


TRAFFIC CIRCLE

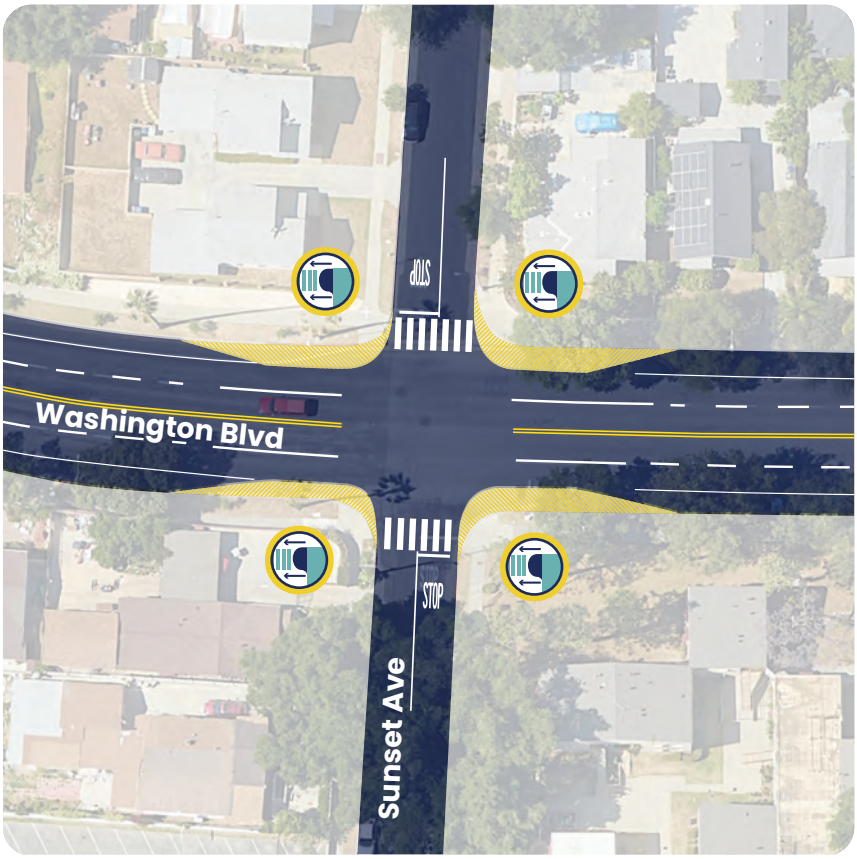

SPEED TABLES

* KSI (Killed or Severely Injured)

DRAFT FINAL

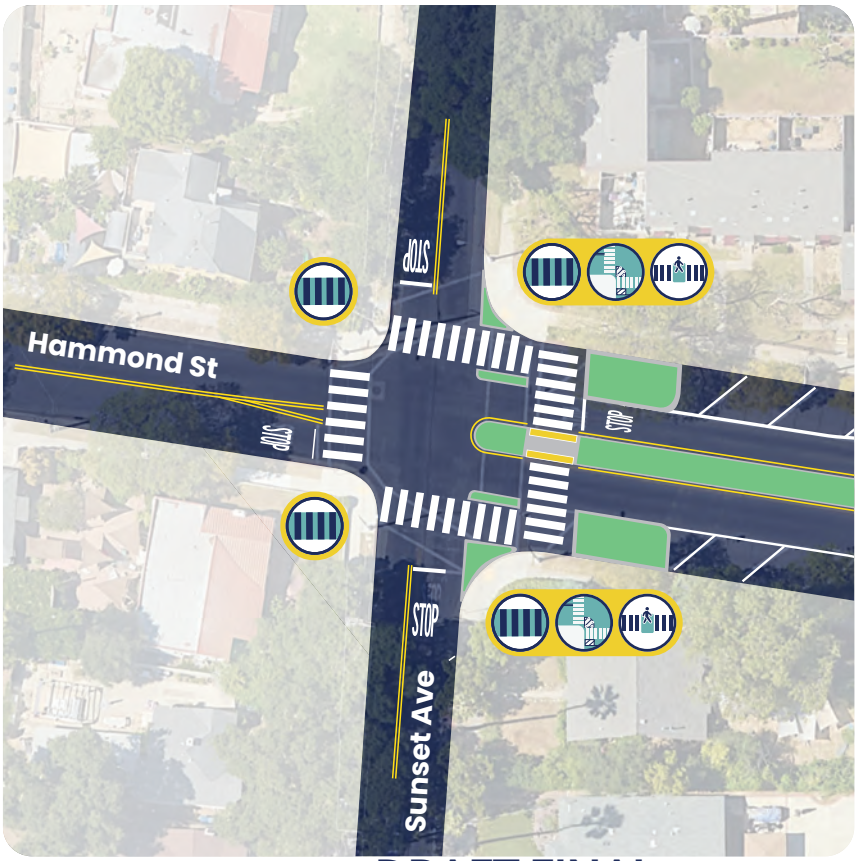
Site Visualization & Potential Countermeasures

SIDE STREET STOP-CONTROLLED INTERSECTION CONCEPT



Curb Extensions

ALL-WAY STOP-CONTROLLED INTERSECTION CONCEPT



Painted Curb Extensions/ Asphalt Art Opportunity Areas

TRAFFIC CALMING COUNTERMEASURES

This project would also consider the following traffic calming countermeasures.

Speed Tables

A speed table is a traffic calming device that use vertical defection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds to avoid damage to the undercarriage of an automobile.

Neighborhood Traffic Circles

Neighborhood traffic circles or mini-roundabouts, are circular traffic calming devices designed to slow vehicles and improve safety at intersections in residential areas.

Chicanes

A chicane consists of curb extensions, or edge islands, along a straight roadway that causes vehicles to jog.

Images: City of Pasadena, CA

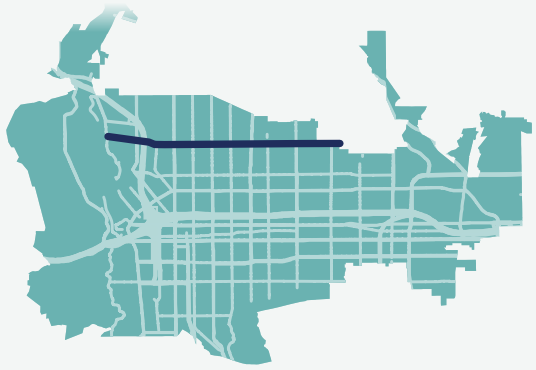
CORRIDOR PROJECT

WASHINGTON BOULEVARD

ARROYO BOULEVARD TO BELLFORD AVENUE

Class III bike boulevard between Arroyo Boulevard and Lincoln Avenue
Class IV bike lane between Lincoln Avenue and Catalina Avenue
To be determined bike facility between Catalina Avenue and Bellford Avenue

The Project Site



CORRIDOR CHARACTERISTICS

LENGTH	3.2 MI
ROADWAY WIDTH	30-60 FT
POSTED SPEED	30-35 MPH
NUMBER OF LANES	2-4 LANES
NUMBER OF SIGNALIZED CROSSINGS	12
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	2,428 FT (10-12 MIN WALK)

COLLISION STATISTICS (2020-2024)

216 TOTAL INJURY COLLISIONS

12 KSI* COLLISIONS

6 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

18% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

67% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

56% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

DRAFT FINAL

The Project**

ORIGINATING PLAN

Local Roadway Safety Plan (2022)

PROJECT DESCRIPTION

This project proposes bicycle facility improvements along Washington Boulevard from Arroyo Boulevard to Bellford Avenue. These improvements include a roadway reconfiguration from four to three lanes, the installation of a Class IV bike lane, and the replacement of pavement markers with thermoplastic or paint.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE	COST
Long-Term	$$$

PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.

CLASS III BIKE BOULEVARD

CLASS IV BIKE LANES

ROADWAY RECONFIGURATION

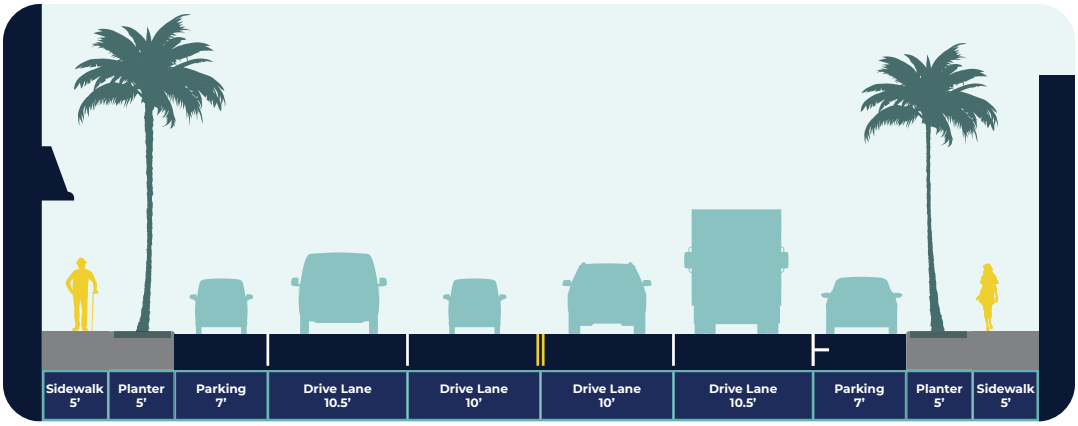
LOWER SPEED LIMIT

* KSI (Killed or Severely Injured)

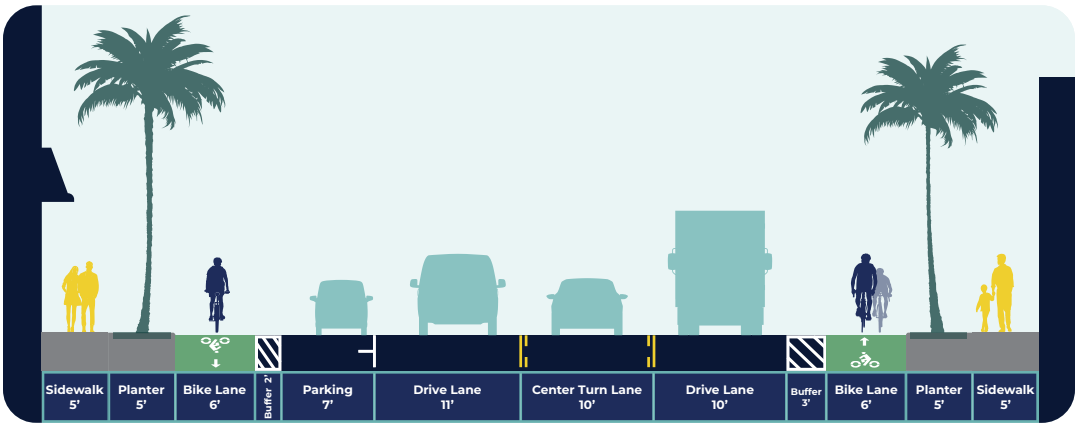
** Boundaries as adopted in the 2024 Pedestrian Transportation Action Plan and assessed by the public as part of this effort consisted of Lincoln Avenue to Sierra Bonita Avenue. Revised and extended boundaries were requested by the Municipal Services Committee in October 2025.

Site Visualization & Potential Countermeasures

EXISTING CROSS-SECTION CATALINA AVE. TO LINCOLN AVE.

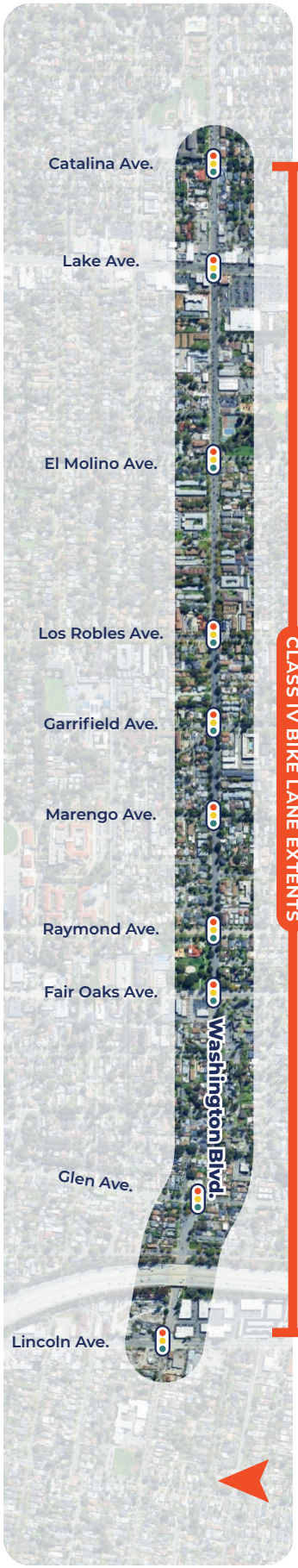


POTENTIAL CROSS-SECTION CATALINA AVE. TO LINCOLN AVE.*



*West of Lincoln Avenue, Washington Boulevard is just one lane in each direction. The bike facility would transition to a bike boulevard with class III sharrows and a lower posted speed limit. Other bike boulevard-compatible traffic calming features should also be considered in the design phase. Bike facility type east of Catalina Ave. to Bellford Ave. to be determined.

SITE AERIAL



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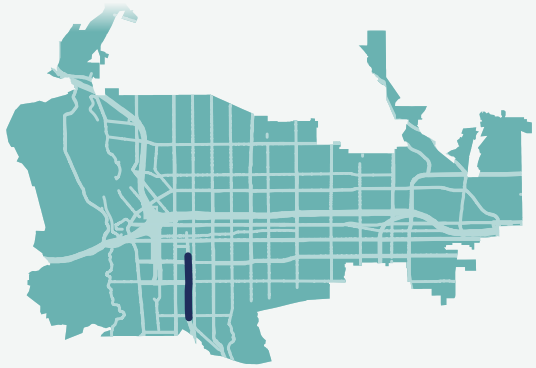
CORRIDOR PROJECT

ARROYO PARKWAY

GLENARM STREET TO CORDOVA STREET

Pedestrian and bicycle improvements along corridor

The Project Site



CORRIDOR CHARACTERISTICS

LENGTH	1.0 MI
ROADWAY WIDTH	80 FT
POSTED SPEED	35 MPH
NUMBER OF LANES	3-4 LANES
NUMBER OF SIGNALIZED CROSSINGS	6
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	2,000 FT (8-10 MIN WALK)

COLLISION STATISTICS (2020-2024)

63 TOTAL INJURY COLLISIONS

92% INTERSECTION COLLISIONS

4 KSI* COLLISIONS

40% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

2 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

100% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

25% KSI* COLLISIONS WERE BROADSIDES (T-BONE)

80% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

DRAFT FINAL

The Project

ORIGINATING PLAN

New, community-generated project

PROJECT DESCRIPTION

The Arroyo Parkway project proposes multi-modal improvements with a focus on the pedestrian environment and safety. Proposed countermeasures include crossing improvements, traffic calming, transit stop amenities, and bicycle wayfinding.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Long-Term

COST
$$$

PROJECT COUNTERMEASURES

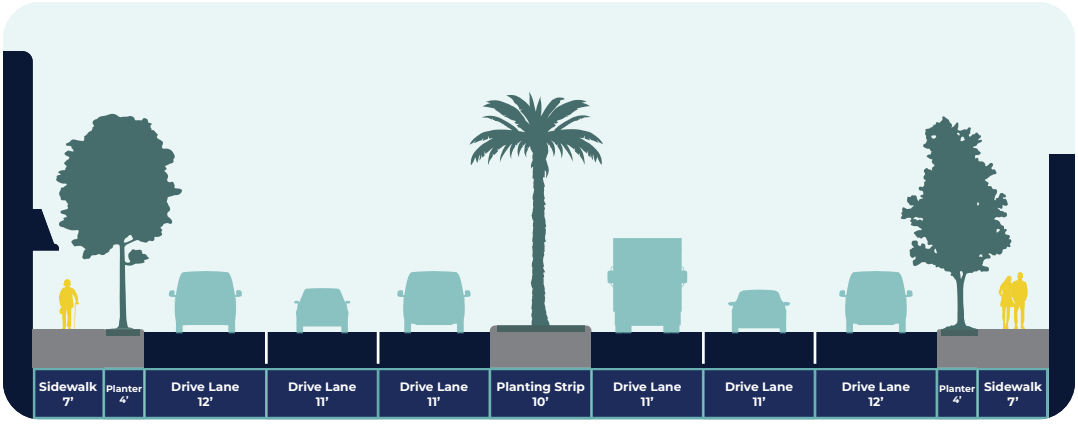
See **countermeasure toolbox in Appendix D** for more details.

- CURB EXTENSIONS
- DIRECTIONAL CURB RAMPS
- IMPROVED TRANSIT AMENITIES
- LANE NARROWING
- MID-BLOCK CROSSINGS
- PEDESTRIAN-SCALE LIGHTING
- LOWER SPEED LIMIT (SPEED LIMIT 30)
- REMOVE PEAK-HOUR PARKING RESTRICTIONS (P)
- STRIPING IMPROVEMENTS
- WAYFINDING

* KSI (Killed or Severely Injured)

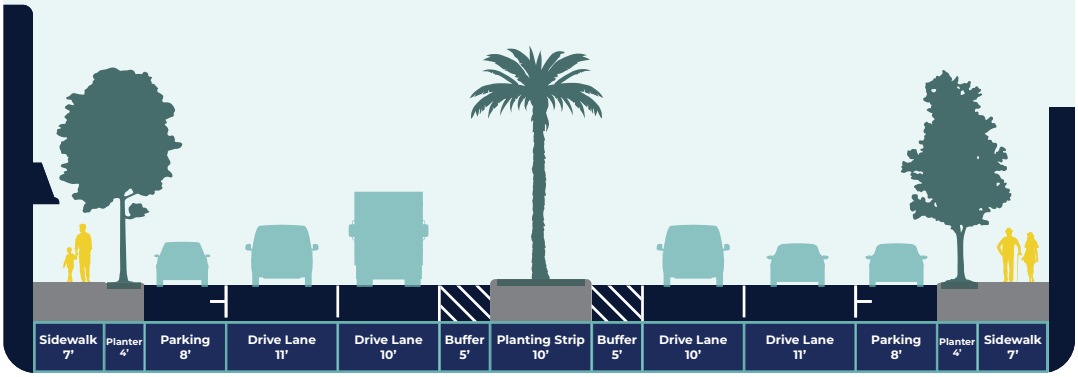
Site Visualization & Potential Countermeasures

EXISTING CROSS-SECTION



Parking is permitted in the outer lane in both directions during non-peak hours (9am-3pm).

POTENTIAL CROSS-SECTION



ADDITIONAL CORRIDOR COUNTERMEASURES

This project would also consider the following countermeasures along the corridor.

Wayfinding[1]

A network of signs that highlight nearby pedestrian and bicycle facilities. Can help to reduce crossings at locations with poor sight distance or limited crossing enhancements.

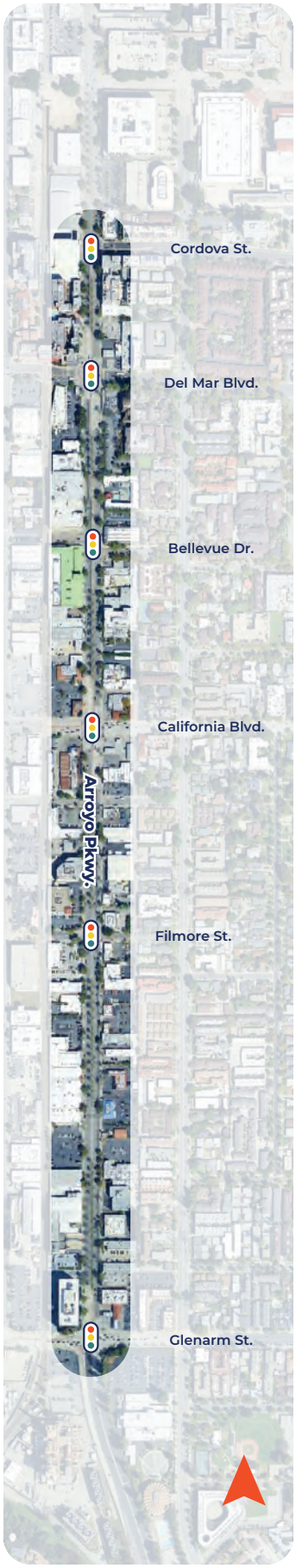
Transit Stop Amenities[2]

Transit amenities are features that enhance user experience and support an increased use of transit.

Lower Speed Limits[3]

Shorten stopping distances, reduce the likelihood and severity of collisions, and enhance the pedestrian and cyclist experience.

SITE AERIAL



[1]Image: City of Pasadena, CA
[2]Image: City of Pasadena, CA
[3]Image: City of Alexandria, VA

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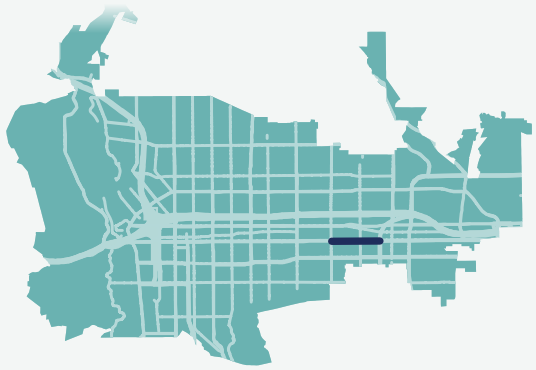
CORRIDOR PROJECT

COLORADO BOULEVARD

ALLEN AVENUE TO SIERRA MADRE BOULEVARD

Pedestrian improvements along corridor

The Project Site



CORRIDOR CHARACTERISTICS

LENGTH	0.7 MI
ROADWAY WIDTH	70 FT
POSTED SPEED	30 MPH
NUMBER OF LANES	5 LANES
NUMBER OF SIGNALIZED CROSSINGS	4
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	1,300 FT (5-7 MIN WALK)

COLLISION STATISTICS (2020-2024)

35 TOTAL INJURY COLLISIONS

100% INTERSECTION COLLISIONS

2 KSI* COLLISIONS

33% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

1 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

50% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

50% KSI* COLLISIONS WERE BROADSIDES (T-BONE)

0% PEDESTRIAN COLLISIONS INVOLVED A TURNING VEHICLE

The Project

ORIGINATING PLAN

New, community-generated project

PROJECT DESCRIPTION

The Colorado Boulevard project proposes pedestrian improvements including additional crossing opportunities.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE

Long-Term

COST

$$$

PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.

- CURB EXTENSIONS
- DIRECTIONAL CURB RAMPS
- LEADING PEDESTRIAN INTERVALS
- HIGH-VISIBILITY CROSSWALKS
- PEDESTRIAN HYBRID BEACON (PHB)
- LOWER SPEED LIMIT

* KSI (Killed or Severely Injured)

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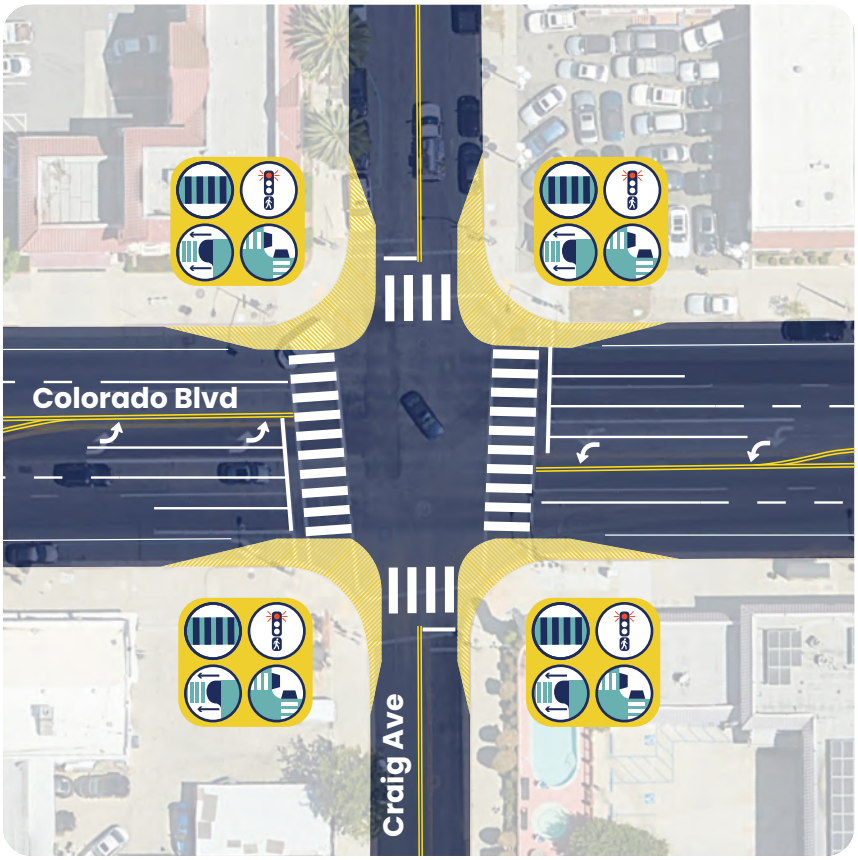
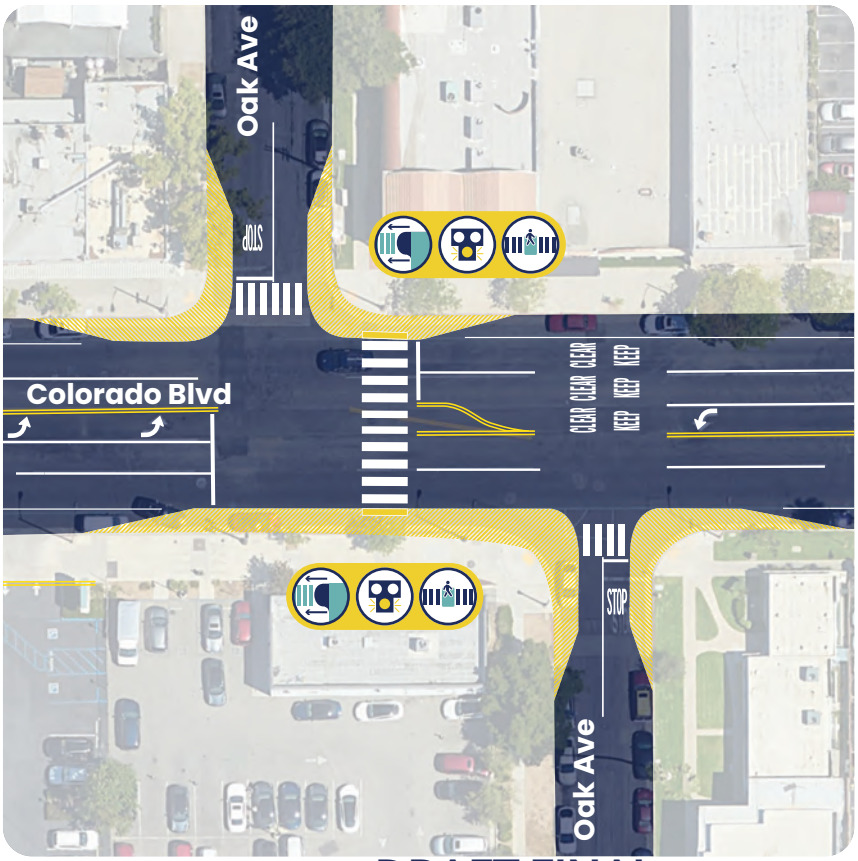
Site Visualization & Potential Countermeasures

SIGNALIZED INTERSECTION CONCEPT



Curb Extensions

SIDE STREET STOP-CONTROLLED INTERSECTION CONCEPT



Curb Extensions

MIDBLOCK COUNTERMEASURES

This project would also consider the following countermeasures along the corridor.

Lower Speed Limits[1]

Shorten stopping distances, reduce the likelihood and severity of collisions, and enhance the pedestrian and cyclist experience.

DRAFT FINAL

[1]Image: City of Alexandria, VA

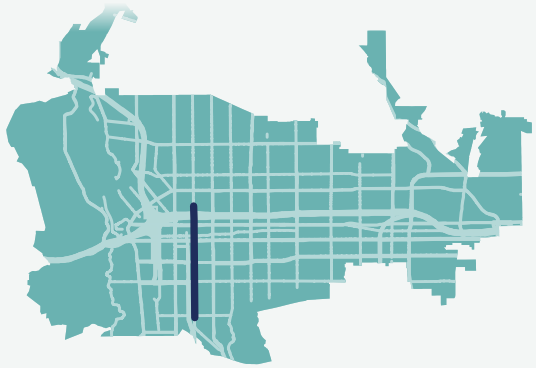
CORRIDOR PROJECT

MARENGO AVENUE

GLENARM STREET TO VILLA STREET

Pedestrian and bicycle improvements along corridor

The Project Site



CORRIDOR CHARACTERISTICS

LENGTH	1.8 MI
ROADWAY WIDTH	55-65 FT
POSTED SPEED	30 MPH
NUMBER OF LANES	3-5 LANES
NUMBER OF SIGNALIZED CROSSINGS	12
MAX DISTANCE BETWEEN CONTROLLED CROSSINGS	3,020 FT (13-15 MIN WALK)

COLLISION STATISTICS (2020-2024)

109 TOTAL INJURY COLLISIONS

99% INTERSECTION COLLISIONS

6 KSI* COLLISIONS

57% BIKE COLLISIONS INVOLVED A TURNING VEHICLE

3 PEDESTRIAN OR CYCLIST-INVOLVED KSI* COLLISIONS

63% PEDESTRIAN COLLISIONS AT A MARKED CROSSWALK

The Project

ORIGINATING PLAN

New community-generated project

PROJECT DESCRIPTION

The Marengo Avenue project proposes bicycle and pedestrian improvements, intersection safety improvements, traffic calming, and extending bike infrastructure north of Cordova Street.

IMPLEMENTATION DETAILS

DESIGN & CONSTRUCTION

TIMELINE
Long-Term

COST
$$$

PROJECT COUNTERMEASURES

See **countermeasure toolbox in Appendix D** for more details.


ROADWAY RECONFIGURATION


CLASS II BIKE LANES

GREEN CONFLICT STRIPING


INTERSECTION TIGHTENING


CURB EXTENSIONS


DIRECTIONAL CURB RAMPS

LOWER SPEED LIMIT


HIGH-VISIBILITY CROSSWALKS


LEADING PEDESTRIAN INTERVALS


SPEED TABLES


RAPID FLASHING BEACONS OR PEDESTRIAN HYBRID BEACONS


CENTERLINE HARDENING


PROTECTED LEFT TURN PHASING


REMOVE SECOND RIGHT TURN LANE

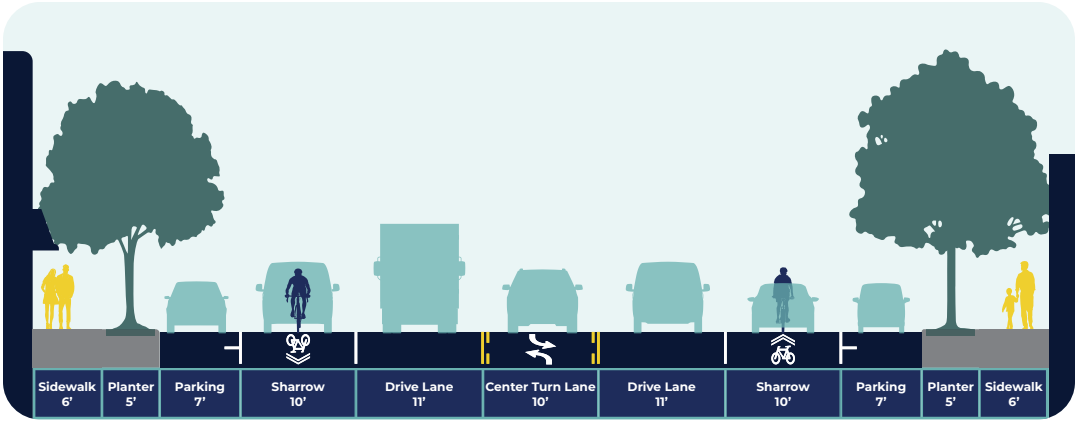

INSTALL NEW SIGNAL

* KSI (Killed or Severely Injured)

DRAFT FINAL

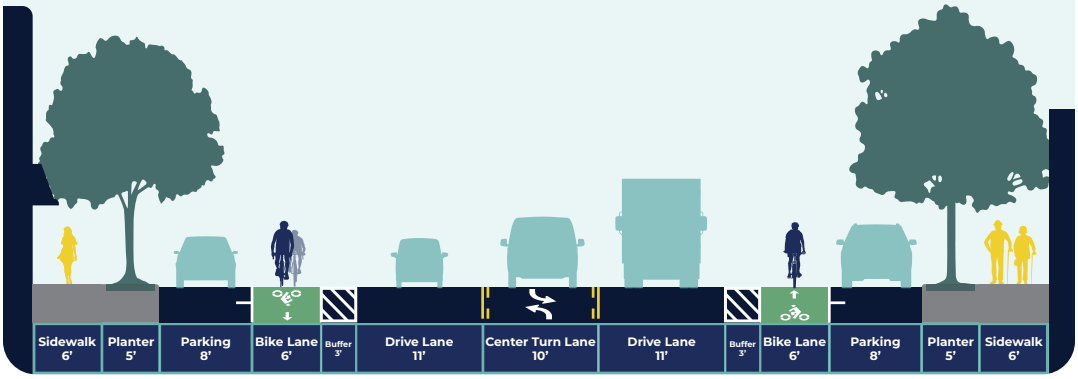
Site Visualization & Potential Countermeasures

EXISTING CROSS-SECTION* CORDOVA ST. TO VILLA ST.



***Class II Bike Lane** already installed between Cordova St. and Glenarm St.

POTENTIAL CROSS-SECTION CORDOVA ST. TO VILLA ST.



ADDITIONAL CORRIDOR COUNTERMEASURES

This project would also consider the following countermeasures along the corridor.

Curb Extensions[1]

Temporarily widen sidewalks to enhance pedestrian visibility and prompt drivers to make sharper, slower turns.

High-Visibility Crosswalks[2]

Use ladder-style stripes made of reflective material increasing visibility, prompting drivers to slow down and yield to pedestrians.

Lower Speed Limits[3]

Shorten stopping distances, reduce the likelihood and severity of collisions, and enhance the pedestrian and cyclist experience.

Directional Curb Ramps[4]

Includes tactile warning strips and dual ramps at corners to guide visually impaired pedestrians into crosswalks.

Leading Pedestrian Interval[5]

Provides pedestrians a 3–7 second head start to enter the crosswalk before vehicles turn, enhancing visibility and safety.

[1]Image: City of Pasadena, CA
[2]Image: City of Pasadena, CA
[3]Image: City of Alexandria, VA
[4]Image: City of Pasadena, CA
[5]Image: City of Pasadena, CA

SITE AERIAL

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TRACKING PROGRESS

Successful implementation depends on consistent and well-organized collaboration among City staff, regular evaluation of the effectiveness of implemented strategies, and continuous engagement with key stakeholders and the broader community. The City has a range of established systems and tools to support these implementation goals.

Implementation Structure

Pasadena Department of Transportation (DOT) and the Department of Public Works (Public Works) will assume a shared responsibility for the implementation of the Action Plan. We will use standing monthly capital improvement planning meetings between DOT and Public Works to advance and monitor the implementation of the priority projects in this Action Plan. By utilizing an existing communication channel among City staff, we can quickly build momentum and efficiently align priorities within Pasadena's broader capital improvement strategy.

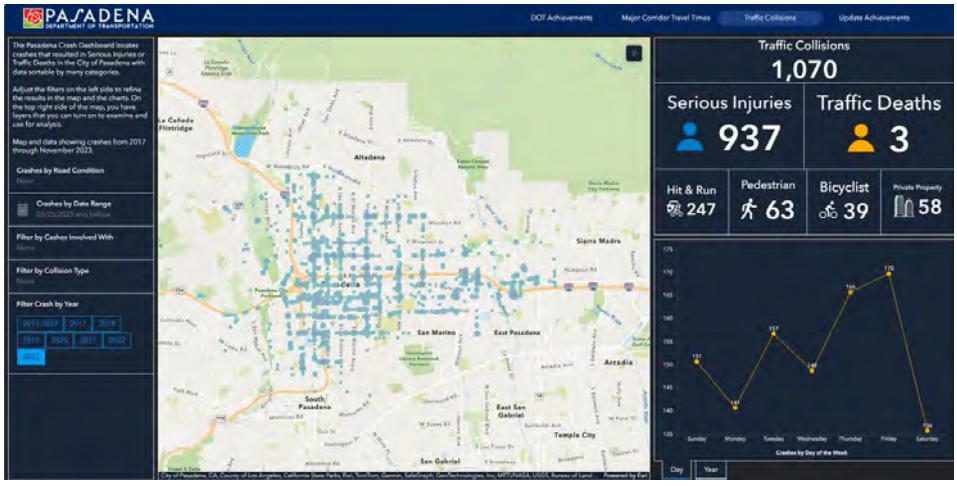
Performance Measures

The City is developing a public dashboard that will track outcome-based performance measures such as the number of traffic related deaths and injuries by severity. This dashboard will be a web-based report that displays metrics in an easy-to-understand format and will be updated quarterly to give City staff, key stakeholders, and the broader community visibility into progress toward our shared goal of achieving zero fatal and serious injury collisions. The implementation group will regularly review the dashboard to assess progress Citywide but will also conduct before and after studies once a priority project is implemented to understand location and countermeasure-specific impacts. Assessing progress at both scales will provide a comprehensive picture of what is working well and where adjustments may be needed.

The dashboard will track the following safety metrics:

- Total injury collisions
- Serious injury collisions
- Traffic deaths
- Hit & run collisions
- Injury collisions on private property
- Injury collisions by day of the week

The implementation group will provide annual updates on citywide progress towards implementing the priority projects and achieving the goal outlined in this Action Plan. By maintaining a consistent reporting schedule, the City aims to foster accountability, support data-driven decision-making, and continuously engage the community around ongoing safety improvements.



City of Pasadena's Draft Collision Dashboard

ACKNOWLEDGEMENTS

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Section 4

APPENDICES

Appendix A
Safety Corridors Methodology

Appendix B
Project Prioritization Methodology and Results

Appendix C
Community Engagement Summary

Appendix D
Countermeasure Toolbox

Appendix E
SS4A Compliance Table

Appendix F
Local Roadway Safety Plan (2022)

Appendix A-
Safety Corridors Methodology

Overview

The Safety Corridors developed for the City of Pasadena identify higher-risk locations for injury collisions across all modes based on collision history. Overlap with the Safety Corridors was factored into the project prioritization process as part of the development of the Pasadena Focused Local Roadway Safety Action Plan (Focused LRSAP).

Safety Corridors Development

COLLISION DATA

The Safety Corridors were developed using data previously collected for the Local Roadway Safety Plan (LRSP) provided by the City of Pasadena. This dataset includes five years of collision data from 2015 to 2019. This dataset only includes injury collisions (i.e. excluding Property Damage Only).

SAFETY CORRIDORS METHODOLOGY

The methodology relies on Pasadena's collision history to build the Safety Corridors. We weighed injury collisions by the collision severity in terms of "comprehensive" crash cost. The weights for collision severity, summarized in Table 1, are based on 2024 California Local Road Safety Manual (LRSM) crash costs for each collision severity. This method is similar to the Highway Safety Manual (HSM) Equivalent Property Damage Only (EPDO) weighting method but uses the "Complaint of Pain" severity level as its baseline. The HSM uses "comprehensive" or "societal" crash costs to associate crash costs with each crash severity level. Comprehensive costs include both economic costs and monetized pain and suffering costs. Economic costs are monetary costs associated with emergency services deployment, medical services, productivity loss due to victim injury, insurance and legal costs, costs associated with congestion impacts as a result of the collision, and property damage costs. Monetized pain and suffering costs are an assumption of the costs associated with lost quality-of-life (or Quality-Adjusted Life Years [QALY]), accounting for reductions in life expectancy and quality of life changes as a result of a crash.

ASSOCIATING COLLISIONS TO ROADWAYS

The following section outlines the major steps of the methodology for associating collisions with roadway segments.

1. **Associating collisions to roadway segments**
   a. Collisions were associated to roadway segments using a 60-foot roadway segment buffer. Collisions within 60 feet of multiple roadway segments (e.g. at an intersection) were assigned to each segment and were double counted.
2. **Calculate Safety Corridor Index**
   a. Each collision was assigned a collision score based on the proposed collision factor weights in Table 1.
   b. A score for each roadway (known as the Safety Corridor Index) was calculated by aggregating the weighted collision sums, which were joined to the network in the previous step.
3. **Safety Corridor building**
   a. The Safety Corridors were built using roadways that fell above the 85th percentile on the Safety Corridor Index.
4. **Safety Corridors check and refinement:** Checked and corrected anomalies in resulting Safety Corridors. Examples include:
   a. Compared the Safety Corridors to the Top Corridors in the City of Pasadena LSRP and extended the Safety Corridors to match the total length of all Top Corridors.
   b. Removed segments that have recently undergone major safety improvements (e.g. the lane reduction on Cordova Street).

Table 1. Weights by Collision Severity

Severity	Crash Cost	Safety Corridors Weight
Fatal and Severe Injury (KSI)	$2,860,000*	26
Evident Injury – Other Visible	$193,000	2**
Possible Injury – Complaint of Pain	$110,000	1

Notes:

[1] Cost assumptions included in the 2024 Caltrans LRSM are based on costs included in the HSM, First Edition, 2010 with costs adjusted to 2024 dollars.

*The fatal and severe injury (KSI) collision cost is an average of the location type costs (signalized intersections, non-signalized intersections, roadway).

**Rounded to nearest whole number.

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Safety Corridors

The City of Pasadena Safety Corridors represent 80 percent of injury collisions across 13 percent of Pasadena's roadways. This network of roadways that can be targeted for future safety improvements across the city. The network can also support efforts to reduce speed limits, as allowed by AB 43.

Table 2. Safety Corridors

Street Name	From	To
Allen Ave	Corson St	Whitefield Rd
Arroyo Pkwy	Glenarm St	Holly St
California Blvd	St. John Ave	Wilson Ave
Colorado Blvd	Arroyo Blvd	Northup Ave
Del Mar Blvd	Orange Grove Blvd	Catalina Ave
Del Mar Blvd	Bonnie Ave	Craig Ave
El Molino Ave	Union St	Mountain St
Fair Oaks Ave	Glenarm St	Fair Oaks Dr
Foothill Blvd	Walnut St	Michillinda Ave
Glenarm St	Pasadena Ave	El Molino Ave
Green St	Grande Ave	Hill Ave
Holly St	Linda Vista Ave	Orange Grove Blvd
Lake Ave	Arden Rd	Atchison St
Lida St	Knollwood Dr	Parkview Ave
Linda Vista Ave	Banyan St	La Vista Pl
Los Robles Ave	California Blvd	Claremont St
Marengo Ave	California Blvd	Orange Grove Blvd
Mountain St	Lincoln Ave	Los Robles Ave
Oak Knoll Ave	Oak Knoll Cir	Cordova St
Orange Grove Blvd	Ellis St	Michigan Ave
Pasadena Ave	Valley St	Corson St
Raymond Ave	Glenarm St	Hammond St
San Gabriel Blvd	Diana St	Sierra Madre Blvd
Seco St	Rosemont Ave	Lincoln Ave
Sierra Madre Blvd	Canterbury Rd	Paloma St
Sierra Madre Villa Ave	Colorado Blvd	Sierra Madre Blvd
Villa St	Cypress Ave	Sinaloa Ave
Walnut St	Orange Grove Blvd	Harkness Ave
Washington Blvd	Mentone Ave	Tierra Alta Dr
Wilson Ave	Blanche St	Emerson St
Union St	Lake Ave	Hill Ave
Union St	St. John Ave	Arroyo Pkwy

Appendix B- Project Prioritization Methodology and Results

Overview

The following pages summarize the methodology and outcome of the project prioritization process for the Pasadena Focused Local Roadway Safety Action Plan (Focused LRSAP). The prioritization effort identified a total of 15 projects for inclusion in the Action Plan: 11 projects from existing City of Pasadena ("City") plans and four new community-generated projects developed based on feedback collected during two rounds of community engagement in Fall 2024 and Spring 2025. Key prioritization criteria for selecting these 15 projects included expected safety and community benefits, and community support.

Existing City Projects

Unfunded safety projects in existing City plans were scored and prioritized for inclusion in the Focused LRSAP based on seven categories: safety benefit, crash reduction factor, community impact, plan concurrence, complete streets benefit, climate and resiliency benefit, and community support.

INITIAL FILTERING AND SCORING

The project prioritization exercise began by identifying all the existing transportation projects in the City's Pedestrian Transportation Action Plan (PTAP), Local Roadway Safety Plan (LRSP), Capital Improvements Program Transportation Projects (CIP), and Greenways Feasibility Study. We identified 80 projects from four City plans to be included in the comprehensive existing project list, included in **Attachment A**. We first applied qualitative filters to remove projects that do not have a safety component and/or are already funded. This "screening" step filtered the comprehensive list of projects down from 80 projects to 35 projects.

- The first qualitative filter assessed and removed projects without a connection to safety because improving roadway safety is the primary goal of the City's LSRAP. This filter removed a subset of Capital Improvement Program (CIP) projects. For example, the "Hydrogen Fueling Station" CIP project will design and construct a hydrogen fueling station for City vehicles, which does not directly improve safety.
- The second qualitative filter categorized projects based on their funding status and removed projects that are 50% or more funded. The purpose of this filter was to exclude projects that are already in the implementation process. Projects with more than 50% funding are also more likely to be able to leverage existing funding resources. Projects were categorized as: fully funded, majority funded, partially funded (50% or less of the budget financed), and unfunded. Similar to the safety component filter, this criterion primarily filtered out a subset of CIP projects.

The next step was to score the 35 remaining projects based on a set of scoring criteria, based on six categories for 25 possible points, as shown in **Table 1**. Each project was given scores for its:

1. **Safety Benefit**
   The goal of the Focused LRSAP is to eliminate severe injuries and fatalities on Pasadena's roadway network. A project earned five points if it overlapped with the City's Safety Corridors to ensure projects are improving locations with a history of severe injury and fatal collisions. Fehr & Peers developed the Safety Corridors based on citywide collision data from 2015-2019 and weighted roadway segments by collision severity.

2. **Crash Reduction Factor**
To evaluate the relative safety impact of each project, projects were scored based on the crash reduction factor (CRF) of their proposed countermeasures as defined in the 2024 California Local Roadway Safety Manual (LRSM). The range of possible CRF's for all countermeasures is between 0% and 100%. This range was divided into five quantiles, which means a countermeasure received between one and five points depending on its corresponding CRF. For each project, we identified and scored the proposed countermeasure with the highest CRF. For example, a project that proposed a leading pedestrian interval (CRF of 60% for pedestrian and bicycle crash types) and protected left turn phasing (CRF of 30% for all crash types) at intersections along Washington Boulevard was scored based on the leading pedestrian interval countermeasure and received a CRF score of 3 points. If a project did not propose any countermeasures from the LRSM, it received zero points for this category.

3. **Community Impact**
Priority projects in the Focused LRSAP should represent equitable investment in the safety needs of historically underserved communities. A A project earned five points if it benefits a disadvantaged community, defined based on socioeconomic and pollution burdern variables.

4. **Plan Concurrence**
A project received a score between zero and three based on the number of City plans in which it appeared. Projects that were included in multiple City plans were scored higher as this suggests these projects are internal priorities, have buy-in across multiple City departments, and/or are highly feasible to implement.

5. **Complete Streets Benefit**
Focused LRSAP projects should promote safe access for all road users, including pedestrians, bicyclists, transit riders, and motorists of all ages and abilities. A project's Complete Streets score ranged from zero to five based on the number of modes the project benefits. The more modes a project benefited, the higher it scored in this category.

6. **Climate and Resiliency Benefit**
The SS4A grant program evaluates to what extent projects support the U.S. Department of Transportation's climate change and sustainability goals. To ensure Focused LRSAP projects advance the City's climate and sustainability efforts, projects that incorporate green infrastructure and strategies that reduce vehicle miles traveled (VMT) received a score of two, while projects that meet one of these two criteria received a score of one. Examples of green infrastructure include street trees, bioswales, and planter boxes. These interventions use natural landscape features to filter and absorb stormwater, which reduces flood risk from rain events along with a host of other environmental and community benefits. VMT reduction strategies, which reduce transportation emissions, were defined as the set of transportation measures in the California Air Pollution Control Officers Association (CAPCOA) 2021 Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities and Advancing Health and Equity ("Handbook").

These categories represent key evaluation criteria for safety grants, including the Federal Department of Transportation's SS4A Program and the California Transportation Commission's Active Transportation Program. We presented the 20 projects with the highest cumulative scores to the public to collect community feedback on project prioritization.

Table 1. Priority Project Scoring

Category	Criteria	Score
Safety Benefit	• Overlaps with Safety Corridors	0-5[1]
Crash Reduction Factor	• Countermeasure crash reduction factor provided in 2024 California Local Road Safety Manual	0-5[2]
Community Impact	• Within an area of the city with higher rates of people living in poverty and/or disproportionately burdened by pollution.	0-5[3]
Plan Concurrence	• Number of existing plans that include the project	0-3[4]
Complete Streets Benefit	• Number of modes benefited (walk, bike/micromobility, transit, vehicle)	0-5[5]
Climate & Resiliency Benefits	• Incorporates green infrastructure • Reduces vehicle miles traveled	0-2

Notes:

[1]Projects were given a score of 0 if there was no overlap with the Safety Corridors, a score of 2 if under half of the project extent overlapped with the Safety Corridors, and a score of 5 if over half of the project extent overlapped with the Safety Corridors.

[2]Projects were scored based on the proposed countermeasure with the highest CRF.

[3]Projects were given a score of 0 if there was no overlap with disadvantaged communities, a score of 2 if under half of the project extent overlapped with disadvantaged communities, and a score of 5 if over half of the project extent overlapped with disadvantaged communities.

[4]Projects that appeared in two plans received a score of one; projects that appeared in three plans received a score of two; projects that appeared in four or more plans received a score of 3. The CIP was not considered when awarding points for multiple plan concurrence because all CIP projects began in a City plan.

[5]Projects that benefit one mode received a score of one; projects that benefit two modes received a score of three; projects that benefit three modes received a score of four; projects that benefit four modes or more received a score of five.

TOP TWENTY SCORING PROJECTS

The top 20 scoring existing City projects are shown in **Table 2**. The scores for the top 20 projects ranged from 19 points for the top project (Pedestrian crossing improvements at intersections on Washington Boulevard) to 12 points. There was a five-way tie for projects in the 18th through 22nd positions on the list. This tie included three projects from the PTAP (pedestrian crossing improvements at intersections on San Gabriel Boulevard, Del Mar Boulevard, and Foothill Boulevard), one project from the CIP (mobility hubs and first/last mile improvements), and one project from the LRSP (fluorescent sign sheeting at priority locations). Based on City feedback, two of these three PTAP projects (San Gabriel Boulevard and Del Mar Boulevard) and the LRSP fluorescent sign sheeting project were selected for the top 20 list. These projects offered a balance of near-term, ready-to-construct projects from the LRSP and CIP alongside larger long-term projects from the PTAP.

The top 20 projects included three projects from the CIP, ten projects from the LRSP, and seven projects from the PTAP. All these projects were expected to improve safety in the City—all 20 are located along one of the City's Safety Corridors and incorporate countermeasures identified in the 2024 California Local Roadway Safety Manual—while still representing a range of project types and locations. The top scoring projects also reflect the importance of prioritizing safety improvements in disadvantaged and underserved communities; 18 of the top 20 projects include some overlap with disadvantaged communities in the City, many of which are entirely located within disadvantaged communities. Most of the projects incorporated strategies that would encourage mode shift away from driving alone, though none of the top 20 projects currently incorporate a green infrastructure component.

Table 2. Top Twenty Projects, Prior to Community Input

PROJECT NAME/LOCATION	
1. Pedestrian crossing improvements at intersections on Washington Boulevard	11. Pedestrian crossing improvements at intersections on Allen Avenue
2. Pedestrian crossing improvements at intersections on Fair Oaks Avenue	w. Crossing improvements at Lake Avenue/Maple Street intersection
3. Pedestrian crossing improvements at intersections on Los Robles Avenue	13. Class II bike lane on Washington Boulevard from Forest Avenue to Catalina Avenue
4. Citywide installation of Leading Pedestrian Intervals and Accessible Pedestrian Signals (LPI/APS) at signalized intersections	14. Crossing improvements at El Molino Avenue/Villa Street intersection
5. Signal and crossing improvements at Lake Avenue/ Washington Boulevard intersection	15. Dynamic speed warning signs on Los Robles Avenue from Washington Boulevard to Maple Street
6. Signal and crossing improvements at Fair Oaks Avenue/ Washington Boulevard intersection	16. Signal improvements at Fair Oaks Avenue/Maple Street intersection
7. Signal and crossing improvements at Fair Oaks Avenue/ Orange Grove Boulevard intersection	17. Pedestrian Hybrid Beacons at priority midblock or non-signalized intersections
8. Pedestrian crossing improvements at intersections on Lake Avenue	18. Pedestrian crossing improvements at intersections on San Gabriel Boulevard
9. Citywide implementation of continental-style crosswalks (high-visibility crosswalks)	19. Pedestrian crossing improvements at intersections on Del Mar Boulevard
10. Traffic signal preemption for emergency vehicles at intersections along arterial streets	20. Fluorescent sign sheeting at 15 priority locations for nighttime visibility

COMMUNITY INPUT SCORING

We then brought these 20 projects to the public for their input and updated their scores based on community feedback collected during the first round of engagement in Fall 2024. Each priority project was given a community input score from 0-5. The final community input score for each project was based on the number of votes it received from both online and in-person community engagement outreach. The maximum number of project votes received for a single project was broken into quintiles, and each project received a community input score based on where the number of votes it received fell in these quintiles. For example, a project that received 75 percent of the highest number of total project votes got a score of four since it fell in the fourth quintile. The top 20 projects were then re-scored to incorporate the community input score. The final existing project scoring methodology was thus based on seven categories for a maximum possible score of 30 points, as shown in **Table 3**.

FOCUSED LRSAP PRIORITY PROJECT SELECTION

The City selected eleven existing City projects for inclusion in the Focused LRSAP based on the results of the updated scoring process. The final scores for the top 20 existing City projects ranged from 22 points for the highest-scoring project (Pedestrian crossing improvements at intersections on Washington Boulevard) to 13 points for the lowest-scoring project (Pedestrian crossing improvements at intersections on San Gabriel Boulevard). **Table 4** lists the scores for the top 20 projects (including community input scoring) and denotes the eleven selected as Focused LRSAP priority projects in bold.

Table 3. Priority Project Scoring with Community Input

Category	Criteria	Score
Safety Benefit	• Overlaps with Safety Corridors	0-5[1]
Crash Reduction Factor	• Countermeasure crash reduction factor provided in 2024 California Local Road Safety Manual	0-5[2]
Community Impact	• Within an area of the city with higher rates of people living in poverty and/ or disproportionately burdened by pollution.	0-5[3]
Plan Concurrence	• Number of existing plans that include the project	0-3[4]
Complete Streets Benefit	• Number of modes benefited (walk, bike/micromobility, transit, vehicle)	0-5[5]
Climate & Resiliency Benefits	• Incorporates green infrastructure • Reduces vehicle miles traveled	0-2
Community Input Score	• Number of votes a project received during community engagement both in-person and online.	1-5[6]

Notes:

[1] Projects were given a score of 0 if there was no overlap with the Safety Corridors, a score of 2 if under half of the project extent overlapped with the Safety Corridors, and a score of 5 if over half of the project extent overlapped with the Safety Corridors.

[2] Projects were scored based on the proposed countermeasure with the highest CRF.

[3] Projects were given a score of 0 if there was no overlap with disadvantaged communities, a score of 2 if under half of the project extent overlapped with disadvantaged communities, and a score of 5 if over half of the project extent overlapped with disadvantaged communities.

[4] Projects that appeared in two plans received a score of one; projects that appeared in three plans received a score of two; projects that appeared in four or more plans received a score of 3. The CIP was not considered when awarding points for multiple plan concurrence because all CIP projects began in a City plan.

[5] Projects that benefit one mode received a score of one; projects that benefit two modes received a score of three; projects that benefit three modes received a score of four; projects that benefit four modes or more received a score of five.

[6] Projects received 1-5 points depending on the number of votes they received during the first round of engagement. Votes were associated with quintiles, which were calculated based on the maximum number of votes received by a single project.

Table 4. Top 20 Project, Including Community Input

Project	Safety	CRF	Community Impact	Plan Concurrence	Complete Streets	Climate & Resiliency	Community Input	Total Score
Pedestrian crossing improvements at intersections on Washington Boulevard[1]	5	3	5	1	4	1	3	22
Citywide installation of Leading Pedestrian Intervals and Accessible Pedestrian Signals (LPI/APS) at signalized intersections	5	3	5	1	1	1	5	21
Citywide implementation of continental-style crosswalks (high visibility crosswalks) at signalized intersections and marked uncontrolled crosswalks	5	1	5	2	1	1	5	20
Pedestrian crossing improvements at intersections on Fair Oaks Avenue	5	3	5	0	4	1	2	20
Pedestrian crossing improvements at intersections on Lake Avenue	5	3	2	1	3	1	4	19
Pedestrian crossing improvements at intersections on Los Robles Avenue	5	3	5	0	3	1	2	19
Class II bike lane on Washington Boulevard from Forest Avenue to Catalina Avenue[1]	5	2	5	0	1	1	4	18
Traffic signal preemption for emergency vehicles at intersections along arterial streets	5	4	5	0	1	0	3	18
Signal and crossing improvements at Fair Oaks Avenue/Orange Grove Boulevard intersection	5	2	5	0	3	1	2	18
Signal and crossing improvements at Lake Avenue/Washington Boulevard intersection[2]	5	1	5	1	3	1	2	18

Table 4. Top 20 Project, Including Community Input

Project	Safety	CRF	Community Impact	Plan Concurrence	Complete Streets	Climate & Resiliency	Community Input	Total Score
Signal and crossing improvements at Fair Oaks Avenue/Washington Boulevard intersection[1]	5	3	2	1	1	1	4	17
Pedestrian Hybrid Beacon (HAWK) signals at priority midblock or non-signalized intersections[2]	5	1	5	1	3	1	1	17
Pedestrian crossing improvements at intersections on Allen Avenue	5	3	2	0	3	1	2	16
Fluorescent sign sheeting at 15 priority locations for nighttime visibility	5	1	5	0	1	0	3	15
Pedestrian crossing improvements at intersections on Del Mar Boulevard	5	3	0	0	3	1	3	15
Crossing improvements at Lake Avenue/Maple Street intersection	5	1	5	1	1	1	1	15
Dynamic speed warning signs on Los Robles Avenue from Washington Boulevard to Maple Street	5	2	5	0	1	0	1	14
Signal improvements at Fair Oaks Avenue/Maple Street intersection	5	2	5	0	1	0	1	14
Crossing improvements at El Molino Avenue/Villa Street intersection	5	1	5	0	1	1	1	14
Pedestrian crossing improvements at intersections on San Gabriel Boulevard	5	3	0	0	3	1	1	13

Notes:

[1] The City allowed for overlap between some projects like the Washington Boulevard PTAP and Washington Boulevard Bicycle Lane Improvements projects because these projects provide the City with the multiple options for improving Washington Boulevard depending on future funding opportunities.

[2] The HAWK Signal project replaced the Signal and Crossing Improvements at Lake Avenue/Washington Boulevard Intersection project because the improvements in this project were similar to the Pedestrian Crossing Improvements at Intersections on Lake Avenue project already included in the final project list.

Community-Generated Projects

Community-generated projects include projects not included in the original top 20 list, but that were identified by the public as important for enhancing traffic safety. These projects were developed using feedback collected during the first round of engagement and then scored and prioritized for inclusion in the Focused LRSAP based on three categories: safety benefit, community impact, and community support.

PROJECT IDENTIFICATION

The first round of community engagement also informed the development of community-generated projects. In-person attendees could place pins on a map of Pasadena, shown in Figure 1, at any location where they have experienced transportation safety concerns. Online participants had the opportunity to place virtual pins on an online map of the City. Attendees and online contributors were asked to specify if their pin referred to a specific intersection or an entire corridor, and what mode(s) are impacted by their transportation safety concern. Participants could also leave comments explaining their concerns in greater detail.

The project team used the pins submitted by participants to develop community-generated projects based on the steps summarized below.

1. The project team consolidated the pins submitted online and during in-person workshops into a single GIS map to visualize all submissions in one place.

2. Next, pins were grouped into projects based on their location. Pins located along the same street were grouped together if there was less than a mile between each pin. Pins at intersections were considered for projects along both intersecting streets. The locations and comments associated with pins determined the final extents of the community-generated projects.

3. Community-generated projects that overlapped with the 20 existing City projects with the highest cumulative scores—as determined in the quantitative scoring step of the prioritization methodology—were removed to ensure the community-generated projects represented new project opportunities. Comments associated with pins that overlapped existing City projects will be revisited when finalizing those project descriptions.

Figure 1. Safety Mapping Exercise

PROJECT SCORING

The project team scored 73 community-generated projects using a similar methodology to what we used to prioritize existing City projects. The scoring categories for the community-generated projects were safety benefit, community impact, and community input. Each project was given a score based on these three categories for a maximum possible score of 15 points, as shown in **Table 5**. The community-generated projects were not scored in the crash reduction factor, plan concurrence, complete street benefit, or climate and resiliency benefit categories because they did not yet include the detailed project scope and countermeasures needed for scoring in these categories.

Table 5. Community-Generated Project Scoring Framework

Category	Criteria	Score
Safety Benefit	• Overlaps with Safety Corridors	0-5[1]
Community Impact	• Within a top 25% scoring CalEnviroScreen 4.0 Census tract • Defined as disadvantaged by the Climate and Economic Justice Screening Tool (CEJST)	0-5[2]
Community Input Score	• Number of votes a project received during community engagement both in-person and online.	1-5[3]

Notes:

[1] Projects were given a score of 0 if there was no overlap with the Safety Corridors, a score of 2 if under half of the project extent overlapped with the Safety Corridors, and a score of 5 if over half of the project extent overlapped with the Safety Corridors.

[2] Projects were scored based on the proposed countermeasure with the highest CRF.

[3] Projects were given a score of 0 if there was no overlap with disadvantaged communities, a score of 2 if under half of the project extent overlapped with disadvantaged communities, and a score of 5 if over half of the project extent overlapped with disadvantaged communities.

FOCUSED LRSAP PRIORITY PROJECT SELECTION

The City selected the four community-generated projects that had the highest total scores but did not overlap with ongoing or planned projects. These four projects are listed in **Table 6.** For a full list of community-generated projects, see Attachment B. The City prioritized projects that did not overlap with ongoing or planned projects like the neighborhood traffic management program along Mountain Street or improvements associated with other City agency projects like the Pasadena Department of Water and Power's undergrounding project along Raymond Avenue. The project description and potential countermeasures for the community-generated projects selected for inclusion in the Focused LRSAP priority project list were informed by the second

Table 6. Community-Generated Project Scoring, Top Four Scoring Projects

Project	Extent	Community Input	Safety[1]	Community Impact	Total Score
Marengo Avenue	Between Villa Street & Glenarm Street	5	5	2	12
Sunset Avenue	Between Howard Street & Hammond Street	5	5	2	12
Arroyo Parkway	Between Cordova Street & Glenarm Street	5	5	0	10
Colorado Boulevard	Between Allen Avenue & Sierra Madre Boulevard	5	5	0	10

Notes:

[1] Projects were given a score of 0 if there was no overlap with the Safety Corridors, a score of 2 if under half of the project extent overlapped with the Safety Corridors, and a score of 5 if over half of the project extent overlapped with the Safety Corridors.

round of community engagement in Spring 2025. The community-generated project descriptions were developed to include safety treatments that maximize safety benefits, while also providing complete streets, and climate and resiliency benefits.
Additional information about the community outreach component of the project can be found in the Community Engagement Plan and Community Engagement Summary memoranda.

Top Fifteen Projects

The 15 projects selected for inclusion as priority projects in the Focused LRSAP is comprised of eleven projects from existing City plans and four community-generated projects and are shown in **Table 7**. This list represents three citywide projects, nine corridor projects, and three intersection or mid-block crossing projects. These projects are multi-modal and include improvements for bicyclists, pedestrians, transit riders, and drivers. They are geographically distributed throughout the City and cover many of its major corridors and critical intersections. The final list of projects offers a mix of near-term and long-term projects that the City can select from based on their future needs and grant opportunities.

Table 7. Top 15 Project Selected for Inclusion in the Focused LRSAP

PROJECT NAME/LOCATION	
1. Pedestrian crossing improvements at intersections on Washington Boulevard	9. Class II bike lane on Washington Boulevard from Forest Avenue to Catalina Avenue
2. Citywide installation of Leading Pedestrian Intervals and Accessible Pedestrian Signals (LPI/APS) at signalized intersections	10. Pedestrian Hybrid Beacon (HAWK) signals at priority midblock or non-signalized intersections
3. Pedestrian crossing improvements at intersections on Fair Oaks Avenue	11. Signal and crossing improvements at Fair Oaks Avenue/Washington Boulevard intersection
4. Citywide implementation of continental-style crosswalks (high visibility crosswalks) at signalized intersections and marked uncontrolled crosswalks	12. Marengo Avenue – between Villa Street and Glenarm Street
5. Pedestrian crossing improvements at intersections on Los Robles Avenue	13. Sunset Avenue – between Howard Street and Hammond Street
6. Pedestrian crossing improvements at intersections on Lake Avenue	14. Arroyo Parkway – between Cordova Street and Glenarm Street
7. Signal and crossing improvements at Fair Oaks Avenue/ Orange Grove Boulevard intersection	15. Colorado Boulevard – between Allen Avenue and Sierra Madre Boulevard
8. Traffic signal preemption for emergency vehicles at intersections along arterial streets	

Attachment A: Projects Identified from Existing City Plans

Table 1. Local Roadway Safety Plan (2022) Projects

PROJECT NAME/LOCATION	
1. Bike Lane on Washington Blvd (from Forest Ave to Catalina Ave)	11. Flashing yellow signal and high visibility crosswalks at Colorado Blvd & Sierra Madre Blvd
2. Bike Lane on Del Mar Blvd (from Los Robles Ave to east City Limit)	12. Install high visibility crosswalk and add curb extensions at Arroyo Pkwy & Green St
3. RRFB Installation at multiple mid-block and non-signalized locations	13. Intersection improvements at Fair Oaks Ave & Maple St
4. HAWK Signal Installation at multiple mid-block and non-signalized locations	14. Retroreflective backing plates at 115 signalized intersections (22 priority intersections)
5. High Visibility Crosswalks at Lake Ave & Maple St	15. Nearside signal heads at 10 intersections
6. High Visibility Crosswalks at El Molino Ave & Villa St	16. Fluorescent sheeting at 15 sign locations
7. Install new traffic signal at Orange Grove Blvd & Sierra Bonita Ave	17. Dynamic speed warning signs and thermoplastic paint at Lake Ave from Mountain St to California Blvd
8. Flashing yellow signal and high visibility crosswalks at Lake Ave & Washington Blvd	18. Dynamic speed warning signs on Los Robles Ave (from Washington Blvd to Maple St)
9. Flashing yellow signal and high visibility crosswalks at Fair Oaks Ave & Washington Blvd	19. Add contrast restriping at 31 locations
10. Flashing yellow signal and high visibility crosswalks at Fair Oaks Ave & Orange Grove Blvd	

Table 2. Pedestrian Transportation Action Plan (2024) Projects

PROJECT NAME/LOCATION	
1. Allen Ave (from north City limit to Colorado Blvd)	7. Los Robles Ave (from north City limit to Walnut St)
2. Del Mar Blvd (from Pasadena Ave to east City limit)	8. Raymond Ave (from Colorado Blvd to E Glenarm St)
3. Fair Oaks Ave (from north City limit to south City limit)	9. San Gabriel Blvd (from Maple St to California Blvd)
4. Foothill Blvd (from Walnut St to east City limit)	10. Washington Blvd (from Lincoln Ave to Sierra Bonita Ave)
5. Lake Avenue (from north City limit to Arden Road)	11. California Blvd (from Fair Oaks Ave to Lake Ave)
6. Lincoln Ave (from north City limit to Washington Blvd	

Table 3. Greenways Feasibility Study (2021) Projects

PROJECT NAME/LOCATION	
1. El Molino Ave (from Atchison St to Bonita Drive)	3. Sierra Bonita Ave (from Washington Blvd to Colorado Blvd)
2. Wilson Ave (from Washington Blvd to California Blvd)	4. Craig Ave (from Orange Grove Blvd to Del Mar Blvd)

Table 4. Capital Improvement Program - Transportation (FY 2025-2029) Projects

PROJECT NAME/LOCATION			
1.	Pasadena Bicycle Program	24.	Citywide Leading Pedestrian Interval/Accessible Pedestrian Signal (LPI/APS) Implementation Program
2.	Citywide Neighborhood Traffic Management Program	25.	Implementation of Citywide Transportation Performance Monitoring Network
3.	Pedestrian Crossing Enhancements Program	26.	Implement Bus Signal Priority System on Pasadena Transit Buses
4.	Arterials Speed Management Program	27.	Walnut St Corridor Signal Improvements
5.	Citywide Complete Streets Program	28.	St. John Capacity Enhancement
6.	Complete Streets Project - Ave 64	29.	Intelligent Transportation System Projects & Traffic Flow Improvements within the SR 710 Affected Corridors
7.	Complete Streets Project - N Hill Ave	30.	Installation of Pedestrian Hybrid Beacon at Washington Blvd/ Hudson Ave
8.	South Lake Ave Pedestrian Access Improvements to A Line Station	31.	Traffic Signal at Del Mar Blvd/Michigan Ave
9.	Installation of Leading Pedestrian Interval and Audible Signals at Signalized Intersections	32.	Traffic Signal at Orange Grove Blvd/Craig Ave
10.	Enhancements to Metro A Line Allen Station	33.	Installation of Traffic Signal and Curb Extensions at Sierra Bonita Ave/Orange Grove
11.	Lake Ave Traffic and Pedestrian Safety Enhancements – Design Phase	34.	A Line Phase I - Project Enhancements
12.	Pedestrian Transportation Action Plan - Outreach and Conceptual Design	35.	Pasadena Light Rail Train Tracking and Network Monitoring System - Phase II
13.	Greenway (Bike Blvd) Implementation	36.	Traffic Signal Improvements at Orange Grove Blvd/Holly St, and Orange Grove Blvd/Colorado Blvd
14.	Pasadena Ave and St John Ave Street Improvements	37.	Multimodal Improvements on San Rafael Ave
15.	Columbia St Multimodal Improvements	38.	Installation of Pedestrian Hybrid Beacons (HAWKs) at Various Locations
16.	Citywide Continental Crosswalk Implementation	39.	Mobility Hubs and First/Last Mile Improvements
17.	Complete Streets Project - Mountain St	40.	Installation of Automated License Plate Readers - Pilot Program
18.	Rose Bowl Pedestrian and Bicycle Access Study	41.	Signal Preemption Equipment at Traffic Signals Citywide - Phase II
19.	Orange Grove Blvd Mobility Improvement Program	42.	Purchase of Replacement Transit Vehicles and Expansion Fixed-Route Transit Vehicles
20.	Mobility Corridor Improvements	43.	Purchase of Dial-A-Ride Vehicles
21.	Transportation System Safety Enhancements Project	44.	Construction of Transit Operations Maintenance Facility
22.	Old Pasadena Traffic Improvement	45.	Bus Stop Improvement Program
23.	Intelligent Transportation System Equipment Upgrades/Replacement	46.	Hydrogen Fueling Station

Attachment B: Community Generated Project List and Scores

Community Generated Project List and Scores

PROJECT	TYPE	EXTENTS	COMMUNITY INPUT	SAFETY[1]	COMMUNITY IMPACT	TOTAL SCORE
Mountain Street	Corridor	Between Raymond Avenue & El Molino Avenue	5	5	5	15
Villa Street (between Champlain Avenue & Lake Avenue)	Corridor	Between Champlain Avenue & Lake Avenue	4	5	5	14
El Molino Avenue	Corridor	Between Woodbury Road & Santa Barbara Street	5	2	5	12
Marengo Avenue	Corridor	Between Villa Street & Glenarm Street	5	5	2	12
Orange Grove Boulevard (Between Fair Oaks Avenue & Sierra Madre Villa Avenue)	Corridor	Between Fair Oaks Avenue & Sierra Madre Villa Avenue	5	2	5	12
Sunset Avenue	Corridor	Between Howard Street & Hammond Street	5	2	5	12
Wilson Avenue	Corridor	Between California Boulevard & Emerson Street	5	5	2	12
Raymond Avenue	Corridor	Between Mountain Street & Howard Street	4	2	5	11
Seco Street	Corridor	Between Lincoln Avenue & Arroyo Boulevard	4	5	2	11
Paloma Street (at Sierra Madre Boulevard)	Intersection	Sierra Madre Boulevard/ Paloma Street	1	5	5	11
Maple Street (Between El Molino Avenue & Wilson Avenue)	Corridor	Between Wilson Avenue & El Molino Avenue	3	2	5	10
Arroyo Parkway	Corridor	Between Cordova & Glenarm Street	5	5	0	10
California Boulevard	Corridor	Between Fair Oaks Avenue & Wilson Avenue	5	5	0	10
Glenarm Street	Corridor	Between Pasadena Avenue & Los Robles Avenue	5	5	0	10
Colorado Boulevard	Corridor	Between Orange Grove Boulevard & Sierra Madre Boulevard	5	5	0	10
Altadena Drive (between Mountain Street & Queensberry Road)	Corridor	Between Mountain Street & Queensberry Road	4	0	5	9
Foothill Boulevard	Corridor	Between Walnut Street & Sierra Madre Boulevard	4	5	0	9
Sierra Madre Villa Avenue	Corridor	Between Sierra Madre Boulevard & Electronic Drive	4	5	0	9
Villa Street (at Sierra Bonita Avenue)	Intersection	Villa Street/Sierra Bonita Avenue	4	5	0	9
Sierra Madre Boulevard	Corridor	Between Paloma Street & Hastings Ranch Drive	5	2	2	9
Howard Street	Corridor	Between Forest Avenue & Raymond Avenue	5	2	2	9
Walnut Street (Between Corson Street & Garfield Avenue)	Corridor	Between Corson Street & Garfield Avenue	3	5	0	8

Community Generated Project List and Scores

PROJECT	TYPE	EXTENTS	COMMUNITY INPUT	SAFETY[1]	COMMUNITY IMPACT	TOTAL SCORE
Garfield Avenue (Between Woodbury Road & Washington Boulevard)	Corridor	Between Woodbury Road & Washington Boulevard	1	2	5	8
Union Street	Corridor	Between Arroyo Parkway & De Lacey Avenue	2	5	0	7
Pasadena Avenue	Corridor	Between Columbia Street & Hulburt Street	5	2	0	7
Michigan Avenue	Corridor	Between Colorado Boulevard & Del Mar Boulevard	5	2	0	7
Mountain Street (at Altadena Drive)	Intersection	Altadena Drive/Mountain Street	2	0	5	7
Washington Boulevard (at Herritage Drive)	Intersection	Washington Boulevard/ Herritage Drive	2	0	5	7
Cordova Street	Corridor	Between Madison Avenue & Arroyo Parkway	4	2	0	6
Holly Street	Corridor	Between City Hall & Leonard J Pieroni St	4	2	0	6
Euclid Avenue	Corridor	Between California Boulevard & Glenarm Street	4	2	0	6
Sierra Bonita Avenue	Corridor	Between Orange Grove Boulevard & Villa Street	4	2	0	6
Painter Street (at Summit Avenue)	Intersection	Painter Street/Summit Avenue	1	0	5	6
Raymond Avenue (at Del Mar Station)	Intersection	Raymond Avenue/Del Mar Station	1	5	0	6
Cooley Place (at Altadena Drive)	Intersection	Altadena Drive/Cooley Place	1	0	5	6
Oak Knoll Avenue (at Colorado Boulevard)	Intersection	Colorado Boulevard/N Oak Knoll Avenue	1	5	0	6
Oakland Avenue (at Colorado Boulevard)	Intersection	Colorado Boulevard/N Oakland Avenue	1	5	0	6
Pasadena Avenue (at Walnut Street)	Intersection	Walnut Street/Pasadena Avenue	1	5	0	6
Roosevelt Avenue (at Colorado Boulevard)	Intersection	Colorado Boulevard/ Roosevelt Avenue	1	5	0	6
Rosemont Avenue (at Seco Street)	Intersection	Seco Street/Rosemont Avenue	1	5	0	6
Walnut Street (at Foothill Boulevard)	Intersection	Foothill Boulevard/Walnut Street	1	5	0	6
Orange Grove Boulevard (at Holly Street)	Intersection	Orange Grove Boulevard/ Holly Street	1	5	0	6
Union Street (at Hill Avenue)	Intersection	Union Street/Hill Avenue	1	5	0	6
Hill Avenue	Corridor	Between Corson Street & Cordova Street	4	2	0	6
Fillmore Street	Corridor	Between Marengo Avenue & Fair Oaks Avenue	3	2	0	5
Garfield Avenue (Between Holly Street & Walnut Street)	Corridor	Between Holly Street & Walnut Street	3	2	0	5

Community Generated Project List and Scores

PROJECT	TYPE	EXTENTS	COMMUNITY INPUT	SAFETY[1]	COMMUNITY IMPACT	TOTAL SCORE
Corson Street	Corridor	Corson Street/Lake Avenue	2	2	0	4
Los Robles Avenue (Between Glenarm Street & Del Mar Boulevard)	Corridor	(Between Glenarm Street & Del Mar Boulevard)	2	2	0	4
Lincoln Avenue	Corridor	Between Howard Street & Washington Boulevard	4	0	0	4
State Street (at Pasadena Avenue)	Intersection	Pasadena Avenue/State Street	4	0	0	4
Target Parking Lot (at Union Street)	Intersection	Union Street/Target	4	0	0	4
Forest Avenue	Corridor	Between Howard Street & Del Monte Street	3	0	0	3
Hastings Ranch Drive	Corridor	Between Sierra Madre Boulevard & Cartwright Street	3	0	0	3
Orange Grove Boulevard (Between Orange Grove Circle & Arlington Drive)	Corridor	Between Orange Grove Circle & Arlington Drive	3	0	0	3
Villa Street (between Altadena Drive & Sierra Madre Boulevard)	Corridor	Between Altadena Drive & Sierra Madre Boulevard	3	0	0	3
Maple Street (Between Foothill Boulevard & San Gabriel Boulevard)	Corridor	Between Foothill Boulevard & San Gabriel Boulevard)	1	2	0	3
Altadena Drive (at Canyon Close Road)	Corridor	Two intersections with Canyon Close Road	2	0	0	2
Walnut Street (at Sunnyslope Avenue)	Intersection	Walnut Street/Sunnyslope Avenue	2	0	0	2
Del Monte Street	Corridor	Betwen Forest Avenue & Lincoln Avenue	2	0	0	2

Community Generated Project List and Scores

PROJECT	TYPE	EXTENTS	COMMUNITY INPUT	SAFETY[1]	COMMUNITY IMPACT	TOTAL SCORE
Columbia Street (at Pasadena Avenue)	Intersection	Pasadena Avenue/ Columbia Street	2	0	0	2
Altadena Drive (at Florecita Drive)	Intersection	Altadena Drive/Florecita Drive	1	0	0	1
Arroyo Boulevard (at 134 NB)	Intersection	Arroyo Boulevard/SR 134	1	0	0	1
Marengo Avenue and Garfield Avenue	Intersection	Marengo Avenue/Garfield Avenue	1	0	0	1
Michillinda Avenue (Between Sierra Madre Boulevard & North City border)	Corridor	Michilinda Avenue	1	0	0	1
Rose Bowl	Intersection	Rose Bowl	1	0	0	1
Rosemead Boulevard (at Sierra Madre Villa Avenue)	Intersection	Rosemead Boulevard/Sierra Madre Villa Avenue	1	0	0	1
Woodbury Road (Between El Molino Avenue & Lake Avenue)	Corridor	Between El Molino Avenue & Lake Avenue	1	0	0	1
Alpine Street (at El Molino Avenue)	Intersection	El Molino Avenue/Alpine Street	1	0	0	1
Arlington Drive (at Pasadena Avenue)	Intersection	Pasadena Avenue/Arlington Drive	1	0	0	1
Cartwright Street (at Hastings Ranch Drive)	Intersection	Hastings Ranch Drive/ Cartwright Street	1	0	0	1
Daisy Avenue (at Foothill Boulevard)	Intersection	Foothill Boulevard/Daisy Avenue	1	0	0	1
Woodbury Road (at El Molino Avenue)	Intersection	El Molino Avenue/E Woodbury Road	1	0	0	1
Cordova Street (at Shoppers Lane)	Intersection	Cordova Street/Shoppers Lane	1	0	0	1

Notes:

[1] Projects were given a score of 0 if there was no overlap with the Safety Corridors, a score of 2 if under half of the project extent overlapped with the Safety Corridors, and a score of 5 if over half of the project extent overlapped with the Safety Corridors

Appendix C
Community Engagement Summary

Overview

The following pages summarize the results of the community engagement efforts for the Focused Local Roadway Safety Action Plan (Focused LRSAP), led by the City of Pasadena in partnership with Fehr & Peers and HERE.LA. The first round of community engagement took place from October to November 2024 to gather feedback on 20 existing safety-related City projects and to solicit ideas for new ones. 201 voters participated in the project-ranking exercise and made 194 contributions to the interactive mapping tool. The findings informed the prioritization of existing and community-generated projects, and guided planning for the second round of engagement. The second round of community engagement took place in April 2025, and focused on collecting feedback on four community-generated safety projects along Arroyo Parkway, Colorado Boulevard, Marengo Avenue, and Sunset Avenue. Over 397 participants cast 503 votes highlighting key safety concerns, including unsafe driver behavior, biking and rolling safety, and crossing conditions. The outcomes of this second round shaped the project descriptions and potential countermeasures for the four corridor-specific safety projects to be included in the LRSAP.

Round One Community Engagement

The first round of community engagement took place from October to November 2024 to gather feedback on 20 existing safety-related City projects and to solicit ideas for new ones.

ENGAGEMENT CHANNELS

To encourage a wide range of responses, the project team conducted in-person and online community engagement. While the capabilities of in-person and online efforts differed slightly, both outreach channels included project ranking and interactive mapping exercises.

In-Person Workshops

Four in-person workshops were held to gather community feedback on the Focused LRSAP. At these workshops, attendees were asked to rank their top five preferred projects from a list of 20 existing projects previously identified by the project team in the Project Prioritization Results Memorandum (September 20, 2024) and contribute to an interactive mapping exercise with locations where they had transportation safety concerns. The workshops also served as a place for attendees to ask City staff any questions they had about existing City projects or the Focused LRSAP process. The workshops were held at venues across Pasadena and were staffed with Spanish and Mandarin speakers to encourage diverse feedback and participation. A total of 32 participants signed in at the workshops. Attendance by workshop location is summarized in **Table 1.**

Table 1. In-Person Workshop Details

Workshop Location	Date and Time	Number of Sign-Ins
Victory Park Community Center	Wednesday, October 16, 6:00pm 8:00pm	7
Villa Parke Community Center	Thursday, October 17, 6:00pm-8:00pm	9
Robinson Park Recreation Center	Tuesday, October 22, 6:00pm-8:00pm	10
City Hall Training Room	Thursday, October 24, 6:00pm-8:00pm	6

Each workshop consisted of a project ranking exercise and an interactive mapping component. Attendees were provided with handouts that included project descriptions for the top 20 projects and a countermeasure toolbox with definitions of all the countermeasures referenced in the project descriptions. In the project ranking exercise, attendees were given five rings that represented a vote and asked to place the rings on the flags representing their preferred existing projects. Each existing project had its own flag, shown in Figure 1. Residents could allocate multiple rings to the same project if they wished. In-person attendees cast a total of 129 votes in the project ranking exercise. The interactive mapping component, also shown in Figure 1, allowed attendees to place a pin on a map of Pasadena at any location where they had safety concerns. Attendees selected orange pins for locations where their concern was tied to a specific intersection and red pins where their concern was tied to a larger corridor. Some attendees also left notes on the map to give more details about their experience at that location. Attendees contributed a total of 50 experience pins across the four workshops.

Online Engagement

Online community engagement was conducted from October 7, 2024, through December 1, 2024. The interactive website was designed using Social Pinpoint to help explain the Focused LRSAP project to visitors virtually and solicit feedback through the same project ranking and interactive mapping exercises used in the in-person format. The website also linked to .pdf versions of the workshop handouts, which provided more detailed project descriptions and a countermeasure toolbox. The project ranking exercise asked website visitors to prioritize the existing top 20 projects from first to fifth most important. During the online engagement window, 169 voters cast 845 project votes in the existing project ranking exercise. The interactive mapping component of the website allowed visitors to place a pin anywhere in Pasadena that they had a safety concern, select what mode of travel the concern was based on (walking, biking, driving, or other concern), leave a comment describing their pin, and upvote contributions from other residents that they agreed with. Online visitors contributed a total of 144 pins to the interactive mapping exercise.

Figure 1: Project Ranking Exercise (left), Safety Mapping Exercise (right)

ENGAGEMENT RESULTS AND KEY FINDINGS

While the response rates of in-person and online outreach efforts differed, overall themes and comments from the project prioritization and mapping exercises were consistent across platforms. In general, the same existing projects performed well in-person and online, with a preference for citywide projects or projects along a major corridor, as opposed to spot improvements or specific intersection investments. Comments and concerns raised in the interactive mapping exercise were consistent, with many contributors mentioning concerns about the ability of pedestrians and bicyclists to cross intersections and concerns about traffic speeds at locations across the city. Total votes for each of the top 20 projects and a visualization of the contributions to the mapping exercise can be found in Attachment A and Attachment B respectively.

Citywide Project Popularity

Projects marked as citywide or those that included a variety of intersections across the City were very popular in the project ranking exercise. The two projects that received the most votes online and in-person overall were the citywide continental-style (high visibility) crosswalk project and the leading pedestrian intervals (LPI)/accessible pedestrian signals (API) project. Two other popular projects, fluorescent sign sheeting and HAWK signal installation, included improvements at multiple locations rather than a single intersection or corridor. The popularity of these more geographically broad projects could be attributed to a

preference for projects that will be implemented across the city rather than at a single location.

Major Corridor Popularity

The projects with the most votes outside the citywide projects were located along a major corridor. Many of these major corridors, like Washington Boulevard, Fair Oaks Avenue, and Lake Avenue, represented Pedestrian Transportation Action Plan (PTAP) corridors and overlapped with commonly noted locations on the interactive mapping website.

Traffic Speeds

One of the most popular themes from the comments left as part of the interactive mapping exercise was concerns about traffic speed at intersections and corridors throughout the City. Contributors identified intersections and corridors where they believed traffic speed was the top concern for transportation safety in that area. Some respondents specifically identified improvements like road diets, while other residents raised traffic speed as a concern more generally.

Difficulty Crossing for Pedestrians and Bicyclists

Another common interactive mapping contribution was a concern about the ability of pedestrians and bicyclists to cross intersections safely. These comments brought up issues such as high traffic speeds, high-speed turns, and a lack of pedestrian infrastructure. Intersection safety concerns were spread across the City.

Bike Lane Protection

Many contributors to the interactive map expressed a preference for separated bikeways over bike lanes and bike routes. A number of workshop attendees shared this sentiment in their live comments and questions related to the proposed bike lane project on Washington Boulevard. These community members felt that separated bikeways would allow bicyclists to feel safer on the road and encourage more residents to bike.

ENGAGEMENT APPROACH LEARNINGS

The first round of community engagement yielded many lessons learned that can were incorporated into the second round of community engagement. The outreach process had some successes, like creativity and interactive website popularity, and some challenges, like low in-person attendance.

Creativity and Materials

Attendees appreciated the creativity and novelty of the project ranking and interactive mapping exercises both in-person and online. The construction of the in-person activity encouraged attendees to move around the room and allowed facilitators to easily answer attendees' questions about specific projects or safety treatments. Additionally, attendees and visitors found the materials like the project maps and descriptions helpful in understanding what was included in each project. For example, attendees appreciated that each "flag" for a project included both a project description and a list of countermeasures, which they could reference in the countermeasure toolbox handout.

In-Person Attendance

Overall, in-person attendance was lower than online engagement and contributions. Some possible factors for the lower in-person attendance include overlap with the World Series which occurred during the same time and some locations being more challenging to find, like the City Hall training room, which was located in the basement. The project team explored different marketing channels and in-person outreach formats to boost in-person participation in the second round of community engagement in Spring 2025.

Online Participation

There was a substantial amount of online participation in the community engagement process, with over three-quarters of project ranking and interactive mapping contributions coming from online contributors. Online engagement allowed the project team to reach residents who may not have been able to attend one of the in-person workshops, but still wanted to contribute to the Focused LRSAP effort.

Diversity of Workshop Locations

While the in-person attendance was lower overall, the diversity in the location of workshops yielded a consistent number of attendees at each event. Additionally, there were typically different attendees at each event, contributing new perspectives and ideas to the project ranking and interactive mapping exercises.

Round Two Community Engagement

The second round of community engagement took place in April 2025, and focused on collecting feedback on four community-generated safety projects along Arroyo Parkway, Colorado Boulevard, Marengo Avenue, and Sunset Avenue

ENGAGEMENT CHANNELS

To encourage feedback from a wide range of community members, the project team conducted in-person pop-up events at four different locations as well as online engagement. While the capabilities of in-person and online efforts differed slightly, both outreach channels included the ability to share top safety concerns by project corridor and provide free response comments.

Pop-Up Events

Four in-person pop-up events were held to gather community feedback about the top safety issues along the four corridors identified by the project team following the first round of engagement: Arroyo Parkway, Colorado Boulevard, Marengo Avenue, and Sunset Avenue. Visitors could vote on their top two safety concerns along each of the four corridors. The seven categories visitors could choose from were lighting, transit stop safety & comfort, sidewalk & accessibility challenges/barriers, crossing & safety, biking & rolling safety, traffic & driver behavior, or no safety concern. Visitors could also provide specific details on the nature and location of their safety concerns via comment cards. Before casting their votes, visitors could learn more about the four community-generated project corridors on posters shown in **Figure 2.** These posters included a map of the project corridor, some key destinations along the corridor, and collision statistics for the corridor.

Figure 2. Corridor Posters (left), Safety Concern Voting Balls (right)

The pop-up events were held across Pasadena and a subset were staffed with Spanish speakers. A total of 286 people visited one of the pop-up events and 141 of these visitors cast a vote or submitted a comment card. In-person attendees cast a total of 486 votes across the four corridors and submitted a total of 25 comment cards at the four pop-ups. Attendance by pop-up location is summarized in **Table 2.**

Online Engagement

Online community engagement was conducted from March 28, 2025 through May 6, 2025. The project website provided an overview of the Focused LRSAP planning effort, collision statistics for each of the four community-generated project corridors and an interactive map activity that allowed visitors to share their top safety concerns along each of the four community-generated project corridors. Nine voters cast 17 votes for safety concerns along the four community-generated project corridors via the project website during the second round of engagement.

Table 2. Pop-Up Event Details

Workshop Location	Date and Time	Total Visitors
Victory Park Farmer's Market[1]	Saturday, April 5, 8:30am-12:00pm	102
Victory Park Farmer's Market	Saturday, April 12, 8:30am-12:00pm	146
Rose Bowl Aquatics Center	Saturday, April 12, 1:30pm-3:30pm	24
La Pintoresca Library[1]	Tuesday, April 15, 3:00pm-6:00pm	14

Notes:

[1] Pop-up event was staffed by a Spanish interpreter

ENGAGEMENT RESULTS AND KEY FINDINGS

While the participation and responses rates differed between in-person and online outreach efforts, overall themes and comments from the safety concern exercises were consistent across platforms. Marengo Avenue received the most community feedback in-person and online, followed by Arroyo Parkway, then Colorado Boulevard, and lastly Sunset Avenue. Driver behavior, biking and rolling safety, and crossing safety were the top areas of concern across corridors and outreach channels. Total votes by safety concern for each corridor are shown in the table to the right.

Top Safety Concerns

The top safety concerns were consistent across all four corridors. For each corridor the top concern was driver behavior followed by biking and rolling safety and then crossing safety. These three concerns accounted for 75% of the total safety concerns shared by the community during the second round of engagement. The fourth concern varied by corridor. Sidewalk accessibility challenges/ barriers was the fourth most common safety concern along Arroyo Parkway and Colorado Boulevard, while lighting ranked fourth for Marengo Avenue and Sunset Avenue.

Corridor Familiarity

Community members were more familiar with projects along the city's major corridors, which generally serve more traffic and destinations. Arroyo Parkway, Colorado Boulevard, and Marengo Avenue all received well over 100 safety concern contributions.

Table 3. Safety Concern Votes by Corridor

Safety Concern	Arroyo Pkwy	Marengo Ave	Colorado Blvd	Sunset Ave
No Safety Concerns	7	3	7	3
Lighting	6	11	8	11
Transit Stop Safety & Comfort	8	9	7	2
Sidewalk & Accessibility Challenges/Barriers	11	9	16	10
Crossing & Safety	26	28	36	14
Biking & Rolling Safety	36	38	38	15
Traffic & Driver Behavior	42	44	43	15
Total	**136**	**142**	**155**	**70**

Notes:

[1] This summary includes votes submitted online and at in-person workshops.

Fewer community members were familiar with Sunset Avenue, a residential street, though this corridor still received 70 contributions.

Engagement Approach

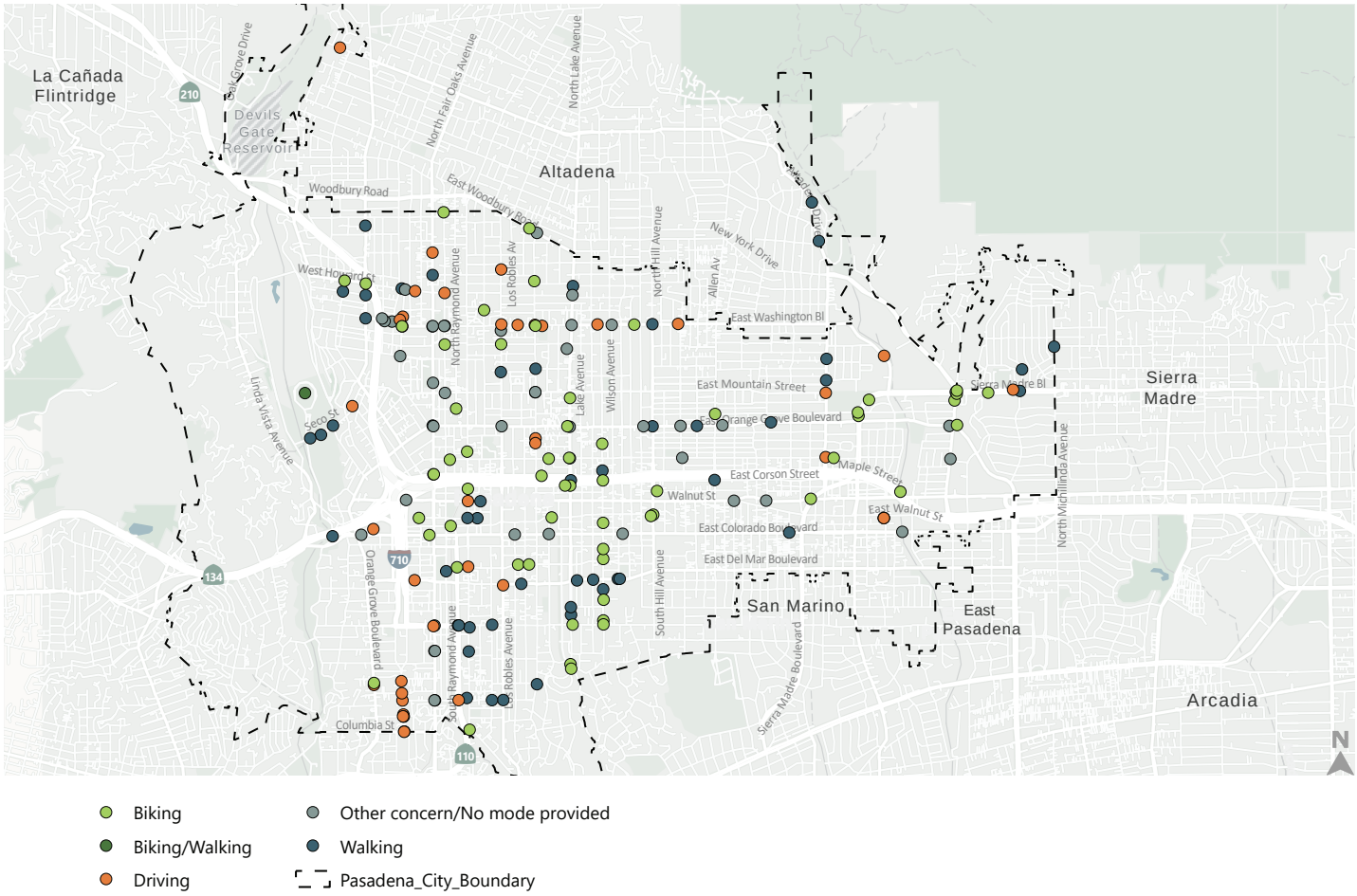
The project team engaged substantially more people via the pop-up event format compared to the in-person workshop format leveraged during the first round of engagement due to the high-traffic locations, primarily weekend timing, and simplicity of the engagement event. The pop-up event format importantly still allowed City staff to have in-depth conversations with interested community members. For future projects where in-person engagement is the priority, City staff can consider a similar approach. The second round of online engagement resulted in less website traffic compared to the first round despite a similar approach to online marketing. This decrease in web traffic could be attributed to the narrower scope of this round of engagement, which focused on four corridors rather than 20 projects across the city. Future engagement efforts focused on individual projects should consider targeted marketing efforts at the project site to help drive more online engagement among the intersection or corridor's existing road users.

Attachment A: Community Votes for Each of the Top 20 Existing Projects

Community Votes for Each of the Top 20 Existing Projects

PROJECT	TOTAL VOTES RECEIVED
Citywide implementation of continental-style crosswalks (high visibility crosswalks) at signalized intersections and marked uncontrolled crosswalks	117
Citywide installation of Leading Pedestrian Intervals and Accessible Pedestrian Signals (LPI/APS) at signalized intersections	114
Pedestrian Hybrid Beacon (HAWK) signals at priority midblock or non-signalized intersections	85
Class II bike lane on Washington Boulevard from Forest Avenue to Catalina Avenue	80
Pedestrian crossing improvements at intersections on Lake Avenue	78
Fluorescent sign sheeting at 15 priority locations for nighttime visibility	65
Pedestrian crossing improvements at intersections on Washington Boulevard	64
Pedestrian crossing improvements at intersections on Del Mar Boulevard	60
Traffic signal preemption for emergency vehicles at intersections along arterial streets	48
Pedestrian crossing improvements at intersections on Fair Oaks Avenue	46
Pedestrian crossing improvements at intersections on Allen Avenue	38
Signal and crossing improvements at Lake Avenue/Washington Boulevard intersection	35
Pedestrian crossing improvements at intersections on Los Robles Avenue	32
Signal and crossing improvements at Fair Oaks Avenue/Orange Grove Boulevard intersection	25
Dynamic speed warning signs on Los Robles Avenue from Washington Boulevard to Maple Street	20
Crossing improvements at Lake Avenue/Maple Street intersection	19
Signal improvements at Fair Oaks Avenue/Maple Street intersection	14
Signal and crossing improvements at Fair Oaks Avenue/Washington Boulevard intersection	12
Crossing improvements at El Molino Avenue/Villa Street intersection	11
Pedestrian crossing improvements at intersections on San Gabriel Boulevard	10

Attachment B: Interactive Mapping Exercise Contributions



Figure

Interactive Map Contributions by Primary Mode of Concern

Appendix D- Countermeasure Toolbox

How to Read This Toolbox

Photo

Icon

Image Source: City of Long Beach

Title

Leading Pedestrian Interval

Description

At intersection locations that have a high volume of turning vehicle and have high pedestrian vs. vehicle crashes, a leading pedestrian interval gives pedestrians the opportunity to enter an intersection 3 - 7 seconds before vehicles are given a green indication. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left or right.

Roadway Contexts
Roadway types adequate for countermeasure implementation.
TYPES OF ROADWAY CONTEXTS:
Local, Collector, and Arterial

ROADWAY CONTEXTS
All roadway types

Updated FHWA Design Hierarchy
Safe System Approach alignment that countermeasure best corresponds to

UPDATED FHWA DESIGN HIERARCHY
Manage Conflicts in Time

Crash Reduction Factor
When describing the CRF note that some CRF's apply to all crash types while others address a subset of crash types. e.g. Leading Pedestrian Intervals address pedestrian/bicycle crashes. Intersection daylighting addresses all crash types.

CRASH REDUCTION FACTOR
60%

Bikeway Projects

Image Source: Los Angeles Eco-Village

Bicycle Boulevard

A bike boulevard is a street with low vehicle traffic volumes and speeds, designated to give bicyclists travel priority and create a low-stress cycling experience. Bike boulevards typically feature various traffic calming measures to reduce vehicle speeds and prioritize bicycles, such as branded wayfinding, pavement markings, traffic diverters, and landscaping. Sharrows are the most common pavement marker used on bike boulevard. They should be centered in the travel lane, at least three feet away from parked cars (outside the "door" zone). Implement traffic calming features every 250 feet to encourage slow, attentive driving.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Increase attentiveness and awareness

CRASH REDUCTION FACTOR

Not yet available

Image Source: NACTO

Bicycle Crossing (Green Paint)

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

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Bikeway Projects

Image Source: Bike Portland

Bicycle Signal/Exclusive Bike Phase

A bicycle signal/exclusive bike phase is specifically designed to control the movement of bicycles at intersections, operating either independently or in coordination with traffic signal. It separates bicycle movements from conflicting motor vehicle, streetcar, light rail, or pedestrian movements enhancing safety and visibility for cyclist navigating through an intersection.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Image Source: NACTO

Bike Box

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

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Manage Conflicts in Time; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

15%

Bikeway Projects

Image Source: City of Long Beach

Bike Detection

Bike detection is a technology used to identify the presence of a bicycle at signalized intersections or along roadways, either through use of push-buttons, in-pavement loops, or by video or infrared cameras, to call a green light for bicyclists and reduce delay for bicycle travel. Provides appropriate signal timing or priority for bicyclists, which can discourage red light running, increase convenience, and safety.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Image Source: City of Orlando

Bike path (Class I)

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

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

45%

Bikeway Projects

Image Source: City of Covina

Buffered bicycle lane (Class II+)

A buffered bike lane is a conventional bike lane paired with a designated buffer space, typically marked with pavement markings or physical barriers, separating the bike lane from the adjacent vehicle travel lane and/or parking lane. The buffer space provides greater shy distance between motor vehicles, reducing the risk of collisions with vehicles, opening car doors, or encroachments in to the bike lane by parked cars.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

35%

Image Source: Irvine Standard

Extend Green Time For Bikes

Extending green time for bikes prolongs the green phase when bicyclists are present to provide additional time for bicyclists to clear the intersection. Longer green times reduce risk of conflicts between bicyclists and turning vehicles, improve visibility of bicyclists and pedestrians, and reduce the need for rushed maneuvering that could lead to unsafe behavior.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

15%

Bikeway Projects

Image Source: San Francisco Bike Coalition

Floating Transit Island

An in-street transit boarding island is used in conjunction with a Class IV bike facility, separating transit traffic from bicycle traffic, reducing conflict between the two modes, and lowering the risk of collision.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Not yet available

Image Source: Fehr & Peers

Green Conflict Striping

Dashed green markings in bike lanes through conflict areas such as at turn pockets, driveways, and intersections. Signals to drivers and bikers to take caution and look for conflicts.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Bikeway Projects

Image Source: Google Streeetview

Mixing Zone

Places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Lane markings delineate space for bicyclists and motorists within the same lane and indicate the intended path for bicyclists to reduce conflict with turning motor vehicles.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Image Source: City of Burbank

Separated Bikeway

A separated bikeway provides dedicated street space, typically adjacent to outer vehicle travel lanes, with physical separation from vehicle traffic, designated lane markings, pavement legends, and signage. Physical separation may consist of plastic posts, parked vehicles, or a curb. Pavement markings that denote the door zone of parked vehicles can help bicyclists maintain safe positioning on the roadway. Separated bikeways 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. A raised barrier of plastic posts and painted pavement is a low-cost/quick build option.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

45%

Bikeway Projects

Image Source: NACTO

Two-Stage Turn Queue Bike Box

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

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Manage Conflicts in Time; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Intersection & Roadway Projects

Image Source: Google Streetview

All-Way Stop Control

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” sign should be placed under the octagonal stop sign at all-way stop-controlled intersections as required by the California Manual on Uniform Traffic Control Devices (MUTCD).

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds; Manage Conflicts in Time; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

50%

Image Source: IIHS

Centerline Hardening

Centerline hardening is the installation of physical barriers or delineators separating two opposing traffic lanes. The enhanced visibility and lane narrowing reduces lane departure crashes and head on-crashes.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

DRAFT FINAL

Intersection & Roadway Projects

Image Source: City of Pasadena, CA

Chicanes

A chicane is a traffic-calming feature consisting of alternating road curves—typically formed with curb extensions—that prompt drivers to slow down and navigate more carefully, thereby improving safety in areas prone to speeding.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Reduce vehicle speeds, increase attentiveness & awareness

CRASH REDUCTION FACTOR

Not yet available

Image Source: New York City Street Design Manual

Close Slip Lane

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

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

30%

Intersection & Roadway Projects

Image Source: Seattle Department of Transportation

Intersection Reconstruction and Tightening

Irregular intersections can be overbuilt and confusing, presenting safety hazards to all users. “Squaring up” an intersection as close to 90 degrees as possible involves intersection reconstruction to provide better visibility for all road users, also reducing high speed turns and reducing pedestrian crossing length.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Image Source: Eric Fischer

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.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Not yet available

Intersection & Roadway Projects

Image Source: City of Pasadena, CA

Leading Pedestrian Interval

At intersection locations that have a high volume of turning vehicle and have high pedestrian vs. vehicle crashes, a leading pedestrian interval gives pedestrians the opportunity to enter an intersection 3 - 7 seconds before vehicles are given a green indication. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left or right.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

60%

Image Source: Erica Fischer

Left Turn Enhanced Daylighting/Slow Turn Wedge

Uses paint and bollards to extend the curb and slow left turns at intersections of one-way to one-way or two-way streets. Widening the turning radii of left-turning vehicles expands the field of vision for drivers and increases the visibility of pedestrians.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

10%

Intersection & Roadway Projects

Image Source: NACTO

Mini Roundabout/Traffic Circle

Traffic circles, also referred to as mini roundabouts, are a type of roundabout typically small in diameter, with on-lane and a fully traversable central island. Traffic circles decrease vehicle speeds and severity of collisions, while reducing congestion and improving traffic flow.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts, Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Varies

Image Source: Urban Grammar

Partial Closure/Diverter

A roadway treatment that restricts through vehicle movements using physical diversion while allowing bicyclists and pedestrians to proceed through an intersection in all directions.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

50%

Intersection & Roadway Projects

Image Source: Dan Gold

Pedestrian Recall

Pedestrian recall is a traffic signal timing function that causes a pedestrian walk phase to activate automatically every cycle. Pedestrian recall can benefit pedestrians by reducing pedestrian delay. Improved convenience of crossing in turn can reduce unsafe crossing behavior.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Image Source: Erica Fischer

Prohibit Left Turns and/or U-Turns

Restricting left turns and/or U-turns where they present issues can improve transit performance, general traffic performance, and walking and bicycling safety at the same time.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Intersection & Roadway Projects

Image Source: Santa Monica Spoke

Protected Intersection

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

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Not yet available

Image Source: New York City Street Design Manual

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.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

35%

DRAFT FINAL

Intersection & Roadway Projects

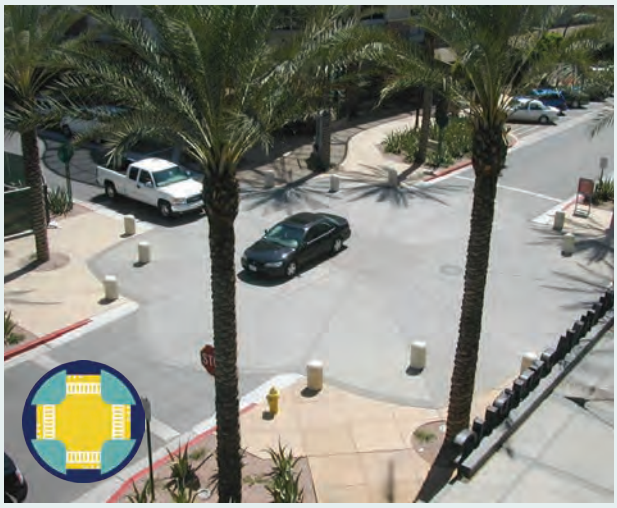


Image Source: NACTO

Raised Intersection

Elevates the intersection bringing vehicles to sidewalk level. Serves as a traffic calming measure by creating a visual and physical reminder for drivers to reduce their speed.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

35%

Image Source: Steven Vance

Raised Median

Raised medians are curbed sections in the center of the roadway that are physically separated from vehicular traffic. They can be extended through an intersection to prevent turns and through-movements to and from the intersecting street. Raised medians reduce vehicular speeding and discourage risky turning movements, increasing pedestrian safety.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

25%

Intersection & Roadway Projects

Image Source: NYC Street Design Manual

Refuge Island

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 designated zones for vehicles to turn, and a pedestrian refuge island improves safety by reducing the exposure time for pedestrians crossing the intersection.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

45%

Image Source: FHWA

Remove Second Right-Turn Lane

Roads with two right turn lanes accommodate more vehicles making right turns simultaneously and often permit both lanes to turn right on red. Removing a second right-turn lane can reduce conflict points and improve the visibility of pedestrians and bicyclists for turning drivers.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Reduce vehicle speeds

CRASH REDUCTION FACTOR

Not yet available

Intersection & Roadway Projects

Image Source: City of Pasadena

Roadway Reconfiguration

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

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts, Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Not yet available

Image Source: Google Earth

Roundabout

A roundabout is a type of circular intersection in which road traffic is permitted to flow in one direction around a central island, and priority is typically given to traffic already in the junction. Mini circles are a type of roundabout that use paint and soft hit posts to replace stop-controlled intersections with a circular design. The types of conflicts that occur at roundabouts are different from those occurring at conventional intersections; namely, conflicts from crossing and left-turn movements are not present in a roundabout. The geometry of a roundabout forces drivers to reduce speeds as they proceed through the intersection; the range of vehicle speeds is also narrowed, reducing the severity of crashes when they do occur. Pedestrians only have to cross one direction of traffic at a time at roundabouts, thus reducing the potential for vehicle/pedestrian conflicts.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Varies (35-67% to convert from signal; 12-78% from unsignalized)

Intersection & Roadway Projects

Image Source: NYC Department of Transportation

Shared Streets

Shared streets are intended to be shared by pedestrians, bicyclists, and low speed motor vehicles. They are typically streets without curbs and sidewalks, and vehicles are slowed by placing trees, planters, parking areas, and other obstacles in the street. The shared street maintains utilitarian uses like loading docks and parking while making the roadway safer and more accessible to non-drivers. They are most often implemented in commercial areas and on local residential streets.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness; Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Not yet available

Image Source: Irvine Standard

Signal

Traffic signals at intersections control the flow of traffic. Traffic signals have the potential to reduce the most severe type crashes but will likely cause an increase in rear-end collisions. A reduction in overall injury severity is likely the largest benefit of traffic signal installation.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

30%

Intersection & Roadway Projects

Image Source: PEDBIKESAFE

Speed Hump

A speed hump is a parabolic traffic calming device that uses vertical defection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds to avoid damage to the undercarriage of an automobile. Speed humps span the full width of the street and are typically used to slow speeds on low volume, low speed roads. They should be spaced every 250 to 500 feet for maximium efficacy.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Unsafe speeds

Image Source: City of Pasadena, CA

Speed Table

A speed table is a traffic calming device that use vertical defection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds to avoid damage to the undercarriage of an automobile. Speed tables are flat-topped and longer than speed humps, which makes them suitable for streets with operating speeds of up to 45 miles per hour. Speed tables should be spaced at a maximum of 500 feet apart for maximum efficacy. Speed tables in opposing directions of travel can be offset or exlude center turn lane to minimize impacts to emergency service vehicles.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Unsafe speeds

Intersection & Roadway Projects

Image Source: NACTO

Straighten Crosswalk

Straightening crosswalks improves sight lines, making pedestrians more visible to oncoming drivers, and may shorten the crossing distance, reducing the length of time required for pedestrians to cross an intersection.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Pedestrian Facilities Projects

Image Source: Fehr & Peers

Add Sidewalk

Adding sidewalks provides a separated and continuous facility for people to walk along the roadway. Adding sidewalks improves safety by minimizing collisions with pedestrians walking in the road.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

80%

Image Source: City of Pasadena, CA

Audible Push Button Upgrade

Push buttons must comply with the Americans with Disability Act (ADA) standards for accessibility. Pushbuttons should be visible and conveniently located for pedestrians waiting at a crosswalk. Accessible pedestrian signals, including audible push buttons, improve access for pedestrians who are blind or have low vision. DIB 82-06 includes accessibility design guidance.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

25%

Pedestrian Facilities Projects

Image Source: NACTO

Bus Stop Placement

Placing bus stops and pedestrian crossings in close proximity allows transit riders to cross the street safely. Locating bus stops on the far side of an intersection, meaning immediately after an intersection, allows the bus to pass through the intersection before stopping for passenger loading and unloading. Far-side stops encourage pedestrians to cross behind the bus for greater visibility and can improve transit service reliability.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Image Source: City of Pasadena, CA

Curb Extensions

A curb extension is a traffic calming measure which widens the sidewalk for a short distance to enhance the pedestrian crossing and reduce vehicle speeds. For the pedestrian, this reduces the crossing distance and improves pedestrian visibility. For the vehicle, this visual narrowing encourages drivers to reduce speed when approaching intersection and modifies the turning movement geometry to encourage shaper, slower turns.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

35%

Pedestrian Facilities Projects

Image Source: Richard Masoner

Decorative Crosswalks

Decorative crosswalks are marked pedestrian crossings across a roadway that include a colored and/or textured pattern, aesthetic, or artistic mural element within its horizontal white boundaries. Artistic elements are often added in partnership with community organizations but may also be implemented to emphasize and alert roadway users of the designated pedestrian crossing. Similar application of artistic elements, often referred to as "asphalt art", can be applied within the boundaries of quick-build curb extensions.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

35%

Image Source: David Schwen

Extended Time Pushbutton

A pushbutton that can be pressed to request extra time for using the crosswalk, beyond the standard crossing time. Ideal near senior-serving land uses.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Pedestrian Facilities Projects

Image Source: NACTO

High-Visibility Crosswalk & Advance Stop Bar

A high-visibility crosswalk has a striped pattern with ladder markings made of high-visibility material, such as thermoplastic tape, instead of paint. A high-visibility crosswalk improves safety by increasing the visibility of marked crosswalks and provides motorists a cue to slow down and yield to pedestrians. Advance stop bars provide clear direction to the motorist where they should stop to allow pedestrians to cross. Having a set back stop bar improves pedestrian/suto sight lines.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

35%

Image Source: NACTO

Improved Transit Amenities

Improving transit amenities refers to enhancing the comfort, accessibility, and functionality of transit stops, including bus shelters, clear signage, lighting, seating, and real-time information. These create a safer and more welcoming environment for people walking to and from transit by improving the visibility of transit stops, shortening crossing distances, and promoting traffic calming.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase attentiveness & awareness

CRASH REDUCTION FACTOR

Not yet available

Pedestrian Facilities Projects

Image Source: Fehr & Peers

New and Widened Sidewalks

New and widened sidewalks provide a more comfortable space for pedestrians, particularly in locations with high volumes of pedestrians, and provides space to accommodate people in wheelchairs. New and widened sidewalks improve safety by minimizing collisions with pedestrians walking in the road.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

Not yet available

Image Source: City of Pasadena, CA

New/Updated Curb Ramp

New and updated curb ramps include tactile warning devices for visually impaired pedestrians and are ideally "directional" curb ramps that direct pedestrians immediately into the crosswalk in the direction they are traveling.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Pedestrian Facilities Projects

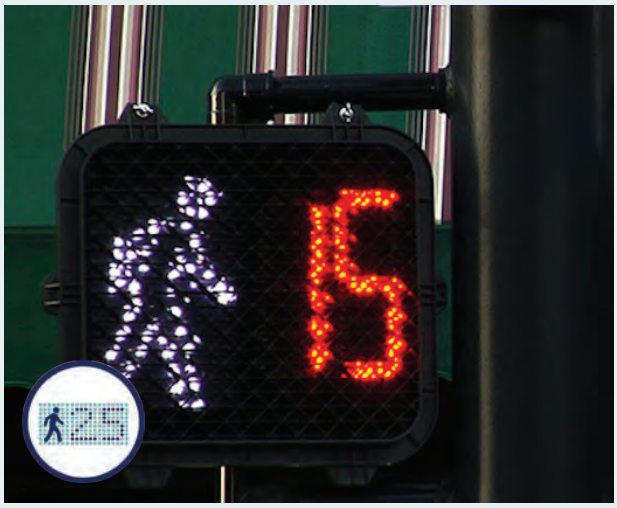


Image Source: LA Walks

Pedestrian Countdown Signals

A pedestrian countdown signal is an LED timer integrated into pedestrian signals that displays remaining time for pedestrians to complete their street crossing at a signalized intersection. These systems give pedestrians adequate warning when attempting to cross a roadway and minimize uncertainty.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

25%

Image Source: PEDBIKESAFE

Pedestrian Detection

Pedestrian detection is an intersection treatment that relies on sensors to detect when a pedestrian is waiting at a crosswalk and automatically triggers the pedestrian "WALK" phase.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

25%

Pedestrian Facilities Projects

Image Source: City of San Luis Obispo

Pedestrian Hybrid Beacon

A pedestrian hybrid beacon (PHB) is used at unsignalized intersections or mid-block crosswalks to notify oncoming motorists to stop with a series of red and yellow lights. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection providing enhanced pedestrian visibility.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

55%

Image Source: City of Covina

Rectangular Rapid Flashing Beacon

Rectangular Rapid Flashing Beacons (RRFBs) are pedestrian safety devices installed at crosswalks to enhance visibility and alert drivers to the presence of pedestrians. Activated by pedestrians, these beacons emit a rapid, alternating flash pattern, capturing drivers' attention and prompting them to yield. RRFBs improve crosswalk visibility, increase driver compliance with yielding to pedestrians, and thereby enhance pedestrian safety. Note that due to their proven efficacy in crash reduction, other flashing beacons (such as LED-flashing signs) are not a substitute for RRFBs.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

35%

Pedestrian Facilities Projects

Image Source: Paul Brennan

Remove Crossing Prohibition

Removes existing crossing prohibitions and provides marked crosswalk and other safety enhancements for pedestrians to cross the street.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

25%

Signal Projects

Image Source: Irvine Standard

Advanced Dilemma Zone Detection

The Advanced Dilemma-Zone Detection system adjusts the start time of the yellow-signal phase (i.e. earlier or later) based on observed vehicle locations and speeds. The Advanced Dilemma-Zone Detection system improves safety by minimizing the number of drivers that are faced with the dilemma of determining if they should stop at the intersection or drive through the intersection based on their speed and distance from the intersection.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Image Source: Rebuilding Place in the Urban Space (Pasadena, CA)

Exclusive Pedestrian Phase

A form of pedestrian "WALK" phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians to safely cross through the intersection in any direction, including diagonally. The pedestrian exclusive phase significantly reduces conflict between vehicles and pedestrians at intersections and provides maximum pedestrian visibility.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

Not yet available

Signal Projects

Image Source: LA Walks

Extend Pedestrian Crossing Time

Extended pedestrian crossing time reduces crossings at inappropriate times, ensures that pedestrians have enough time to safely cross the roadway, and improves pedestrians visibility.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

15%

Image Source: Irvine Standard

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 all 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.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

15%

Signal Projects

Image Source: City of Pasadena, CA

Flashing Left Turn Signal

A flashing yellow arrow at a traffic signal indicates to drivers that they must yield to oncoming traffic and pedestrians before making a left turn. Flashing left turn signals are considered safer than traditional solid green lights at intersections for permissive left turns because they reduce confusion and increase attentiveness and awareness.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Increase attentiveness & awareness

CRASH REDUCTION FACTOR

Not yet available

Image Source: UNC at Chapel Hill

Prohibit Right-Turn-on-Red

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

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Signal Projects

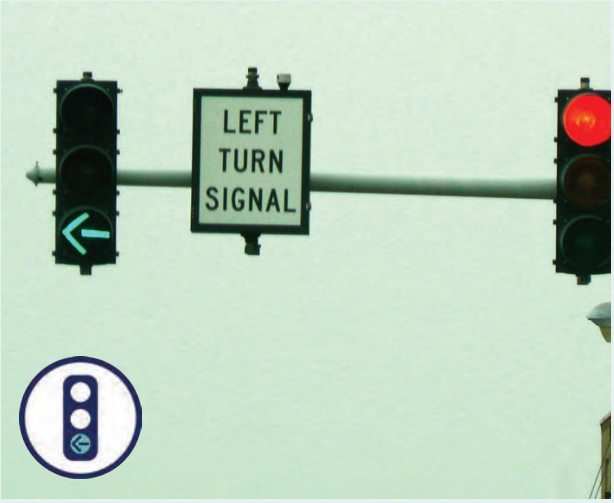


Image Source: Benny Mazur

Protected Left Turns

A protected left turn is a traffic signal configuration that allows vehicles to make a left turn at an intersection while being shielded from conflicting traffic. Left turns are widely recognized as the highest-risk movements at signalized intersections, so providing protected left-turn phases for signalized intersections significantly improves the safety for vehicles making the left-turn maneuver and the conflicting pedestrians.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts; Manage Conflicts in Time

CRASH REDUCTION FACTOR

30-55%

Image Source: Irvine Standard

Rest in Red Signal

At certain hours (e.g. late night) a signal remains red for all approaches or certain approaches until a vehicle arrives at the intersection to encourage lower travel speeds. Speed sensitive rest in red signals will not turn green until after a vehicle stops, if the vehicle is going faster than the desired speed. If the vehicle is going the desired speed the signal will change to green before the vehicle arrives, providing an operational benefit to drivers traveling at the desired speed limit. This countermeasure can be paired with variable speed warning signs.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Manage Conflicts in Time

CRASH REDUCTION FACTOR

30%

Signal Projects

Image Source: City of Surrey

Retroreflective Signal Borders

Retroreflective signal borders enhance the visibility of traffic signals for aging and color vision impaired drivers, enabling them to understand which signal indication is illuminated. Retroreflective borders may also alert drivers to signalized intersections during periods of power outages when the signals would otherwise be dark, and non–reflective signal heads and backplates would not be visible.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

15%

Image Source: Gabon Gazette

Separate Right-Turn Phasing

A separate right-turn phasing provides a green arrow phase for right-turning vehicles. Avoids conflicts between right-turning traffic and bicyclists or pedestrians crossing the intersection on their right.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Signal Projects

Image Source: City of San Gabriel, CA

Shorten Cycle Length

Traffic signal cycle lengths have a significant impact on the quality of the urban realm and consequently, the opportunities for bicyclists, pedestrians, and transit vehicles to operate safely along a corridor. Long signal cycles, compounded over multiple intersections, can make crossing a street or walking even a short distance prohibitive and frustrating. Shortening cycle lengths decrease exposure to conflicts, reduce wait time, and improve intersection capacity.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Image Source: Pixabay

Signal Interconnectivity and Coordination / Green Wave

Certain timing, phasing, and control strategies can produce multiple safety benefits. Sometimes capacity improvements come along with the safety improvements and other times adverse effects on delay or capacity occur. The emphasis of improving signal coordination for this countermeasure is to provide an opportunity for slow speed signal coordination. Coordinating signals to allow for bicyclist progression, also known as a 'green wave,' gives bicyclists and pedestrians more time to safely cross through the 'green wave' intersections.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

15%

Signal Projects

Image Source: City of Pasadena, CA

Emergency Vehicle Traffic Signal Preemption

Traffic signal preemption allows emergency vehicles to temporarily control traffic signals, giving them a green light to safely and efficiently pass through intersections during emergency responses. This technology aims to reduce response times and reduce conflicts at intersections between emergency vehicles and other vehicles.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Manage conflicts in time

CRASH REDUCTION FACTOR

70%

Signing and Striping Projects

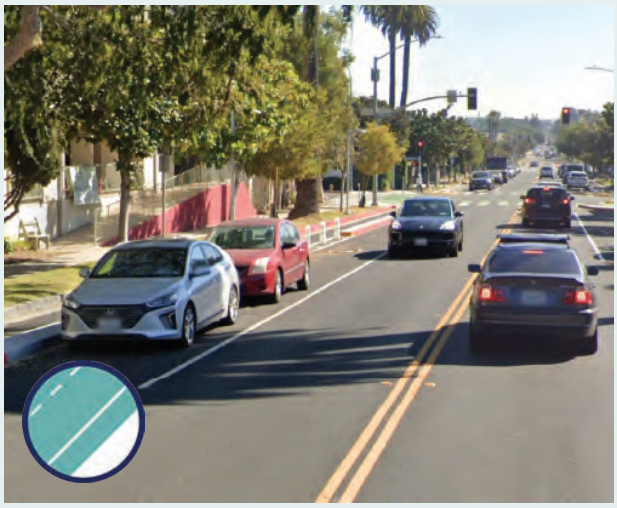


Image Source: Google Streetview

Edge Line

Edge lines are striping between the travel lane and the parking lane and are used to narrow a driver's visual field, which can help lower speeds. Edge lines and other striping (centerline, striped median, etc.) can be a lower-cost traffic calming alternative to vertical and horizontal traffic displacement devices like speed humps/speed tables and lateral shifts.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

25%

Image Source: City of Covina

Speed Monitoring and Feedback

Monitor individual vehicle speeds through video and/or radar roadside sensors and notify motorist of excessive speed through a combination of dynamic roadside signage and V2I messaging. Deliver speed data to the traffic operations center (TOC) for monitoring. While automated enforcement is not currently legal in California, the system could be extended to include enforcement when it becomes legal.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Not yet available

Signing and Striping Projects

Image Source: Google Earth

Striping Through Intersection

Adding clear pavement markings, also known as "cat tracks," can guide motorists through complex intersections. Intersections where the lane designations are not clearly visible to approaching motorists and/or intersections noted as being complex and experiencing crashes that could be attributed to a driver's unsuccessful attempt to navigate the intersection can benefit from this treatment.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

10%

Image Source: Montgomery County, MD

Upgrade Intersection Pavement Markings

Upgrading intersection pavement marking can include "Stop Ahead" markings and the addition of centerlines and stop bars. Upgrading intersection pavement markings can improve safety by increasing the visibility of intersections for drivers approaching and at the intersection.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

25%

Signing and Striping Projects

Image Source: Wikimedia Commons, Scott Batson

Upgrade Signs with Fluorescent Sheeting

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.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

15%

Image Source: FHWA

Upgrade Striping

Restriping lanes with contrast striping or high-visibility materials can improve striping visibility and clarify lane assignment. This is especially helpful in low-light or bright conditions.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

Signing and Striping Projects

Image Source: Lara Justine

Flashing Beacon as Advance Warning

A flashing beacon as Advanced Warning is a blinking light with signage to notify motorists of an upcoming intersection or crosswalk. A flashing beacon improves safety by providing motorists more time to be aware of and slow down for an intersection or yield to pedestrians crossing a crosswalk.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

30%

Image Source: Jo Naylor

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).

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

15%

Lighting Projects

Image Source: Fehr & Peers

Intersection Lighting

Adding intersection and/or pedestrian-scale lighting at intersections improves safety by increasing visibility of all road users. This countermeasure improves safety for all users by increasing the visibility of pedestrians at intersections at night.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

40%

Image Source: Erik McLean

Pedestrian Scale Lighting

Pedestrian-scale lighting features low-mounted fixtures that brighten sidewalks, crosswalks, and paths to improve visibility and create a safer, more inviting environment for foot traffic. Unlike traditional streetlights, they are typically closer to the ground to focus light on pedestrian areas rather than over roadways.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase attentiveness & awareness

CRASH REDUCTION FACTOR

Not yet available

Lighting Projects

Image Source: Bill Morrow

Upgrade Lighting to LED

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.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

15%

Other Projects

Image Source: Live 5 News WCSC

Access Control for Commercial Vehicles

Restrict large commercial trucks from certain areas or streets within the City. Access control is often implemented on local and residential streets and can help reduce vehicle conflicts in areas with higher bicycle and pedestrian activity.

ROADWAY CONTEXTS

Collector, Local

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Image Source: Ryan Smith

Access Management

Forms of access management include closing driveways and restricting left turns. Vehicles entering and exiting driveways may conflict with pedestrians and with vehicles on the main road, especially at driveways within 250 feet of intersections. Closing driveways near intersections with high collision rates related to driveways may reduce potential conflicts. Prohibitions of left turns at locations where a turning vehicle may conflict with pedestrians in the crosswalk or where opposing traffic volume is high reduces pedestrian interaction with vehicles when crossing. Directional median openings restrict 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.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Manage Conflicts in Time

CRASH REDUCTION FACTOR

Not yet available

Other Projects

Image Source: Curb IQ

Curbside Management

Curbside management can better prioritize reliable transit and safe bicycling infrastructure, freight deliveries, passenger pick-ups/ drop-offs, green stormwater infrastructure, public spaces, and parking management.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Remove Severe Conflicts

CRASH REDUCTION FACTOR

Not yet available

Image Source: Google Streetview

Delineators, Reflectors, and/or Object Markers

Delineators, reflectors and/or object markers are intended to warn drivers of an approaching curve or fixed object that cannot easily be removed. They are generally less costly than Chevron Signs as they don't require posts to place along the roadside, avoiding an additional object with which an errant vehicle can crash into.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

15%

Other Projects

Image Source City of Covina, CA:

Dynamic Speed Management

Variable or dynamic speed limits may be appropriate on roads with significant variations in congestion throughout the day or in response to a crash, as well as roads with frequent weather conditions that affect safe travel speed. Sensors in the road detect congestion, weather conditions, vulnerable road user activity, or scheduled events (such as school bell times), then automatically lower the speed limit in stages to manage a more even slowing of traffic, delay of congestion onset, and smooth traffic flows. These changes plus lower speed have potential to reduce crashes, including secondary crashes.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds

CRASH REDUCTION FACTOR

Not yet available

Image Source: Digi_Shot

Red Light Camera

A red light camera enforces traffic signal compliance by capturing the image of a vehicle that has entered an intersection in spite of the traffic signal indicating red. The automatic photographic evidence is used by authorities to enforce traffic laws and issue traffic violation tickets.

ROADWAY CONTEXTS

Arterial, Collector

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Not yet available

DRAFT FINAL

Other Projects

Image Source: WOSU Public Media

Remove Obstructions For Sightlines

Remove objects that may prevent drivers and pedestrians from having a clear sightline. May include installing red curb at intersection approaches to remove parked vehicles (also called "daylighting"), trimming or removing landscaping, or removing or relocating large signs. This countermeasure supports compliance with AB 413, California's daylighting law that prohibits the stopping ,standing, parking of a vehicle within 20 feet of the vehicle approach side of any unmarked or marked crosswalk.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

20%

Image Source: LADOT

Remove Peak-Hour Parking Restrictions

Removing peak hour parking lanes eliminates driver confusion and the hazards caused by parked cars blocking peak hour lanes. It also benefits local businesses and improves pedestrian comfort by moving higher speed traffic away from the sidewalk.

UPDATED FHWA DESIGN HIERARCHY

Reduce vehicle speeds; remove severe conflicts

CRASH REDUCTION FACTOR

Not yet available

Other Projects

Image Source: City of Alexandria, VA

Speed Limit Reduction

Setting speed limits to reflect the surrounding context of the roadway and that meet with driver expectations can help improve driver respect for speed limits. Lower speed limits allow for shorter stopping distances, reduce the likelihood of collisions, decrease the severity of crashes, and enhance the overall experience for pedestrian and bicyclists.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Reduce Vehicle Speeds; Increase Attentiveness and Awareness

CRASH REDUCTION FACTOR

Varies

Image Source: City of Pasadena, CA

Wayfinding

Wayfinding involves a system of elements, such as signage and maps, to direct road users to local destinations. Wayfinding can help guide pedestrians and cyclists to safer, low-traffic routes with dedicated spaces. Clear signage also makes pedestrian and bicycle facilities more visible for all road users, increasing awareness and potentially reducing conflicts.

ROADWAY CONTEXTS

All roadway types

UPDATED FHWA DESIGN HIERARCHY

Increase attentiveness & awareness

CRASH REDUCTION FACTOR

Not yet available

Appendix E
SS4A Compliance Table

Overview

One of the goals for the development of the City of Pasadena Focused Local Roadway Safety Action Plan (Focused LRSAP) was to establish a Safe Streets for All (SS4A)-compliant action plan. The City developed the 2022 Local Roadway Safety Plan (LRSP) to identify and address traffic safety concerns for all road users with the goal of achieving zero traffic fatalities in Pasadena. The 2022 LRSP satisfied some but not all of the SS4A Action Plan requirements. The Focused LRSAP builds upon the 2022 LRSP by incorporating the components described below to enable the City to apply for SS4A implementation grants.

SS4A Action Plan Components

- Leadership Commitment and Goal Setting
- Planning Structure
- Safety Analysis
- Engagement and Collaboration
- Policy and Process Changes
- Strategy and Project Selection
- Progress and Transparency
- Equity Considerations[1]

Notes:

[1] Equity considerations was one of the SS4A Action Plan requirements at the time the SS4A planning grant was awarded to the City of Pasadena and during the development of this Action Plan. However, equity considerations is no longer described in the SS4A eligibility requirements as of 2025.

Table 1. 2022 LRSP Compliance with SS4A Action Plan Requirements

SS4A Action Plan Component	Component Requirements	Corresponding Focused LRSAP Section(s)
Leadership Commitment and Goal Setting	Action Plans should include official public commitment to an eventual goal of zero roadway fatalities and severe injuries.	The Introduction chapter of the Focused LRSAP establishes a public commitment to a goal of zero roadway fatalities and severe injuries by 2035.
Planning Structure	As part of Action Plan development, a committee or task force should be established to oversee the Action Plan development, implementation, and monitoring.	The Action Plan chapter of the Focused LRSAP commits the Departments of Transportation and Public Works to monitor Action Plan implementation through monthly capital improvement planning meetings. Previously, the 2022 LRSP included two stakeholder engagement sessions where key participants were invited to provide input on its development.
Safety Analysis	SS4A Action Plans are required to analyze existing conditions and historical trends of crashes.	The 2022 LRSP met this requirement. The Action Plan supplements the previous analysis and includes the development of Safety Corridors described in the Developing the Action Plan chapter.
Engagement and Collaboration	Action Plans should include robust public engagement to allow for feedback on project development and groundtruth data analysis.	The Developing the Action Plan chapter of the Focused LRSAP outlines the community engagement carried out through two rounds of public outreach to gather feedback on both existing and new transportation projects and concerns.
Policy and Process Changes	Action Plans should include an assessment of existing policies, plans, and practices to identify opportunities to improve how processes prioritize safety.	The Developing the Action Plan chapter of the Focused LRSAP details the assessment of existing city planning documents to identify opportunities to improve safety in the city. Additionally, the Action Plan chapter discusses process changes to monitor the implementation of the Action Plan.
Strategy and Project Selection	Action Plans are required to include a comprehensive set of projects and strategies and the timeline for their implementation.	The Action Plan chapter of the Focused LRSAP details the priority safety projects identified and a timeline for their implementation. This project list includes projects identified in the 2022 LRSP and other city transportation plans.
Progress and Transparency	SS4A Action Plans should include measures to report progress over time	The Action Plan chapter of the Focused LRSAP details the public-facing dashboard that the City will maintain and update to track outcome-based performance measures such as the number of traffic related deaths.
Equity Considerations	Action Plans should include an equity lens, including building inclusive processes and identifying underserved communities through data and other analyses.	The Developing the Action Plan chapter of the Focused LRSAP describes the use of equity measures in priority project scoring. Equity considerations are no longer described in the SS4A eligibility requirements but were included when this Focused LRSAP was developed.

Appendix F-
Local Roadway Safety Plan (2022)

LOCAL ROADWAY SAFETY PLAN
CITY OF PASADENA

AUGUST 2022

Prepared for:
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1.0 EXECUTIVE SUMMARY

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

OVERVIEW

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

This report has been prepared per Caltrans LRSP guidelines and the *Caltrans Local Roadway Safety Manual* (LRSM) version 1.6 dated June 2022. The general content of this LRSP report follows this outline:

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

The LRSP fulfills the following purposes:

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

PROMINENT COLLISION PATTERN

Five years of RoadSafe GIS collision records was utilized from January 1, 2015 to December 31, 2019, adhering to the maximum period permitted by the HSIP for a safety infrastructure project application for federal funding. The collisions were categorized by severity, collision type, Primary Collision Factor (PCF), involved parties, lighting conditions, and facility type (signalized intersections, non-signalized intersections, and mid-block locations). A total of 7,576 crashes were recorded from 2015 to 2019. The following summarizes the collision patterns within the City:

- The most common collision types were broadside, rear-end, and sideswipe.
- Bicycle- and pedestrian-related crashes accounted for approximately .08 percent of total collisions and 14.9 percent of KSI collisions.
- Broadside due to automobile right of way is one of the prominent collision patterns.

SAFETY MEASURES

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

- Signalized Intersections
- Bicyclists and Pedestrian Safety
- Speeding
- Visibility

The LRSP recommends engineering countermeasures derived based on the discussion with stakeholders and city staff, identified emphasis areas, and collision patterns. In addition to infrastructure improvements, non-engineering safety measures address traffic safety concerns through education and enforcement. The emphasis areas were utilized to identify non-engineering programs. Several state and federal grant programs offer funds for non-engineering programs, such as:

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

2.0 INTRODUCTION

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

2.1 FIVE E'S OF SAFETY

This Plan provides a framework for reducing fatalities and severe injuries across all travel modes and on all public roads. The LRSP focuses on improving roadway safety with engineering improvements and non-engineering programs/campaigns. The plan utilized the following Five E's: **Engineering, Enforcement, Education, Emergency Services, and Emerging Technologies**. Working together with the Five E's at the city level will help make city roads safer.

2.2 PURPOSE OF THE LRSP

The LRSP systematically identifies and analyzes safety problems and recommends safety improvements. The recommendations in the LRSP also considered the comments of stakeholders involved in the process. Stakeholders included the City's Police and Fire Department, Public Health, Public Works, the Pasadena Department of Transportation, and other city staff. The results of the LRSP are summarized with a prioritized list of improvements and actions. The LRSP offers a proactive approach to addressing roadway safety needs in Pasadena.

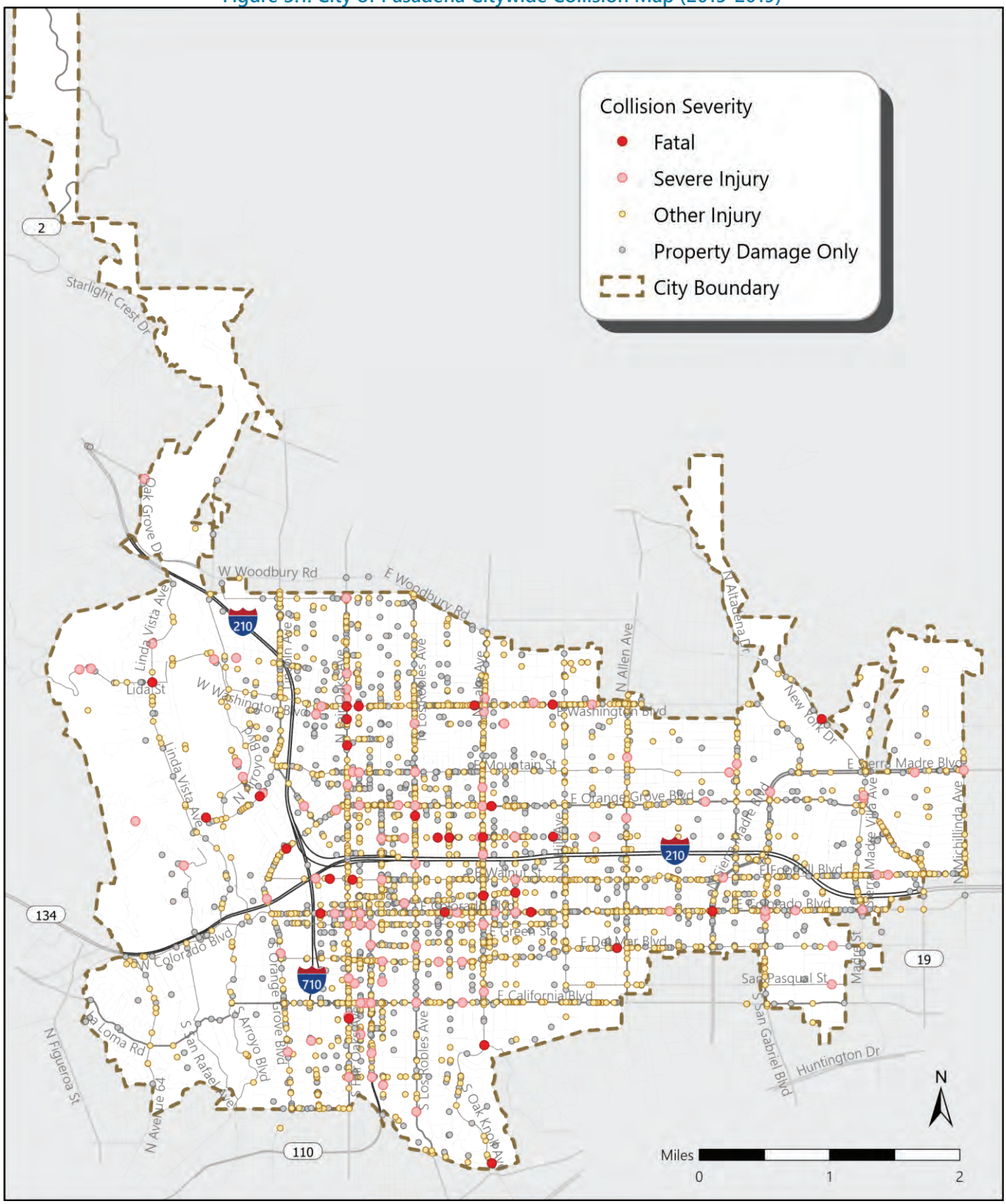
2.3 ADDITIONAL PLANS AND DOCUMENTS

In addition to the safety projects listed in this document, other documents include more mode specific safety analysis and associated projects that further enhance overall safety and can complement this plan. The additional plans and documents include the **Pedestrian Plan** and the **Bicycle Transportation Action Plan**. Additionally, the **City's Capital Improvement Program (CIP)** identifies a number of safety projects developed through traffic investigations and public engagement and are in accordance with the principles of the LRSP. Collectively, the Local Road Safety Plan and these additional documents provide the City of Pasadena's safety project list consistent with a Safe System Approach and help determine grant funding application opportunities. The referenced plans have undergone a series of public outreach and engagement activities to formalize the key projects.

2.4 CITY OF PASADENA

The City of Pasadena is a city located northeast of downtown Los Angeles. According to the US Census, the estimated 2021 population is 138,699 residents. Based on the RoadSafe GIS collision database, between January 2015 and December 2019, there were 7,576 collisions in Pasadena, of which 138 resulted in fatal and severe injuries. Figure 3.1 illustrates a map of the collisions citywide.

Figure 3.1: City of Pasadena Citywide Collision Map (2015-2019)



2.5 LRSP OVERVIEW

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

2.5.1 Data Collection

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

- Five years (1/1/2015 to 12/31/2019) of collision data collected via the RoadSafe GIS collision database
- Five years (1/1/2015 to 12/31/2019) of collision data were collected via the California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) to compare Pasadena and Los Angeles County at large
- Classification of control type: signalized intersection, non-signalized intersection, and midblock locations

2.5.2 Safety Data Analysis

Following the comprehensive GIS database, the collision data was analyzed for Pasadena. Collisions were compared to the safety emphasis areas defined in the California SHSP. The safety data analysis is summarized in Section 5 of this document. The transportation emphasis areas are identified based on the collision data analysis and are discussed in Section 7 of this document.

2.5.3 Identify Safety Measures

In coordination with city staff, a list of engineering-related safety countermeasures and non-engineering safety measures were developed for use as recommendations in this LRSP. These safety measures are discussed in Section 8 and Section 9 of this document.

2.5.4 Develop Safety Projects and Cost Estimation

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

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

The safety projects and cost estimates are discussed in Section 10 of this document.

3.0 VISION AND GOALS

This LRSP aims to develop the safety measures under the following 5 E's of safety: Engineering, Enforcement, Education, Emergency Services, and Emerging Technologies through data-driven analysis and stakeholder participation. The development of the Pasadena LRSP identified the following vision and goal to guide the LRSP implementation plan.

VISION

To improve roadway safety for all road users on public roads in Pasadena

GOAL

Achieving zero traffic fatalities in Pasadena

In consideration of the vision and goal, the following will be the primary objective of this Plan:

1. Improve safety for pedestrians, bicyclists, and other vulnerable road users
2. Deliver safer infrastructure, clearer signage, and implement improvements at top collision locations
3. Facilitate and promote engagement with local stakeholders to promote the road safety message
4. Continue to collaborate with stakeholders to deliver a strong road safety message

This Plan is consistent with FHWA's safe system approach to achieving zero traffic fatalities in Pasadena. The LRSP ensures that the City continues to adopt a comprehensive approach to roadway safety. Also, the LRSP aims to develop safety measures through data-driven analysis and stakeholder participation. This Plan provides details on the improvements and the implementation process by emphasis areas.

4.0 METHODOLOGY

4.1 COLLISION DATA SOURCES

The collision data drew from three sources. The collision trend data was derived between 2015 and 2019 from the (1) city's RoadSafe GIS database; (2) California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) database; (3) California Office of Traffic Safety Rankings (OTS). The OTS traffic safety data for Pasadena compared it with 59 cities in California with a similar population.

4.1.1 RoadSafe GIS

The RoadSafe GIS maintains Pasadena's collision record. The database provides geocoded collisions through an online platform to input, manage, and query the collision records. The most recent five years of collision data from 2015 to 2019 were extracted from RoadSafe GIS to identify long–term collision trends and patterns within the City. The analysis is aggregated and classified by control type (signalized, non-signalized, and midblock locations). The 2020 collision data was excluded from the analysis because the COVID-19 pandemic may have impacted travel patterns and traffic volumes for that year.

4.1.2 SWITRS

The California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) database collects and processes data on collisions throughout California. The online SWITRS application provides geographically- and temporally-targeted collision reports in an electronic format. The SWITRS collision database was utilized to compare Pasadena and Los Angeles County at large to identify prominent transportation trends.

4.1.3 OTS

The California Office of Traffic Safety (OTS) Rankings compare traffic safety statistics among cities in California with similar populations. The statistics focus on the victims killed and injured in crashes. Cities can use these comparisons to see the areas in which they underperform. In the OTS collision ranking system, Pasadena belongs to Group B, containing 59 cities with a population between 100,001 and 250,000. The data is based on the 2018 data from the OTS website.

4.2 IDENTIFYING LOCATIONS FOR ENGINEERING COUNTERMEASURES

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

Caltrans' *Local Roadway Safety, A Manual for California's Local Road Owners*, Version 1.6, April 2022 (LRSM) encourages a proactive rather than reactive approach to safety issue identification. Traditionally, agencies using a reactive approach have located and implemented safety projects solely based on recent crashes, specific crash concentrations, or safety issues raised by stakeholders. According to the LRSM, a proactive approach is preferred. With traditional methods, "crash concentrations and crash trends may be missed if local agencies rely exclusively on these identifiers for their roadway safety effort." A proactive approach would identify safety improvements by analyzing the safety of the entire roadway network. For this document, the process for identifying candidate

locations for safety improvements considers any one of the following three factors:

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

The LRSM guidelines require analyzing at least three to five years of the most recent crash data. Five years' worth of collision data from January 2015 to December 2019 was reviewed for the Pasadena LRSP. Five years of crash data usage adheres to the maximum threshold permitted by the Highway Safety Improvement Program (HSIP) for a safety infrastructure project application for federal funding.

4.2.1 Ranking Function

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

4.2.2 Average Crash Frequency

The average Crash frequency is the most basic method for assessing collision incidence. The analysis tallies the number of collisions at each location in the system, both aggregate and by category of interest (e.g., level of severity, collision type, etc.). The analysis then ranks intersection or roadway segments based on the collisions' frequency. The method involves easy computation and little data collection. A collision database such as the SWITRS database usually suffices.

4.2.3 EPDO Scores

Equivalent Property Damage Only (EPDO) scores are calculated by assigning weighted factors to collisions by severity relative to property damage only collisions. The weights generally reflect the order of magnitude difference between the societal cost of fatal and severe injury collisions versus the non-severe injury collisions. Table 4.1 shows the weights by collision severity, based on the Caltrans Local Roadway Safety Manual (LRSM), April 2022.

Table 4.1: Collision Weight by Severity

Collision Severity	Location Type	Crash Cost
Fatality and Severe Injury	Signalized Intersection	$1,787,000
	Non Signalized Intersection	$2,843,000
Combined (KA)	Roadway	$2,461,000
Evident Injury – Other Visible (B)	-	$159,900
Possible Injury–Complaint of Pain (C)	-	$90,900
Property Damage Only (O)	-	$14,900

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

4.3 PROPOSING ENGINEERING COUNTERMEASURES

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

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

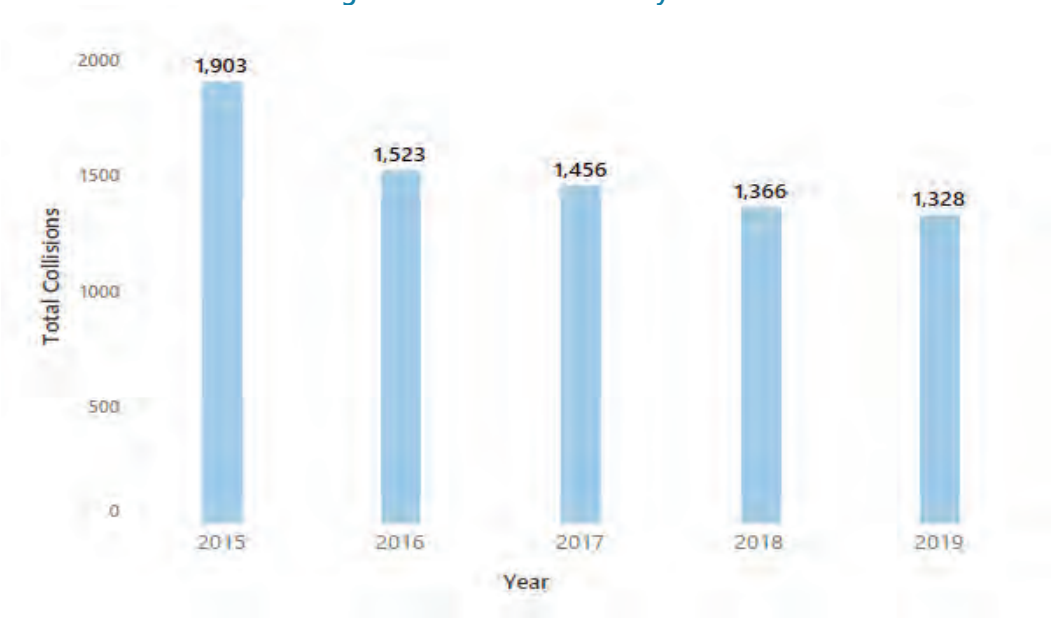
5.0 SYSTEMIC SAFETY ANALYSIS – COLLISION TREND AND PATTERNS

5.1 PRELIMINARY COLLISION ANALYSIS

5.1.1 Year Trend

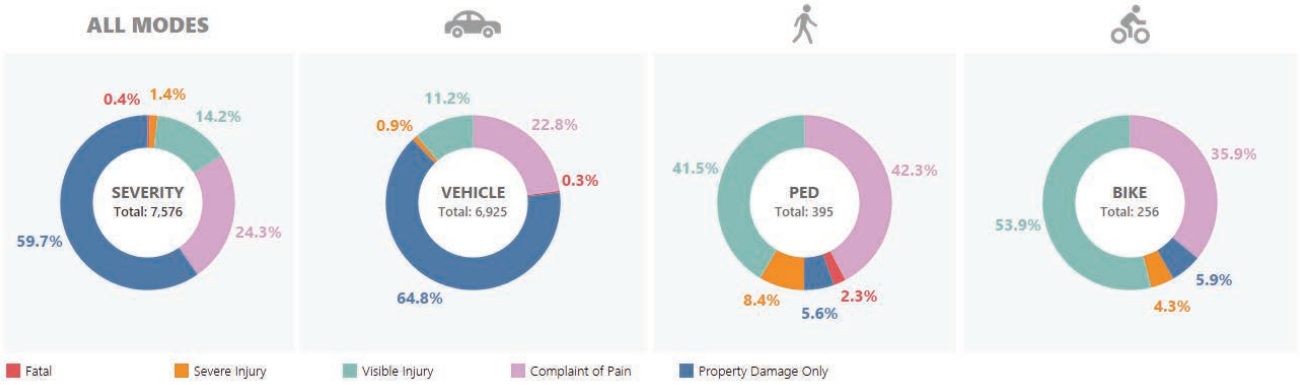
The collision trend analysis draws from the five years of RoadSafe data. From 2015 to 2019, a total of 7,576 collisions occurred on City roadways. Figure 5.1 shows that the annual number of collisions decreases from 1,903 to 1,328 between 2015 and 2019. Figure 5.2 illustrates the collision severity by mode of transportation. The far-left chart depicts the severity of all collisions, followed by vehicle, pedestrian, and bicyclist. Overall, 60% of the total collisions were associated with property damage only. Pedestrian-related collisions had the highest frequency of fatalies (2.3%) and severe injuries (8.4%) compared to bicycle- and vehicle-related collisions.

Figure 5.1: Total Collisions by Year



Source: RoadSafe GIS, 2015-2019

Figure 5.2: Collision Severity



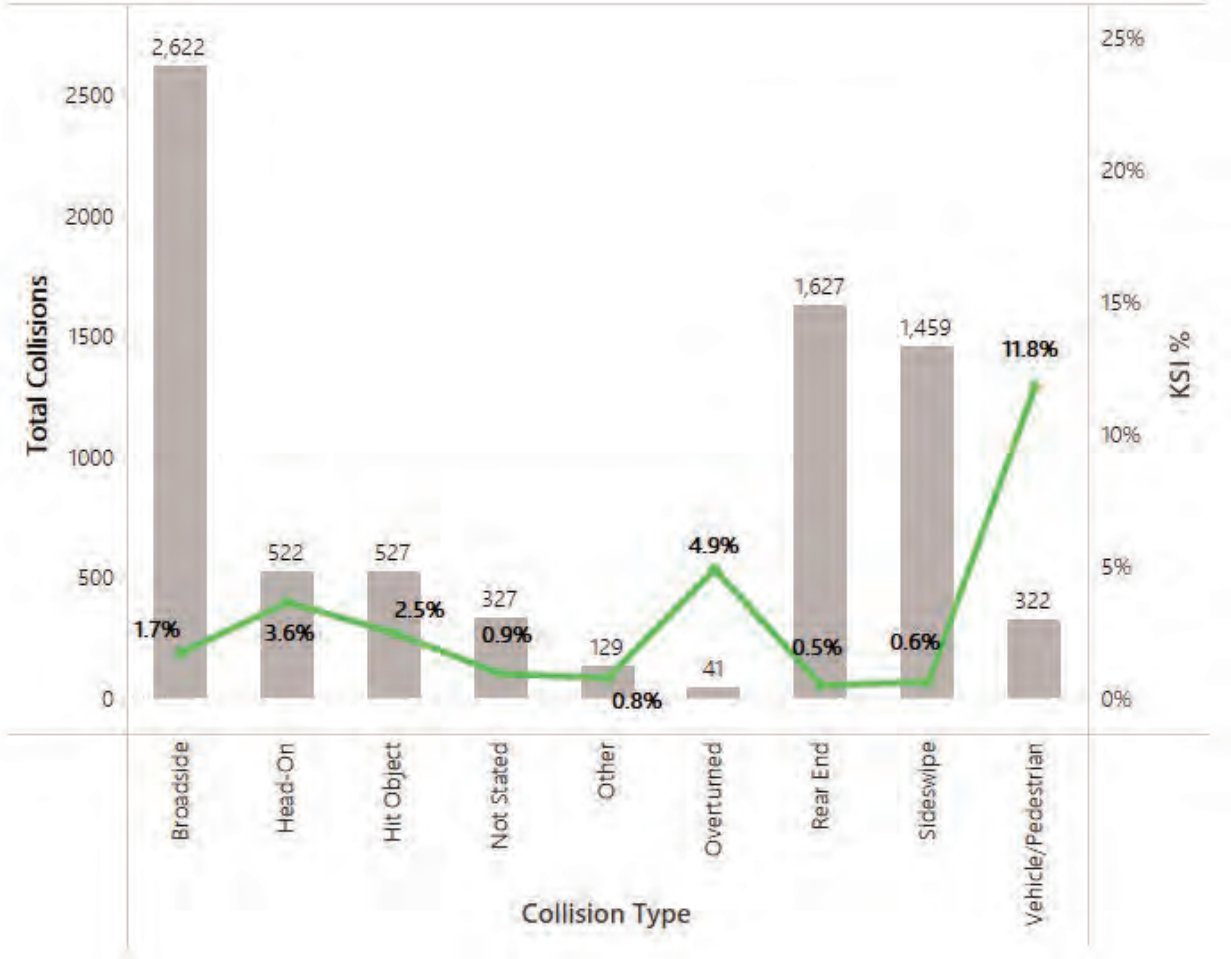
Source: RoadSafe GIS, 2015-2019

5.1.2 Collision Type

Figure 5.3 compares the percent of fatal and severe injury (KSI) collisions for each collision type with the total number of collisions for each type. The total number of collisions is categorized by collision type, as represented by the gray bars in the chart (see Y-Axis on the left side). Broadside accounted for the largest category, comprising 34.6% of total collisions. Rear end (21.5% of total) and sideswipe (19.3% of total) made up the second-and third-largest crash categories.

The green line in the chart shows the percentage of each collision type that resulted in fatalities or severe injuries (see the Y-Axis on the right side). The labeled percentages represent the KSI collision percentages of each collision type. For example, as high as 11.8% of the pedestrian-related collisions were KSI collisions, 4.9% of the overturned collisions led to fatalities and severe injuries. In contrast, less than one percent of the sideswipe collisions resulted in victims killed or seriously injured.

Figure 5.3: Types of Collisions and Types of Collisions vs. KSI Collisions



Source: RoadSafe GIS, 2015-2019

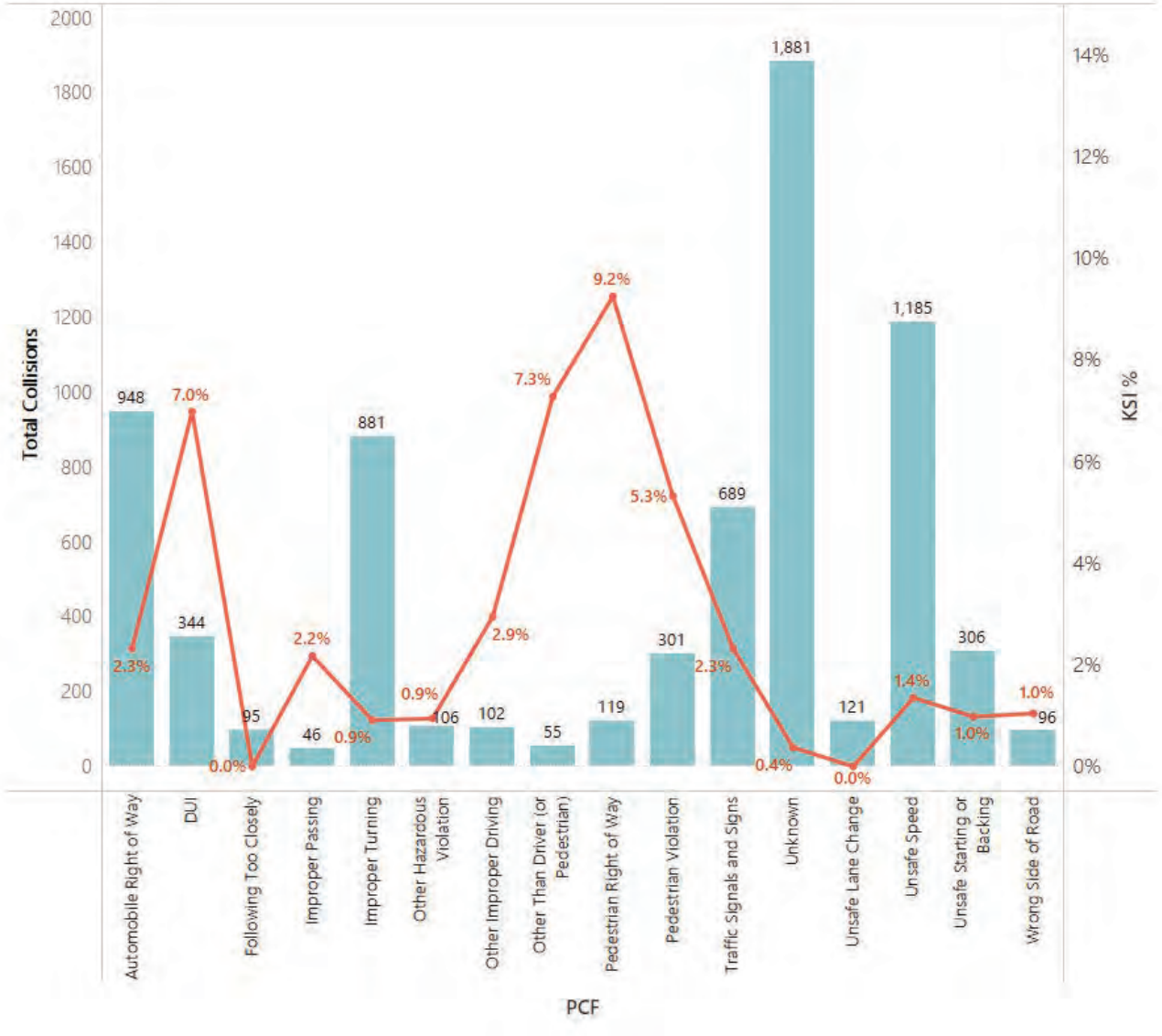
5.1.3 Primary Collision Factor (PCF)

Figure 5.4 summarizes the Primary Collision Factor (PCF) for all the collisions in the past five years. PCF is the leading cause of a collision based on the available evidence in a collision. Also, KSI-related collisions are compared with the PCF. The PCF data may be insufficient, as shown in the chart below indicates 1,881 (26%) of the total collisions were classified as "unknown."

As shown in Figure 5.4, unsafe speed (1,185), automobile right-of-way (948), and improper turning (881) were the top three causes of all collisions. These top PCFs do not represent the top KSI-related collisions. As shown in the line graph (see Y-Axis on the right side), pedestrian right of way (9.2%), other than the driver (7.3%), and driving under the influence (DUI) (7%) collisions are the top three KSI-related collisions associated with the PCF.

Note: The pedestrian right of way primary collision factor is a collision where a motorists did not yield the right of way to a pedestrian crossing a roadway within a marked or unmarked crosswalk at an intersection, resulting in a collision.

Figure 5.4: Primary Collision Factor (PCF) Collisions and PCF Collisions vs. KSI Collisions

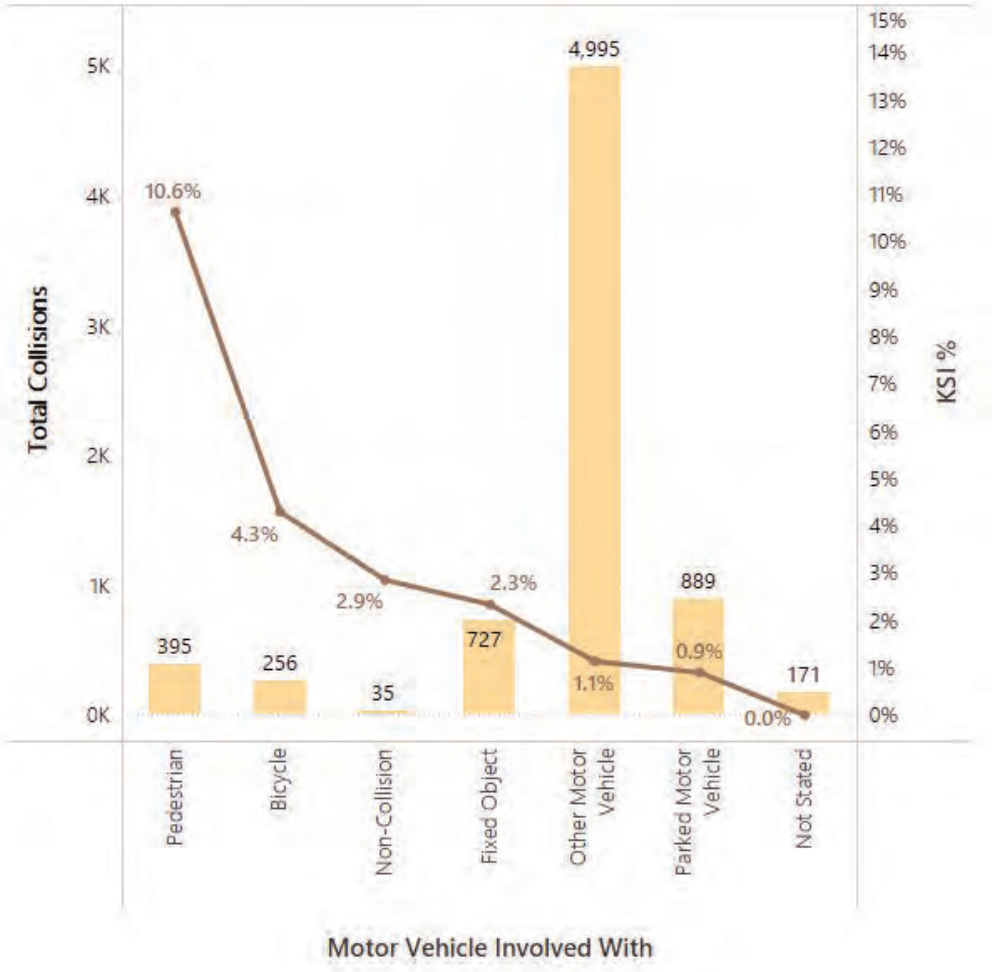


Source: RoadSafe GIS, 2015-2019

5.1.4 Motor Vehicle Involved With

Figure 5.5 summarizes that the motor vehicle was involved with another motor vehicle, pedestrian, bicycle, fixed object, parked vehicle, or non-collision. Motor vehicles involved with other motor vehicles were associated with 4,995 collisions, which was associated with KSI collisions at 1.1%. A motor vehicle involved with a pedestrian had the highest percentage of KSI collisions at 10.6%, followed by involving a bicyclist at 4.3%.

Figure 5.5: Motor Vehicle Involved With (MVIW) Collisions and MVIW Collisions vs KSI Collisions

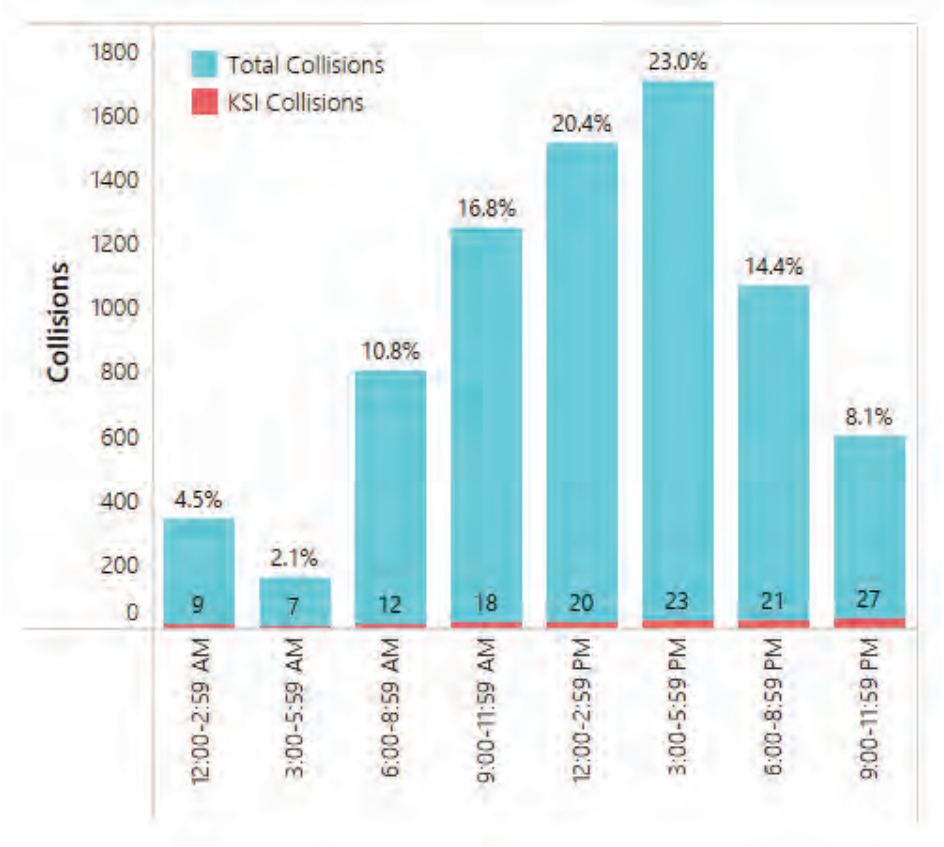


Source: RoadSafe GIS, 2015-2019

5.1.5 Time of Day

Figure 5.6 summarizes the time of day a collision occurred between 2015 and 2019. Most of the collisions happened in the late afternoon, with 23% associated between 3 PM and 6 PM, followed by 20.4% of the collisions between 12 PM and 3 PM. KSI-related collisions associate the most during the timeframe between 9 PM and midnight.

Figure 5.6: Collisions by Time of Day



Source: RoadSafe GIS, 2015-2019

5.1.4 At-Fault Party

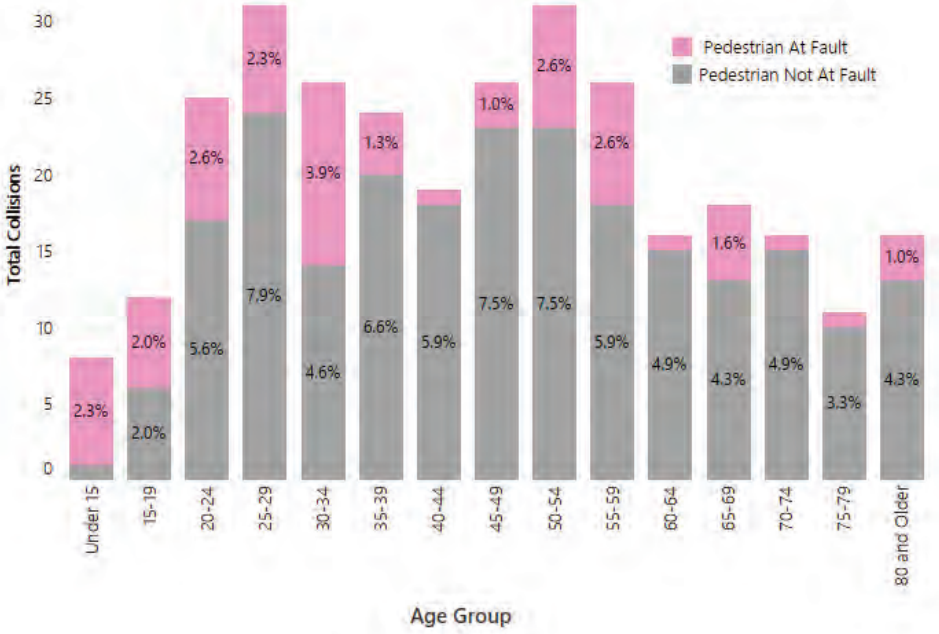
At-fault motorists in Pasadena tended to be young males, as shown in Figure 5.7. Nearly 14.9% of motorists were in the 20-24 age group, followed by 13% in the 25-29 age group. The 20-24 age group accounts for the largest share of at-fault motorists among any age group, with the number of at-fault motorists decreasing in older age groups. In all age groups, men accounted for most collisions at fault. Note that some of the collision data does not specify the gender and age of the party at fault.

Pedestrians are the most vulnerable roadway users, and they were involved in one-fourth of the KSI collisions. Figure 5.8 shows the age group distribution of pedestrians involved in crashes from 2015 to 2019. The highest number of pedestrians were in the 50 to 54 year-old (10%) and the 25 to 29 year-old (10%) age groups. While pedestrians of the age 25 to 29 and 50 to 54 were usually victims of a collision. Pedestrian at-fault (2%) are similar in both age groups. Also, the age group 30-34 year-old had the highest number of pedestrians at-fault (nearly 4%).

Figure 5.7: At-Fault Party by Age and Gender

Source: RoadSafe GIS, 2015-2019

Figure 5.8: Pedestrian-Involved Collisions by Age Group



Source: RoadSafe GIS, 2015-2019

5.2 COLLISIONS BY FACILITY TYPE

Collision patterns were analyzed by facility type (intersections vs. mid-block locations) using the most recent five years of collision data (2015 to 2019). This analysis allowed for determining the effect of access control and intersection geometry on collision frequency. The analysis classifies collisions by facility type as follows:

- Collisions that occurred within 50 feet of an intersection are considered signalized intersections or non-signalized intersection collisions
- Collisions that occurred more than 50 feet away from an intersection are classified as mid-block collisions

Table 5.1 shows the total number of crashes associated with each type of facility. About half of all collisions occurred at signalized intersections (52%). Nearly all collisions were vehicle-related collisions (91%) and only 8.6% were pedestrian- and bicycle-related collisions, most of which occurred at signalized intersections.

Table 5.1: Transportation Mode of Collisions by Facility Type

	Signalized Intersection		Non-Signalized Intersection		Midblock Locations		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Vehicle-Related Collisions	3,602	47.5%	1,651	21.8%	1,672	22.1%	6,925	91.4%
Bicycle-Related Collisions	103	1.4%	82	1.1%	71	0.9%	256	3.4%
Pedestrian-Related Collisions	224	3.0%	77	1.0%	94	1.2%	395	5.2%
Total	**3,929**	**52%**	**1,810**	**24%**	**1,837**	**24%**	**7,576**	**100%**

Source: RoadSafe GIS, 2015-2019

Table 5.2 shows how the collision type varies by location. Broadside collisions comprise the largest share of crashes at signalized intersections (39.7%). At signalized intersections, rear-end (23.3%), and sideswipe (14.8%) collisions are the second- and third-most-common crash types. Similarly, broadside, rear ends, and sideswipe collisions were the top three collision types at non-signalized and midblock locations.

Table 5.2: Collisions by Facility Type

Collision Type	Signalized Intersections		Non-Signalized Intersections		Midblock		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Broadside	**1,559**	**39.7%**	**645**	**35.6%**	**418**	**22.8%**	2,622	34.6%
Head-On	253	6.4%	124	6.9%	145	7.9%	522	6.9%
Hit Object	180	4.6%	136	7.5%	211	11.5%	527	7.0%
Not Stated	185	4.7%	58	3.2%	84	4.6%	327	4.3%
Other	54	1.4%	28	1.5%	47	2.6%	129	1.7%
Overturned	19	0.5%	6	0.3%	16	0.9%	41	0.5%
Rear End	**914**	**23.3%**	**459**	**25.4%**	**254**	**13.8%**	1,627	21.5%
Sideswipe	**581**	**14.8%**	**290**	**16.0%**	**588**	**32.0%**	1,459	19.3%
Vehicle/Pedestrian	184	4.7%	64	3.5%	74	4.0%	322	4.3%
Total	**3,929**	**100%**	**1,810**	**100%**	**1,837**	**100%**	**7,576**	**100%**

Source: RoadSafe GIS, 2015-2019

Table 5.3 shows the relationship between collision severity and facility type. Collision severity shows that the fatal and severe injury (KSI) collisions comprise 138 total collisions. Among the 29 fatal collisions, 14 of the crashes occurred at signalized intersections, 10 occurred at non-signalized intersections, and 5 at midblock locations.

Table 5.3: Collision Severity by Facility Type

Severity	Signalized Intersections		Non-Signalized Intersections		Midblock		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Fatal	14	0.4%	10	0.6%	5	0.3%	29	0.4%
Severe Injury	53	1.3%	27	1.5%	29	1.6%	109	1.4%
Visible Injury	540	13.7%	278	15.4%	259	14.1%	1,077	14.2%
Complaint of Pain	1,064	27.1%	426	23.5%	350	19.1%	1,840	24.3%
Property Damage Only	2,258	57.5%	1,069	59.1%	1,194	65.0%	4,521	59.7%
Total	**3,929**	**100%**	**1,810**	**100%**	**1,837**	**100%**	**7,576**	**100%**

Source: RoadSafe GIS, 2015-2019

Table 5.4 shows the relationship between street lighting conditions and facility type. A majority of collisions occurred in the presence of lighting (i.e., either in daylight or nighttime with street lighting) at all three location types. About one-fourth of the lighting conditions were not stated (24.8%). Among the 62 collisions that occurred under dark-no street lighting conditions, 35 crashes occurred at midblock locations, more than 50% of the total for dark-no street lights.

Table 5.4: Street Lighting by Facility Type

	Signalized Intersections		Non-Signalized Intersections		Midblock		Grand Total	
Lighting	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Dark - No Street Lights	12	0.3%	15	0.8%	35	1.9%	62	0.8%
Dark - Street Lights	704	17.9%	360	19.9%	410	22.3%	1,474	19.5%
Dark - Street Lights Not Functioning	4	0.1%	0	0.0%	0	0.0%	4	0.1%
Daylight	2,012	51.2%	952	52.6%	995	54.2%	3,959	52.3%
Dusk - Dawn	103	2.6%	45	2.5%	30	1.6%	178	2.3%
Not Stated	1,086	27.6%	431	23.8%	361	19.7%	1,878	24.8%
Unknown	8	0.2%	7	0.4%	6	0.3%	21	0.3%
Total	**3,929**	**100%**	**1,810**	**100%**	**1,837**	**100%**	**7,576**	**100%**

Source: RoadSafe GIS, 2015-2019

Table 5.5 tabulates the primary collision factor (PCF) by facility type. The three largest PCF categories include unsafe speed, automobile right-of-way, and improper turning based on the total collisions from the "Grand Total" column. The PCF for unknown accounted for nearly one-fourth of total collisions, which was also ranked the top PCF by collision frequency. The collision data may be underrepresented.

- Among the 301 pedestrian violations, 237 collisions occurred at signalized intersections, 29 at non-signalized intersections, and 35 at midblock locations.
- At signalized intersections, traffic signals and signs (15.2%), unsafe speed (12.5%), and automobile right-of-way violations (10.8%) were the dominant PCFs.
- At non-signalized intersections, unsafe speed (19.3%), automobile right-of-way violations (18.9%), and improper turning (10.6%) were the dominant PCFs.
- At midblock locations, the most frequent PCFs were unsafe speed (18.8%) and improper turning (16.8%).

Table 5.5: Primary Collision Factor by Facility Type

PCF	Signalized Intersections		Non-Signalized Intersections		Midblock		Grand Total	
	Collisions	%	Collisions	%	Collisions	%	Collisions	%
Unknown	1,056	26.9%	445	24.6%	380	20.7%	1,881	24.8%
Unsafe Speed	491	12.5%	349	19.3%	345	18.8%	1,185	15.6%
Automobile Right of Way	424	10.8%	342	18.9%	182	9.9%	948	12.5%
Improper Turning	380	9.7%	192	10.6%	309	16.8%	881	11.6%
Traffic Signals and Signs	599	15.2%	81	4.5%	9	0.5%	689	9.1%
DUI	127	3.2%	83	4.6%	134	7.3%	344	4.5%
Unsafe Starting or Backing	122	3.1%	53	2.9%	131	7.1%	306	4.0%
Pedestrian Violation	237	6.0%	29	1.6%	35	1.9%	301	4.0%
-*	147	3.7%	61	3.4%	79	4.3%	287	3.8%
Unsafe Lane Change	39	1.0%	29	1.6%	53	2.9%	121	1.6%
Pedestrian Right of Way	85	2.2%	28	1.5%	6	0.3%	119	1.6%
Other Hazardous Violation	42	1.1%	17	0.9%	47	2.6%	106	1.4%
Other Improper Driving	47	1.2%	17	0.9%	38	2.1%	102	1.3%
Wrong Side of Road	27	0.7%	41	2.3%	28	1.5%	96	1.3%
Following Too Closely	66	1.7%	14	0.8%	15	0.8%	95	1.3%
Other Than Driver (or Pedestrian)	17	0.4%	16	0.9%	22	1.2%	55	0.7%
Improper Passing	19	0.5%	9	0.5%	18	1.0%	46	0.6%
Hazardous Parking	3	0.1%	1	0.1%	2	0.1%	6	0.1%
Brakes	0	0.0%	3	0.2%	0	0.0%	3	0.0%
Fell Asleep	0	0.0%	0	0.0%	2	0.1%	2	0.0%
Impeding Traffic	0	0.0%	0	0.0%	1	0.1%	1	0.0%
Lights	1	0.0%	0	0.0%	0	0.0%	1	0.0%
Other Equipment	0	0.0%	0	0.0%	1	0.1%	1	0.0%
Total	**3,929**	**100%**	**1,810**	**100%**	**1,837**	**100%**	**7,576**	**100%**

Source: RoadSafe GIS, 2015-2019

**The primary collision factor was not stated.*

Broadside, rear end, and sideswipe collisions were the most frequently occurring collision types in Pasadena. Broadside collisions caused by automobile right of way and traffic signals and signs (47.7%) contributed to the largest collisions between 2015 and 2019 among all PCF categories. Unsafe speed was the most common PCF associated with rear end collisions (39.3%). Finally, improper turning was the most common PCF associated with sideswipe collisions (25.5%) among all PCF categories. The following tables, Table 5.6, Table 5.7, and Table 5.8, show the percentage of crashes associated with the top three collision types.

Table 5.6 Broadside Collisions by Facility Type

Facility Type	Total Broadside Collisions	Broadside due to Automobile Right of Way & Traffic Signals and Signs	Percentage
Signalized intersections	1,559	766	49.1%
Non-signalized intersections	645	346	53.6%
Midblock locations	418	140	33.5%
Total	2,622	1,252	47.7%

Source: RoadSafe GIS, 2015-2019

Table 5.7 Rear-end Collisions by Facility Type

Facility Type	Total Rear End Collisions	Rear End due to Unsafe Speed	Percentage
Signalized intersections	914	336	36.8%
Non-signalized intersections	459	203	44.2%
Midblock locations	254	100	39.4%
Total	1,627	639	39.3%

Source: RoadSafe GIS, 2015-2019

Table 5.8 Sideswipe Collisions by Facility Type

Facility Type	Total Sideswipe Collisions	Sideswipe due to Improper Turning	Percentage
Signalized intersections	581	217	37.3%
Non-signalized intersections	290	111	38.3%
Midblock locations	588	44	7.5%
Total	1,459	372	25.5%

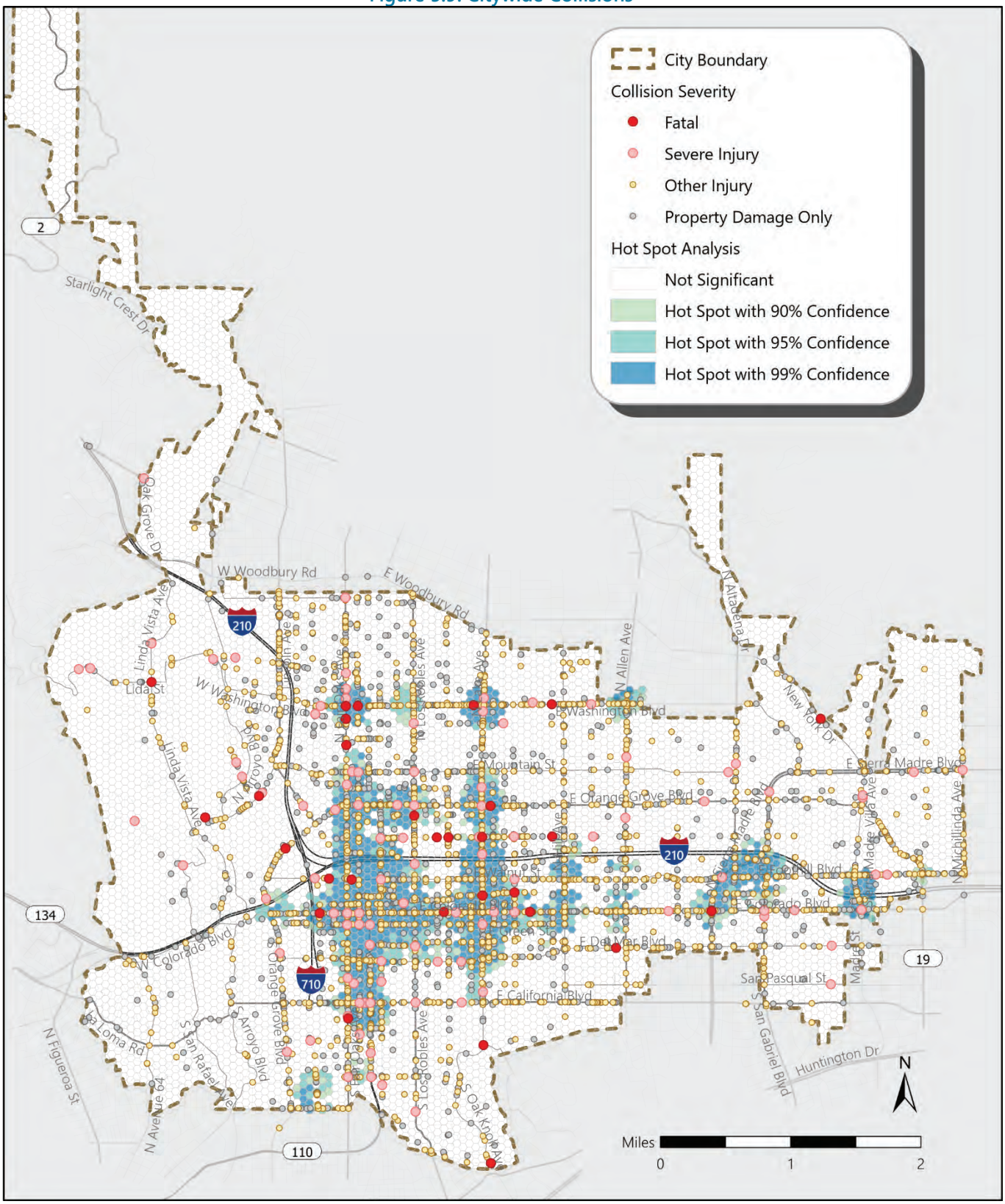
Source: RoadSafe GIS, 2015-2019

5.3 GEOGRAPHIC COLLISION ANALYSIS

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

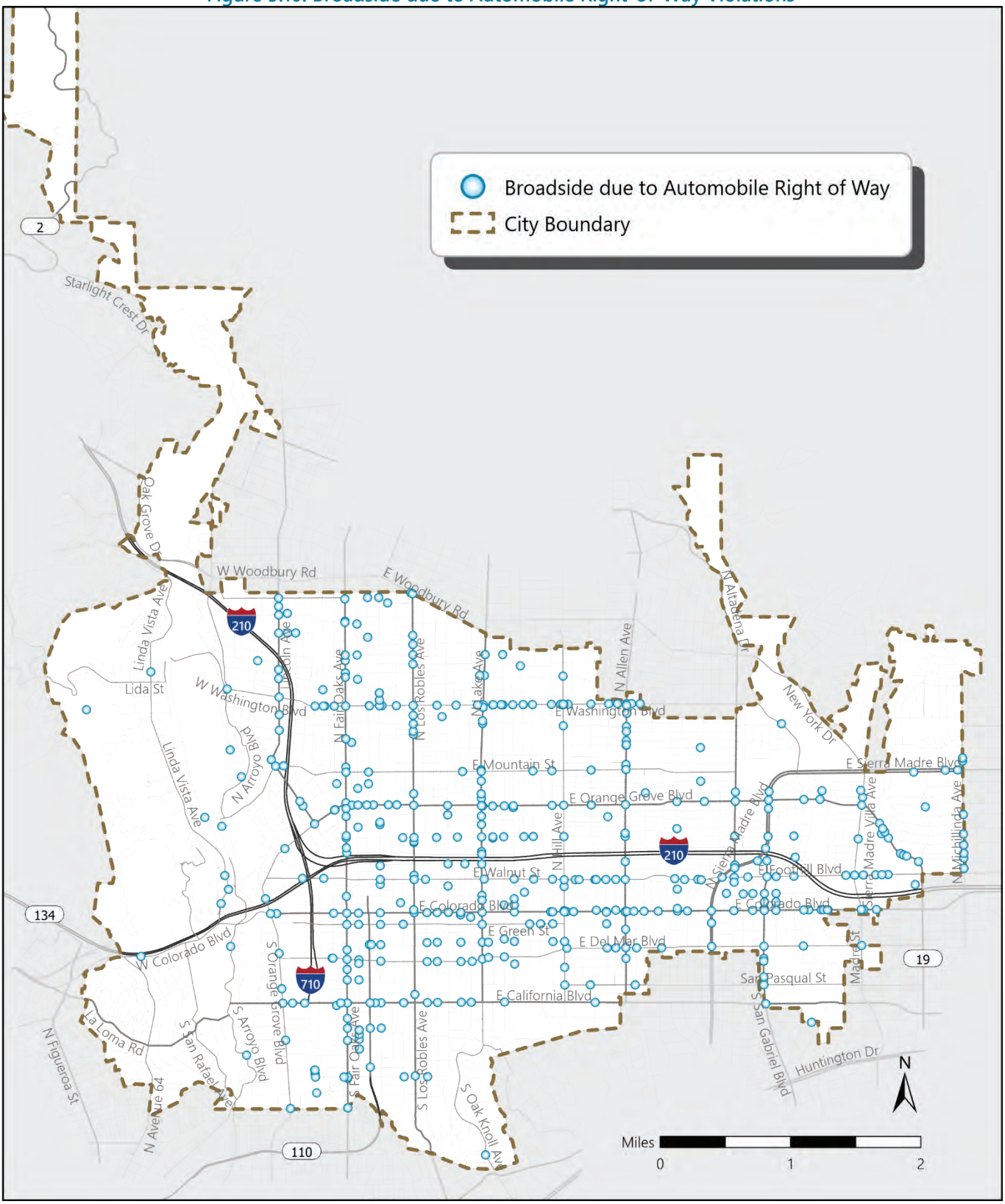
- **Figure 5.9** illustrates the citywide collision hotspot locations and collision severity.
- **Figure 5.10** illustrates the location of broadside collisions in correlation with automobile right-of-way violations.
- **Figure 5.11** illustrates the location of rear end collisions in correlation with unsafe speed.
- **Figure 5.12** illustrates the location of sideswipe collisions in correlation with improper turning.
- **Figure 5.13** illustrates the location of the bicycle- and pedestrian-related collisions citywide.

Figure 5.9: Citywide Collisions



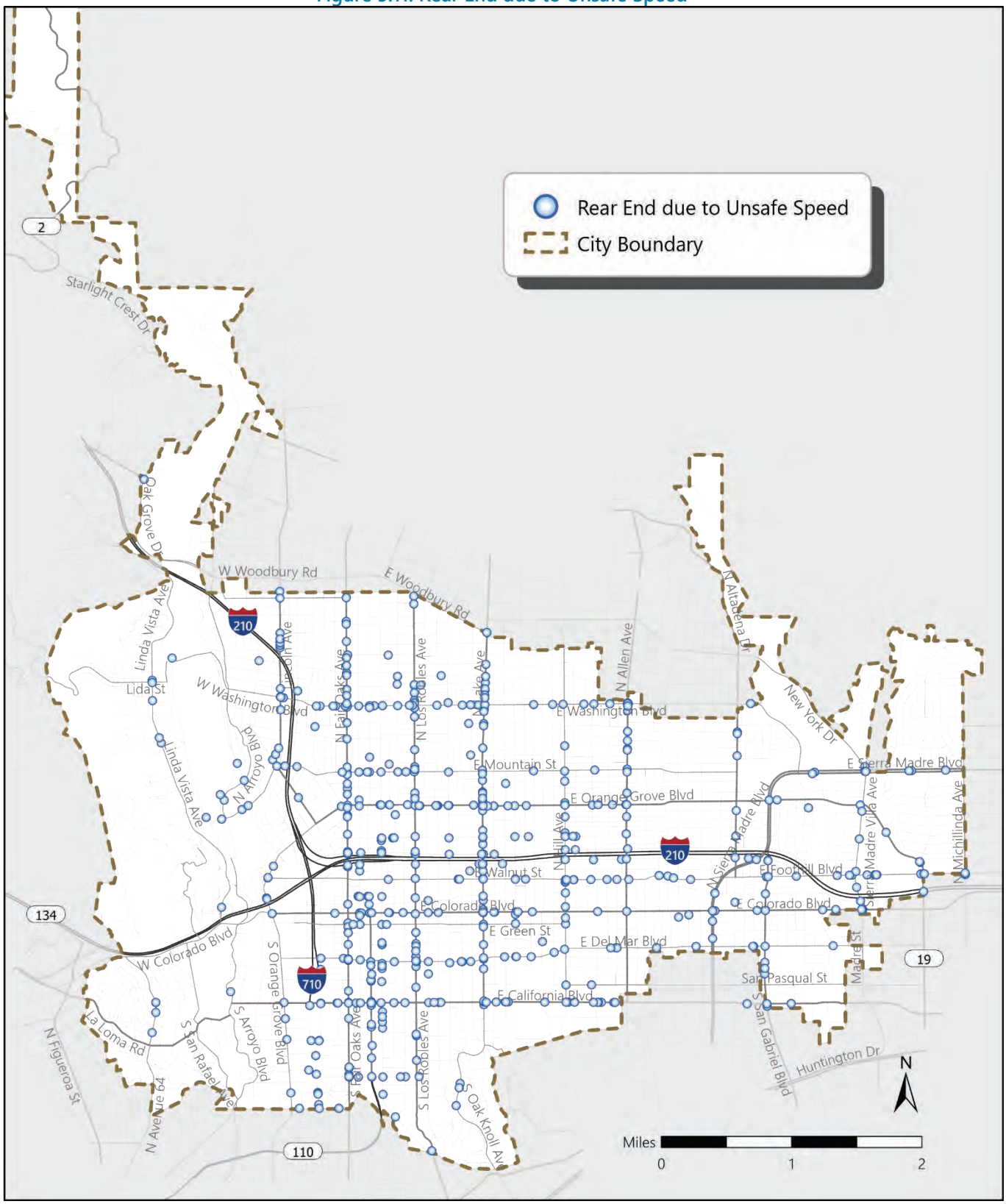
Source: Source: RoadSafe GIS, 2015-2019

Figure 5.10: Broadside due to Automobile Right-of-Way Violations



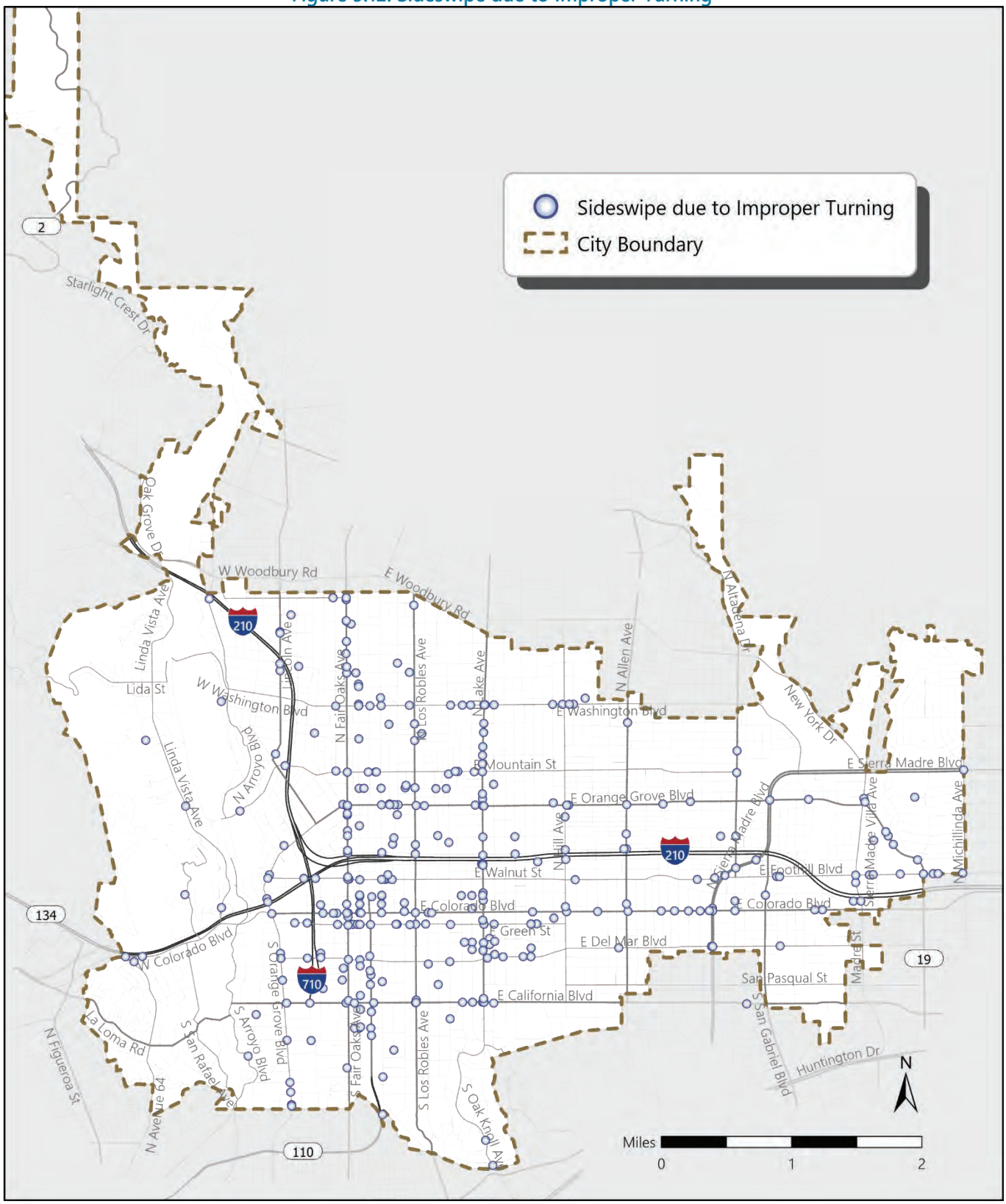
Source: Source: RoadSafe GIS, 2015-2019

Figure 5.11: Rear End due to Unsafe Speed



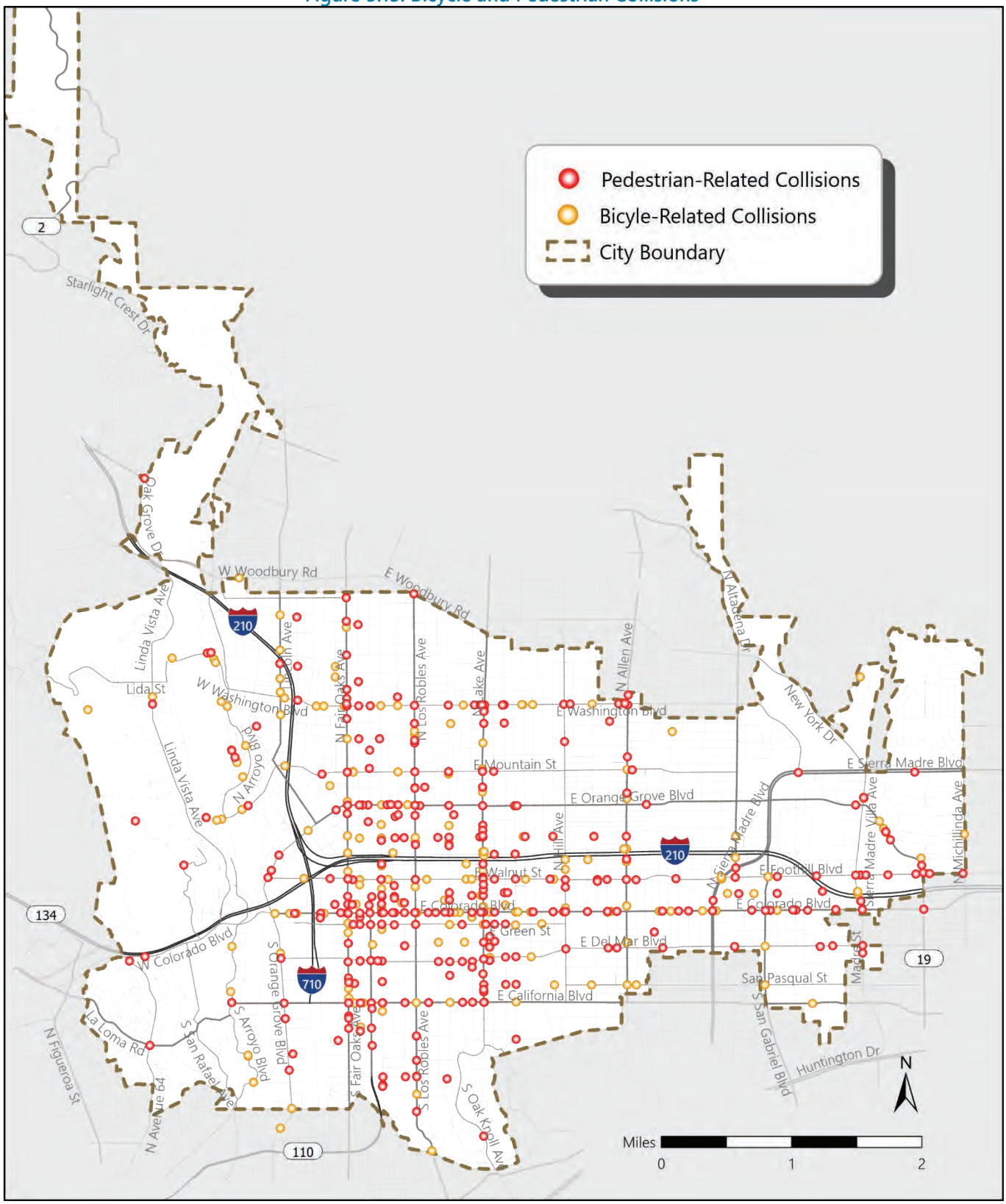
Source: RoadSafe GIS, 2015-2019

Figure 5.12: Sideswipe due to Improper Turning



Source: RoadSafe GIS, 2015-2019

Figure 5.13: Bicycle and Pedestrian Collisions



Source: RoadSafe GIS, 2015-2019

5.4 CITY OF PASADENA VS. LOS ANGELES COUNTY

Five years of SWITRS collision data was used to compare the characteristics of injury and fatality collisions for the City of Pasadena with those of the County of Los Angeles. As shown in Table 5.9, the City had 141,029 residents in 2019, and an estimated 10,744 collisions per million residents per year. During the same period, Los Angeles County had 10,039,107 residents and an estimated 9,848 collisions per million residents per year. Pasadena's total KSI collisions were one percent lower (1.8% vs. 2.8%) than Los Angeles County. Pedestrian- and bicycle-related collisions in Pasadena were similar to the County's collision statistics.

Table 5.9: Total Collision Comparison for Pasadena vs. LA County

Total Collisions	City of Pasadena	Los Angeles County
Population (2019 estimates)	141,029	10,039,107
Total Collisions	**7,576**	**494,344**
Collision/1,000,000/Year	10,744	9,848
Fatal and Severe Collisions (KSI)	138	13,914
KSI %	1.8%	2.8%
Total Pedestrian Collisions	**395**	**26,408**
Pedestrian %	5.2%	5.3%
Total Bicycle Collisions	**256**	**17,808**
Bicycle %	3.4%	3.6%

Source: 2015-2019 collision data from RoadSafe GIS and SWITRS

Table 5.10 focuses on the KSI collisions in Pasadena and Los Angeles County based on 2015-2019 collision data. Pasadena had a lower KSI collision per million residents per year than Los Angeles County (196 vs. 277). Among the KSI collisions, both pedestrian- and bicycle-related collisions in Pasadena had a lower fatality rate and severe injury than the county.

Table 5.10: KSI Collision Comparison for Pasadena vs. LA County

KSI Collisions	City of Pasadena	Los Angeles County
Population (2019 estimates)	141,029	10,039,107
Total KSI Collisions	**138**	**13,914**
KSI Collision/1,000,000/Year	196	277
Fatal	29	2,518
Severe Injury	109	11,396
Total Pedestrian Collisions	**395**	**26,408**
KSI Pedestrian	42	4,285
KSI Pedestrian %	10.6%	16.2%
Total Bicycle Collisions	**256**	**17,808**
KSI Bicycle	11	1,166
KSI Bicycle %	4.3%	6.5%

Source: 2015-2019 collision data from RoadSafe GIS and SWITRS

Table 5.11 breaks down the 2015-2019 collision data by collision type for Pasadena and Los Angeles County. Rear-end and Broadside collisions made up the highest proportions of crashes in Pasadena and Los Angeles County. Broadsides accounted for 34.6% of collisions in Pasadena and 28.1% in Los Angeles County, while rear ends comprised roughly 21.5% of collisions in Pasadena and 24% of collisions in Los Angeles County.

Table 5.11: Collision Type Comparison for Pasadena vs. Los Angeles County

Collision Type	City of Pasadena	Los Angeles County
Broadside	34.6%	28.1%
Head-On	6.9%	7.3%
Hit Object	7.0%	7.8%
Other	1.7%	3.0%
Overturned	0.5%	0.7%
Rear End	21.5%	24.0%
Sideswipe	19.3%	22.7%
Vehicle/Pedestrian	4.3%	4.8%
Not Stated	4.3%	1.6%

Source: 2015-2019 collision data from RoadSafe GIS and SWITRS

Table 5.12 compares the PCFs for the City and the County based on the 2015-2019 collision data. Compared with the County, Pasadena had a noticeably higher percentage of collisions categorized at the unknown as the primary cause. Aside from the unknown PCF category, collisions caused by unsafe speeding (15.6% vs. 20.4%) were the highest PCF among all categories.

Table 5.12: PCF Comparison for Pasadena vs. Los Angeles County

Primary Collision Factor	City of Pasadena	Los Angeles County
Automobile Right of Way	12.5%	19.0%
Brakes	0.0%	0.0%
DUI	4.5%	5.7%
Fell Asleep	0.0%	0.0%
Following Too Closely	1.3%	3.3%
Hazardous Parking	0.1%	0.1%
Impeding Traffic	0.0%	0.0%
Improper Passing	0.6%	1.3%
Improper Turning	11.6%	17.0%
Lights	0.0%	0.0%
Other Equipment	0.0%	0.0%
Other Hazardous Violation	1.4%	0.9%
Other Improper Driving	1.3%	0.8%
Other Than Driver (or Pedestrian)	0.7%	1.0%
Pedestrian Right of Way	1.6%	2.2%
Pedestrian Violation	4.0%	1.7%
Traffic Signals and Signs	9.1%	7.7%
Unknown	24.8%	5.0%
Unsafe Lane Change	1.6%	4.9%
Unsafe Speed	15.6%	20.4%
Unsafe Starting or Backing	4.0%	5.1%
Wrong Side of Road	1.3%	2.3%
Not Stated	3.8%	1.1%

Source: 2015 -2019 collision data from RoadSafe GIS and SWITRS

5.5 CITY OF PASADENA VS. CITIES OF SIMILAR SIZES

The Office of Traffic Safety (OTS) data was utilized to compare traffic safety problems of other cities with similarly sized populations. The rankings are calculated based on a ranking method that adds weights to different statistical categories such as crash counts, population, and vehicle miles traveled. In the State of California's OTS Crash Ranking system, Pasadena falls under Group B. This group consists of 59 cities in California with a population between 100,001 and 250,000. **Table 5.13** shows the City's 2018 crash ranking among the cities in Group B (1 being the highest or worst and 59 being the lowest or best). Overall, the City's traffic safety performance ranges from average to good, with a few exceptions:

- The City ranked 2nd for killed or injured pedestrians over 65 years old
- The City ranked 3rd for killed or injured pedestrians
- The City ranked 16th for killed or injured pedestrians under 15 years old
- The City ranked 18th for killed or injured bicyclists.

Table 5.13: 2018 OTS Data

Type of Crash	Victims Killed & Injured	OTS Ranking
Total Fatal and Injury	933	21/59
Alcohol Involved	74	26/59
Had Been Drinking Driver < 21	1	44/59
Had Been Drinking Driver 21 – 34	28	21/59
Motorcycles	27	43/59
Pedestrians	**83**	**3/59**
Pedestrians < 15	**6**	**16/59**
Pedestrians 65+	**13**	**2/59**
Bicyclists	**42**	**18/59**
Bicyclists < 15	1	54/59
Composite	331	31/59
Type of Crash	**Fatal & Injury Crashed**	**OTS Ranking**
Speed Related	118	39/59
Nighttime (9:00pm – 2:59am)	70	27/59
Hit and Run	40	29/59
Type of Arrests	**Arrests**	**OTS Ranking**
DUI Arrests	NA	NA

Source: OTS, 2018

DUI arrest figures are shown for cities only, not counties. The number of cities ranked against may differ from the number of cities in the other categories. Not all cities report DUI arrests to the Department of Justice.

5.6 TOP COLLISION LOCATIONS

The initial step of the systemic analysis is evaluating the existing roadway network and its various characteristics. The analysis was divided into intersections and roadway segments and utilized two main ranking methods: average crash frequency and Equivalent Property Damage Only (EPDO) scores. The description of the ranking methods is discussed in Section 3.2 of this document. Based on the collision analysis, the high-risk collision intersections and roadway segments in Pasadena are shown in Figure 5.14. Appendix A provided a summary of all the collisions by intersection.

Figure 5.14 Top Collision Locations

5.6.1 Intersection Ranking

This is a general process for identifying potential locations by ranking the intersections based on Crash Frequency and EPDO score. The ranking is a quantitative method used to evaluate a particular corridor segment and compare it with other segments. It is ultimately just a tool to streamline the collision analysis and the selection process for potential locations. **Table 5.14** shows the top 10 intersections by collision frequency, EPDO score, and crash rate. **Table 5.15** focuses on non-signalized intersections only where the number of collisions is greater than 10.

Table 5.14: Top Intersection Ranking

			COLLISION SEVERITY					COLLISION TYPE														
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian	Control Type	Rank Collision Frequency	EPDO Score	Rank EPDO Score	Crash Rate	Rank Crash Rate	Daily Intersection Volumes
1	Lake Ave & Orange Grove Bl	69		1	9	19	40	22	5	2	7	2		21	7	3	Signal	1	372.4	1	2.77	2	13,642
2	Fair Oaks Ave & Maple St	47			6	15	26	25		1	2		1	11	7		Signal	2	181.9	6	1.68	5	15,330
3	Corson St & Lake Ave	46			3	15	28	16		1		1		12	15	1	Signal	3	151.7	8	2.58	3	9,771
4	Lake Ave & Washington Bl	45			4	18	23	9	9	1	4			7	11	4	Signal	4	175.7	7	1.46	9	16,842
5	Lake Ave & Maple St	44		1	2	8	33	14		1	3	2		16	8		Signal	5	223.2	5	2.90	1	8,328
6	Pasadena Ave & State St	38			5	10	23	20	3	1	3			6	5		Non-Signal	6	137.7	10	1.52	8	13,673
7	Fair Oaks Ave & Orange Grove Bl	38			7	7	24	7	3	1	3	2	1	9	10	2	Signal	6	141.8	9	1.55	7	13,439
8	Colorado Bl & Sierra Madre Bl	38	1	1	2	8	26	17	1	2	2			10	5	1	Signal	6	336.1	3	1.24	10	16,782
9	Arroyo Pkwy & Green St	38		1	8	15	14	24	1	2	2			1	7	1	Signal	6	311.3	4	2.31	4	9,009
10	Fair Oaks Ave & Washington Bl	37	1	1	1	14	20	9	5	2	1	1		12	5	2	Signal	10	356.0	2	1.56	6	12,981

Table 5.15: Top Collisions at Non-Signalized Intersections Only

			COLLISION SEVERITY					COLLISION TYPE													
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian	Control Type	Rank Collision Frequency	EPDO Score	Rank EPDO Score	Crash Rate	Rank Crash Rate	Daily Intersection Volumes
1	Pasadena Ave & State St	38			5	10	23	20	3	1	3			6	5		Non-signal	1	137.7	4	0.79	2	13,673
2	Del Mar Bl & San Marino Ave	18			7	6	5	11	3					3		1	Non-signal	2	116.7	5	0.42	5	26,448
3	California Bl & Oak Knoll Ave	15		1	3	7	4	8	1		1			2	3		Non-signal	3	269.7	1	0.34	7	23,247
4	Glenarm St & Los Robles Ave	14			1	4	9	5	1	3				1	2	2	Non-signal	4	44.1	8	0.60	3	24,400
5	Cordova St & Oakland Ave	13				3	10	11	1						1		Non-signal	5	28.3	10	0.49	4	12,709
6	Fair Oaks Ave & Tremont St (N)	12			3	3	6	4	1					1	5	1	Non-signal	6	56.5	7	0.35	6	14,597
7	Orange Grove Bl & Worcester Ave	12				4	8	2				1		5	4		Non-signal	6	32.4	9	0.20	10	18,731
8	Boylston St & Lake Ave	12		1	2	3	6	3	2					3		4	Non-signal	6	236.6	2	0.34	8	33,715
9	Del Mar Bl & Madison Ave	12		1		4	7	8			1			1	2		Non-signal	6	222.2	3	0.22	9	19,549
10	Arlington Dr & Pasadena Ave	12			4	3	5	9		1	1			1			Non-signal	6	66.2	6	0.81	1	30,118

5.6.2 Roadway Segment Ranking

The roadway segment rankings are also by Crash Frequency and EPDO scores. The ranking is a quantitative method used to evaluate a particular corridor segment and compare it with other segments. It is ultimately just a tool to streamline the collision analysis and the selection process for potential locations. **Table 5.16** shows the top collision roadway segments.

Table 5.16: Top Roadway Segment Ranking

					COLLISION SEVERITY					COLLISION TYPE													
ID	Roadway Segment	From	To	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian	Rank Collision Frequency	EPDO Score	Rank EPDO Score	Crash Rate	Rank Crash Rate	ADT	Corridor Length (miles)
1	Washington Blvd	Forest Ave	Catalina Ave	127	1	1	23	33	69	44	5	3	4		1	24	43	3	1	847.5	1	273.43	1	17,674	1.44
2	Lake Ave	Mountain St	California Blvd	114		2	10	30	72	25	8	7	5	2	1	25	31	10	2	692.7	3	152.73	4	23,107	1.77
3	Orange Grove Blvd	Lincoln Ave	Catalina Ave	94	1	2	8	29	54	26	4	8	1	3		24	22	6	3	812.3	2	204.08	3	16,826	1.5
4	Fair Oaks Ave	Mountain St	California Blvd	76		1	11	22	42	22	4	3	4			24	17	2	4	459.4	5	93.02	7	25,293	1.77
5	Foothill Blvd	San Gabriel Blvd	Michillinda Ave	72		1	5	15	51	22	4	3	6	2		11	20	4	5	361.3	7	145.49	5	18,831	1.44
6	Colorado Blvd	Pasadena Ave	Allen Ave	70		1	10	12	47	18	3	7	1	4		13	20	4	6	392.7	6	103.18	6	15,819	2.35
7	Los Robles Ave	Washington Blvd	Maple St	70	1	1	10	15	43	16	7	4	3	2		17	15	6	6	572.2	4	231.90	2	14,509	1.14

6.0 STAKEHOLDER OUTREACH

Two virtual stakeholder meetings were held via Microsoft Teams. At these meetings, stakeholders were invited to share safety issues regarding the City's circulation system, pedestrian network, and other transportation safety issues. Stakeholders invited to these meetings included staff from the City's Department of Transportation, Public Works Department, Police Department, Fire Department, Pasadena's Transit Division, the Public Health Division, and the Accessibility Coordinator.

STAKEHOLDER MEETING #1

The first stakeholder meeting was held on October 28, 2021. The citywide collision analysis findings were presented, and the stakeholders were invited to share their safety concerns and help develop the LRSP's goals and objectives. Stakeholder comments included:

- Concern for the intersection ranking of Orange Grove Boulevard & Lake Avenue due to a new protected permissive signal installed after 2019. The collisions data used for the LRSP (2015-2019) did not reflect changes in collisions after the signal was installed
- Consider breaking down crosswalk data into "marked" and "unmarked" crosswalks
- First responders agreed collision data findings do reflect what is seen on the job

STAKEHOLDER MEETING #2

The second stakeholder meeting was held on February 24, 2022. At this meeting, the engineering and non-engineering safety solutions were presented. A summary of the stakeholder comments are listed below:

Engineering Intersection Countermeasures:

- Fair Oaks Avenue and Maple Street – Caltrans will be removing the pedestal signal pole, working on curb ramps, and signal modifications near the 210 freeway. Additional pedestrian improvements may be made.
- The Implementation Plan in the CIP includes installing high visibility crosswalks at all signalized intersections
- See if intersections are ADA compliant
- Consider median improvements due to panhandlers at Lake Avenue & Maple street

Engineering Roadway Countermeasures:

- Bike lane improvements – concern for opposition from the removal of parking along Washington Boulevard and Del Mar Boulevard
- Concerns that bicycle facility improvements that are not listed in the Bicycle Transportation Action Plan are not approved

Engineering Systemic Countermeasures:

- Fair Oaks Ave & Orange Grove Blvd
  - Heritage Square project may overlap with recommendations at this intersection
- Curb Extensions
  - If all curb extensions include curb ramps, they should be directional curb ramps
  - Concern for curb extensions near bus stops

Non-Engineering Program Recommendations:

- Include all age groups in the safety education programs

7.0 TRANSPORTATION SAFETY EMPHASIS AREAS

Transportation safety emphasis areas provide a strategic framework for developing and implementing the Local Roadway Safety Plan (LRSP). The emphasis areas show the City of Pasadena where to focus when developing projects and programs based on the LRSP. The implementation of the emphasis areas should directly relate to the goals, policies, and strategies of the LRSP. Based on the collision data analysis conducted for the City of Pasadena, the following are the transportation safety emphasis areas:

- Signalized Intersection
- Bicyclists and Pedestrian Safety
- Unsafe Speed
- Visibility

SIGNALIZED INTERSECTIONS

The signalized intersections emphasis area -- collisions occurred at intersections with traffic signals. The collision analysis revealed that 52% of collisions occurred at signalized intersections. Bicycle and pedestrian-related collisions account for the highest percentage of collisions at signalized intersections than at other facility types (non-signalized intersections and midblock locations), accounting for 50% of bicycle and pedestrian collisions.

BICYCLISTS AND PEDESTRIAN SAFETY

Bicyclists and pedestrian safety emphasis area -- includes instances where pedestrians or bicyclists have been involved in a collision with a motor vehicle. Pedestrian and bicycle collisions accounted for the highest percentage of killed and severe injury (KSI) collisions, with those involving pedestrians accounting for 10.6%, and those involving bicycles accounting for 4.3%. Based on its number of KSI pedestrian collisions, Pasadena ranked 3rd of 59 cities of similar size and 18th for KSI bicycle collisions (1 being the highest or worst and 59 being the lowest or best).

UNSAFE SPEED

Speeding emphasis area – where a motorist is traveling too fast or exceeding the posted speed limit, causing a collision. Unsafe speeding is one of the frequent primary collision factors in the City of Pasadena, accounting for 1,185 collisions (15.6%).

VISIBILITY

The visibility emphasis area -- focuses on improving the ability of drivers to respond to existing traffic controls and messages. One crucial element of visibility in nighttime visibility. Pasadena currently has excellent coverage of street lighting across the City. However, lighting is not the only aspect that may contribute to nighttime collisions. 1,540 collisions (20%) in the City are reported as occurring at night, which accounts for the second-highest time of day collisions. Even with street lighting, traffic signals, and signage, visibility may be challenging at night.

8.0 ENGINEERING COUNTERMEASURES

The recommended engineering countermeasures were derived from the collision patterns from the collision analysis. The recommended countermeasures identified below are based on a combination of collision data and responses from stakeholders and city staff: the recommended countermeasures focus on signalized intersections, bicyclists and pedestrian safety, unsafe speeding, and visibility. The countermeasures include systemic improvements as illustrated in Figure 8.1 and intersection and roadway improvements at locations shown in Figure 8.2.

Figure 8.1: Recommended Systemic Countermeasure Locations

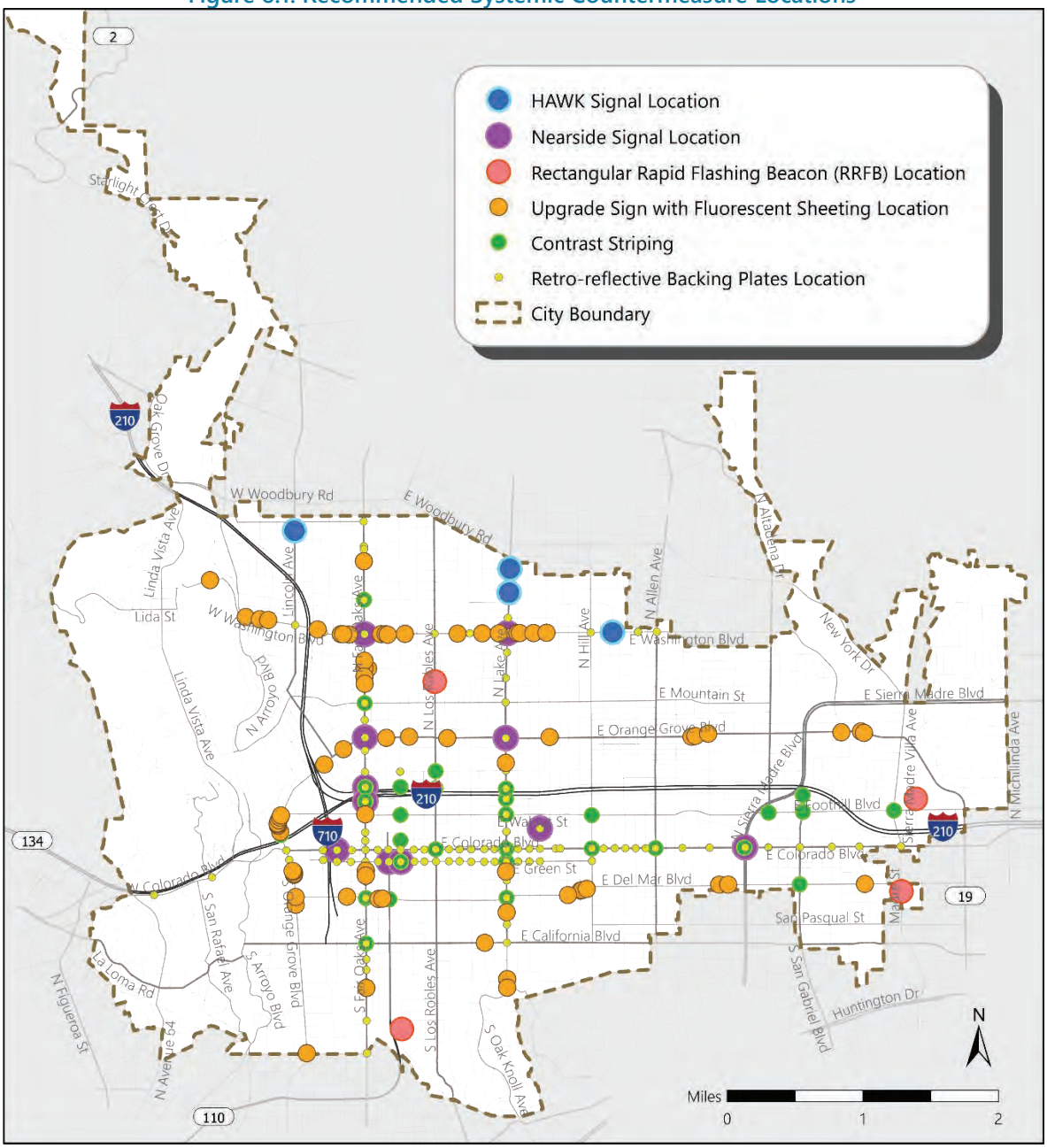
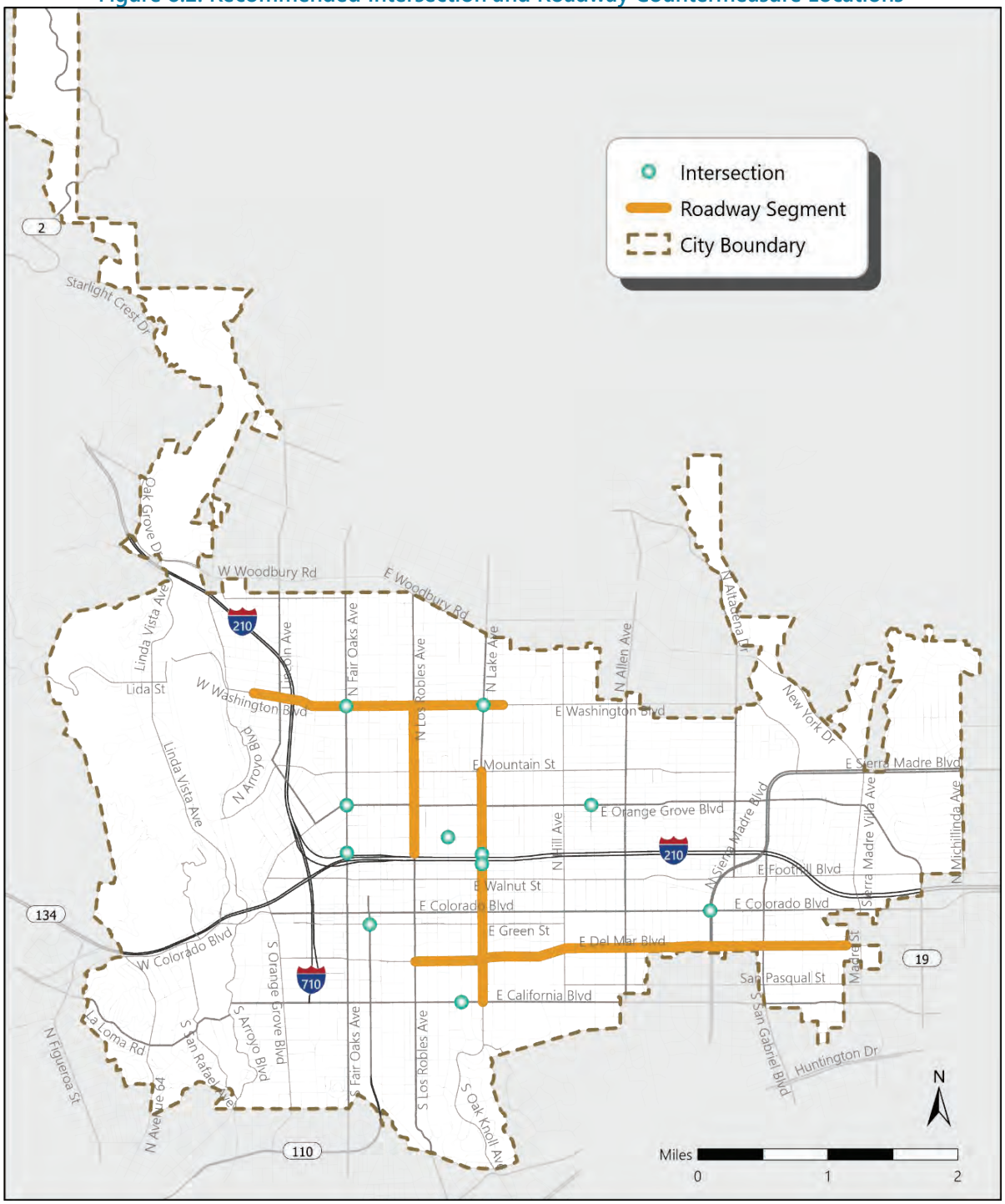


Figure 8.2: Recommended Intersection and Roadway Countermeasure Locations



The top three types of most frequently encountered collisions in Pasadena were broadside, rear end, and sideswipe. The common causes of these three collision types and the typical safety countermeasures addressing each collision type are listed in Table 8.1.

Table 8.1: Common Causes and Countermeasures-Citywide Collisions

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

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

Table 8.2 summarizes the list of safety countermeasures included in the LRSM and applied to this project. The table summarizes each countermeasure's applicable crash types, CRF, project life of the recommended improvement, maximum federal reimbursement percentage, and the opportunity for a systemic approach.

The countermeasure numbers (far left column) in Table 8.2 represent the ID number for the types of improvements that are eligible for HSIP funding. Throughout this document, countermeasures eligible for HSIP funding will have the ID number, and those that are not eligible will not have an ID number.

Table 8.2: Safety Countermeasures Applied to the City of Pasadena LRSP

CM No.	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	HSIP Funding Eligibility
NS03	Install Signal	Pedestrian and Bicycle	30%	20	90%
NS21PB	Curb Extension	Pedestrian and Bicycle	35%	20	90%
NS22PB	Rectangular Rapid Flashing Beacon (RRFB)	Pedestrian and Bicycle	35%	20	90%
NS23PB	Pedestrian Hybrid Beacon (HAWK)	Pedestrian and Bicycle	55%	20	90%
R22	Regulatory Signs	All	15%	10	90%
R26	Install Dynamic Speed Warning Signs	All	30%	10	90%
R32PB	Install Bike Lane	Pedestrian and Bicycle	35%	20	90%
S02	Retro-Reflective Backing Plates	All	15%	10	90%
S08	Convert Signal Mast Arm	All	30%	20	90%

Source: Local Roadway Safety Manual, Version 1.6 April 2022

8.1 SYSTEMIC COUNTERMEASURES

8.1.1 Retro-Reflective Backing Plates

Reflective backing plates are recommended for consideration at 115 signalized intersections. The locations listed below are data-driven, selected based on nighttime collisions across the City. Additional locations listed in **Appendix B** were selected based on their proximity to the original list of locations and did not have supportive data.

Source: MLT News

Retro-reflective backing plates improve the visibility of traffic signals in daytime and nighttime conditions. They also help color vision-deficient drivers to see whether the light is red or green when approaching an intersection.[1] Color vision deficient people are typically not able to see the color red or green, and the retro-reflective backing plates help them see whether the light is on at the top or bottom of the signal head.

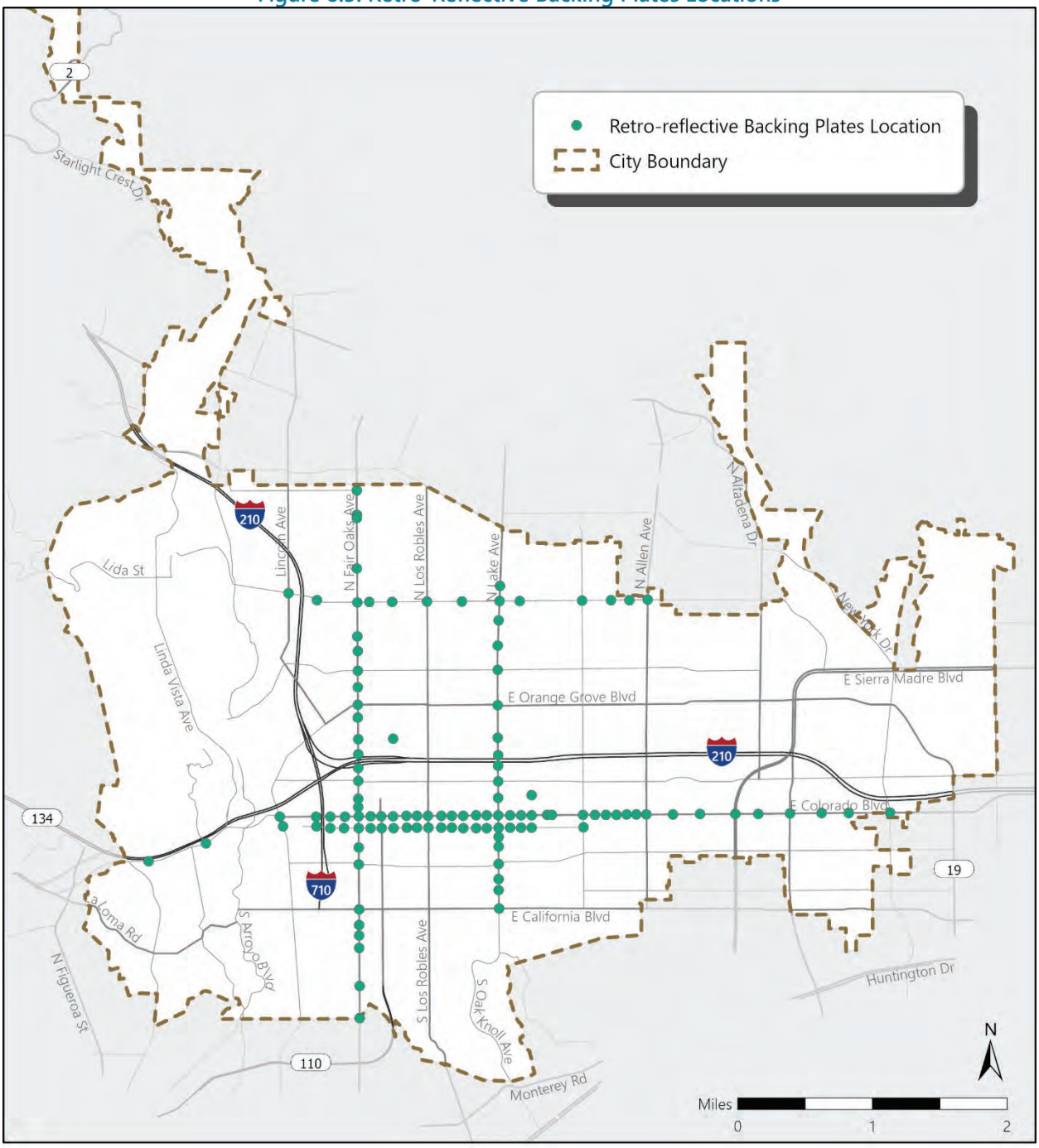
Consider upgrading the existing traffic signals with retro-reflective backing plates at the following locations based on data:

1. Lake Ave & Orange Grove Bl
2. Corson St & Lake Ave
3. Fair Oaks Ave & Washington Bl
4. Colorado Bl & Sierra Madre Bl
5. Arroyo Pkwy & Green St
6. Lake Ave & Maple St
7. Fair Oaks Ave & Maple St
8. Lake Ave & Washington Bl
9. Fair Oaks Ave & Orange Grove Bl
10. Colorado Bl & Pasadena Ave
11. Lake Ave & Villa St
12. Lake Ave & Union St
13. Raymond Ave & Washington Blvd
14. Union St & Wilson Ave
15. Fair Oaks Ave & Glenarm St
16. Colorado Blvd & San Gabriel Blvd
17. Fair Oaks Ave & Hammond St
18. Colorado Blvd & Orange Grove Blvd
19. Colorado Blvd & Fair Oaks Ave
20. Colorado Blvd & Raymond Ave
21. Marengo Ave & Villa St
22. Marengo Ave & Green St

Figure 8.3 illustrates the locations where the improvements are recommended for consideration.

[1] *Backplates with Retroreflective Borders. FHWA. (n.d.). Retrieved January 20, 2022, from https://safety.fhwa.dot.gov/provencountermeasures/backplate.cfm*

Figure 8.3: Retro-Reflective Backing Plates Locations



8.1.2 Nearside Signals

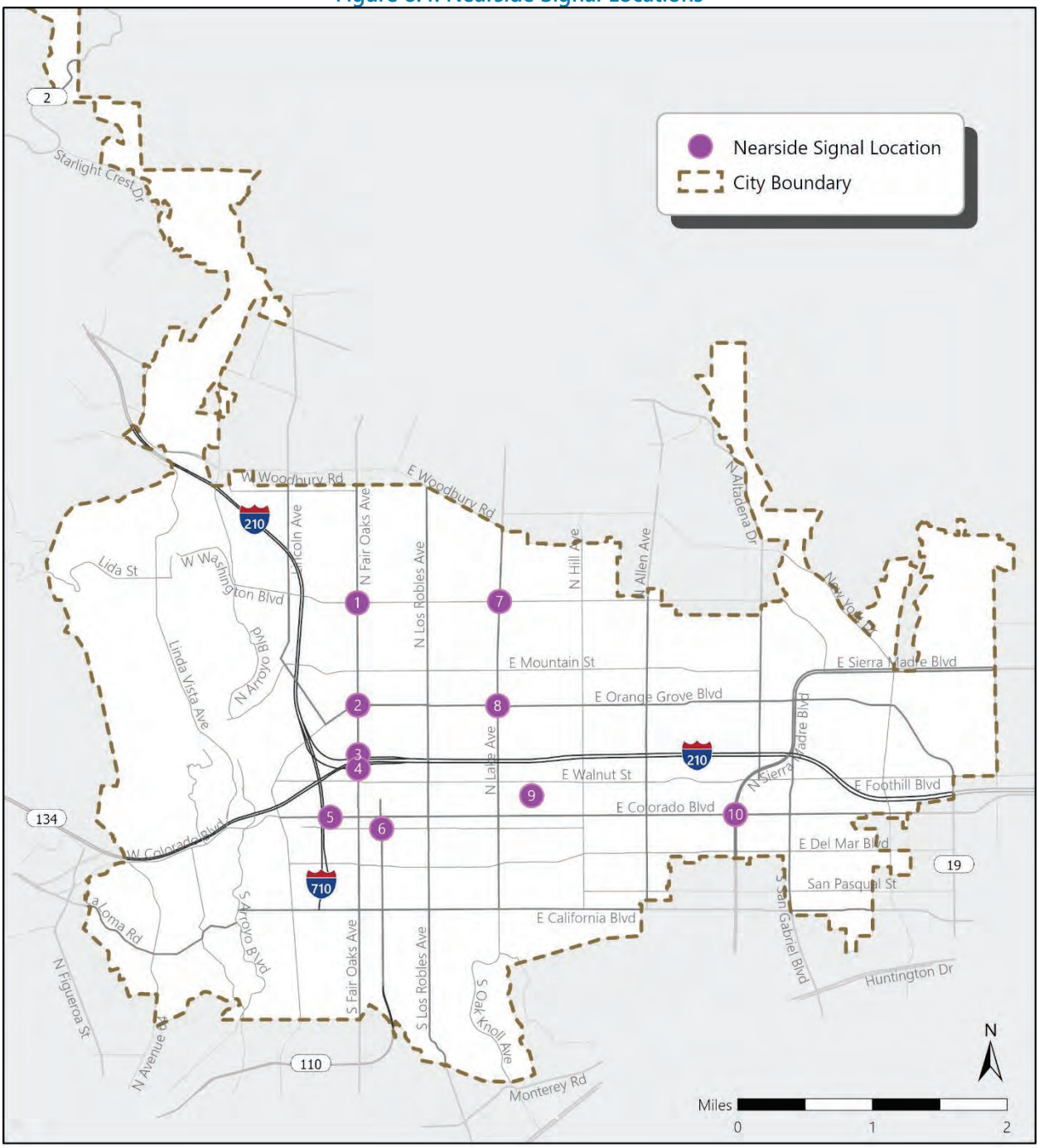
The selected nearside signals are data-driven based on the top 10 intersections with the highest Equivalent Property Damage Only (EDPO) scores. A total of 10 signalized intersections are recommended for consideration and are listed below. The locations are primarily along Fair Oaks Avenue, as shown in **Figure 8.4**. The data analysis revealed that the top primary collision factor (PCF) on Fair Oaks Avenue was unsafe speed. Most locations listed below had PCF's of unsafe speed and traffic sign and signal violations. Nearside traffic signals are considered at these locations to improve traffic signal visibility as drivers approach the intersection.

Consider the installation of nearside signal heads at the following locations:

1. Fair Oaks Ave & Washington Bl (All directions)
2. Fair Oaks Ave & Orange Grove Bl (All directions)
3. Fair Oaks Ave & Maple St (North and southbound approach)
4. Corson St & Fair Oaks Ave (North and southbound approach)
5. Colorado Bl & Pasadena Ave
6. Arroyo Pkwy & Green St
7. Lake Ave & Washington Bl (All directions)
8. Lake Ave & Orange Grove Bl (All directions)
9. Union St & Wilson Ave
10. Colorado Bl & Sierra Madre Bl (All directions)

Figure 8.4 illustrates the locations where the improvements are recommended for consideration.

Figure 8.4: Nearside Signal Locations



8.1.3 Rectangular Rapid Flashing Beacon (RRFB)

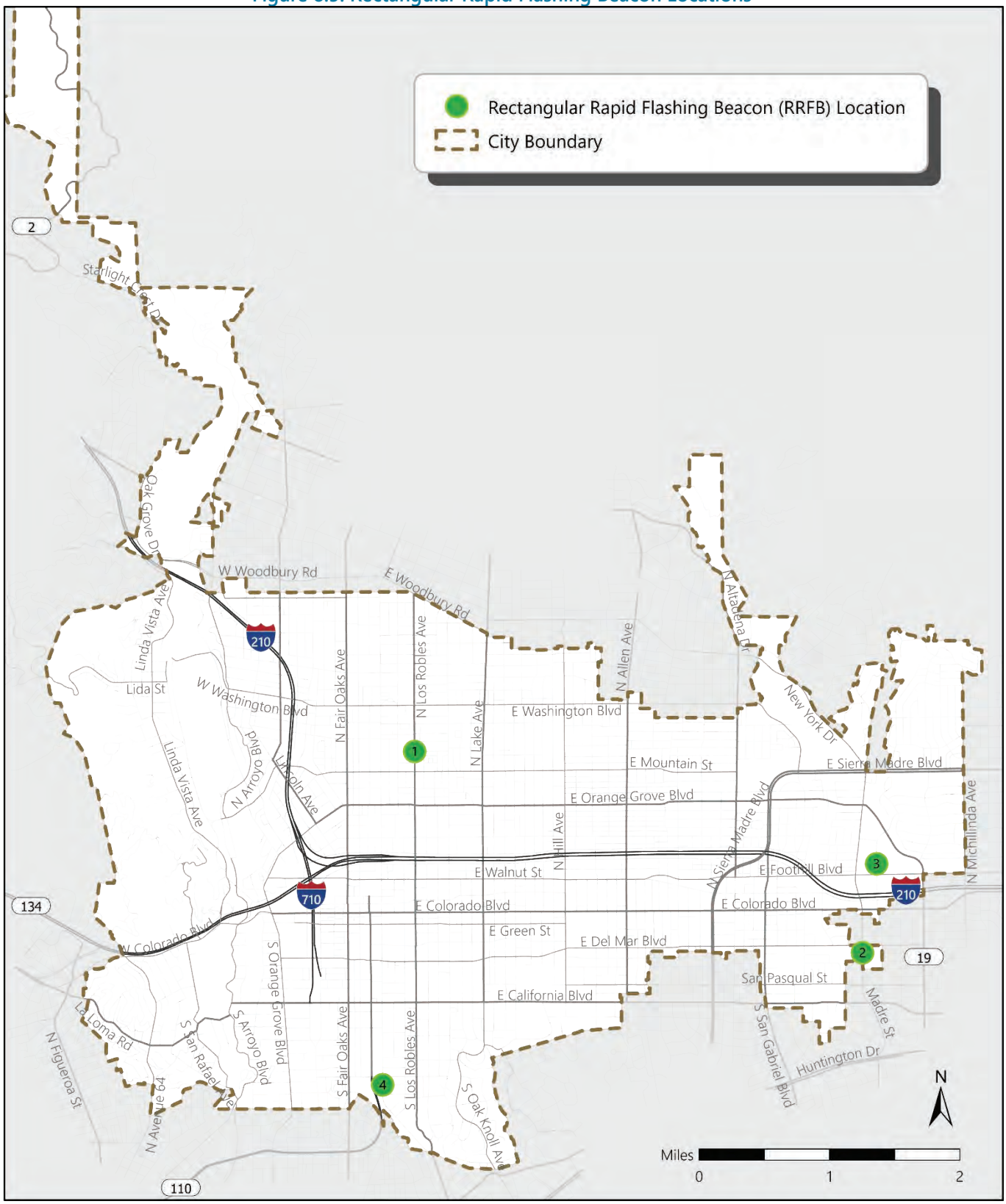
The locations listed below are at midblock locations or non-signalized intersections that could improve the pedestrian crossing. Rectangular rapid flashing beacons (RRFB) enhance pedestrian safety by emitting high-intensity flashing warning lights to drivers that a pedestrian is crossing. Consider the installation of RRFB at the following locations:

1. Los Robles Avenue & Jackson Street
2. Madre Street between Del Mar Boulevard & Thorndale Rd
3. Halstead Street between Rosemead Boulevard & Foothill Boulevard
4. Marengo Avenue & Wallis Street

Source: Arizona DOT

Figure 8.5 illustrates the locations where the improvements are recommended for consideration.

Figure 8.5: Rectangular Rapid Flashing Beacon Locations



8.1.4 HAWK (High-Intensity Activated Crosswalk) Signals

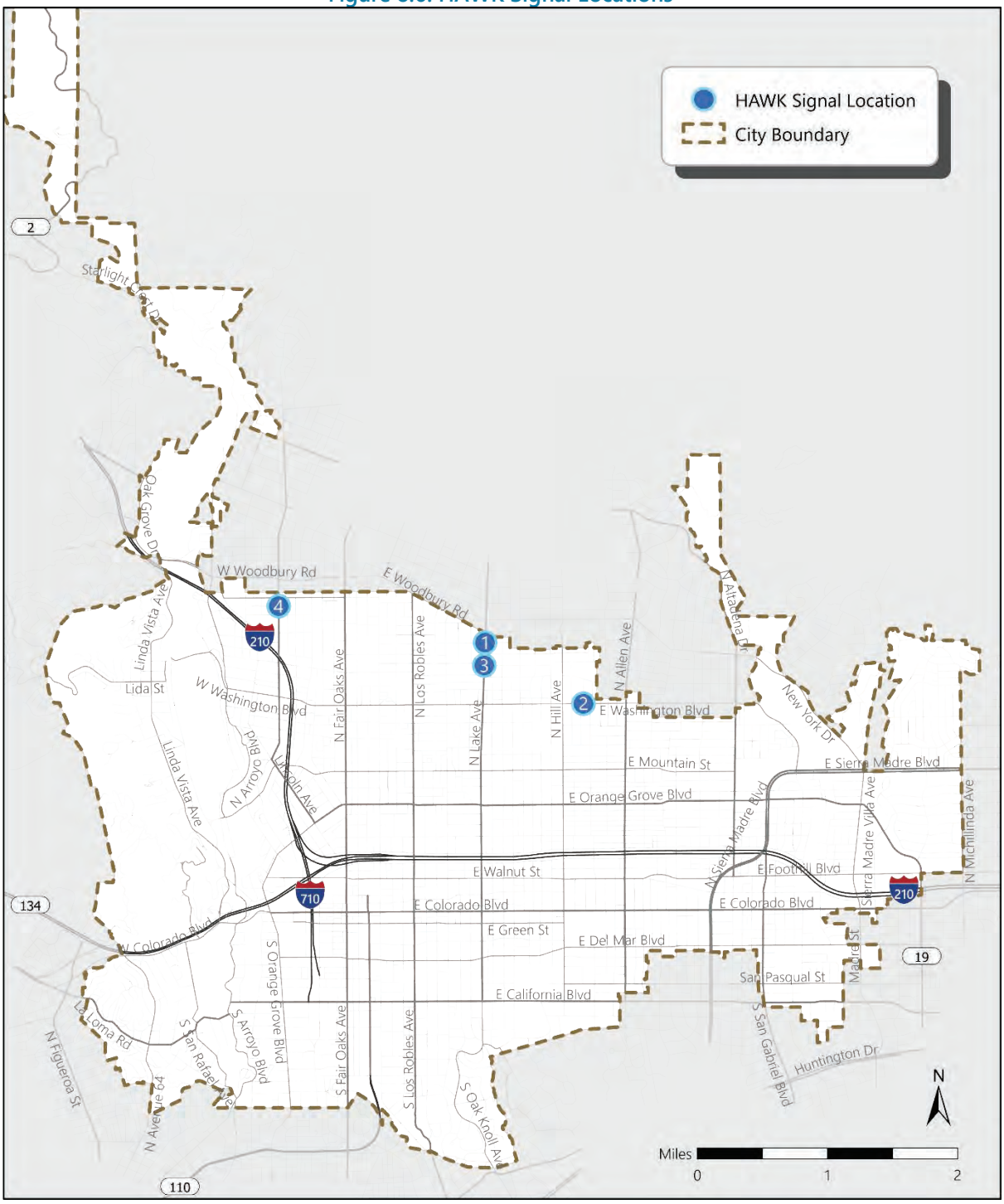
The proposed locations listed below are at midblock locations or non-signalized intersections with designated pedestrian crossings that could be improved. High-Intensity Activated Crosswalk (HAWK) Signals allow pedestrians to cross the road safely operating in a Yellow–Red–Flashing Red sequence to alert motorists that pedestrians need to cross the road. Consider the installation of HAWK Signals at the following locations:

1. Atchison Street & Lake Avenue
2. Bresee Avenue & Washington Boulevard (East leg)
3. Elizabeth Street & Lake Avenue (South leg)
4. Lincoln Avenue & Toolen Place

Source: FHWA

Figure 8.6 illustrates the locations where the improvements are recommended for consideration.

Figure 8.6: HAWK Signal Locations



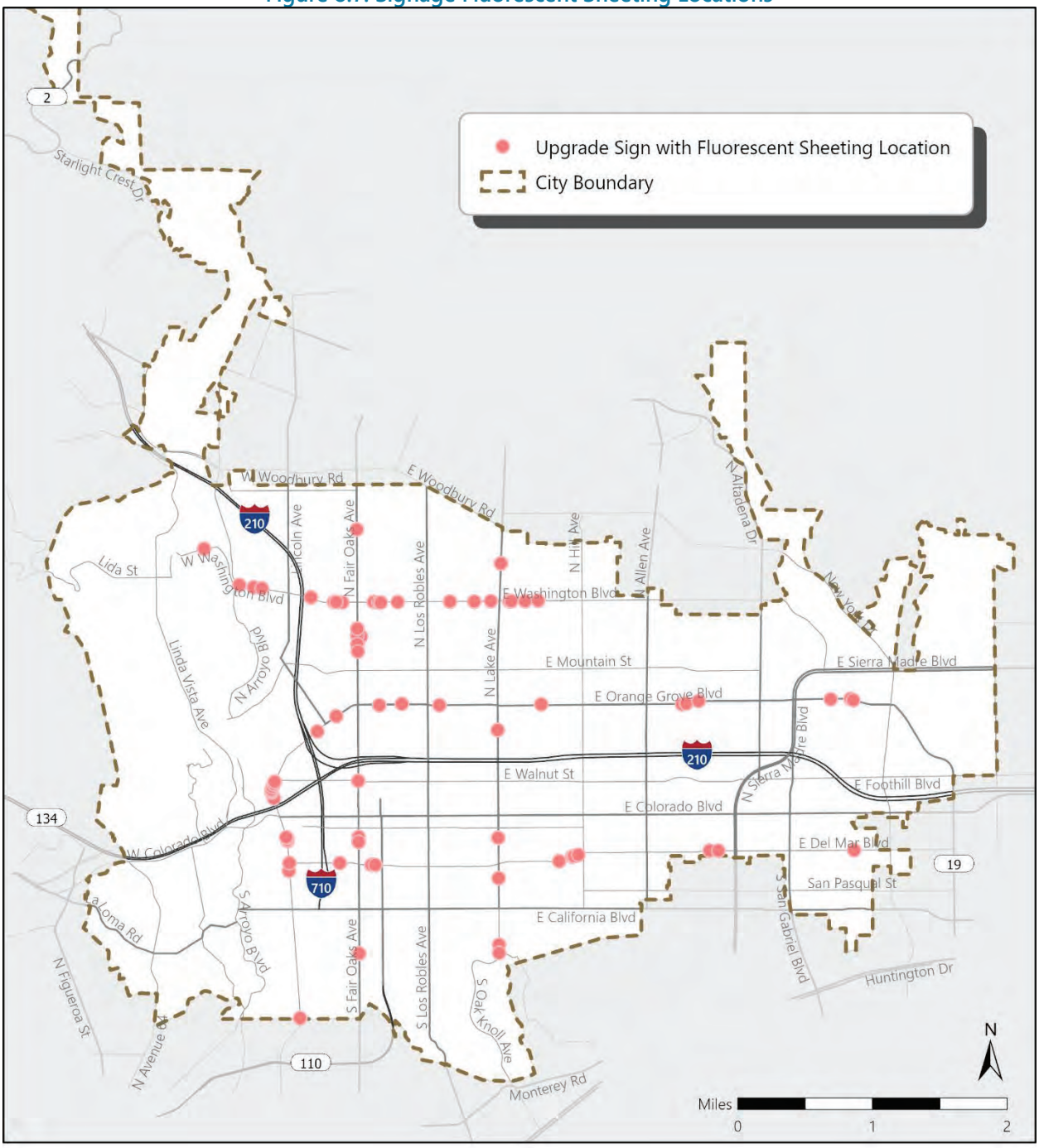
8.1.5 Fluorescent Sheeting

The signs listed below are recommended for consideration to be upgraded with fluorescent sheeting. A sign audit would need to be conducted for these signs to be upgraded. The signs include bicycle, pedestrian, fire station, and other regulatory/warning signs. These signs were identified through Google Maps street view, where they appear not to have fluorescent sheeting. The fluorescent sheeting will make the signs more visible at night when vehicles approach them. The locations were identified in locations with clusters of nighttime collisions. Additional locations listed in **Appendix C** were selected based on their proximity to the original list of locations with similar roadway characteristics. Consider upgrading signs with new fluorescent sheeting at the following locations:

1. Del Mar Boulevard & Holliston Avenue (W11-8)
2. Del Mar Boulevard, east of Holliston Avenue (W11-8)
3. Del Mar Boulevard, west of Hill Avenue (W11-8)
4. Lake Avenue, south of Santa Barbara Street ("Fire Station"sign)
5. Fair Oaks Avenue, south of Dayton Street (W11-8)
6. Fair Oaks Avenue, north of Valley Street (W11-8)
7. Hammond Street, east of Fair Oaks Avenue ("Fire station, watch for trucks" sign)
8. Hammond Street & Fair Oaks Boulevard northeast corner ("Fire station, watch for trucks" sign)
9. Hammond Street, south of Fair Oaks Avenue (NB) ("Fire station, watch for trucks" sign)
10. Fair Oaks Avenue, south of Claremont Street (SB) ("Fire station, watch for trucks" sign)
11. Lincoln Avenue, east of Orange Grove Boulevard (EB) (Pedestrian W11-2)
12. El Molino Avenue, west of Washington Boulevard (EB) Bike "share the road" sign (W11-1 & W16-1P)
13. Palm Terrace, east of Washington Boulevard (EB) Bike "share the road" sign (W11-1 & W16-1P)
14. Prime Court, west of Washington Boulevard (WB) Pedestrian (W11-2)
15. Mentor Avenue & Washington Boulevard (EB) School pedestrian sign (S1-1 & W16-9P)

Figure 8.7 illustrates the locations where the improvements are recommended for consideration, including the list from **Appendix C**

Figure 8.7: Signage Fluorescent Sheeting Locations



8.1.6 Restriping

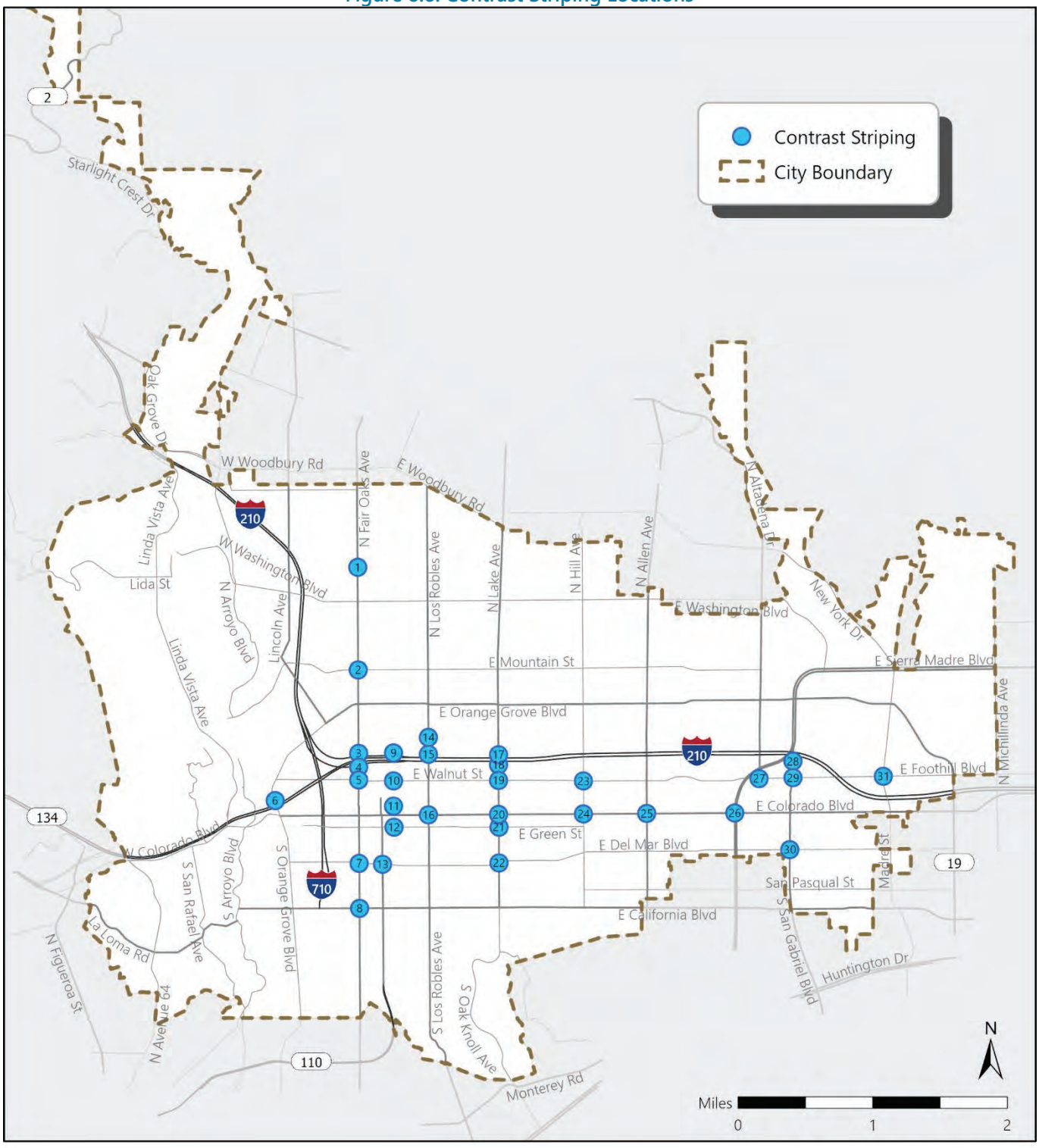
The locations listed are recommended for consideration to be restriped with contrast striping. The top 10 intersections were initially analyzed to see if it is feasible to recommend contrast striping. Additional locations were identified based on daytime collisions. The extents of the contrast striping was measured from the center of the intersection to the end of the light-colored concrete. Contrast striping is helpful for making travel lanes more visibile when the sun is directly hitting the concrete.

Restriping with contrast striping on the light concrete is recommended for consideration at the following locations:

1. Fair Oaks Avenue & Howard Street
2. Fair Oaks Avenue & Mountain Street
3. Fair Oaks Avenue & Maple Street
4. Corson Street & Fair Oaks Avenue
5. Fair Oaks Avenue & Walnut Street
6. Holly Street & Orange Grove Boulevard
7. Del Mar Boulevard & Fair Oaks Avenue
8. Fair Oaks Avenue & California Boulevard
9. Maple Street & Marengo Avenue
10. Marengo Avenue & Walnut Street
11. Marengo Avenue & Union Street
12. Green Street & Marengo Avenue
13. Arroyo Parkway & Del Mar Boulevard
14. Los Robles Avenue & Villa Street
15. Los Robles Avenue & Maple Street
16. Colorado Boulevard & Los Robles Avenue
17. Lake Avenue & Maple Street
18. Corson Street & Lake Avenue
19. Lake Avenue & Walnut Street
20. Colorado Boulevard & Lake Avenue
21. Green Street & Lake Avenue
22. Del Mar Boulevard & Lake Avenue
23. Hill Avenue & Walnut Street
24. Colorado Boulevard & Hill Avenue
25. Allen Avenue & Colorado Boulevard
26. Colorado Boulevard & Sierra Madre Boulevard
27. Altadena Drive & Foothill Boulevard
28. La Tierra Street & San Gabriel Boulevard
29. Foothill Boulevard & San Gabriel Boulevard
30. Del Mar Boulevard & San Gabriel Boulevard
31. Foothill Boulevard & Sierra Madre Villa Avenue

Figure 8.8 illustrates the locations where the improvements are recommended for consideration.

Figure 8.8: Contrast Striping Locations



8.2 ROADWAY SEGMENTS

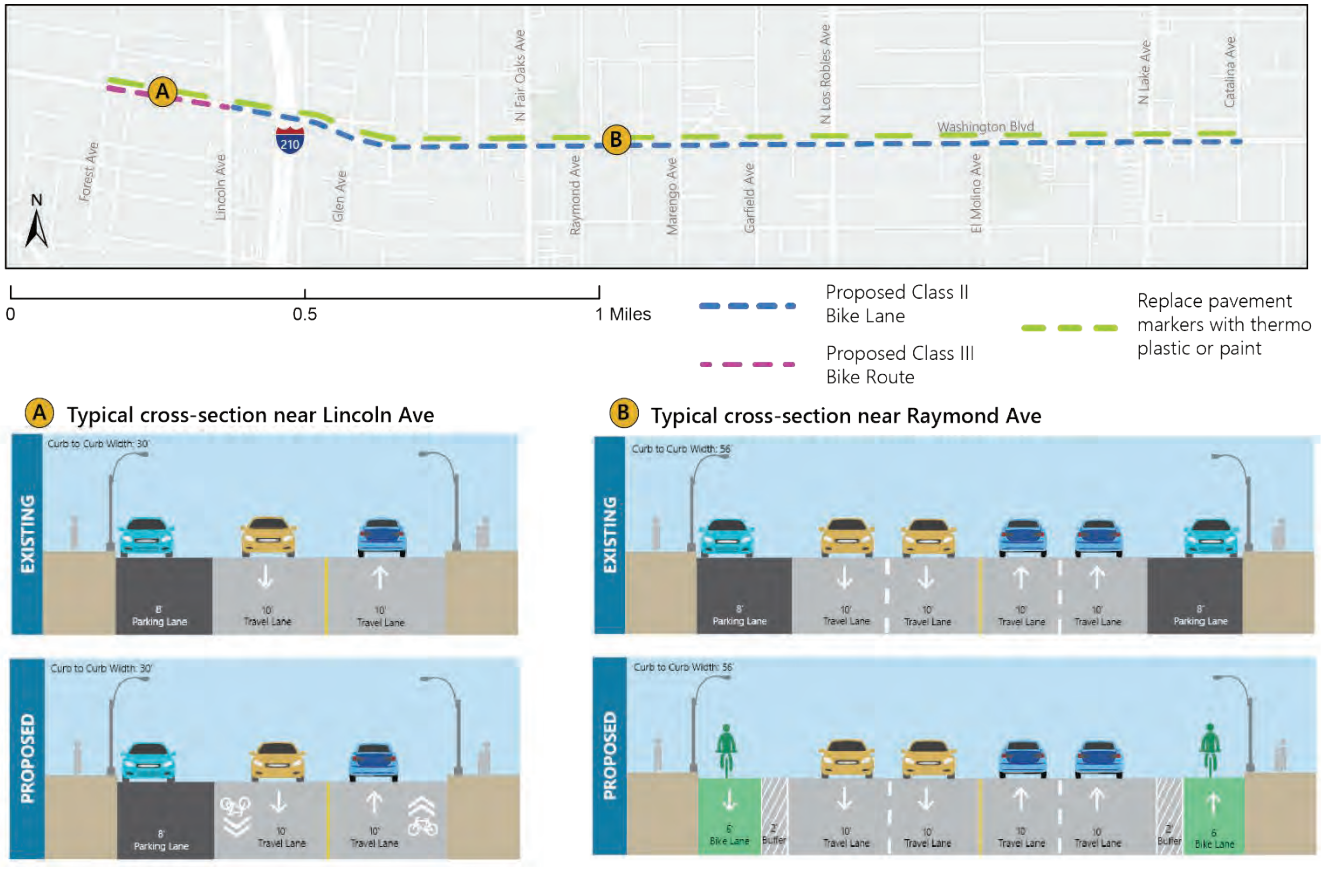
8.2.1 Washington Blvd from Forest Ave to Catalina Ave

Washington Boulevard is a 1.9-mile roadway running in the east-west direction, from Forest Avenue to Catalina Avenue. Between Forest Avenue to Lincoln Avenue, Washington Boulevard has one travel lane in each direction, and on-street parking along the south side of the roadway (eastbound direction). From Lincoln Avenue to Catalina Avenue, Washingon Boulevard has two travel lanes in each direction. This part of the segment also has parking which appear underutilized at all times of the day.

A total of 127 collisions occurred along the corridor. The collision data revealed that the top primary collision factors of this segment include automobile right of way (41 collisions or 19.%), unsafe speed (40 collisions or 19.1%), and improper turning (30 collisions or 14.3%). Most of those collisions occurred when vehicles were traveling along the segment.

An option for Washington Boulevard is to install a Class III bike route from Forest Avenue to Lincoln Avenue and preserve parking. From Lincoln Avenue to Catalina Avenue, parking could be removed from both sides of the street and be replaced with a buffered 5-foot bike lane with a striped 2-foot buffer. The travel lane width would remain the same. This lane reconfiguration may require further analysis to determine whether the removal of the on-street parking would impact residents and businesses along this corridor. Per initial on-street parking observation, the roadway has underutilized street parking with overnight parking restrictions which do not allow overnight parking Citywide without a permit. Additionally, pavement markers along the roadway could be replaced with thermoplastic or paint for better visibility of the travel lanes. The improvement concept is illustrated in Figure 8.9.

Figure 8.9: Concept for Washington Boulevard



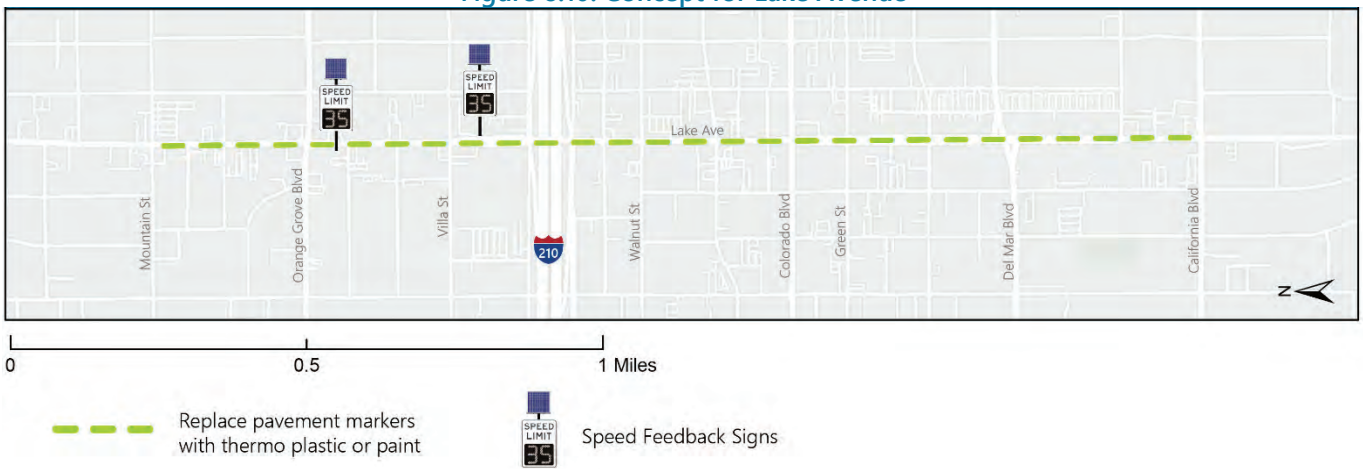
8.2.2 Lake Ave from Mountain St to California Blvd

Lake Avenue is a 1.75-mile roadway running north-south from Mountain Street to California Boulevard. The corridor has two travel lanes in each direction, with a raised median and on-street parking permitted on both sides of the street. The posted speed limit is 35 mph. Lake Avenue is one of the commercial corridors in Pasadena and is heavily utilized by vehicles, with at least 30,000 vehicles traveled daily.

A total of 114 collisions occurred along this corridor. Unsafe speed is the top primary collision factor along the roadway, accounting for 20.3% of collisions. Automobile right of way (12.4%) and improper turning (10.7%) are the second and third highest primary collision factors.

Lake Avenue is primarily a commercial use corridor with multiple clusters of unsafe speed collisions along the roadway. Speed feedback signs are recommended for consideration on Lake Avenue between Orange Grove Boulevard and Maple Street (two signs). Lastly, the existing pavement markers along the roadway are recommended to be replaced with thermoplastic or paint for better visibility of the travel lanes. The improvement concept is illustrated in Figure 8.10.

Figure 8.10: Concept for Lake Avenue



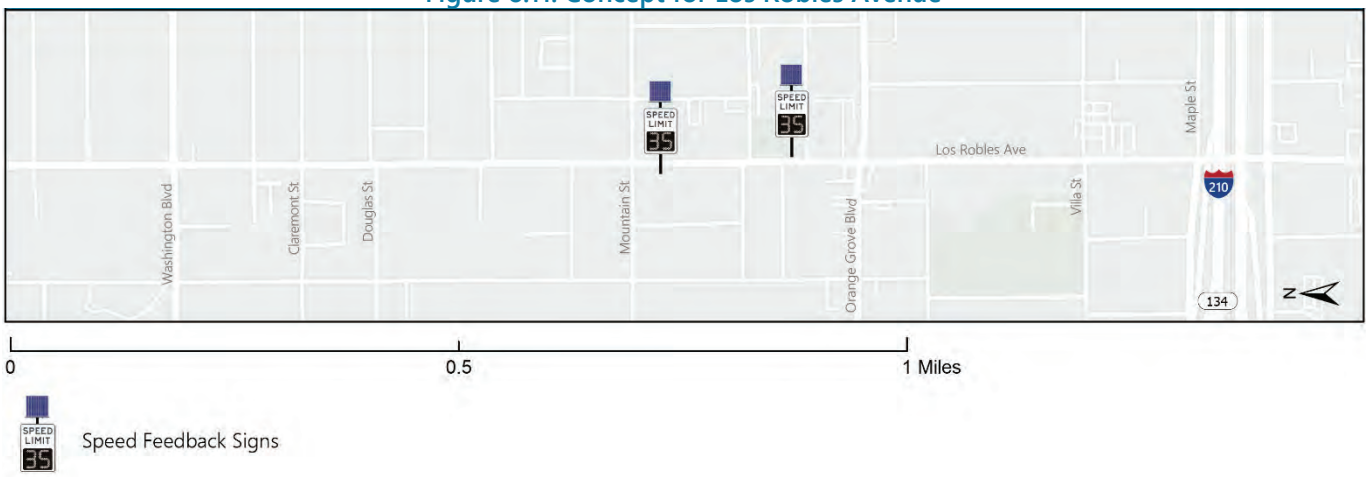
8.2.3 Los Robles Ave from Washington Blvd to Maple St

Los Robles Avenue is a 1.15-mile roadway segment running north-south, from Washington Boulevard to Maple Street. It is primarily a residential use corridor with one travel lane in each direction with a two-way-left-turn lane. On-street parking is permitted on both sides of the street, and the posted speed limit is 35 mph.

A total of 70 collisions occurred along the corridor. Unsafe speed (23.7%), automobile right of way (14.1%), and driving or bicycling under the influence (10.4%) are the top primary collision factors. Nearly half of collisions occurred during daylight conditions (46.7%).

Clusters of unsafe speeding collisions occurred along Los Robles Avenue. Based on the location of an existing speed feedback sign south of Mountain Street, an additional speed feedback sign is recommended for consideration north of Orange Grove Boulevard. The new speed feedback sign would be for northbound traffic, opposite to the existing sign. The improvement concept is illustrated in **Figure 8.11.**

Figure 8.11: Concept for Los Robles Avenue



8.2.4 Del Mar Blvd from Los Robles Ave to East City Limit

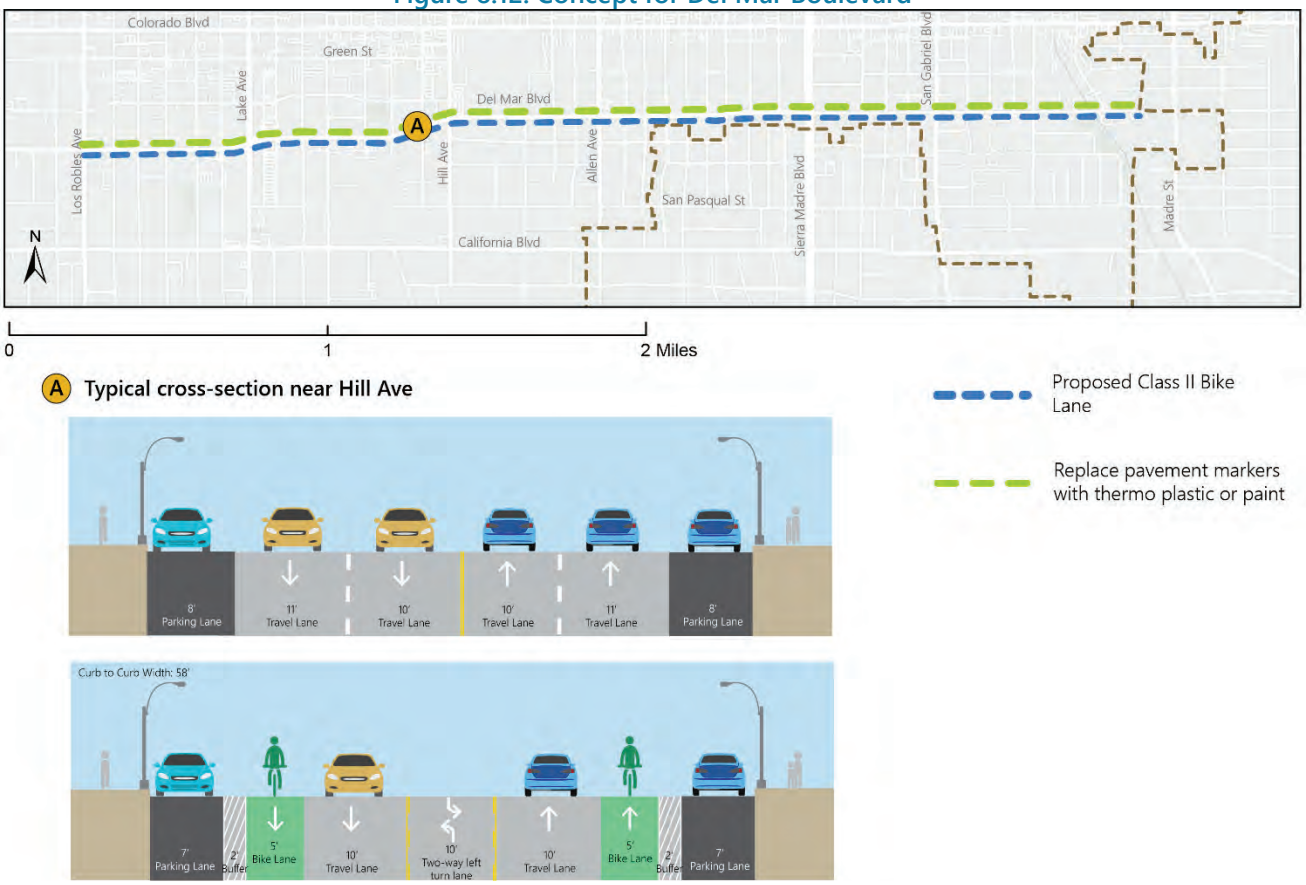
The Del Mar Boulevard roadway is approximately 3.38-miles, running in the east-west direction, from Los Robles Avenue to the eastern terminus of the city boundary. It is primarily a residential use corridor with two travel lanes in each direction with left-turn pockets. On-street parking is generally permitted with peak period restrictions on both sides of the street. Del Mar Avenue has approximately 20,000 vehicles traveling daily.

A total of 276 collisions occurred along the corridor. The top primary collision factors of the roadway were automobile right of way (22.4%), unsafe speed (14.7%), and improper turning (11.2%). Most collisions occurred during daylight collisions (52.5%). Of the 276 collisions, six were bicycle-related, and 13 were pedestrian-related.

A lane reconfiguration project is an option on Del Mar Boulevard, where one travel lane would be removed from each direction and a Class II buffered bike lane would be installed between the on-street parking and the travel lane. A two-foot buffer is recommended for consideration between the parking and bike lanes to allow for door space for parked vehicles. Parking will be preserved for residents and commercial businesses along this segment. Additionally, a center turn lane is recommended for consideration to allow vehicles to turn left without blocking traffic. The minimum travel lane width would adhere to *Pasadena's Street Design Guidelines*. Figure 8.12 illustrates the conceptual lane reconfiguration improvement on Del Mar Boulevard.

Additionally, pavement markers along the roadway segment could be replaced with thermoplastic or paint for better visibility of the travel lanes. The replacement of the pavement markers would address automobile right-of-way collisions. The improvement concepts are illustrated in Figure 8.12

Figure 8.12: Concept for Del Mar Boulevard



8.3 INTERSECTIONS

8.3.1 Fair Oaks Ave & Maple St

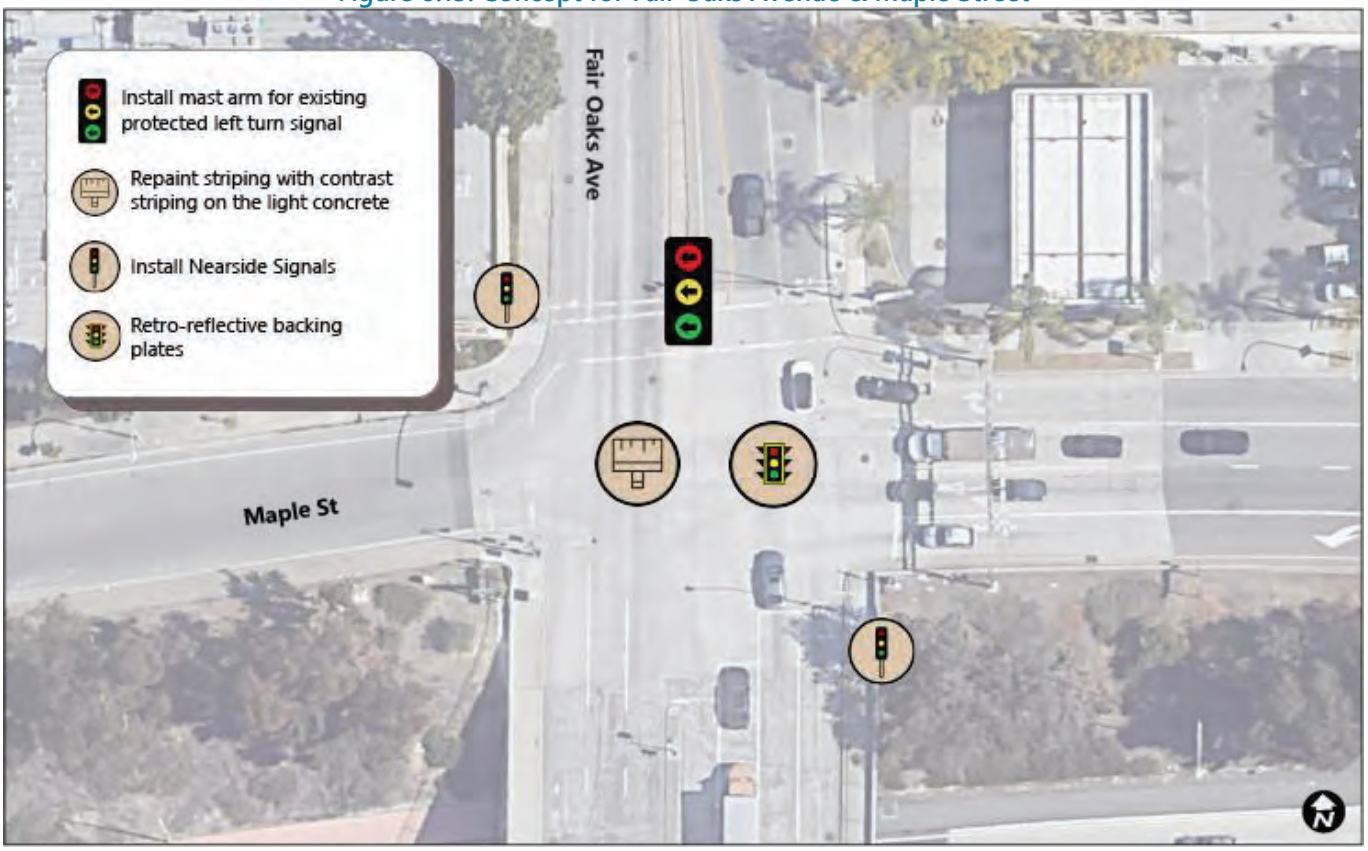
Fair Oaks Avenue and Maple Street is a four-legged signalized intersection near the 210 and 134 freeway on/off ramps. Maple Street is a one-way westbound street, and Fair Oaks Avenue is a two-way street running in the north-south direction. All approaches have permissive phasing, except the northbound approach has a protected left-turn phasing for the dual left-turn lanes.

A total of 47 collisions occurred at this intersection. The collision data revealed that traffic signal and sign violations were the top primary collision factor at this intersection, accounting for 27% of collisions. Unsafe speed was the second most common PCF, which accounted for 13.5% of collisions. Half (50%) of the collisions occurred during daylight conditions at this intersection.

The existing northbound protected left-turn phasing signal is located at the raised median on a pedestal pole. The left-turn phasing signal head may not be readily visible as the driver approaches the intersection, turning left onto Maple Street. It is recommended that the City consider replacing the signal pole with an extended mast arm that encompasses the protected left-turn signal head. The concept is illustrated in Figure 8.13.

Note: Caltrans will be making improvements along the 210 freeway. The improvement may overlap with the recommended countermeasures for this intersection.

Figure 8.13: Concept for Fair Oaks Avenue & Maple Street



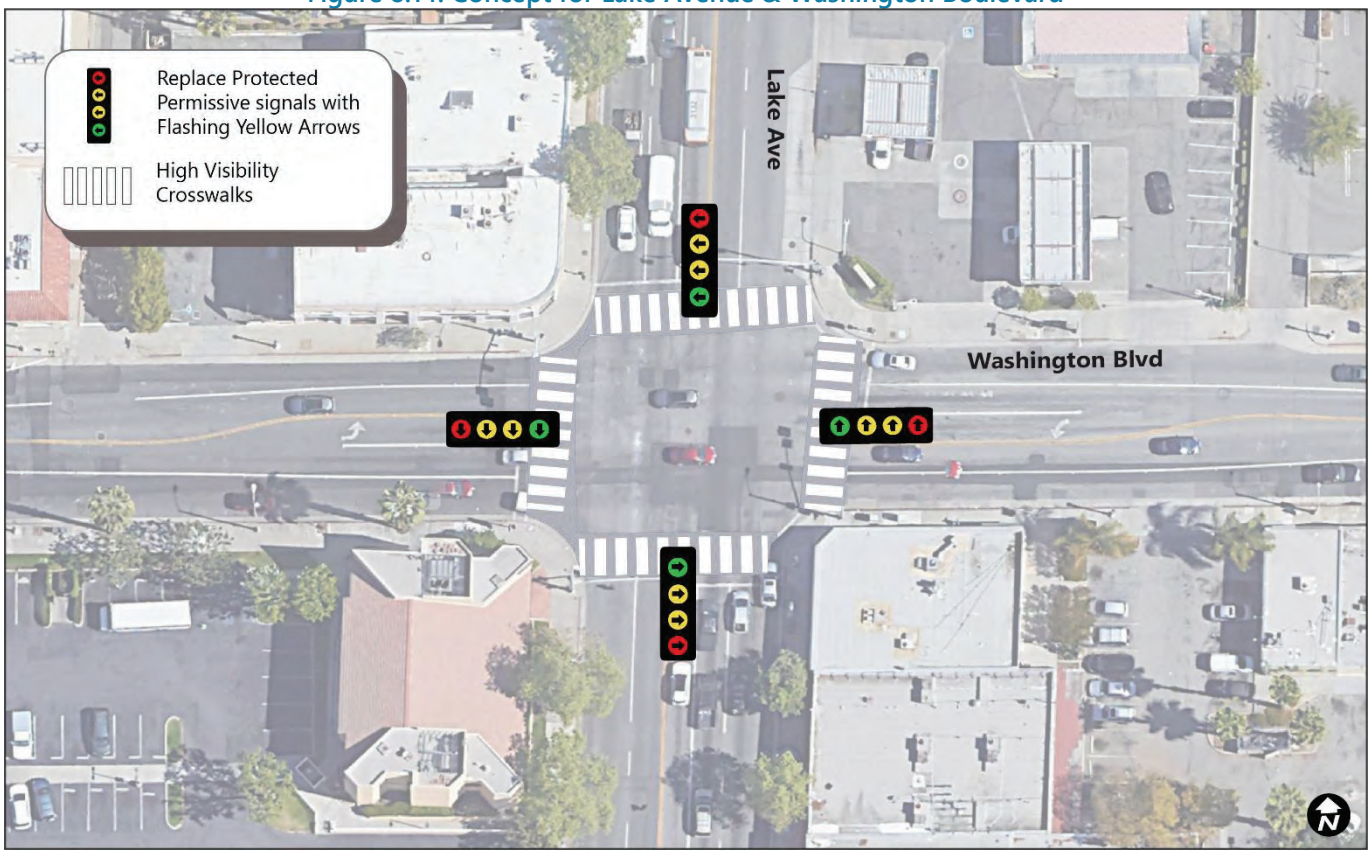
8.3.2 Lake Ave & Washington Blvd

The intersection of Lake Avenue and Washington Boulevard is a four-legged signalized intersection with protected-permissive phasing in all directions. All approaches have two travel lanes and a dedicated left-turn lane. This intersection has bus stops for Metro bus lines and Pasadena Transit.

This intersection had a total of 58 collisions. The top primary collision factors include improper turning (20.7%) and automobile right of way (19%). Pedestrians were involved in 13.8% of vehicle-involved collisions, accounting for the second-highest category of vehicle-involved collisions.

It is recommended that the City consider replacing all protected permissive signals with flashing yellow arrows on all legs of this intersection. To enhance pedestrian safety, at the intersection, high visibility crosswalks are recommended for consideration on all legs. High visibility crosswalks would enhance the visibility of the pedestrian crossing at all times of the day. The recommended concepts are illustrated in Figure 8.14.

Figure 8.14: Concept for Lake Avenue & Washington Boulevard



8.3.3 Fair Oaks Ave & Washington Blvd

Fair Oaks Avenue and Washington Boulevard intersection is a four-legged signalized intersection with protected left-turn phasing in the east-west direction (Washington Boulevard). Protected-permissive phasing is provided on Fair Oaks Avenue. All legs of the intersection have two travel lanes in each direction with a dedicated left-turn lane.

The intersection had a total of 41 collisions. The top primary collision factors were unsafe speed (31.7%), traffic sign and signal violations (9.8%), and automobile right of way (9.8%). Pedestrian-related collisions accounted for 12.2% of total crashes at this intersection.

It is recommended that the City consider replacing all protected permissive signals with flashing yellow arrows on all legs of this intersection. High visibility crosswalks are also recommended for consideration on all legs of the intersection to improve visibility of pedestrians crossing. The concepts are illustrated in Figure 8.15.

Figure 8.15: Concept for Fair Oaks Avenue & Washington Boulevard

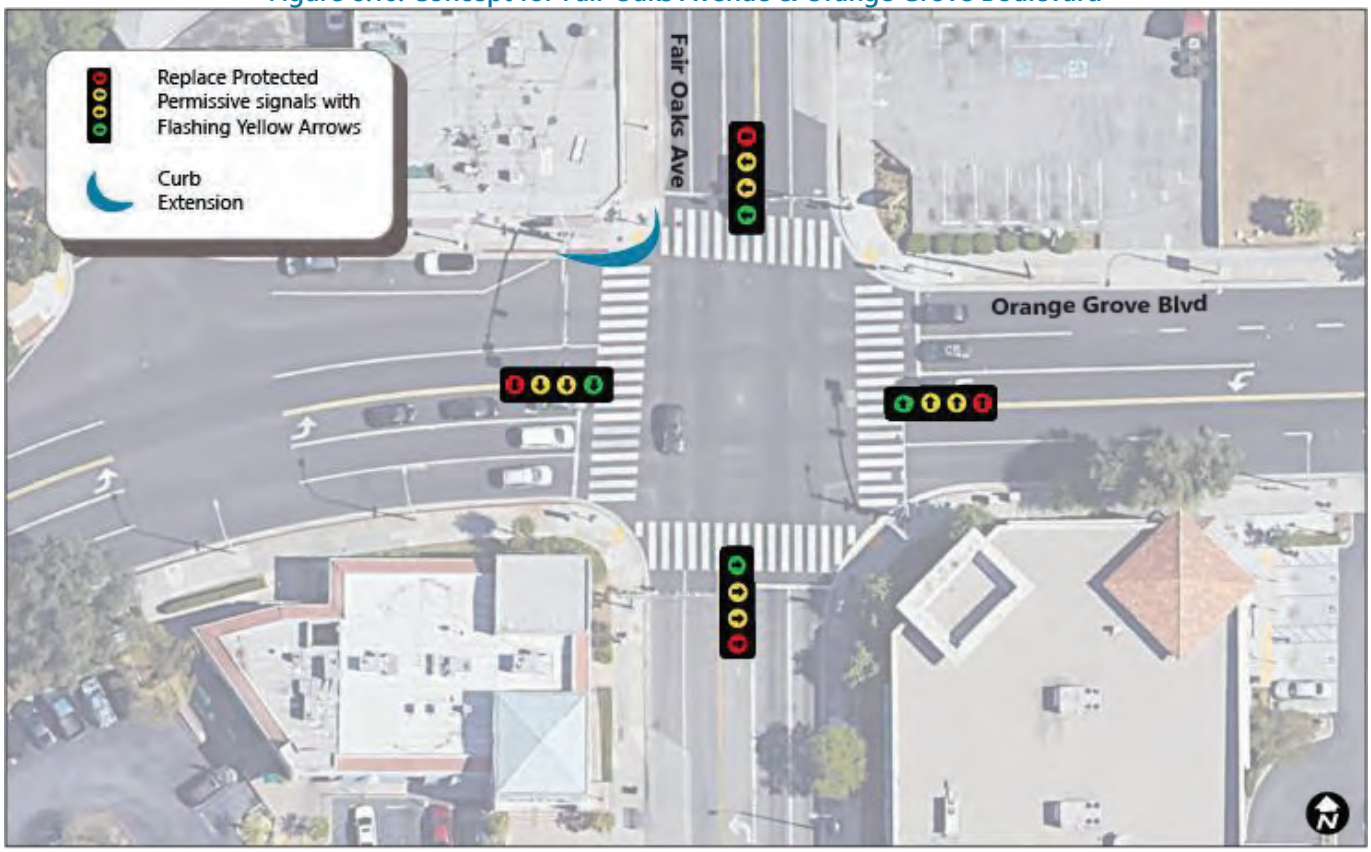
8.3.4 Fair Oaks Ave & Orange Grove Blvd

Fair Oaks Avenue and Orange Grove Boulevard intersection is a four-legged signalized intersection with high visibility crosswalks. Protected-permissive phasing is provided in all directions. The intersection has two travel lanes and a dedicated left-turn lane in each direction. Bus stops for Metro bus lines and Pasadena Transit are provided at this intersection.

A total of 43 collisions occurred at this intersection. The top collision type was sideswipe accounting for 27.9% of total collisions. Also, the leading primary collision factor includes improper turning (23.3%) and automobile right of way (23.3%).

It is recommended that the City consider replacing all protected permissive signals with flashing yellow arrows on all legs of this intersection. The concept is illustrated in Figure 8.16.

Figure 8.16: Concept for Fair Oaks Avenue & Orange Grove Boulevard



8.3.5 Colorado Blvd & Sierra Madre Blvd

The intersection of Colorado Boulevard and Sierra Madre Boulevard is a four-legged signalized intersection with protected-permissive phasing. The intersection has two travel lanes and a dedicated left-turn lane. Also, dedicated right-turn lanes are provided on Colorado Boulevard. A Class II bike lane is provided along Sierra Madre Boulevard, and on-street parking is generally prohibited at the intersection. Bus stops for Foothill Transit and Pasadena Transit bus lines are provided at this intersection.

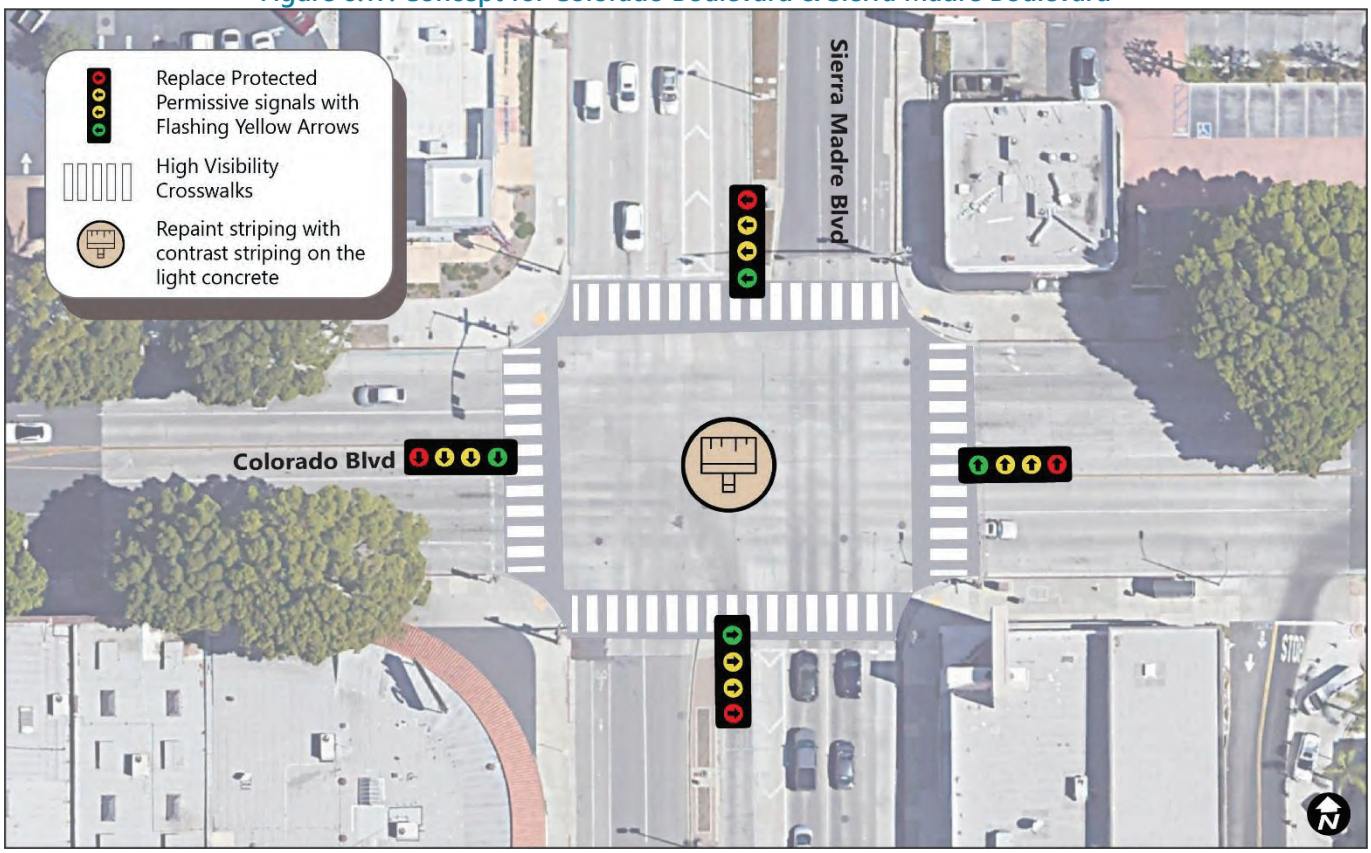
This intersection experienced a total of 43 collisions. Improper turning(16.3%) and automobile right of way (9.3%) accounted for the top primary collision factors. However, the unknown primary collision factor contributed nearly 37.2% of total collisions at this intersection. Roughly half of the collisions occurred during daylight conditions (46.5%). Finally, the broadside collision type accounts for 39.5% of total collisions.

It is recommended that the City consider replacing all protected permissive signals with flashing yellow arrows on all legs of this intersection. High visibility crosswalks are also recommended for consideration on all legs. The striping of the intersection is also recommended to be restriped with contrast striping on the light-colored concrete. The extents of the contrast striping are as follows (measured from the center of the intersection):

- East Leg 195ft
- West Leg 185ft
- North Leg 200ft
- South Leg 200ft

The concepts are illustrated in Figure 8.17.

Figure 8.17: Concept for Colorado Boulevard & Sierra Madre Boulevard



8.3.6 Arroyo Pkwy & Green St

Arroyo Parkway and Green Street is a four-legged signalized intersection. Green Street is an eastbound one-way street with four travel lanes and on-street parking. A raised median is provided on Arroyo Parkway, south of Green Street.

This intersection had a total of 38 collisions. More than half of the collisions were traffic signals and sign violations (57.9%), making this the highest primary collision factor, and five collisions were pedestrian-related. Finally, the broadside collision type accounts for 63.2% of total collisions.

It is recommended that the City consider installing high visibility crosswalks on all legs of this intersection and a curb extension on the northeast corner of Arroyo Parkway. The concepts are illustrated in Figure 8.18.

Figure 8.18: Concept for Arroyo Parkway & Green Street

8.3.7 Lake Ave & Maple St

Lake Avenue and Maple Street is a four-legged signalized intersection near the Lake Avenue Metro L Line station. Marked crosswalks are provided, except for the south leg. Maple Street is a westbound one-way street adjacent to the I-210 westbound on/off ramps. Lake Avenue has two travel lanes in each direction with dual left-turn lanes for the northbound approach.

This intersection had a total of 48 collisions. The top primary collision factor includes unsafe speeding (16.7%) and traffic signals and signs violations (10.4%). However, the unknown primary collision factor contributed nearly 37.5% of total collisions at this intersection. Almost half of all collisions occurred in daylight (43.8%).

It is recommended that the City consider installing high visibility crosswalks on the north, east, and west legs of this intersection. The concepts are illustrated in Figure 8.19.

Figure 8.19: Concept for Lake Avenue & Maple Street

8.3.8 El Molino Ave & Villa St

El Molino Avenue and Villa Street is a four-legged signalized intersection with one travel lane. The intersection has permissive phasing and marked crosswalks in all directions. Also, this intersection is located within the residential neighborhood.

A total of 17 collisions occurred at this intersection, where traffic sign and signal violations (23.5%) accounted for the highest primary collision factor. Pedestrian-related collisions accounted for 17.6% of total collisions.

For improved pedestrian safety, it is recommended that the City consider installing high visibility crosswalks on all legs of the intersection. The concepts are illustrated in Figure 8.20.

Figure 8.20: Concept for El Molino Avenue & Villa Street

8.3.9 Orange Grove Blvd & Sierra Bonita Ave

Orange Grove Boulevard and Sierra Bonita Avenue is a four-legged stop-controlled intersection with stop signs located on Sierra Bonita Avenue. The intersection has high visibility crosswalks and a dedicated left turn lane along Orange Grove Boulevard. Also, on-street parking is provided on Orange Grove Boulevard.

This intersection had a total of four collisions involving automobile right-of-way, improper turning, traffic signal and signs, and unsafe speeding. Collision severity includes complaint of pain, visibly injury, and property damage only.

The City's Capital Improvement Program (CIP) identified this location as a future signalized intersection. Currently, the proposed signal has no funding for implementation. The recommendation for this intersection is to install a traffic signal. The concept is illustrated in Figure 8.21.

Figure 8.21: Concept for Orange Grove Boulevard & Sierra Bonita Avenue

9.0 NON-ENGINEERING SAFETY MEASURES

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

9.1 SIGNALIZED INTERSECTIONS

Currently, the City of Pasadena does not have programs specifically for signalized intersections. In the past, the City implemented the "Stop B4 the Line" safety campaign specific to pedestrian safety at signalized intersections. This asserts the need for more programs to ensure drivers are aware of safe driving practices and the rules of the road at signalized intersections. The following summarizes the recommendations on education and enforcement programs with respective funding sources.

EDUCATION

- Run an advertising campaign on social media platforms (e.g., Facebook, Instagram) and at public events to educate drivers on the dangers of unsafe driving and the rules of the road at signalized intersections
- Develop an online website to provide educational resources such as articles, games, and videos of the rules of the road and how to drive safely at signalized intersections
- Implement targeted safety education programs for vulnerable users such as children (administered in schools) and elderly (administered at community gathering locations) active transportation users. Using presentations and flyers, the program should convey the need for increased precaution at signalized intersections

ENFORCEMENT

- Deploy targeted enforcement at signalized intersections with a history of high numbers of collisions

FUNDING SOURCES

Table 9.1 presents the potential funding sources for programs addressing safety challenges.

Table 9.1: Signalized Intersection Programs Funding Sources

Description	Agency Responsible	Funding Program
EDUCATION		
Run an advertising campaign on social media platforms (e.g., Facebook, Instagram) and at public events to educate drivers on the dangers of unsafe driving and the rules of the road at signalized intersections	City of Pasadena	OTS Grants
Develop an online website to provide educational resources such as articles, games, and videos of the rules of the road and how to drive safely at signalized intersections	City of Pasadena	OTS Grants

Description	Agency Responsible	Funding Program
Implement targeted safety education programs for vulnerable users such as children (administered in schools) and elderly (administered at community gathering locations) active transportation users. Using presentations and flyers, the program should convey the need for increased precaution at signalized intersections	City of Pasadena, Pasadena Unified School District	OTS Grants
ENFORCEMENT		
Deploy targeted enforcement at signalized intersections with a history of high numbers of collisions	City of Pasadena, Pasadena Police Department	OTS Grants

9.2 BICYCLIST AND PEDESTRIAN SAFETY

The Pasadena Police Department currently has a traffic safety website containing information about child safety in a vehicle, seatbelts, school bus/zone, bicycle helmets, driving under the influence (DUI), and enforcement.[2] The Pasadena Police Department also has educational programs where police officers educate young drivers at high schools about traffic safety and DUIs. Pasadena's Department of Transportation (DOT) also offers a website containing videos and information relating to school zones, pedestrians, and bicyclists.[3] The following summarizes the recommendations on education and enforcement programs with respective funding sources.

EDUCATION

Launch an education campaign for motorists on pedestrian rights. This can include:

- Run a Go Human safety advertisement campaign[4] to encourage drivers to watch for people walking and biking. This campaign would be at targeted locations with a history of bicycle and pedestrian collisions. Advertising can be done with neighborhood lawn signs – residents can post these signs on their properties to urge drivers to slow down/stop for pedestrians and bicyclists.
- Incorporate pedestrian and bicycle safety education into physical education classes in the Pasadena Unified School District
- Develop an education campaign for motorists on pedestrian and bicycle rights and rules of the road. This can include:
    - Advertising on the radio, streaming services (Pandora/Spotify), or social media
    - Distributing pamphlets or brochures in schools, parks, and other public places
- Organize bicycle rodeos at schools or other public events to educate the youth on the rules of the road

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[2] Traffic Safety and Education. Pasadena Police Department. (n.d.). Retrieved January 20, 2022, from https://www.cityofpasadena.net/police/traffic-safety-and-education/

[3] Traffic Engineering Safety. Pasadena Department of Transportation. (n.d.). Retrieved January 20, 2022, from https://www.cityofpasadena.net/transportation/traffic-engineering-safety/#common-crash-types

[4] Join the safety campaign. Southern California Association of Governments. (n.d.). Retrieved January 20, 2022, from https://scag.ca.gov/go-human-safety-campaign

ENFORCEMENT

- Deploy targeted enforcement at locations with a history of bicycle and pedestrian collisions

FUNDING SOURCES

Table 9.2 presents potential funding sources for programs addressing bicyclist and pedestrian safety challenges.

Table 9.2: Bicyclist and Pedestrian Safety Program Funding Sources

Description	Agency Responsible	Funding Program
EDUCATION		
Run a Go Human safety advertisement campaign to encourage drivers to watch for people walking and biking. This campaign would be at targeted locations with a history of bicycle and pedestrian collisions.	City of Pasadena	SCAG
Incorporate pedestrian and bicycle safety education into physical education classes in the Pasadena Unified School District	City of Pasadena, Pasadena Unified School District	OTS Grants
Develop an education campaign for motorists on pedestrian and bicycle rights and rules of the road.	City of Pasadena	OTS Grants
Organize bike rodeos at schools or other public events to educate the youth on the rules of the road	City of Pasadena, Pasadena Unified School District	OTS Grants
ENFORCEMENT		
Deploy targeted enforcement at locations with a history of bicycle and pedestrian collisions	City of Pasadena, Pasadena Police Department	OTS Grants

9.3 SPEEDING

Currently, the City of Pasadena does not have programs specific to speeding. However, the City has conducted various safety campaigns associated with speeding in the past. For instance, the City had a school zone safety program that included speed related messaging. The City also had a Slow Streets Program during the pandemic that included over 50-miles of residential streets. The following programs are recommended to address speeding in the City. The following summarizes the recommendations on education and enforcement programs with respective funding sources.

EDUCATION

- Create a social media campaign with infographics conveying the collision and injury statistics associated with speeding vehicles (Facebook, Tik Tok, Twitter, etc).
- Run a Go Human safety advertisement campaign to encourage drivers to watch for people walking and biking. This campaign would be at targeted locations with a history of speeding. Advertising can be done with lawn signs – schools, residents, and businesses can post these signs on their properties to urge drivers to slow down

ENFORCEMENT

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

FUNDING SOURCES

Table 9.3 presents potential funding sources for programs addressing safety challenges for speeding.

Table 9.3: Speeding Program Funding Sources

Description	Agency Responsible	Funding Program
EDUCATION		
Create a social media campaign with infographics conveying the collision and injury statistics associated with speeding vehicles.	City of Pasadena	OTS Grants
Run a Go Human safety advertisement campaign to encourage drivers to watch for speed. This campaign would be at targeted locations with a history of unsafe speed collisions.	City of Pasadena	OTS Grants
ENFORCEMENT		
Install radar speed feedback signs at periodic intervals along arterials with reported speeding issues. These technologies display passing drivers' travel speed below a sign with the posted speed limit, thus showing whether drivers travel over the speed limit.	City of Pasadena, Pasadena Police Department	OTS Grants
Expand the ticketing operations in which police officers equipped with radar or lidar technology are deployed at strategic locations to ticket speeding drivers.	City of Pasadena, Pasadena Police Department	OTS Grants

9.4 SUMMARY OF FUNDING SOURCES

Several state and federal grant programs offer to fund non-engineering roadway safety projects. The California Department of Transportation's (Caltrans) Active Transportation Program (ATP) aims to encourage bicycle and pedestrian use by funding programs that increase bike or pedestrian mode share or improve bicycle or pedestrian safety. Caltrans also administers the Sustainable Communities Grant Program, which awards grants to municipal projects that reduce Greenhouse Gas Emissions and support Multi-modal transportation. The Sustainable Communities Program prioritizes projects that solicit stakeholder and community engagement and support state policies like the 2040 California Transportation Plan. The California Office of Traffic Safety awards grants for projects addressing ten priority areas, including driving under the influence (DUI), distracted driving, pedestrian and bicycle safety, law enforcement, safety data collection, and marketing/publicity campaigns.

The Advanced Transportation and Congestion Management Technologies Deployment Program funds technology to promote safety and efficiency in the transportation system at the federal level. The Highway Safety Improvement

Program (HSIP) funds safety projects on any public roadway. The program mainly supports engineering projects, but the program's legislation permits funding for law enforcement and data collection efforts. Table 9.4 summarizes the funding opportunities

Table 9.4 Transportation Safety Funding Summary

Agency	Source	Eligible Programs	Areas Addressed
Federal Highway Administration (FHWA)	Highway Safety Improvement Program (HSIP)	Any roadway improvements related to public roads, bikeways, and pedestrian paths/trails. For the most part, only engineering projects are eligible, but the FAST Act permits funding for data collection by law enforcement[1,2].	Data Collection
Federal Highway Administration (FHWA)	Advanced Transportation and Congestion Management Technologies Deployment Program	Funds advanced transportation and congestion management technologies to improve safety, efficiency, and performance. Funded project types include advanced traveler information systems and data collection and analysis efforts[3].	Digital Enforcement; Technology Partnerships
California Department of Transportation (Caltrans)	Active Transportation Program (ATP)	Local government projects improve safety or increase bicycling and walking mode share. Additional program objectives include reducing emissions and enhancing public health[4].	Bicycle and Pedestrian Education and Enforcement
California Department of Transportation (Caltrans)	Sustainable Communities Grant Program	The program awards "Competitive Grants" to local governments. These grants prioritize projects that reduce Greenhouse Gas Emissions, support multi-modal transportation, involve stakeholder/ community engagement, and support related plans like the California Transportation Plan and California Complete Streets Framework[5].	Active Transportation
			Speed and Education
California Office of Traffic Safety	Office of Traffic Safety (OTS) Grants	Programs should address one of ten priority areas (six relevant ones listed to the right). Grant recipients should expect to wait up to 90 days before being reimbursed/funded and should be able to provide traffic safety data to justify funded programs[6].	DUI
			Distracted Driving
			Ped/Bike Safety
			Police Enforcement
			Roadway Safety and Data Collection
			Social Media/Marketing

Sources:

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

10.0 SAFETY PROJECTS

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

10.1 PROJECT SCOPES AND BENEFIT CALCULATIONS

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

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

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

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

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

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

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

The safety project scopes are listed in Table 10.1 and Table 10.2, including the applicable countermeasure category for each improvement and benefits calculated according to the method above.

Table 10.1 Safety Project Scopes

	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)
1	Fair Oaks Ave & Maple St	S08	Convert signal mast arm	Replace protected left turn signal with a protected left turn signal mast arm (northbound)	All	30%	20
		Other	Contrast Striping	Restripe the intersection with contrast striping. Extents of the restriping are as follows: - East leg 123ft - West leg 60ft - North leg 144ft - South leg 2035ft	-		
		S02	Nearside Signals	Install near side signal on the northbound and southbound approaches	All		
		S02	Retro-reflective backing plates	Upgrade all existing traffic signals with retro-reflective backing plates.	All		
2	Orange Grove Bl & Sierra Bonita Ave	NS03	Install Signal	Install traffic signal	All	14%	20
3	Washington Bl from Forest Ave to Catalina Ave	R32PB	Install Bike Lane	Install buffered 5' bike lanes with 2' striped buffer from Lincoln Ave to El Molino Ave and a Class III bike route from Forest Ave to Lincoln Ave	P&B	35%	20
		Other	Striping	Replace pavement markers with thermo plastic of paint			
4	Del Mar Bl from Los Robles Ave to east City Limit	R32PB	Install Bike Lane	Install Class II bike lanes and remove one travel lane from each direction.	P&B	35%	20
		Other	Striping	Replace pavement markers with thermo plastic or paint			
5	Multiple Locations	S02	Retro-reflective backing plates	Upgrade existing traffic signals with retro-reflective backing plates	All	15%	10
6	Multiple Locations	S02	Nearside Signals	Install nearside signal heads	All	15%	10
7	Multiple Locations	NS22PB	Rectangular Rapid Flashing Beacon (RRFB)	Install Rectangular Rapid Flashing Beacons - Los Robles Ave & Jackson St - Madre St btwn Del Mar Bl & Thorndale Rd - Halstead St btwn Rosemead Bl & Foothill Bl	P&B	35%	20

Table 10.1 Safety Project Scopes

	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)
				- Marengo Ave & Wallis St			
8	Multiple Locations	NS23PB	HAWK Signal	Install HAWK Signals at the following locations: - Bresse Ave & Washington Bl (east leg) - Atchison St & Lake Ave - Elizabeth St & Lake Ave (South leg) - Lincoln Ave & Toolen Place	P&B	55%	20
9	Multiple Locations	R22	Regulatory Signs	Upgrade signs with new fluorescent sheeting	All	15%	10

Table 10.2 Optional Safety Project Scopes

	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)
1	Lake Ave & Washington Bl	Other	Flashing yellow arrow	Replace protected permissive signals with flashing yellow arrows on all directions	Left Turn	14%	20
		Other	High visibility crosswalks	Install high visibility crosswalks	Vehicle/ Pedestrian		
2	Fair Oaks Ave & Washington Bl	Other	High visibility crosswalks	Install high visibility crosswalks	Vehicle/ Pedestrian	14%	20
		Other	Flashing Yellow Arrow	Install flashing yellow arrows on all directions	Left Turn		
3	Fair Oaks Ave & Orange Grove Bl	Other	Flashing Yellow Arrow	Install flashing yellow arrows on all directions	Left Turn	14%	20
		Other	Curb Extensions	Install curb extension on the northwest corner of Orange Grove Blvd	P&B		
4	Colorado Bl & Sierra Madre Bl	Other	High visibility crosswalks	Install high visibility crosswalks	Vehicle/ Pedestrian	14%	20
		Other	Flashing Yellow Arrow	Add flashing yellow arrows in all directions	Left Turn		
5	Arroyo Pkwy & Green St	Other	High visibility crosswalks	Install high visibility crosswalks	Vehicle/ Pedestrian	40%	10

Table 10.2 Optional Safety Project Scopes

	Location	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)
		Other	Curb Extensions	Install curb extension on the northeast corner of Arroyo Pkwy	P&B		
6	Lake Ave & Maple St	Other	High visibility crosswalks	Install high visibility crosswalks	Vehicle/ Pedestrian	40%	10
7	El Molino Ave & Villa St	Other	High visibility crosswalks	Install high visibility crosswalks	Vehicle/ Pedestrian	40%	10
8	Lake Ave from Mountain St to California Bl	Other	Install dynamic speed warning signs	Install speed feedback signs -South of Orange Grove Blvd (southbound) -South of Villa St (northbound)	All	22%	10
		Other	Striping	Replace pavement markers with thermo plastic or paint from Colorado Bl to Walnut St			
9	Los Robles Ave from Washington Bl to Maple St	Other	Install dynamic speed warning signs	Install speed feedback signs -North of E Ashtabula St (northbound) -South of Mountain St (southbound)	All	22%	10
10	Multiple Locations	Other	Restriping	Restripe existing lanes with contrast striping on the light concrete	-	-	10

10.2 COST ESTIMATE

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

10.3 BENEFIT/COST RATIO

A Benefit/Cost Ratio (BCR) is the ratio of a project's benefits relative to its costs, and both are expressed in monetary terms. Projects with a higher BCR mean greater benefits relative to costs, while a lower BCR means fewer benefits relative to costs.

Based on Caltrans's need for a fair, data-driven, statewide project selection process for HSIP call-for-projects, the benefit and cost calculations were completed using the same process shown in the HSIP Analyzer to calculate the B/C ratio of the project. The B/C ratios were used to identify the projects with high cost-effectiveness that may have a greater chance of receiving federal funding in Caltrans call-for-projects. Table 10.3 and Table 10.4 summarizes the proposed safety projects

with respective BCRs. The detail of the safety project, including the BCR analysis summary table, is provided in Appendix E.

Table 10.3 Benefits/Cost Ratio Analysis by Safety Project

	Location	CM #	Countermeasure Names	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/ Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
1	Fair Oaks Ave & Maple St	S08	Convert signal mast arm	52	$2,860,800	$3,432,960	$104,042	33.0	90%	$93,638	$10,404
		Other	Contrast Striping								
		S02	Nearside Signals								
		S02	Retro-reflective backing plates								
2	Orange Grove Bl & Sierra Bonita Ave	NS03	Install Signal	4	$280,600	$157,136	$435,800	0.4	90%	$392,220	$43,580
3	Washington Bl from Forest Ave to Catalina Ave	R32PB	Install Bike Lane	30	$10,513,300	$14,718,620	$157,389	93.5	90%	$141,650	$15,739
		Other	Striping								
4	Del Mar Bl from Los Robles Ave to east City Limit	R32PB	Install Bike Lane	19	$4,497,200	$6,296,080	$265,920	23.7	90%	$239,328	$26,592
		Other	Striping								
5	Multiple Locations	S02	Retro-reflective backing plates	2118	$180,900,900	$54,270,270	$669,760	81.0	90%	$602,784	$66,976
6	Multiple Locations	S02	Nearside Signals	418	$39,072,100	$11,721,630	$247,229	47.4	90%	$222,506	$24,723
7	Multiple Locations	NS22PB	Rectangular Rapid Flashing Beacon (RRFB)	5	$3,268,600	$4,576,040	$301,450	15.2	90%	$271,305	$30,145
8	Multiple Locations	NS23PB	HAWK Signal	0	$0	$0	$2,188,426	0.0	90%	$1,969,583	$218,843
9	Multiple Locations	R22	Regulatory Signs	488	$50,393,100	$15,117,930	$124,750	121.2	90%	$112,275	$12,475

Table 10.4 Benefits/Cost Ratio Analysis by Optional Safety Project

	Location	CM #	Countermeasure Names	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/ Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
1	Lake Ave & Washington Bl	Other	Flashing Yellow Arrow	17	$1,220,300	$698,012	$63,464	11.0	0%	$0	$63,464
		Other	High visibility crosswalks								
2	Fair Oaks Ave & Washington Bl	Other	High visibility crosswalks	7	$2,249,400	$1,259,664	$63,464	19.8	0%	$0	$63,464
		Other	Flashing Yellow Arrow								
3	Fair Oaks Ave & Orange Grove Bl	Other	Flashing Yellow Arrow	16	$1,198,400	$671,104	$489,924	1.4	0%	$0	$489,924
		Other	Curb Extensions								
4	Colorado Bl & Sierra Madre Bl	Other	High visibility crosswalks	11	$536,900	$300,664	$63,464	4.7	0%	$0	$63,464
		Other	Flashing Yellow Arrow								
5	Arroyo Pkwy & Green St	Other	High visibility crosswalks	2	$250,800	$200,640	$467,140	0.4	0%	$0	$467,140
		Other	Curb Extensions								
6	Lake Ave & Maple St	Other	High visibility crosswalks	0	$0	$0	$17,600	0.0	0%	$0	$17,600
7	El Molino Ave & Villa St	Other	High visibility crosswalks	2	$1,877,900	$1,502,320	$22,040	68.2	0%	$0	$22,040

Table 10.4 Benefits/Cost Ratio Analysis by Optional Safety Project

	Location	CM #	Countermeasure Names	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/ Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
8	Lake Ave from Mountain St to California Bl	Other	Install dynamic speed warning signs	415	$39,504,200	$17,381,848	$55,409	313.7	0%	$49,868	$5,541
		Other	Striping								
9	Los Robles Ave from Washington Bl to Maple St	Other	Install dynamic speed warning signs	123	$16,065,100	$7,068,644	$40,280	175.5	0%	$36,252	$4,028
10	Multiple Locations	Other	Restriping	0	$0	$0	$2,661,888	-	0%	$0	$2,661,888

As shown in the table above (Table 10.3 and Table 10.4), the improvements are listed by intersections, roadway segments, and systemic improvements. Some improvements have a BCR of zero due to no collisions associated with the improvement type. The calculated BCR for each project summarizes the cost-effectiveness of the 19 proposed safety projects without considering how the project would be funded.

10.4 PROJECT PRIORITIZATION

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

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

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

Considering the HSIP application, Table 10.5 summarizes the BCR analysis for the safety projects. The safety projects are categorized by countermeasure ID and are prioritized by BCR. The City may use the list from Table 10.5 to determine which will be implemented based on the City's goals and funding availability. The City may also determine which project to be prioritized based on available funding sources, public support, and other factors.

Table 10.5: Safety Project List

Location	CM #	Countermeasure Names	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
Multiple Locations	R22	Regulatory Signs	488	$50,393,100	$15,117,930	$124,750	121.2	90%	$112,275	$12,475
Washington Bl from Forest Ave to Catalina Ave	R32PB	Install Bike Lane	30	$10,513,300	$14,718,620	$157,389	93.5	90%	$141,650	$15,739
	Other	Striping								
Multiple Locations	S02	Retro-reflective backing plates	2118	$180,900,900	$54,270,270	$669,760	81.0	90%	$602,784	$66,976
Multiple Locations	S02	Nearside Signals	418	$39,072,100	$11,721,630	$247,229	47.4	90%	$222,506	$24,723
Fair Oaks Ave & Maple St	S08	Convert signal mast arm	52	$2,860,800	$3,432,960	$104,042	33.0	90%	$93,638	$10,404
	Other	Contrast Striping								
	S02	Nearside Signals								
	S02	Retro-reflective backing plates								
Del Mar Bl from Los Robles Ave to east City Limit	R32PB	Install Bike Lane	19	$4,497,200	$6,296,080	$265,920	23.7	90%	$239,328	$26,592
	Other	Striping								
Multiple Locations	NS22PB	Rectangular Rapid Flashing Beacon (RRFB)	5	$3,268,600	$4,576,040	$301,450	15.2	90%	$271,305	$30,145

APPENDIX A
INTERSECTION COLLISION SUMMARY

Pasadena LRSP

Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
1	LAKE AVE & ORANGE GROVE BL	69		1	9	19	40	22	5	2	7	2		21	7	3
2	FAIR OAKS AVE & MAPLE ST	47			6	15	26	25		1	2		1	11	7	
3	CORSON ST & LAKE AVE	46			3	15	28	16		1		1		12	15	1
4	LAKE AVE & WASHINGTON BL	45			4	18	23	9	9	1	4			7	11	4
5	LAKE AVE & MAPLE ST	44		1	2	8	33	14		1	3	2		16	8	
6	PASADENA AVE & STATE ST	38			5	10	23	20	3	1	3			6	5	
7	FAIR OAKS AVE & ORANGE GROVE BL	38			7	7	24	7	3	1	3	2	1	9	10	2
8	COLORADO BL & SIERRA MADRE BL	38	1	1	2	8	26	17	1	2	2			10	5	1
9	ARROYO PKWY & GREEN ST	38		1	8	15	14	24	1	2	2			1	7	1
10	FAIR OAKS AVE & WASHINGTON BL	37	1	1	1	14	20	9	5	2	1	1		12	5	2
11	GREEN ST & MARENGO AVE	34			4	9	21	18	1	1	2		2	3	5	2
12	LA TIERRA ST & SAN GABRIEL BL	32			1	11	20	19	1	2	1			2	7	
13	COLORADO BL & FAIR OAKS AVE	32		1	6	9	16	7			1	1		10	6	7
14	ALLEN AVE & WASHINGTON BL	32			5	8	19	7	4		1	1		12	6	1
15	MARENGO AVE & UNION ST	31			4	11	16	22			2			2	2	3
16	FAIR OAKS AVE & MOUNTAIN ST	31			4	11	16	9	1	1	4			9	5	2
17	LAKE AVE & WALNUT ST	31			3	9	19	3	2	4	1	2		13	3	3
18	COLORADO BL & HILL AVE	31			6	5	20	10	4	1	3		1	5	5	2
19	LOS ROBLES AVE & WALNUT ST	30			3	5	22	13	1	1	2	2	1	6	3	1
20	HILL AVE & WALNUT ST	30			3	6	21	11	4		2			12	1	
21	HOLLY ST & ORANGE GROVE BL	29		2	4	8	15	16	4		1			3	5	
22	LAKE AVE & MOUNTAIN ST	29			6	10	13	9	5	3	1			6	2	3
23	COLORADO BL & ORANGE GROVE BL	29			4	3	22	16	3		2			3	5	
24	COLORADO BL & RAYMOND AVE	29		1	1	6	21	6			1	1		7	11	3
25	CALIFORNIA BL & SAN GABRIEL BL	29			8	2	19	13	3	1	3			6	3	
26	MAPLE ST & MARENGO AVE	27			4	7	16	15	1	1			1	5	4	
27	DEL MAR BL & FAIR OAKS AVE	27			4	9	14	3	2		3	1		11	6	1
28	COLORADO BL & LOS ROBLES AVE	27			5	6	16	11	2		3			4	7	
29	SIERRA MADRE VILLA AVE & WALNUT ST	26			4	9	13	16		1				3	4	2

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			COLLISION SEVERITY					COLLISION TYPE								
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30	FAIR OAKS AVE & WALNUT ST	26	1		4	4	17	10	1				1	4	8	2
31	ARROYO PKWY & CALIFORNIA BL	26		2	3	5	16	13	1	1	2			8	1	
32	FOOTHILL BL & SAN GABRIEL BL	25			2	6	17	7	3	2	3			6	4	
33	FOOTHILL BL & SIERRA MADRE BL	25		1	3	7	14	14	4	1	2			1	3	
34	COLORADO BL & LAKE AVE	25			1	13	11	6	3	1		1		10	3	1
35	ALLEN AVE & COLORADO BL	25			3	5	17	14	2	2		1		3	3	
36	LAKE AVE & VILLA ST	24	1		2	10	11	7	1					11	3	2
37	ARROYO PKWY & DEL MAR BL	24			2	4	18	8	3	1	3	2		4	2	1
38	FOOTHILL BL & SIERRA MADRE VILLA AVE	23			1	7	15	3	1		1			12	5	1
39	CORSON ST & HILL AVE	23			2	7	14	12			1			8	2	
40	ALTADENA DR & FOOTHILL BL	23			3	4	16	12	1	1	1			1	4	3
41	CORSON ST & FAIR OAKS AVE	22			4	6	12	13	1	1	1	1		3	2	
42	DEL MAR BL & LAKE AVE	22			8	9	5	6	5		2			6		3
43	EL MOLINO AVE & ORANGE GROVE BL	22			3	5	14	8	1	1	1			5	3	3
44	LOS ROBLES AVE & WASHINGTON BL	21			1	6	14	4	5	1				8	2	1
45	RAYMOND AVE & UNION ST	21			2	5	14	7		2	1			6	4	1
46	LOS ROBLES AVE & ORANGE GROVE BL	21		1	2	4	14	9	3					7	1	1
47	MARENGO AVE & WALNUT ST	21		1	4	4	12	11	1	2	2	1		2	2	
48	GREEN ST & LOS ROBLES AVE	21				5	16	15		1		1			4	
49	DEL MAR BL & MARENGO AVE	21		1	3	5	12	7	2		4			4	1	3
50	CORDOVA ST & LAKE AVE	21			2	5	14	6	2	1	1			8	2	1
51	BONNIE AVE & COLORADO BL	21			4	2	15	6	1	1	3			5	3	2
52	CALIFORNIA BL & RAYMOND AVE	21		1	3	4	13	14		1	1			3	1	1
53	CALIFORNIA BL & LAKE AVE	21			1	6	14	5	1	1				7	6	1
54	MARENGO AVE & VILLA ST	20		1	1	11	7	4	2	1	2			9	1	1
55	LAKE AVE & UNION ST	20	1		3	7	9	10	1		1			2	4	2
56	GARFIELD AVE & WASHINGTON BL	20			5	5	10	8	1	1	1			6	3	
57	GREEN ST & LAKE AVE	20		1	4	8	7	13				1		2	4	
58	COLORADO BL & SAN GABRIEL BL	20		2		5	13	4	1	1	1	1		6	4	2

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
59	COLORADO BL & WILSON AVE	20		1	2	5	12	9	2	1				5	3	
60	ALLEN AVE & ORANGE GROVE BL	20			5	7	8	6	3					5	6	
61	ALLEN AVE & WALNUT ST	20			6	7	7	12	3					1	1	3
62	FOOTHILL BL & ROSEMEAD BL	19			1	4	14	3		1	1			10	3	1
63	FAIR OAKS AVE & GREEN ST	19		1	3	4	11	2	1	1	4			7	4	
64	COLORADO BL & PASADENA AVE	19	1		5	5	8	11	1	2	2		1	1	1	
65	DEL MAR BL & LOS ROBLES AVE	19			5	4	10	4	5				1	5	4	
66	ARROYO PKWY & FILLMORE ST	19				8	11	7	1	1	1		1	5	3	
67	ORANGE GROVE BL & SIERRA MADRE BL	18			6	5	7	12	1					3	2	
68	RAYMOND AVE & WASHINGTON BL	18	1		3	2	12	8	1					2	5	2
69	HILL AVE & WASHINGTON BL	18			2	7	9	12	1		1			3	1	
70	HILL AVE & MAPLE ST	18			1	3	14	7		1	1			2	7	
71	FAIR OAKS AVE & HOWARD ST	18		1	2	6	9	7	2					5	4	
72	DEL MAR BL & SAN MARINO AVE	18			7	6	5	11	3					3		1
73	CORSON ST & MARENGO AVE	18			2	5	11	9		1	1			2	4	1
74	CORSON ST & LOS ROBLES AVE	18		1	1	9	7	8		1	3			3	3	
75	CALIFORNIA BL & SAINT JOHN AVE	18				4	14	7		2	1			1	7	
76	CALIFORNIA BL & PASADENA AVE	18				5	13	7	1	1	1			7	1	
77	LINCOLN AVE & MONTANA ST	17			1	7	9	8			1	1		6	1	
78	DEL MAR BL & SAN GABRIEL BL	17			3	5	9	7	2	2	1	1		3	1	
79	COLORADO BL & SAINT JOHN AVE	17			3	3	11	13			1			2	1	
80	COLORADO BL & MARENGO AVE	17			3	3	11	8	3				1	1	3	1
81	DEL MAR BL & SIERRA MADRE BL	17				6	11	7	2	1				3	4	
82	CALIFORNIA BL & ORANGE GROVE BL	17			1	3	13	5		3	1			5	2	1
83	ALLEN AVE & MAPLE ST	17			3	2	12	8	1	1	3			3	1	
84	LINCOLN AVE & WYOMING ST	16			1	5	10	5	2		1			3	5	
85	FAIR OAKS AVE & TREMONT ST (N)	16			3	3	10	5	1					3	6	1
86	FAIR OAKS AVE & UNION ST	16			3	4	9	6	2		1			4	2	1
87	GLENARM ST & MARENGO AVE	16			3	4	9	8	1		1		1	3	1	1

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Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
88	DEL MAR BL & RAYMOND AVE	16			1	5	10	2			1	3		4	4	2
89	COLUMBIA ST & ORANGE GROVE BL	16			3	7	6	10			1	1		3	1	
90	EL MOLINO AVE & VILLA ST	16	1	1	2	5	7	4	2	1		1		4	2	2
91	CORDOVA ST & LOS ROBLES AVE	16		1	5	2	8	8	3					4	1	
92	CALIFORNIA BL & FAIR OAKS AVE	16			1	7	8	7	1	1				5	2	
93	ALTADENA DR & MAPLE ST	16			4	4	8	16								
94	ALTADENA DR & ORANGE GROVE BL	16			1	7	8	10			2			1	3	
95	ALLEN AVE & MOUNTAIN ST	16			5	3	8	7	2					4	2	1
96	ORANGE GROVE BL & RAYMOND AVE	15		3	3	3	6	8	1				1	2	2	1
97	GARFIELD AVE & ORANGE GROVE BL	15		1	2	1	11	7	1		2			2	1	2
98	GREEN ST & RAYMOND AVE	15		1	2	3	9	4						3	7	1
99	COLORADO BL & DE LACEY AVE	15		1	1	2	11	3		1	1			2	8	
100	COLORADO BL & MENTOR AVE	15		1	2	3	9	8			1			3	3	
101	COLORADO BL & HUDSON AVE	15			1	7	7	9				2		1	2	1
102	COLORADO BL & MADRE ST	15		1	1	4	9	7	2					5		1
103	ALTADENA DR & CORSON ST	15			1	5	9	8			2			4	1	
104	CALIFORNIA BL & OAK KNOLL AVE	15		1	3	7	4	8	1		1			2	3	
105	CALIFORNIA BL & MARENGO AVE	15			1	6	8	6	1					4	2	2
106	ALTADENA DR & SIERRA MADRE BL	15				10	5	8	1		2			2	1	1
107	BONNIE AVE & DEL MAR BL	15			3	3	9	8	2					2	2	1
108	ARROYO PKWY & GLENARM ST	15		1		7	7	6	2					7		
109	ARROYO PKWY & COLORADO BL	15			1	2	12	4	1					7	2	1
110	LOS ROBLES AVE & MOUNTAIN ST	14		1	2	4	7	5			1			6	1	1
111	UNION ST & WILSON AVE	14	1		2	2	9	8	2			1		2	1	
112	WALNUT ST & WILSON AVE	14		1	4	3	6	9		1	1			2		1
113	MOUNTAIN ST & RAYMOND AVE	14		1	2	3	8	6	2		2			2	2	
114	FOOTHILL BL & HALSTEAD ST	14		1	1	4	8	2		1	1			6	4	
115	LINCOLN AVE & ORANGE GROVE BL	14			4	4	6	10			1			1	1	1
116	GREEN ST & FAIR OAKS AVE	14			2	1	11		1	3		1		5	2	2

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Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
117	GLENARM ST & LOS ROBLES AVE	14			1	4	9	5	1	3				1	2	2
118	DEL MAR BL & EL MOLINO AVE	14			4	5	5	4	1	3				3	1	2
119	DEL MAR BL & HILL AVE	14			2	2	10	5	3					4	1	1
120	CORSON ST & WALNUT ST	14			1	5	8	7	5	1				1		
121	CORDOVA ST & MARENGO AVE	14			1	3	10	5	1		1			6	1	
122	ALLEN AVE & CORSON ST	14			2	4	8	6	1	1				3	2	1
123	CALIFORNIA BL & HUDSON AVE	14			1	4	9	6	1					1	6	
124	PASADENA AVE & WALNUT ST	13	1	2	1	4	5	7		3				1	1	1
125	MARENGO AVE & ORANGE GROVE BL	13			2	3	8	3	2					7	1	
126	HILL AVE & VILLA ST	13			2	3	8	7		2				4		
127	HOLLY ST & RAYMOND AVE	13				1	12	3		1	1			4	4	
128	EL MOLINO AVE & WALNUT ST	13			1	5	7	12						1		
129	CORDOVA ST & OAKLAND AVE	13				3	10	11	1						1	
130	DEL MAR BL & HUDSON AVE	13			3	3	7	5	1					3	3	1
131	CATALINA AVE & WASHINGTON BL	13			1	6	6	6	1		1			4		1
132	ALLEN AVE & VILLA ST	13			2	3	8	3				1		4	4	1
133	LOS ROBLES AVE & MAPLE ST	12			2	5	5	6		1				4	1	
134	ORANGE GROVE BL & WORCESTER AVE	12				4	8	2				1		5	4	
135	SIERRA MADRE BL & SIERRA MADRE VILLA AVE	12			2	6	4	2		2	2			5	1	
136	LOS ROBLES AVE & VILLA ST	12			2	1	9	5				1		4	2	
137	LAKE AVE & SAN PASQUAL ST	12				3	9	2			1	2		3	2	2
138	GLENARM ST & PASADENA AVE	12				5	7	3	2	1				5	1	
139	EL MOLINO AVE & MAPLE ST	12			2	5	5	8		1				2	1	
140	DEL MAR BL & MADISON AVE	12		1		4	7	8			1			1	2	
141	CORDOVA ST & EL MOLINO AVE	12			1	4	7	9	1			1			1	
142	COLORADO BL & CRAIG AVE	12			2	4	6	7						1	2	2
143	DEL MAR BL & PASADENA AVE	12				2	10	1		1	1			1	8	
144	COLORADO BL & OAK KNOLL AVE	12			1	2	9	7						3	2	
145	CORSON ST & EL MOLINO AVE	12				7	5	11						1		

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
146	BOYLSTON ST & LAKE AVE	12		1	2	3	6	3	2					3		4
147	ARLINGTON DR & PASADENA AVE	12			4	3	5	9		1	1			1		
148	LINCOLN AVE & WASHINGTON BL	11			1	5	5	5	1	1				4		
149	HASTINGS RANCH DR & ROSEMEAD BL	11				3	8	2	1					5	2	1
150	HOLLISTON AVE & WASHINGTON BL	11	1			5	5	6	2					2	1	
151	FAIR OAKS AVE & GLENARM ST	11		1	4	1	5	6			1			3	1	
152	GREEN ST & HOLLISTON AVE	11			1	4	6	10						1		
153	EL MOLINO AVE & MOUNTAIN ST	11				2	9	3			1	1	1	3	1	1
154	COLORADO BL & OAKLAND AVE	11			5	1	5	3		1	2			3	2	
155	EUCLID AVE & GLENARM ST	11			5	3	3	7			1		1	1		1
156	CALIFORNIA BL & LOS ROBLES AVE	11		1		1	9	2	2	1	1			2	3	
157	ALTADENA DR & COLORADO BL	11			2	3	6	5	2					2	1	1
158	CHESTER AVE & GREEN ST	11			3	3	5	7				1			2	1
159	ALLEN AVE & DEL MAR BL	11			1	4	6	9						1	1	
160	ARROYO PKWY & UNION ST	11			3	2	6	6						1	3	1
161	SAN GABRIEL BL & WALNUT ST	10			1	3	6	5	1	1				3		
162	MAPLE ST & SIERRA MADRE BL	10			4	2	4	7					1	2		
163	MOUNTAIN ST & SUMMIT AVE	10			3	2	5	3		2			1	3	1	
164	MENTOR AVE & WASHINGTON BL	10			2		8	5	1						4	
165	ORANGE GROVE BL & WILSON AVE	10			3	1	6	2	1		1			4	1	1
166	MENTOR AVE & VILLA ST	10				2	8	7	2		1					
167	FOOTHILL BL & MICHILLINDA AVE	10			3	2	5	3		1	1			2	2	1
168	FAIR OAKS AVE & MONTANA ST	10		1	3	3	3	3						4	2	1
169	HILL AVE & ORANGE GROVE BL	10				4	6	3	1					5	1	
170	GREEN ST & MENTOR AVE	10			2	3	5	3			1			2	3	1
171	DEL MAR BL & WILSON AVE	10				5	5	5						4	1	
172	COLORADO BL & EUCLID AVE	10			1	2	7	2						6	1	1
173	CORDOVA ST & OAK KNOLL AVE	10			1	5	4	10								
174	CRAIG AVE & DEL MAR BL	10			2	3	5	4		4					2	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
175	COLORADO BL & GARFIELD AVE	10				2	8	1	1					4	3	1
176	COLUMBIA ST & PASADENA AVE	10			1	2	7	3	1					5	1	
177	DOMINION AVE & WASHINGTON BL	10			3	1	6	4		1				3	1	1
178	COLORADO BL & HOLLISTON AVE	10			3	4	3	6	1	2						1
179	CORSON ST & WILSON AVE	10			1	1	8	6		2	1				1	
180	DEL MAR BL & ORANGE GROVE BL	10			2	1	7	1		3			1	1	3	1
181	DEL MAR BL & HOLLISTON AVE	10				1	9	6	1					3		
182	ALTADENA DR & VILLA ST	10			2	5	3	4		1	1			2	2	
183	ARROYO PKWY & HOLLY ST	10			1	1	8							4	4	2
184	CATALINA AVE & COLORADO BL	10			1	1	8	5		1				2	2	
185	ALLEN AVE & CASA GRANDE ST (N)	10			1	2	7	3	1			1		3	2	
186	BELLEFONTAINE ST & PASADENA AVE	10			1	2	7	3		1				4	2	
187	BELLEVUE DR & FAIR OAKS AVE	10			3	5	2	8			1				1	
188	MENTOR AVE & UNION ST	9			3		6	8		1						
189	MAR VISTA AVE & VILLA ST	9			2	1	6	2	2					3	1	1
190	ROSEMONT AVE & SECO ST	9			3	1	5	2			1			4	1	1
191	MAPLE ST & WILSON AVE	9			1	4	4	6		1					1	1
192	MARENGO AVE & WASHINGTON BL	9			4	2	3	4	1		1			1	2	
193	MENTOR AVE & ORANGE GROVE BL	9			1	1	7	5				1		2	1	
194	FAIR OAKS AVE & HAMMOND ST	9			2	3	4	2	2	1	2			2		
195	GREENHILL RD & MICHILLINDA AVE	9				2	7	6	1					2		
196	FAIR OAKS AVE & VILLA ST	9				2	7	6						1	2	
197	GLENARM ST & RAYMOND AVE	9			2	3	4	1	3	2				3		
198	HOWARD ST & LINCOLN AVE	9				2	7	2		3				1	2	1
199	HILL AVE & MOUNTAIN ST	9				2	7	2	1	1	1			4		
200	FAIR OAKS AVE & PEORIA ST (N)	9			2	1	6	4						4	1	
201	EL MOLINO AVE & WASHINGTON BL	9			2	5	2	3	2		1	1		1		1
202	COLORADO BL & MADISON AVE	9			1	2	6	1				1		5	2	
203	DAISY AVE & FOOTHILL BL	9			1	1	7	2	1	1	2				2	1

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
204	COLORADO BL & SUNNYSLOPE AVE	9		1	5	1	2	2		1		1				5
205	COLORADO BL & KINNELOA AVE	9			2	1	6	5	1	1				1	1	
206	DEL MAR BL & OAK KNOLL AVE	9		1	4	3	1	4	1					2		2
207	BELLEFONTAINE ST & SAINT JOHN AVE	9		1	3	1	4	3		1				1	4	
208	ALTADENA DR & DEL MAR BL	9			3	2	4	3	1		1			1	1	2
209	ARROYO PKWY & PICO ST	9				1	8	1		2				4	2	
210	ALPINE ST & LOS ROBLES AVE	9			1	1	7	4	1					4		
211	ARLINGTON DR & FAIR OAKS AVE	9				1	8	1				1		6	1	
212	LOS ROBLES AVE & WOODBURY RD	8			6	1	1	3						1	3	1
213	SUMMIT AVE & WASHINGTON BL	8			1	1	6	3						1	4	
214	ORANGE GROVE BL & ROSEMONT AVE	8			1	1	6	1		3				1	2	1
215	SIERRA MADRE BL & WALNUT ST	8			1	1	6	4		1				3		
216	PALOMA ST & SIERRA MADRE BL	8		1		1	6	6			1			1		
217	SUNSET AVE & WASHINGTON BL	8			1	3	4	5						2	1	
218	HUDSON AVE & UNION ST	8			1	2	5	2	1					1	3	1
219	LINCOLN AVE & MOUNTAIN ST	8			2	1	5	3	1		2	1		1		
220	HOLLY ST & MARENGO AVE	8			1	3	4	3						1	3	1
221	GREEN ST & ORANGE GROVE BL	8			1	1	6	1	3	1				2	1	
222	EUCLID AVE & WALNUT ST	8				3	5	5	1	1	1					
223	CORDOVA ST & MADISON AVE	8			3	1	4	6	1	1						
224	EL SERENO AVE & WASHINGTON BL	8			1	3	4	4						2	2	
225	COLORADO BL & MERIDITH AVE	8			1	2	5	2	1	1				1	3	
226	CORDOVA ST & WILSON AVE	8			1	3	4	6						2		
227	CORSON ST & SIERRA MADRE BL	8			2		6	4	2	1					1	
228	DEL MAR BL & MERIDITH AVE	8	1		2	1	4	3	1			1		3		
229	COLORADO BL & MICHIGAN AVE	8	1		1	4	2	1		1				3	2	1
230	DEL MAR BL & SHOPPERS LN	8			3		5	6						1	1	
231	CLAREMONT ST & LAKE AVE	8			1	4	3	1	1					4	1	1
232	DEL MAR BL & MADRE ST	8			3	3	2	4	1					1	1	1

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
233	CALIFORNIA BL & WILSON AVE	8			1	3	4	1	1		1			5		
234	ARROYO PKWY & BELLEVUE DR (N)	8			3	2	3	1		2				4	1	
235	CALIFORNIA BL & EL MOLINO AVE	8				3	5	3	1					2	2	
236	RAYMOND AVE & VILLA ST	7			2	2	3	4						1	2	
237	PASADENA AVE & UNION ST	7			1	2	4	2	1					1	3	
238	SIERRA BONITA AVE & WASHINGTON BL	7		1	1	3	2	3	1		1			1	1	
239	MENTOR AVE & WALNUT ST	7			3	3	1	5	1							1
240	MADISON AVE & UNION ST	7				1	6	2		1					4	
241	MADELINE DR & ORANGE GROVE BL	7				1	6	3	1	1				1	1	
242	LOS ROBLES AVE & UNION ST	7			2	2	3	4		1				1	1	
243	SIERRA BONITA AVE & WALNUT ST	7			1	2	4	3						3		1
244	MICHILLINDA AVE & SIERRA MADRE BL	7		1			6	1		3				1	2	
245	VILLA ST & WILSON AVE	7		1	1	1	4	2						3	2	
246	EUREKA ST & FAIR OAKS AVE	7				2	5	2	1		1			3		
247	GREEN ST & PASADENA AVE	7			2	3	2	6							1	
248	HAMMOND ST & RAYMOND AVE	7			2		5	4		1					1	1
249	GARFIELD AVE & WALNUT ST	7					7				1	1		4	1	
250	FILLMORE ST & LOS ROBLES AVE	7			1	3	3	1			1	1		2	2	
251	FAIR OAKS AVE & PENN ST	7			2	3	2	3						2	1	1
252	HALSTEAD ST & ROSEMEAD BL	7			3	2	2	3	1					1	2	
253	GREEN ST & MICHIGAN AVE	7				3	4	4			1				2	
254	HASTINGS RANCH DR & SIERRA MADRE BL	7			1	2	4	5						2		
255	FAIR OAKS AVE & VALLEY ST	7			1	4	2	1	1	1				2		2
256	GREEN ST & HILL AVE	7			1	1	5	1	1	2	1			2		
257	COLORADO BL & VINEDO AVE	7			1	1	5	4						1	2	
258	DEL MAR BL & EL NIDO AVE	7				1	6	5			2					
259	DE LACEY ST & MCCORMICK ALY	7					7			2	1				4	
260	DAYTON ST & FAIR OAKS AVE	7			2	1	4	2	1					4		
261	CORDOVA ST & EUCLID AVE	7			2	2	3	2						3		2

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
262	CORDOVA ST & HUDSON AVE	7			3	1	3	5						1	1	
263	CATALINA AVE & DEL MAR BL	7			1	1	5	3		1				2		1
264	210 WB RAMP & SIERRA MADRE VILLA AVE	7			2	2	3	6			1					
265	CALIFORNIA BL & OAKLAND AVE	7				5	2	4	1	1				1		
266	BUCKEYE ST (N) & LOS ROBLES AVE	7			1	1	5	1						3	2	1
267	CALIFORNIA BL & CATALINA AVE	7			1	4	2	1						6		
268	CANADA AVE & LINCOLN AVE	7			1	5	1				1	1		5		
269	ORANGE GROVE BL & SIERRA MADRE VILLA AVE	6			1	1	4	2		2				2		
270	ROSEMEAD BL & SIERRA MADRE VILLA AVE (N)	6		1	1	1	3	2	1		1			1		1
271	ORANGE GROVE BL & WALNUT ST	6			2		4							3	2	1
272	MICHIGAN AVE & WASHINGTON BL	6		1	2	2	1	1						4	1	
273	SECO ST & WEST DR (N)	6	1		1	1	3	1	1	1	1			1	1	
274	MICHILLINDA AVE & SEARS WAY	6				1	5	5			1					
275	SIERRA MADRE BL & VILLA ST	6				3	3	4	1						1	
276	RAYMOND AVE & WALNUT ST	6				3	3	3			1				2	
277	MADISON AVE & WALNUT ST	6			1	1	4	5							1	
278	MOUNTAIN ST & SUNSET AVE	6			1	2	3	1	1	1					1	2
279	LINCOLN AVE & SECO ST	6			3	2	1	1	2	1				2		
280	FAIR OAKS AVE & FILLMORE ST	6			1	3	2	3						1	1	1
281	FOOTHILL BL & SUNNYSLOPE AVE	6			2	3	1	4		1				1		
282	LAKE AVE & LOCUST ST	6				3	3	1						1	3	1
283	HURLBUT ST & PASADENA AVE	6			2		4				1			4	1	
284	GREEN ST & HUDSON AVE	6			2	2	2	4					1	1		
285	IDAHO ST & LINCOLN AVE	6				1	5	1	1					2	2	
286	CORSON ST & SIERRA BONITA AVE	6				3	3	4					1	1		
287	DEL MAR BL & OAKLAND AVE	6			1		5	4						2		
288	CRAIG AVE & ORANGE GROVE BL	6			1	3	2	5		1						
289	CORDOVA ST & MENTOR AVE	6			1	3	2	1						1	2	2
290	CORDOVA ST & HILL AVE	6				1	5	2			1			2	1	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
291	CONGRESS ST & FAIR OAKS AVE	6	1		2	1	2	1	2					1	1	1
292	ESTHER ST & FAIR OAKS AVE	6					6	1		1				2	2	
293	EL MOLINO AVE & UNION ST	6				3	3	2		1	2					1
294	CLAREMONT ST & LOS ROBLES AVE	6		1		1	4	3						1	1	1
295	COLUMBIA ST & FAIR OAKS AVE	6			1	2	3	5				1				
296	CRAIG AVE & FOOTHILL BL	6			1	3	2	3	2	1						
297	BELLEFONTAINE ST & ORANGE GROVE BL	6			2	2	2	1	1					3	1	
298	210 WB RAMP & LINCOLN AVE	6			1	1	4			1				5		
299	CALIFORNIA BL & MADISON AVE	6			1	1	4	3	1		1			1		
300	CALIFORNIA BL & HILL AVE	6			1	3	2	1	1					4		
301	BERKELEY AVE & DEL MAR BL	6			1	2	3	2	2					2		
302	BARTHE DR & MOUNTAIN ST	6				2	4	1	2	2					1	
303	ARROYO PKWY & CORDOVA ST	6		1	1	1	3	1		2				3		
304	ORANGE GROVE BL & SUMMIT AVE	5			2	1	2	1		1				1	1	1
305	PAINTER ST & RAYMOND AVE	5			2	3		3		1					1	
306	SINALOA AVE & WASHINGTON BL	5				3	2	3						1		1
307	MARENGO AVE & MOUNTAIN ST	5				2	3	3						2		
308	LOS ROBLES AVE & MARENGO AVE	5				2	3	1		2				2		
309	MADISON AVE & VILLA ST	5	1				4	3	1							1
310	MICHENER ALY & ORANGE GROVE BL	5				3	2	1						4		
311	SAN GABRIEL BL & SAN PASQUAL ST	5			1	4		3	1		1					
312	MICHIGAN AVE & MOUNTAIN ST	5			2		3	4						1		
313	LINDA VISTA AVE & SAN RAFAEL AVE	5				1	4	1		1				1	2	
314	OAKLAND AVE & UNION ST	5			1		4	1			1			3		
315	NEW YORK DR & SIERRA MADRE VILLA AVE (N)	5			2	2	1	2		1					2	
316	FAIR OAKS AVE & HOLLY ST	5			3	2		1	1	1						2
317	HOWARD ST (N) & LAKE AVE	5				2	3	3	1						1	
318	FAIR OAKS AVE & FAIR OAKS DR	5				2	3		1	1				2	1	
319	FAIR OAKS AVE & PICO ST	5					5	2	1						2	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
320	HOLLISTON AVE & WALNUT ST	5				3	2	4	1							
321	HOWARD ST (N) & LOS ROBLES AVE	5				1	4	2	1			1		1		
322	IDAHO ST & MENTONE AVE	5				2	3	2						2	1	
323	FILLMORE ST (N) & MARENGO AVE	5				1	4	1	1					3		
324	GREEN ST & MADISON AVE	5					5	2						2	1	
325	HAMPTON RD & MICHILLINDA AVE	5			1		4	3				1			1	
326	HOLLISTON AVE & MOUNTAIN ST	5				3	2	5								
327	GREEN ST & SAINT JOHN AVE	5			2	1	2	3						1	1	
328	EATON DR & SIERRA MADRE BL	5			1	3	1	1		2	1					1
329	COLORADO BL & TERRACE DR	5			1		4							2	2	1
330	COLORADO BL & GRAND OAKS AVE	5			2	1	2	1						1	2	1
331	COLORADO BL & HARKNESS AVE	5					5	1						4		
332	EARLHAM ST & LAKE AVE	5				1	4	1	1	1				1	1	
333	DE LACEY AVE & UNION ST	5			2		3								3	2
334	EL MOLINO AVE & GREEN ST	5				2	3	2		1					2	
335	COLORADO BL & DAISY AVE	5			1	2	2	2	2						1	
336	EUCLID AVE & GREEN ST	5				2	3	1			1			1	1	1
337	COLORADO BL & SIERRA BONITA AVE	5				2	3	1						3	1	
338	COLORADO BL & EL MOLINO AVE	5			1	2	2	2			1				1	1
339	BELVIDERE ST & LAKE AVE	5			1		4							4	1	
340	ALLEN AVE & QUEENSBERRY RD	5				3	2	1		1				3		
341	CALIFORNIA BL & SIERRA BONITA AVE	5				3	2	1						4		
342	CATALINA AVE & ORANGE GROVE BL	5				2	3	1		1				1	2	
343	ALLENDALE RD & MARENGO AVE	5				1	4				1			4		
344	ARROYO BL & ROSEMONT AVE	5			1	1	3	2		1				1	1	
345	ALLEN AVE & LOCUST ST	5				1	4	2			1			1	1	
346	CALIFORNIA BL & EDMONDSON ALY	5			1	2	2	3						1	1	
347	BELLEFONTAINE ST & FAIR OAKS AVE	5			1	1	3	3		1				1		
348	BELLEVUE DR (N) & MARENGO AVE	5		1	1	2	1	1						2	1	1

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Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
349	CALIFORNIA BL & LANDOR LN	5				2	3	1						4		
350	BONNIE AVE & WALNUT ST	5			1	2	2	2		1				1		1
351	210 EB RAMP & MOUNTAIN ST	5				1	4	4						1		
352	CALIFORNIA BL & EUCLID AVE	5			2	1	2	1			1			2		1
353	ASHTABULA ST (N) & LOS ROBLES AVE	5				2	3	1	1					3		
354	ASBURY DR & HILL AVE	5			1	1	3	1		1				2	1	
355	MARENGO AVE & RAMONA ST	4			1		3	1				1		1	1	
356	MAYLIN ST & ORANGE GROVE BL	4			1	1	2	1	1						2	
357	WASHINGTON BL & WESLEY AVE	4			1		3	1	1					1	1	
358	MONTANA ST & RAYMOND AVE	4			1	2	1	3	1							
359	SIERRA MADRE BL & WASHINGTON BL	4			1	1	2	2			1				1	
360	OAK KNOLL AVE & OLD MILL RD	4	1				3			1			1	2		
361	VINEDO AVE & WALNUT ST	4			2	1	1	4								
362	OAK KNOLL AVE & UNION ST	4				1	3	2		1					1	
363	PAINTER ST & SUMMIT AVE	4					4	1		1				1	1	
364	LINCOLN AVE & ZANJA ST	4			1	1	2	3			1					
365	RUTAN WAY & WASHINGTON BL	4			1	1	2	1						1	2	
366	ORANGE GROVE BL & SIERRA BONITA AVE	4			1	1	2	2		1				1		
367	LOS ROBLES AVE & PARKE ST	4	1				3							2	1	1
368	MAPLE ST & SAN GABRIEL BL	4				1	3	2						2		
369	GARFIELD AVE & MONTANA ST	4				1	3	2			1				1	
370	HILLCREST AVE (N) & OAK KNOLL AVE	4				1	3					1		3		
371	LIDA ST & LINDA VISTA AVE	4	1			3		1	1					2		
372	FILLMORE ST & RAYMOND AVE	4			2		2			1					2	1
373	HOWARD ST & MENTONE AVE	4				2	2	1	1		1					1
374	FOOTHILL BL & KINNELOA AVE	4			1	1	2	1	1		1			1		
375	LA TIERRA ST & SIERRA MADRE BL	4				2	2			1				3		
376	FOOTHILL BL & OAK GROVE DR	4		1	1	2			1	1				1		1
377	HILL AVE & LAS LUNAS ST	4				2	2							3	1	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
378	GREEN ST & WILSON AVE	4				2	2	1						2	1	
379	HOLLISTON AVE & VILLA ST	4	1			1	2	2		1						1
380	FOOTHILL BL & QUIGLEY AVE	4					4		1	1		1		1		
381	HUDSON AVE (E) & WALNUT ST	4				1	3	1						1	1	1
382	GREENHILL RD & ROSEMEAD BL	4				1	3	1	1					1	1	
383	GARFIELD AVE & MOUNTAIN ST	4				1	3	3						1		
384	FAIR OAKS AVE & PAINTER ST	4				1	3	1						2	1	
385	LAKE AVE & RIO GRANDE ST	4				2	2	2						2		
386	FOOTHILL BL & SANTA PAULA AVE	4					4							4		
387	HARKNESS AVE & WALNUT ST	4				3	1	1						2	1	
388	DEL MAR BL & MICHIGAN AVE	4				1	3							2	2	
389	COLORADO BL & MARION AVE	4				1	3			1				1	1	1
390	COLORADO BL & SIERRA MADRE VILLA AVE	4					4	2						1	1	
391	COLORADO BL & MILLS PL	4					4							2	2	
392	ELLIS ST & ORANGE GROVE BL	4		1	2		1	1							3	
393	CRAIG AVE & WALNUT ST	4			2		2	3							1	
394	DEL MAR BL & PARKWOOD AVE	4			1		3	1						2	1	
395	CYNTHIA AVE & SIERRA MADRE BL	4			1	1	2	1		2				1		
396	COLORADO BL & WALNUT ST	4				1	3	1						2	1	
397	DAISY AVE & WALNUT ST	4				2	2	1		2						1
398	CONGRESS PL & ORANGE GROVE BL	4			1	2	1		1					2		1
399	DE LACEY AVE & DEL MAR BL	4				2	2	3							1	
400	ESTHER ST & RAYMOND AVE	4				1	3		1					2	1	
401	COLORADO BL & PARKWOOD AVE	4			1		3	2						1	1	
402	COLORADO BL & EL NIDO AVE	4			1	1	2	2		1					1	
403	ALLEN AVE & BRIGDEN RD (N)	4				1	3	2						1	1	
404	ALLEN AVE & GALBRETH RD	4				1	3	2						2		
405	ALLEN AVE & LOMA VISTA ST	4				1	3	1						3		
406	AVENUE 64 & MARIANNA RD	4			2		2			4						

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
407	ARROYO BL & WASHINGTON BL	4			1		3	2		2						
408	CALIFORNIA BL & FAIRMOUNT AVE	4				1	3			1				2	1	
409	ARDEN RD & CALIFORNIA BL	4				3	1	1						3		
410	ALTADENA DR & LOMA VISTA ST	4				1	3	2						2		
411	BOSTON CT & LAKE AVE	4				2	2	1			1			1	1	
412	ALLEN AVE & SAN PASQUAL ST	4			2	1	1	4								
413	CATALINA AVE & GREEN ST	4				1	3	2	1		1					
414	BELLEFONTAINE ST (W) & PASADENA AVE	4				1	3	1		1	1			1		
415	ALTADENA DR & PALOMA ST	4			2	1	1	4								
416	BERKELEY AVE & COLORADO BL	4					4	1						3		
417	ORANGE GROVE BL & PASADENA AVE	3				1	2		1						2	
418	MERIDITH AVE & WALNUT ST	3			2		1	1						1	1	
419	ORANGE GROVE BL & PROSPECT BL	3	1			1	1	1	1	1						
420	MADISON AVE & ORANGE GROVE BL	3			1	2						1		2		
421	MAR VISTA AVE & WALNUT ST	3				2	1	2						1		
422	ORANGE GROVE BL & STATE ST (N)	3				1	2							2	1	
423	ROSE BOWL DR & ROSEMONT AVE	3			2		1			1					1	1
424	MOUNTAIN ST & WRIGHT AVE	3				1	2	2			1					
425	SAN GABRIEL BL & TOPSFIELD ST	3				1	2							3		
426	ORANGE GROVE BL & SUNNYSLOPE AVE	3					3	2							1	
427	NAVARRO AVE & WASHINGTON BL	3				1	2	1	1	1						
428	ORANGE GROVE BL & SUNSET AVE	3			1	1	1			1				1	1	
429	MAYFAIR DR & MICHILLINDA AVE	3				1	2	1					1		1	
430	OAK KNOLL AVE & WALNUT ST	3			1	1	1							2	1	
431	RIVIERA DR & SIERRA MADRE BL	3				1	2	1						2		
432	OAKLAND AVE & ORANGE GROVE BL	3					3	1						1	1	
433	MENTONE AVE & WASHINGTON BL	3			1	1	1	1							1	1
434	MARENGO AVE & WALLIS ST	3		1		1	1	1						1		1
435	MAPLE ST & SUNNYSLOPE AVE	3				2	1	2							1	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
436	OSWEGO ST & SIERRA MADRE BL	3					3	1	2							
437	MAPLE ST & WALNUT ST	3				1	2								3	
438	MAPLE ST & SIERRA BONITA AVE	3			1		2	2						1		
439	MAR VISTA AVE & UNION ST	3			1	2		3								
440	OAKLAND AVE & WALNUT ST	3			2		1	1		1					1	
441	MICHIGAN AVE & UNION ST	3				1	2	2						1		
442	PALM TER & WASHINGTON BL	3			1	1	1	1			1				1	
443	WASHINGTON BL & WILSON AVE	3			1	1	1	3								
444	MOHAWK ST & SIERRA MADRE BL	3					3	1			1			1		
445	LOS ROBLES AVE & MONTANA ST	3					3							2	1	
446	PARKWOOD AVE & WALNUT ST	3			1		2	1							2	
447	JACKSON ST (N) & LOS ROBLES AVE	3			1		2				1			2		
448	GRANITE DR & LAKE AVE	3		1	2			1							1	1
449	LAKE AVE & MERRETT DR	3				1	2	1						2		
450	GREEN ST & OAK KNOLL AVE	3				1	2	1	1					1		
451	HUNTINGTON GARDEN DR & OAK KNOLL AVE	3			1		2	1	1						1	
452	HASTINGS RANCH DR & SHADOW GROVE RD	3			1	1	1	3								
453	FOOTHILL BL & GREENWOOD AVE	3				1	2	1						1	1	
454	FOOTHILL BL & OAK AVE	3				1	2	1						2		
455	LAKE AVE & TOPEKA ST	3				1	2	2							1	
456	HILL AVE & LOCUST ST	3			1		2	1							2	
457	GLEN AVE & IDAHO ST	3				1	2	1			1			1		
458	FOOTHILL BL & WALNUT ST	3					3							3		
459	HAMMOND ST & LINCOLN AVE	3				1	2	2		1						
460	HILL AVE & UNION ST	3				1	2							3		
461	HAMMOND ST & MARENGO AVE	3				2	1		2							1
462	GLENARM ST & OAKLAND AVE	3					3	3								
463	FAIR OAKS AVE & WAVERLY DR	3				1	2				1			1	1	
464	HOLLISTON AVE & ORANGE GROVE BL	3			1	1	1	1	1						1	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
465	GLEN AVE & MOUNTAIN ST	3			1	1	1		1					2		
466	FAIR OAKS AVE & PEORIA ST	3			1		2	1						1	1	
467	FOREST AVE & LINCOLN AVE	3			1		2	1						1	1	
468	GARFIELD AVE (W) & PARKE ST	3					3							1	2	
469	FAIR OAKS AVE & PALMETTO DR	3			1	1	1	1						1	1	
470	LINCOLN AVE & TOOLEN PL	3				1	2	2							1	
471	EL MOLINO AVE & SANTA BARBARA ST	3			1	1	1	1	1						1	
472	EATON CANYON DR & NEW YORK DR	3					3	1		1				1		
473	COLORADO BL & NORTHRUP AVE	3					3	1						2		
474	DE LACEY AVE & GREEN ST	3					3					1		1	1	
475	EL MOLINO AVE & GLENARM ST	3					3	1		2						
476	CHESTER AVE (W) & COLORADO BL	3				1	2	1						2		
477	ELIZABETH ST & HILL AVE	3			1		2	1			1				1	
478	DEL MAR BL & KINNELOA AVE	3		1	1	1		1						1		1
479	EUCLID AVE & MOUNTAIN ST	3					3	1						2		
480	CORDOVA ST & SHOPPERS LN	3				2	1	2							1	
481	COLORADO BL & MAR VISTA AVE	3			2		1			1	1			1		
482	DEL MAR BL & SAINT JOHN AVE	3			1		2	2							1	
483	CLAREMONT ST (N) & FAIR OAKS AVE	3				1	2		1					2		
484	CLAREMONT ST & SUNSET AVE	3					3	1		1				1		
485	ELECTRONIC DR & SIERRA MADRE VILLA AVE	3			1		2	1						2		
486	CHESTER AVE & WASHINGTON BL	3				1	2	1	1					1		
487	ELIZABETH ST (N) & LAKE AVE	3					3							2	1	
488	DOUGLAS ST & LOS ROBLES AVE	3				1	2	2							1	
489	ELMIRA ST & ORANGE GROVE BL	3					3	1						2		
490	EARLHAM ST & EL MOLINO AVE	3			1		2	1						1	1	
491	CORSON ST & CRAIG AVE	3				2	1	3								
492	DIANA ST & SAN GABRIEL BL	3			1	1	1							3		
493	CATALINA AVE & CORDOVA ST	3				1	2	2						1		

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			COLLISION SEVERITY					COLLISION TYPE							
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	
494	CATALINA AVE & WALNUT ST	3			1		2	1				1		1	
495	ALTADENA DR & COOLEY PL (N)	3				1	2							2	
496	ALTADENA DR & LAMBERT DR (N)	3					3							1	
497	CEDAR ST & EL SERENO AVE	3					3	1			1				
498	ALLEN AVE & PALOMA ST	3				2	1							2	
499	ATCHISON ST & LAKE AVE	3				1	2	1	1	1					
500	ARROYO BL & CALIFORNIA BL	3			1		2					1			
501	CHATEAU RD & SAN RAFAEL AVE	3					3	1							
502	ALTADENA DR & BRIGDEN RD	3			1	1	1							3	
503	AVENUE 64 & LA LOMA RD	3			1	2					1			1	
504	CEDAR ST & FAIR OAKS AVE	3		1		1	1							2	
505	ARROYO BL (W) & SECO ST	3			1		2	1		1				1	
506	BELLFORD AVE & WASHINGTON BL	3				1	2	1		1				1	
507	ATCHISON ST & LOS ROBLES AVE	3				1	2	2							
508	LOS ROBLES AVE & PENN ST (N)	2			2			2							
509	MAR VISTA AVE & TOPEKA ST	2					2			1				1	
510	MANZANITA AVE & ORANGE GROVE BL	2				1	1							2	
511	PEPPER ST (N) & SUNSET AVE	2		1	1				1	1					
512	MARENGO AVE & PICO ST	2				1	1							1	
513	PLOTKIN ALY & RAYMOND AVE	2				1	1	1							
514	LINDA VISTA AVE & WABASH ST (N)	2			1		1							2	
515	RAYMOND AVE & TREMONT ST (N)	2			1		1	2							
516	MAR VISTA AVE & ORANGE GROVE BL	2					2							2	
517	LOS ROBLES AVE & PRESCOTT ST	2				1	1				1			1	
518	MADELINE DR & PASADENA AVE	2					2	1			1				
519	MATARO ST & SIERRA MADRE VILLA AVE	2				1	1	2							
520	SUMMIT AVE (W) & WASHINGTON BL	2			1		1		1					1	
521	MOUNTAIN ST & WILSON AVE	2				2					1			1	
522	MARION AVE & WALNUT ST	2					2	1						1	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
523	FOREST AVE & PALISADE ST (N)	2				1	1			1				1		
524	PENN ST & RAYMOND AVE	2				1	1	1						1		
525	MARENGO AVE & PAINTER ST	2					2							1	1	
526	MAPLE WAY & VILLA ST	2					2							2		
527	ROSE ALY & SAN GABRIEL BL	2			2				2							
528	MAPLE ST & MENTOR AVE	2					2							1		1
529	GLEN OAKS BL & MANFORD WAY	2					2			1					1	
530	MOUNTAIN ST & WHEELER LN	2		1		1		2								
531	MEDFORD RD & SIERRA MADRE BL	2					2							2		
532	MICHIGAN AVE & ORANGE GROVE BL	2					2							2		
533	ORANGE GROVE BL & PALMETTO DR	2			2			2								
534	MICHIGAN AVE & VILLA ST	2					2	2								
535	WASHINGTON BL & WEST DR (N)	2				1	1					1		1		
536	MAPLE ST & MAPLE WAY	2				1	1							1	1	
537	SAINT JOHN AVE & UNION ST	2					2	2								
538	MAR VISTA AVE & WASHINGTON BL	2					2	1						1		
539	SAINT JOHN AVE & WALNUT ST	2			1		1	1							1	
540	VIRGINIA AVE & WALNUT ST	2					2	2								
541	MORTON AVE & MOUNTAIN ST	2					2			1					1	
542	MARKHAM PL & ORANGE GROVE BL	2			1	1				1	1					
543	OAK AVE & ORANGE GROVE BL	2			1		1	1						1		
544	MARENGO AVE & PARKE ST	2					2				1				1	
545	LOS ROBLES AVE & WICKLIFFE DR	2					2							2		
546	NEWTON ALY & VILLA ST	2					2	2								
547	MAR VISTA AVE (W) & WASHINGTON BL	2				2		2								
548	MOUNTAIN ST & SIERRA BONITA AVE	2			1		1	1						1		
549	LINCOLN AVE & VILLA ST	2				1	1	2								
550	GARFIELD AVE & VILLA ST	2			1		1							2		
551	KINNELOA AVE & WALNUT ST	2				1	1		1					1		

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
552	HUDSON AVE & WASHINGTON BL	2			1		1							1	1	
553	GREENWOOD AVE & WALNUT ST	2			1		1	1	1							
554	LAKE AVE & MARKET ALY	2			1		1	2								
555	HAMMOND ST & SUMMIT AVE	2					2							1	1	
556	LAKE AVE & WOODBURY RD	2				1	1							2		
557	HILL AVE & HOWARD ST	2			1		1	1		1						
558	JACKSON ST & LOS ROBLES AVE	2				2			1	1						
559	HILL AVE & LOMA VISTA ST (N)	2			1	1								1	1	
560	LADERA ST & LAKE AVE	2			1		1	1						1		
561	FOOTHILL BL & VISTA AVE	2					2							1	1	
562	GARFIELD AVE & UNION ST	2					2					1			1	
563	HILL AVE & OAKDALE ST	2					2	2								
564	GREEN ST & TERRACE DR	2			1	1								1	1	
565	GLEN AVE & WASHINGTON BL	2			1		1	1						1		
566	LIDA ST & ONTARIO AVE	2					2			1					1	
567	HILL AVE & SAN PASQUAL ST	2				2		1						1		
568	FOOTHILL BL & LINDA ROSA AVE	2				1	1	1						1		
569	EXCHANGE ALY & FAIR OAKS AVE	2					2	1		1						
570	FAIRFIELD CIR (W) & OAK KNOLL CIR	2					2		1					1		
571	LINCOLN AVE & VERMONT ST	2				1	1							2		
572	LA VEREDA RD (N) & LINDA VISTA AVE	2					2	1		1						
573	FOREST AVE & HOWARD ST	2				1	1	1						1		
574	LADERA ST & LOS ROBLES AVE	2					2							2		
575	FLOWER ST & LOS ROBLES AVE	2			1	1		1							1	
576	GARFIELD AVE & RAMONA ST	2					2							2		
577	FLOWER ST & LUNDY AVE	2					2					1		1		
578	GLEN AVE & PEPPER ST	2					2	2								
579	FOREST AVE & WESTGATE ST	2			1		1	2								
580	LAKE AVE & SANTA BARBARA ST	2				1	1				1					1

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Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
581	FOREST AVE & ZANJA ST	2				1	1				1				1	
582	FAIR OAKS AVE & YALE ST	2		1		1			1					1		
583	FAIR OAKS AVE & HURLBUT ST	2				1	1	1		1						
584	LAS LUNAS ST & SINALOA AVE	2					2	2								
585	HUDSON AVE & MOUNTAIN ST	2					2			1					1	
586	GARFIELD AVE & HOLLY ST	2				1	1	2								
587	GARFIELD AVE & GRANDVIEW ST	2					2							1	1	
588	COLORADO BL & GREENWOOD AVE	2				1	1	1						1		
589	CYPRESS AVE (W) & ORANGE GROVE BL	2			1	1						1		1		
590	EL MOLINO AVE & RIO GRANDE ST (N)	2				1	1		1					1		
591	CORSON ST & RAYMOND AVE	2					2		1					1		
592	COLORADO BL & MICHIGAN AVE (W)	2			2			1						1		
593	DEL MAR BL & VINEDO AVE	2				2								2		
594	CLARK ALY & HILL AVE	2					2							2		
595	DEL MAR BL & WALDO AVE	2					2	1				1				
596	COLUMBIA ST & FREMONT AVE	2				1	1	1		1						
597	CHEVRON CT (N) & WINDSOR AVE	2					2		1	1						
598	ELECTRONIC DR & HALSTEAD ST	2					2	1						1		
599	DEL MONTE ST & LINCOLN AVE	2				1	1	1							1	
600	DEL MAR BL & ROOSEVELT AVE	2				2			1	1						
601	DEL REY AVE & FOOTHILL BL	2				1	1			1				1		
602	COLORADO BL & MELROSE AVE	2			1		1							1		1
603	COLORADO BL & ROOSEVELT AVE	2			1		1			1					1	
604	CORDOVA ST & HOLLISTON AVE	2			1		1	1						1		
605	COLORADO BL & ROSEMEAD BL	2			1		1				1					1
606	CRAIG AVE & MONTE VISTA ST	2				1	1	1	1							
607	DE LACEY AVE (W) & GREEN ST	2					2								2	
608	CLAREMONT ST & FAIR OAKS AVE	2			1	1			1						1	
609	COLORADO BL & SAN MARINO AVE	2				2			1						1	

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Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
610	DAISY AVE & DEL MAR BL	2					2							2		
611	DEL MAR BL & MENTOR AVE	2					2							2		
612	EUCLID AVE & VILLA ST	2		1			1	1								1
613	EATON DR & MAPLE ST	2			1		1		1	1						
614	CRAIG AVE & WHITE ST	2					2								2	
615	COLORADO BL & SAN RAFAEL AVE	2			1		1			1					1	
616	DEL MAR BL & EUCLID AVE	2				1	1	1							1	
617	EL DORADO ST & LOS ROBLES AVE	2					2							1	1	
618	CLINTON ST & LINCOLN AVE	2		1			1	1				1				
619	EL MOLINO AVE & ELIZABETH ST	2					2	1							1	
620	EUCLID AVE & MARENGO AVE	2				1	1		1					1		
621	CRAIG AVE & VILLA ST	2				1	1	1						1		
622	EUCLID AVE & UNION ST	2		1		1									1	1
623	COLORADO BL & HALSTEAD ST	2			1		1	1						1		
624	CLAREMONT ST & EL MOLINO AVE	2					2								2	
625	DEL MAR BL & OAK AVE	2					2			1				1		
626	CASA GRANDE ST & MARTELO AVE	2					2	1		1						
627	ALLEN AVE & REVERE ALY	2				1	1	1							1	
628	CATALINA AVE & UNION ST	2			1		1	1								1
629	CALIFORNIA BL & CONCORDIA CT	2					2		1					1		
630	BLANCHE ST & MICHIGAN AVE	2					2								2	
631	ARROYO BL & WESTBRIDGE PL	2			1	1		1	1							
632	ATCHISON ST & EL MOLINO AVE	2				1	1	1						1		
633	ALTADENA DR & MOUNTAIN ST	2				1	1			1					1	
634	CHESTER AVE & COLORADO BL	2					2	1							1	
635	AVENUE 64 & NITHSDALE RD	2					2							2		
636	BERKELEY AVE (E) & COLORADO BL	2				1	1	1						1		
637	BARTHE DR & LINCOLN AVE	2					2	1						1		
638	CARLTON AVE & LINCOLN AVE	2				1	1								2	

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Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
639	210 WB RAMP & MOUNTAIN ST	2				1	1			1					1	
640	ARROYO BL & GRAND AVE (N)	2			1	1		1							1	
641	ARROYO PKWY & BELLEVUE DR (S)	2					2								2	
642	CATALINA AVE & MOUNTAIN ST	2				1	1	1	1							
643	BELLEFONTAINE ST & FAIRMOUNT AVE	2				1	1					1				1
644	BROOKMERE RD & COLUMBIA ST	2			1		1	1						1		
645	210 WB RAMP & ARROYO BL	2				1	1	2								
646	ALTADENA DR & MOHAWK ST	2					2	1							1	
647	ALLEN AVE & ASBURY DR	2				1	1	1						1		
648	ALLEN AVE & ROSE VILLA ST	2			1		1	2								
649	CALIFORNIA BL & LOS ARBOLES LN	2			1	1								1	1	
650	CANADA AVE & CASITAS AVE	2					2	1		1						
651	ALLEN AVE & WHITEFIELD RD	2			2			2								
652	CANYON WASH DR & SIERRA MADRE BL	2				1	1							2		
653	ALTADENA DR & WALNUT ST	2				1	1	2								
654	CARMELO AVE & FOOTHILL BL	2			1		1					1			1	
655	CALIFORNIA BL & MAGNOLIA AVE	2				2								1	1	
656	CATALINA AVE & CLAREMONT ST	2		1	1										1	1
657	ALTADENA DR & WOODLYN RD (N)	2				1	1							1	1	
658	ARROYO BL & HOWARD ST	2			1	1				1					1	
659	CALIFORNIA BL & MENTOR AVE	2			1		1							1	1	
660	ALLEN AVE & LAS LUNAS ST	2		1		1								2		
661	BELLEVUE DR & ORANGE GROVE BL	2			1		1							1	1	
662	ARROYO BL & SECO ST (E)	2			1		1					1		1		
663	BELLEVUE DR & PASADENA AVE	2					2							1	1	
664	BRESEE AVE & WASHINGTON BL	2					2			1				1		
665	BELLEVUE DR & RAYMOND AVE	2					2	1						1		
666	BRYANT ST & LINDA VISTA AVE	2			1		1	1							1	
667	ALTADENA DR & DUDLEY ST	2		1	1			1	1							

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Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
668	CEDAR ST & NAVARRO AVE	2				1	1	2								
669	ARDEN RD & WILSON AVE	2				1	1								1	1
670	ALLEN AVE & WOODLYN RD	2				1	1								2	
671	CHESTER AVE & CORDOVA ST	2			1	1		1						1		
672	AVENUE 64 & COLORADO BL	2					2			1					1	
673	CHESTER AVE & WALNUT ST	2			1		1	1							1	
674	AVENUE 64 & GLENOVER DR	2			2								1			1
675	AVENUE 64 & GLEEN DR	2			1		1	1	1							
676	ONEIDA ST & SAN GABRIEL BL	1				1								1		
677	MADISON AVE (E) & MOUNTAIN ST	1					1								1	
678	LINCOLN AVE & WESTGATE ST	1				1			1							
679	ORANGE GROVE BL & WHEELER LN	1					1	1								
680	SAN PASQUAL ST & WILSON AVE	1				1		1								
681	ORANGE GROVE BL & WIGMORE DR	1					1					1				
682	SUMMIT AVE (E) & WASHINGTON BL	1			1									1		
683	MARENGO AVE (N) & MONTANA ST	1					1								1	
684	WILLIS ALY & ZANJA ST	1					1				1					
685	MICHILLINDA AVE & VALLEY VIEW AVE	1					1								1	
686	MENTOR AVE & MOUNTAIN ST	1				1		1								
687	MIRA MONTE PL & OAK KNOLL AVE	1					1							1		
688	MAPLE ST & RAYMOND AVE	1				1								1		
689	OXFORD AVE & WASHINGTON BL	1					1	1								
690	ORANGE GROVE BL & MADISON AVE	1					1				1					
691	MADRILLO CT & SAN GABRIEL BL	1					1							1		
692	SUNSET AVE & WASHINGTON PL	1					1							1		
693	MARKET ALY & MENTOR AVE	1					1							1		
694	LINDA VISTA AVE & YOCUM ST	1			1			1								
695	PAINTER ST & WHEELER LN	1					1	1								
696	MICHILLINDA AVE & MONTECITO AVE	1			1			1								

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
697	MONTANA ST & SUMMIT AVE	1				1		1								
698	OAK KNOLL AVE & PINEHURST DR	1				1								1		
699	PALO VERDE AVE & PALOMA ST	1					1	1								
700	SAN GABRIEL BL & YORKSHIRE RD	1			1			1								
701	PALOMA ST & SIERRA BONITA AVE	1					1			1						
702	SECO ST & WEST DR (S)	1					1	1								
703	MORNINGSIDE ST & SAN GABRIEL BL	1					1								1	
704	OAKLAND AVE & VILLA ST	1			1					1						
705	PARKWOOD AVE & SAN PASQUAL ST	1			1			1								
706	SIERRA MADRE VILLA AVE & SIERRA MADRE VILLA ON 210WB	1					1	1								
707	LIVE OAKS AVE & ORANGE GROVE BL	1					1							1		
708	LOS ROBLES AVE & RIO GRANDE ST	1					1							1		
709	MOUNTAIN ST & OAKLAND AVE	1					1								1	
710	ORANGE GROVE BL & PALO VERDE AVE	1				1										1
711	MOUNTAIN ST & PALM TER	1					1								1	
712	MARENGO AVE & PLYMOUTH DR	1				1		1								
713	PASADENA AVE & VALLEY ST	1					1							1		
714	LINDA VISTA AVE & LINDA VISTA WAY	1				1								1		
715	MARTELO AVE & ORANGE GROVE BL	1					1	1								
716	MICHIGAN AVE & WALNUT ST	1			1			1								
717	PASADENA AVE & WAVERLY DR	1					1							1		
718	MADISON AVE (N) & ORANGE GROVE BL	1					1			1						
719	MARTELO AVE & PALOMA ST	1					1	1								
720	LINDA VISTA AVE & MIRA VISTA TER	1					1			1						
721	PEORIA ST & RAYMOND AVE	1				1		1								
722	PEPPER ST (S) & SUNSET AVE	1					1							1		
723	MOUNTAIN ST & SINALOA AVE	1					1	1								
724	SAN GABRIEL BL & SIERRA MADRE BL	1					1								1	
725	PICO ST & RAYMOND AVE	1					1	1								

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
726	LUNDY AVE & MONTANA ST	1					1	1								
727	LOMA VISTA ST & MARTELO AVE	1			1			1								
728	SAN PASQUAL ST & SHOPPERS LN	1					1								1	
729	PLUMOSA DR & SAN PASQUAL ST	1		1				1								
730	OAK KNOLL AVE & WENTWORTH AVE	1					1	1								
731	PRIMAVERA ST & SIERRA MADRE VILLA AVE	1					1		1							
732	SECO ST (LOT K) & WEST DR	1				1										1
733	QUEENSBERRY RD & TIERRA ALTA DR	1				1		1								
734	LOMBARDY RD & SIDNEY AVE	1				1		1								
735	RAYMOND AVE & PICO ST	1					1				1					
736	LINDA VISTA AVE & RANCHEROS RD	1					1							1		
737	RAYMOND AVE & TREMONT ST	1				1			1							
738	ORANGE GROVE BL & FAIR OAKS AVE	1					1				1					
739	LOS ROBLES AVE & PARKER ALLEY	1					1							1		
740	SIERRA MADRE VILLA AVE & VILLA HIGHLANDS DR	1			1										1	
741	MAR VISTA AVE (E) & WASHINGTON BL	1				1		1								
742	ORANGE GROVE BL & ORANGE GROVE CIR	1					1			1						
743	MCGREW ALY & ORANGE GROVE BL	1					1		1							
744	SUMMIT AVE & WOODBURY RD	1					1			1						
745	MOUNTAIN ST & WORCESTER AVE	1					1	1								
746	SUMMIT AVE (S) & WASHINGTON BL	1					1							1		
747	MARENGO AVE & MONTANA ST	1					1			1						
748	MERCEDES AVE & VILLA ST	1			1				1							
749	RHODES ALY (N) & WILSON AVE	1				1		1								
750	SUNSET AVE & YALE ST	1					1			1						
751	RIDA ST & SIERRA MADRE VILLA AVE	1					1	1								
752	VENTURA ST & WINDSOR AVE	1					1			1						
753	MENTONE AVE & MONTANA ST	1			1				1							
754	MARENGO AVE & ROBINSON RD	1					1								1	

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
755	NELSON ALY & SIERRA BONITA AVE	1			1					1						
756	MICHIGAN AVE & STEUBEN ST	1					1	1								
757	FAIR OAKS AVE & TREMONT ST (E)	1					1							1		
758	MADISON AVE (E) & ORANGE GROVE BL	1					1							1		
759	MENTONE AVE & PALISADE ST	1			1									1		
760	WASHINGTON BL (S) & WEST DR	1				1						1				
761	ROSEMEAD BL & SIERRA MADRE VILLA AVE (S)	1					1			1						
762	FOREST AVE & PALISADE ST (S)	1					1								1	
763	MENTONE AVE & STANTON ST	1				1				1						
764	GARFIELD AVE (E) & WALNUT ST	1					1							1		
765	ROSEMONT AVE & WASHINGTON BL	1			1											1
766	HUDSON AVE (W) & WALNUT ST	1			1						1					
767	NINA ST & SAN GABRIEL BL	1					1	1								
768	LINDA VISTA AVE & SECO ST	1			1										1	
769	MARENGO AVE & MONTANA ST (N)	1					1	1								
770	MADRE NB ON 210EB & WALNUT ST	1					1	1								
771	MENTONE AVE & WYOMING ST	1				1									1	
772	ORANGE GROVE BL & WAVERLY DR	1					1							1		
773	SALVIA CANYON RD & WEST DR	1			1					1						
774	NEW YORK DR & SIERRA MADRE BL	1					1			1						
775	FAIR OAKS AVE & MERCANTILE PL	1					1			1						
776	LA LOMA RD & SAN RAFAEL AVE (N)	1					1		1							
777	GARFIELD AVE (S) & WALNUT ST	1					1							1		
778	FOOTHILL BL (W) & QUIGLEY AVE	1				1									1	
779	FILLMORE ST & PICHER ALY	1					1			1						
780	GARFIELD AVE (W) & WALNUT ST	1				1		1								
781	HILL AVE & PALOMA ST	1					1							1		
782	GLENOVER DR & MALCOLM DR	1			1					1						
783	KEWEN DR & OAK KNOLL CIR	1					1		1							

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
784	HILL AVE & WHITEFIELD RD	1					1							1		
785	LA TIERRA ST & VINEDO AVE	1					1	1								
786	FISKE AVE & WOODBURY RD	1					1								1	
787	FERN DR & LINDA VISTA AVE	1			1				1							
788	HILLSIDE TER & LA LOMA RD	1					1	1								
789	FAIR OAKS AVE & WOODBURY RD	1					1								1	
790	HAMMOND ST & SUNSET AVE	1					1		1							
791	HILL AVE & TOPEKA ST	1					1	1								
792	HAMMOND ST & WORCESTER AVE	1					1		1							
793	LINCOLN AVE & PEORIA ST	1					1			1						
794	HOLLISTON AVE & SAN PASQUAL ST	1					1								1	
795	LA LOMA RD & LAGUNA RD	1			1					1						
796	HAMPTON RD & HASTINGS RANCH DR	1					1								1	
797	GREEN ST & OAKLAND AVE	1					1								1	
798	GLEN OAKS BL & LINDA GLEN DR	1			1				1							
799	FAIR OAKS AVE & ORANGE PL	1				1		1								
800	FOREST AVE & MONTANA ST	1					1								1	
801	GARFIELD AVE & PARKE ST	1					1								1	
802	HOLLY ST & LINDA VISTA AVE	1					1	1								
803	LAKE AVE & OAKWOOD PL	1					1							1		
804	FOREST AVE & WASHINGTON BL	1				1		1								
805	HAMILTON AVE & VILLA ST	1					1							1		
806	GRAND OAKS AVE & JONES ALY	1					1							1		
807	GARFIELD AVE (E) & PARKE ST	1				1										1
808	GRANDVIEW ST & MARENGO AVE	1					1								1	
809	GRAND AVE & LA LOMA RD	1					1								1	
810	HOWARD ST & KENNETH WAY	1		1											1	
811	LINCOLN AVE & MANZANITA AVE	1			1				1							
812	HOWARD ST & LAKE AVE	1				1								1		

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
813	GARFIELD AVE (W) & VILLA ST	1				1								1		
814	FRONTAGE RD & ROSEMEAD BL	1					1	1								
815	LINCOLN AVE & PROSPECT BL	1					1	1								
816	HOWARD ST & LOS ROBLES AVE	1					1								1	
817	HIGHLAND ST (N) & LOS ROBLES AVE	1			1										1	
818	HASTINGS RANCH DR & PEAR ORCHARD LN	1				1								1		
819	LA LOMA RD & ROCKWOOD RD	1					1			1						
820	HOWARD ST & NAVARRO AVE	1					1							1		
821	LA LOMA RD & SYCAMORE GLEN	1					1		1							
822	FILLMORE ST & MAGNOLIA AVE	1					1			1						
823	FOOTHILL BL & MAPLE ST	1			1											1
824	GARFIELD AVE & HIGHLAND ST	1					1								1	
825	LA VEREDA RD & LINDA VISTA AVE	1					1			1						
826	GRANDVIEW ST & RAYMOND AVE	1					1								1	
827	GLEN AVE & TREMONT ST	1					1							1		
828	HASTINGS RANCH DR & SEARS WAY	1			1			1								
829	EXCHANGE ALY & RAYMOND AVE	1					1	1								
830	GRANDVIEW ST & SUMMIT AVE	1					1			1						
831	HILL AVE & LOMA VISTA ST (E)	1					1			1						
832	GLEN OAKS BL & SAN RAFAEL AVE	1		1												1
833	HAMILTON AVE & MAPLE ST	1				1								1		
834	FAIR OAKS AVE & PEACH PL	1					1							1		
835	HILL AVE & LOMBARDY RD	1			1				1							
836	GARFIELD AVE & HOWARD ST	1					1			1						
837	HILL AVE & MONTE VISTA ST	1				1					1					
838	GARFIELD AVE & MAPLE ST	1				1										1
839	HAMILTON AVE (S) & VILLA ST	1			1									1		
840	GREEN ST & MILLS PL	1					1							1		
841	GLORIETA ST & MORTON AVE	1					1					1				

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			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
842	IDAHO ST & NEWPORT AVE	1				1		1								
843	GARFIELD AVE (E) & VILLA ST	1			1											1
844	INVERNESS DR & LINDA VISTA AVE	1		1						1						
845	LANCANSHIRE PL & LIDA ST	1					1			1						
846	HEATHERSIDE RD (N) & LINDA VISTA AVE	1			1				1							
847	GLEN AVE & STANTON ST	1				1								1		
848	HERMANOS ST & SIERRA MADRE BL	1					1	1								
849	LINCOLN AVE & MACDONALD ST	1					1			1						
850	JUANITA AVE & MONTANA ST	1					1							1		
851	LINCOLN AVE & MAPLE ST	1					1			1						
852	JUNIPER DR & LA LOMA RD	1					1								1	
853	GREENHILL RD & HASTINGS RANCH DR	1				1		1								
854	KAWEAH DR (N) & TAMARAC DR	1					1							1		
855	LINCOLN AVE & PALISADE ST	1				1								1		
856	KENDALL ALY & UNION ST	1					1								1	
857	LINCOLN AVE & PEPPER ST	1				1								1		
858	KENMORE RD & OAK KNOLL AVE	1				1									1	
859	GRAND AVE & LOCKEHAVEN ST	1					1					1				
860	KENSINGTON PL & ORANGE GROVE BL	1			1				1							
861	FORD PL & LOS ROBLES AVE	1			1										1	
862	GIDDINGS ALY & HOLLISTON AVE	1					1								1	
863	FOREST AVE & HAMMOND ST	1					1				1					
864	COLORADO BL & SAN MARINO AVE (E)	1					1			1						
865	COTTAGE PL & MARENGO AVE	1					1		1							
866	COLORADO BL & COLORADO ST	1					1							1		
867	DEL MAR BL & RAMONA PL	1					1		1							
868	EL SERENO AVE & MONTANA ST	1					1							1		
869	CULVER ALY & SIERRA MADRE VILLA AVE	1					1			1						
870	CONGRESS ST & FAIRMOUNT AVE	1					1							1		

Pasadena LRSP

Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
871	COLORADO BL & LOTUS AVE	1				1								1		
872	EL MOLINO AVE & MIRA MONTE PL	1					1	1								
873	CLAREMONT ST (N) & MARENGO AVE	1					1								1	
874	CLAREMONT ST & GLEN AVE	1					1	1								
875	CLAREMONT ST & RAYMOND AVE	1				1		1								
876	ELIZABETH ST & GARFIELD AVE	1			1										1	
877	COLORADO BL & OAK AVE (E)	1			1											1
878	EMERSON ST & MENTOR AVE	1					1							1		
879	COLORADO BL & ELOISE AVE	1					1							1		
880	CRAWFORD ALY & HILL AVE	1					1							1		
881	DEL MAR BL & SIERRA BONITA AVE	1					1							1		
882	EL MOLINO AVE & LADERA ST	1					1						1			
883	DAISY AVE & NINA ST	1					1	1								
884	EL MOLINO AVE & OLD MILL RD (N)	1				1			1							
885	DAISY AVE & SIERRA GRANDE ST	1					1							1		
886	CORONA DR & MARENGO AVE	1					1	1								
887	CORSON ST & MARTELO AVE	1				1				1						
888	EL NIDO AVE & MORNINGSIDE ST	1					1								1	
889	DAYTON ST & DE LACEY AVE	1					1								1	
890	CHESTNUT ST & RAYMOND AVE	1					1							1		
891	CORSON ST & OAKLAND AVE	1					1			1						
892	ELIZABETH ST & LOS ROBLES AVE	1					1	1								
893	DEL MONTE ST & MENTONE AVE	1					1	1								
894	ELMIRA ST & EL MOLINO AVE	1					1			1						
895	DAYTON ST & PASADENA AVE	1					1			1						
896	CRAIG AVE & PALOMA ST	1					1							1		
897	DEL ROSA DR & ORANGE GROVE BL	1				1									1	
898	COLORADO BL & SAN RAFAEL AVE (E)	1					1							1		
899	DEL VINA ST & SIERRA MADRE BL	1			1			1								

Pasadena LRSP

Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
900	COOK AVE & WALNUT ST	1					1	1								
901	DEODAR CIR & SIERRA MADRE BL	1					1							1		
902	EL MOLINO AVE & HIGHLAND ST	1			1			1								
903	CLAREMONT ST & HUDSON AVE	1					1							1		
904	COLUMBIA PL & COLUMBIA ST	1				1						1				
905	COLORADO BL (W) & SAN RAFAEL AVE	1					1			1						
906	COLORADO BL & MOLINA AVE	1	1													1
907	DORESTA RD & OLD MILL RD	1			1							1				
908	COLUMBIA ST & FAIRVIEW AVE	1					1	1								
909	DE LACEY AVE & FRASER ALY	1					1							1		
910	CHESTNUT ST & FAIR OAKS AVE	1				1		1								
911	CLIFF DR & HASTINGS RANCH DR	1					1							1		
912	COLUMBIA ST & GRACE DR	1				1								1		
913	CHESTER AVE (E) & COLORADO BL	1					1	1								
914	CRAIG AVE & MAPLE ST	1					1	1								
915	EASTERN AVE & THOMPSON ALY	1					1			1						
916	EL SERENO AVE & HOWARD ST	1					1							1		
917	EATON CANYON DR & KINNELOA CANYON RD	1					1								1	
918	CLAREMONT ST & MARENGO AVE	1					1			1						
919	DE LACEY AVE & VALLEY ST	1					1			1						
920	COLORADO BL & EASTERN AVE	1					1							1		
921	DE LACEY AVE (E) & GREEN ST	1					1								1	
922	CRAIG AVE & MOUNTAIN ST	1			1			1								
923	CORNELL RD & EL MOLINO AVE	1					1			1						
924	ELIZABETH ST & MAR VISTA AVE	1				1		1								
925	EDMONDSON ALY & FILLMORE ST	1					1								1	
926	COLORADO BL & SAN MARINO AVE (W)	1			1			1								
927	EDMONDSON ALY & GLENARM ST	1					1							1		
928	COLORADO BL & OAK AVE	1		1					1							

Pasadena LRSP

Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
929	EL CIRCULO DR & LINDA VISTA AVE	1			1			1								
930	ESTADO ST & SIERRA MADRE VILLA AVE	1					1				1					
931	CLUB RD & COLORADO BL	1					1							1		
932	COLORADO BL & LINDA VISTA AVE	1					1								1	
933	EL DORADO ST & MADISON AVE	1					1	1								
934	CLAREMONT ST & PALM TER	1					1			1						
935	EL DORADO ST & OAKLAND AVE	1					1	1								
936	CORSON ST & HUDSON AVE	1			1			1								
937	EL MIRADOR DR & WELLINGTON AVE	1					1								1	
938	CRESTVIEW DR (N) & RIVIERA DR	1					1								1	
939	DEARBORN ST & MARENGO AVE	1					1		1							
940	COLORADO BL & SIERRA MADRE BL (WAYRENS PARKING LOT)	1					1				1					
941	DEL MAR BL & EDMONDSON ALY	1			1			1								
942	ARROYO BL & ARROYO DR ON 210 EB	1					1								1	
943	CHESTER AVE & CORSON ST	1					1			1						
944	ARROYO BL & DEL MONTE ST	1				1		1								
945	140 S LAKE AVE	1					1			1						
946	ARROYO BL & ARROYO DR	1			1				1							
947	ARROYO BL & WESTGATE ST	1			1			1								
948	CASTANO AVE & VILLA ST	1				1		1								
949	ARROYO BL & ZANJA ST	1			1										1	
950	ARROYO BL & NORWOOD DR	1					1		1							
951	210 WB & FOOTHILL BL	1					1							1		
952	AFTON ST (N) & LINDA VISTA AVE	1					1	1								
953	ARROYO DR & HOLLY ST	1					1			1						
954	BANBURY ALY & MOUNTAIN ST	1					1			1						
955	ALLEN AVE (N) & CASA GRANDE ST	1					1							1		
956	CARTER ALY & ORANGE GROVE BL	1					1									1
957	ALTADENA DR & NINA ST	1				1								1		

Pasadena LRSP

Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
958	CATALINA AVE & CORSON ST	1					1							1		
959	BONITA AVE & DEL MAR BL	1				1								1		
960	ALLEN AVE & DUNHAM ALY	1			1			1								
961	ALLENDALE RD & EUCLID AVE	1			1			1								
962	CHAMPLAIN AVE & VILLA ST	1					1							1		
963	ALLEN AVE & MONTE VISTA ST	1					1			1						
964	ALLEN AVE & ALLEN CT	1			1										1	
965	ALLENDALE RD (N) & LOS ROBLES AVE	1			1			1								
966	ARMADA DR & PROSPECT BL	1					1		1							
967	ALTADENA DR & VERANADA AVE	1					1	1								
968	AVOCA AVE & COLUMBIA ST	1					1	1								
969	ALLENDALE RD (S) & LOS ROBLES AVE	1			1							1				
970	CANYON WASH DR & PALOMA ST	1					1	1								
971	BRADFORD ST & ORANGE GROVE BL	1					1								1	
972	CARMELO AVE & VILLA ST	1					1								1	
973	BRADLEY ST & NEW YORK DR	1	1							1						
974	CASA GRANDE ST & SIERRA BONITA AVE	1					1	1								
975	BRAINARD ALY & MARENGO AVE	1			1			1								
976	BELL ST & MENTOR AVE	1					1	1								
977	ALPINE ST & EL MOLINO AVE	1			1			1								
978	BELLA VISTA AVE & CORSON ST	1				1								1		
979	BRESEE AVE & WELLS ALY	1					1								1	
980	CATALINA AVE & SAN PASQUAL ST	1				1										1
981	BRIGDEN RD & PALADORA AVE	1			1										1	
982	ALAMEDA ST & SIERRA MADRE VILLA AVE	1					1								1	
983	BRIGDEN RD & SIERRA BONITA AVE	1				1		1								
984	BELLEFONTAINE ST (E) & PASADENA AVE	1				1								1		
985	ALTADENA DR & WHITE ST	1					1	1								
986	ALLEN AVE & KEYSTONE ST	1				1		1								

Pasadena LRSP

Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
987	ALLEN AVE & CASA GRANDE ST	1		1												1
988	CHESTER AVE & VILLA ST	1					1	1								
989	BUCKEYE ST & EL MOLINO AVE	1					1		1							
990	ARLINGTON DR & ORANGE GROVE BL (N)	1				1			1							
991	BUCKEYE ST & EUCLID AVE	1					1								1	
992	CALIFORNIA BL & PICHER ALY	1					1	1								
993	BUCKEYE ST & LOS ROBLES AVE (N)	1				1										1
994	AVENUE 64 & MELROSE AVE	1					1							1		
995	ANDERSON PL & LINCOLN AVE	1					1							1		
996	CALIFORNIA BL & SIDNEY AVE	1			1				1							
997	BUCKEYE ST (S) & LOS ROBLES AVE	1				1			1							
998	BANBURY ALY & LINCOLN AVE	1			1									1		
999	BURLEIGH DR & LAGUNA RD	1			1			1								
1000	BANCROFT WAY & HOWARD ST	1			1						1					
1001	BUTTER CREEK DR & CROWNE DR	1					1			1						
1002	BANYAN ST & LINDA VISTA AVE	1					1			1						
1003	CALDERWOOD LN & RIM RD	1					1		1							
1004	BARTHE DR & MANZANITA AVE	1					1								1	
1005	ANNANDALE RD & COLORADO BL	1					1			1						
1006	CAROL DR & LINCOLN AVE	1					1				1					
1007	ARROYO PKWY (N) & BELLEVUE DR	1					1							1		
1008	ALAMEDA ST & SANTA PAULA AVE (W)	1					1								1	
1009	ARROYO SECO PKWY & GLENARM ST	1					1			1						
1010	CASTANO AVE & ORANGE GROVE BL	1					1				1					
1011	ARROYO TER & GRAND AVE (N)	1					1			1						
1012	BELL ST & LAKE AVE	1					1								1	
1013	ARROYO TER & ORANGE GROVE BL	1				1									1	
1014	BELL ST & MICHIGAN AVE	1					1				1					
1015	ARROYO VIEW DR & LIDA ST	1			1									1		

Pasadena LRSP

Appendix A: Intersection Collision Summary

			COLLISION SEVERITY					COLLISION TYPE								
ID	Intersections	Grand Total	Fatal	Severe Injury	Visible Injury	Complaint of Pain	Property Damage Only	Broadside	Head-On	Hit Object	Not Stated	Other	Overturned	Rear End	Sideswipe	Vehicle/ Pedestrian
1016	BELLA VISTA AVE & COOLEY PL	1					1				1					
1017	ANNANDALE RD & NITHSDALE RD	1					1					1				
1018	BELLA VISTA AVE & FOOTHILL BL	1					1							1		
1019	ASBURY DR & OXFORD AVE	1					1	1								
1020	CATALINA AVE & RHODES ALY	1				1		1								
1021	ASHLEY DR & WASHINGTON BL	1					1								1	
1022	CATALINA AVE & TOPEKA ST	1				1		1								
1023	ASHTABULA ST & EL MOLINO AVE	1					1		1							
1024	CATALINA AVE & VILLA ST	1			1			1								
1025	ARBOLEDA ST & FOOTHILL BL	1					1		1							
1026	ARROYO BL & MADELINE DR	1				1		1								
1027	ASHTABULA ST (S) & LOS ROBLES AVE	1				1								1		
1028	BELLEFONTAINE ST & ST JOHN AVE	1				1		1								
1029	ATCHISON ST & CATALINA AVE	1			1			1								
1030	CEDAR ST & SUNSET AVE	1					1		1							
1031	210 WB RAMP & SIERRA MADRE VILLA ST	1			1			1								
1032	ARROYO BL & ROSE BOWL DR	1				1								1		
1033	ALTADENA DR & CASA GRANDE ST	1					1								1	
1034	BELLEVUE DR & GORDON TER	1					1							1		
1035	ARDEN RD (S) & LAKE AVE	1	1						1							
1036	ALARCON PL & GLENARM ST	1				1		1								
1037	AVENUE 64 & CHURCH ST	1					1		1							
1038	ARROYO BL & SECO ST (W)	1				1									1	
1039	557 N LOS ROBLES AVE	1					1		1							
1040	134 FREEWAY EXCHANGE & 210 EASTBOUND FWY	1				1				1						

APPENDIX B

PROPOSED LIST OF RETRO-REFLECTIVE BACKING PLATE LOCATIONS

PASADENA LRSP

APPENDIX B: PROPOSED LIST OF RETRO-REFLECTIVE BACKING PLATE LOCATIONS

Hot Spot Locations (Data-driven):

1. Lake Ave & Orange Grove Bl
2. Corson St & Lake Ave
3. Fair Oaks Ave & Washington Bl
4. Colorado Bl & Sierra Madre Bl
5. Arroyo Pkwy & Green St
6. Lake Ave & Maple St
7. Fair Oaks Ave & Maple St
8. Lake Ave & Washington Bl
9. Fair Oaks Ave & Orange Grove Bl
10. Colorado Bl & Pasadena Ave
11. Lake Ave & Villa St
12. Lake Ave & Union St
13. Raymond Ave & Washington Blvd
14. Union St & Wilson Ave
15. Fair Oaks Ave & Glenarm St
16. Colorado Blvd & San Gabriel Blvd
17. Fair Oaks Ave & Hammond St
18. Colorado Blvd & Orange Grove Blvd
19. Colorado Blvd & Fair Oaks Ave
20. Colorado Blvd & Raymond Ave
21. Marengo Ave & Villa St
22. Marengo Ave & Green St

Similar Locations (Non-data driven):

23. Fair Oaks Ave & Montana St
24. Fair Oaks Ave & W Tremont St
25. Fair Oaks Ave & E Tremont St
26. Fair Oaks Ave & Howard St
27. Fair Oaks Ave (south of Hammond St)
28. Fair Oaks Ave & Mountain St
29. Fair Oaks Ave & Painter St
30. Fair Oaks Ave & Peoria St
31. Fair Oaks Ave & Villa St
32. Fair Oaks Ave & Corson St
33. Fair Oaks Ave & Walnut St
34. Fair Oaks Ave & Holly St
35. Fair Oaks Ave & Union St
36. Fair Oaks Ave & Green St
37. Fair Oaks Ave & Valley St
38. Fair Oaks Ave & Del Mar Bl
39. Fair Oaks Ave & California Bl
40. Fair Oaks Ave & Congress St
41. Fair Oaks Ave & Fillmore St
42. Fair Oaks Ave & Bellefontaine St
43. Fair Oaks Ave & Columbia St
44. Lake Ave & Rio Grande St
45. Lake Ave & Claremont St
46. Lake Ave & Belvidere St
47. Lake Ave & Mountain St
48. Lake Ave & Walnut St
49. Lake Ave & Colorado Bl
50. Lake Ave & Green St
51. Lake Ave & (south of Green St)
52. Lake Ave & Cordova St
53. Lake Ave & Del Mar Bl
54. Lake Ave & (south of Del Mar Bl)
55. Lake Ave & San Pasqual St
56. Lake Ave & California Bl
57. Colorado Bl & Melrose Ave
58. Colorado Bl & San Rafael Ave
59. Colorado Bl & St John Ave
60. Colorado Bl & De Lacey Ave
61. Colorado Bl & Arroyo Pkwy
62. Colorado Bl & Marengo Ave
63. Colorado Bl & Garfield Ave
64. Colorado Bl & Euclid Ave
65. Colorado Bl & Los Robles Ave
66. Colorado Bl & Oakland Ave
67. Colorado Bl & Madison Ave
68. Colorado Bl & El Molino Ave
69. Colorado Bl & Oak Knoll Ave
70. Colorado Bl & Hudson Ave
71. Colorado Bl & Mentor Ave
72. Colorado Bl & Catalina Ave
73. Colorado Bl & Wilson Ave
74. Colorado Bl & S Michigan Ave
75. Colorado Bl & N Michigan Ave
76. Colorado Bl & Hill Ave
77. Colorado Bl & Harkness Ave
78. Colorado Bl & Marion Ave
79. Colorado Bl & Sierra Bonita Ave
80. Colorado Bl & Bonnie Ave
81. Colorado Bl & Meridith Ave
82. Colorado Bl & Allen Ave
83. Colorado Bl & Berkeley Ave
84. Colorado Bl & Craig Ave
85. Colorado Bl & Altadena Dr
86. Colorado Bl & Sunnyslope Ave
87. Colorado Bl & Kinneloa Ave

88. Colorado Bl & Madre St
89. Washington Bl & Lincoln Ave
90. Washington Bl & Glen Ave
91. Washington Bl & Marengo Ave
92. Washington Bl & Los Robles Ave
93. Washington Bl & El Molino Ave
94. Washington Bl & Catalina Ave
95. Washington Bl & Hill Ave
96. Washington Bl & Sierra Bonita Ave
97. Washington Bl & Sinaloa Ave
98. Washington Bl & Allen Ave
99. Green St & Orange Grove Bl
100. Green St & St John Ave
101. Green St & Pasadena Ave
102. Green St & S De Lacey Ave
103. Green St & Fair Oaks Ave
104. Green St & Raymond Ave
105. Green St & Paseo Colorado
106. Green St & Euclid Ave
107. Green St & Los Robles Ave
108. Green St & Oakland Ave
109. Green St & Madison Ave
110. Green St & El Molino Ave
111. Green St & Oak Knoll Ave
112. Green St & Hudson Ave
113. Green St & Mentor Ave
114. Green St & Catalina Ave
115. Green St & Wilson Ave
116. Green St & Hill Ave

APPENDIX C

PROPOSED LIST OF FLUORESCENT SHEETING LOCATIONS

PASADENA LRSP

APPENDIX C: PROPOSED LIST OF FLUORESCENT SHEETING LOCATIONS

Hot Spot Locations (Data-driven):

1. Del Mar Bl & Holliston Ave (W11-8)
2. Del Mar Bl, east of Holliston Ave (W11-8)
3. Del Mar Bl, west of Hill Ave (W11-8)
4. Lake Ave, south of Santa Barbara St ("Fire Station"sign)
5. Fair Oaks Ave, south of Dayton St (W11-8)
6. Fair Oaks Ave, north of Valley St (W11-8)
7. Hammond St, east of Fair Oaks Ave ("Fire station, watch for trucks" sign)
8. Hammond St & Fair Oaks Bl northeast corner ("Fire station, watch for trucks" sign)
9. Hammond St, south of Fair Oaks Ave (NB) ("Fire station, watch for trucks" sign)
10. Fair Oaks Ave, south of Claremont St (SB) ("Fire station, watch for trucks" sign)
11. Lincoln Ave, east of Orange Grove Blvd (EB) (Pedestrian W11-2)
12. El Molino Ave, west of Washington Blvd (EB) Bike"share the road" sign (W11-1 & W16-1P)
13. Palm Terrace, east of Washington Blvd (EB) Bike "share the road" sign (W11-1 & W16-1P)
14. Prime Ct, west of Washington Blvd (WB) Pedestrian (W11-2)
15. Mentor Ave & Washington Blvd (EB) School pedestrian sign (S1-1 & W16-9P)

Similar Locations (Non-data driven):

16. Washington Bl, west of Rosemont Ave (EB) (S1-1)
17. Washington Bl, east of Arroyo Bl (WB) (D11-1)
18. Washington Bl, west of Forest Ave (WB) (D11-1)
19. Forest Ave & Washington Bl (NE corner) (W17-1 & W13-1P)
20. Washington Bl & Washington Pl (EB) (W11-1 & W16-1P)
21. Navarro Ave & Washington Bl (NE corner) (W17-1 & W13-1P)
22. Washington Bl, west of El Sereno Ave (EB) (W11-1 & W16-1P)
23. Washington Bl, east of Navarro Ave (WB) (W11-1 & W16-1P)
24. Iowa Ave & Washington Bl (NE corner) (W8-1 & W13-1P)
25. Washington Bl, west of Summit Ave (WB) (W11-1 & W16-1)
26. Washington Bl, east of N Marengo Ave (EB) (W11-1 & W 16-1)
27. N Summit Ave & Washington Bl (SE corner) (W8-1 & W13-1P)
28. Washington Bl, east of Mentor Ave (EB) (SR4-1)
29. Washington Bl, west of N Wilson Ave (WB) (SR4-1)
30. Mar Vista Ave & Washington Bl (NE corner) (W8-1 & W13-1P)
31. Fair Oaks Ave, north of Fair Oaks Dr (NB & SB)("Ped Xing" sign)
32. Fair Oaks Ave, south of Hammond Ave (NB & SB)("Ped Xing" sign)
33. Fair Oaks Ave & Walnut St (SW corner) (R10-15)
34. Alessandro Pl & Fair Oaks Ave (WB) (W14-2)
35. Lake Ave, south of Elizabeth St (NB) (W11-1)
36. Lake Ave, south of Green St (NB & SB) ("Ped Xing" sign)
37. Lake Ave south of Del Mar Bl (NB & SB) ("Ped Xing" sign)
38. Lake Ave, north of Arden Rd (SB) (W3-1)
39. Lake Ave & Arden Rd (SB) (W1-2 & W13-1P)
40. Orange Grove Bl & Columbia St (WB) ("Watch Opposing Traffic" sign)
41. Arbor St & Orange Grove Bl (WB) (W8-1 & W13-1P)
42. Orange Grove Bl & Del Mar Bl (WB) (W1-7)
43. Orange Grove Bl, 4 signs south of Del Rosa Dr (NB) (W1-8)
44. Del Rosa Dr & Orange Grove Bl (WB) (W8-1 & W13-1P)
45. Orange Grove Bl, north of Holly St (NB) (W1-1 & W13-1P)
46. Orange Grove Bl, north (4 signs) and south (1 sign) of Live Oaks Ave (NB & SB) (W1-8)
47. Orange Grove Bl, south of Walnut St (SB)(W1-1 & W13-1P)
48. Orange Grove Bl & Walnut St (WB)(W1-7)
49. Cypress Ave & Orange Grove Bl (SB)(W17-1 & W13-1P)
50. Summit Ave & Orange Grove Bl (SB)(W8-1 & W13-1P)

APPENDIX C: PROPOSED LIST OF FLUORESCENT SHEETING LOCATIONS

51. Worcester Ave & Orange Grove Bl (NB) (W17-1 & W13-1P)
52. Orange Grove Bl & Oakland Ave (NB) (SR4-1)
53. Mar Vista Ave & Orange Grove Bl (NB) (W17-1 & W13-1P)
54. Orange Grove Bl, west of Oak Ave (EB) (W1-4 & W13-1P)
55. Orange Grove Bl & Oak Ave (EB) (W2-1)
56. Orange Grove Bl & Craig Ave (WB) (W1-4 & W13-1P)
57. Sunnyslope Ave & Orange Grove Bl (SB) (W17-1 & W13-1P)
58. Canyon Wash Dr & Orange Grove Bl (NB) (W17-1 & W13-1P)
59. Orange Grove Bl, east of Canyon Wash Dr (EB) (W11-1 & W16-1P)
60. Del Mar Bl, west of De Lacey Ave (WB) (W73A)
61. Raymond Ave & Del Mar Bl (EB) (W10-1 & W48)
62. Del Mar Bl, west of Arroyo Pkwy (WB) (W82-1)
63. Del Mar Bl & Chester Ave (SB) (W1-7)
64. Del Mar Bl & Grand Oaks Ave (WB) (W1-4)
65. Del Mar Bl & Bonita Ave (WB) (S1-1)
66. Del Mar Bl, east of El Nido Ave (W11-2)
67. California Bl & Oak Knoll Ave (SB) (R3-5) "right turn only" with peak period restriction

Appendix D
SAFETY PROJECT COST ESTIMATES

CITY OF PASADENA LRSP
FAIR OAKS AVENUE AND MAPLE STREET
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
S08	***TRAFFIC SIGNAL***				
	REMOVE TYPE 17 SIGNAL POLE AND FOUNDATION COMPLETE	1	EA	$2,000	$2,000
	REMOVE TYPE 1 SIGNAL POLE AND FOUNDATION COMPLETE	1	EA	$1,300	$1,300
	REMOVE SIGNAL MAST ARM	1	EA	$500	$500
	REMOVE LUMINAIRE	1	EA	$500	$500
	REMOVE VEHICLE HEAD	3	EA	$200	$600
	REMOVE PEDESTRIAN HEAD	2	EA	$200	$400
	REMOVE PEDESTRIAN PUSH BUTTON	1	EA	$100	$100
	REMOVE STREET NAME SIGN	2	EA	$150	$300
	REMOVE SIGN	8	EA	$100	$800
	RELOCATE VIDEO CAMERA	1	EA	$1,000	$1,000
	INSTALL 19-4-100 SIGNAL POLE AND FOUNDATION COMPLETE	1	EA	$9,300	$9,300
	INSTALL 30' SIGNAL MAST ARM	1	EA	$2,650	$2,650
	INSTALL 15' LINAIRE MAST ARM	1	EA	$1,000	$1,000
	INSTALL LED LUMINAIRE	1	EA	$750	$750
	INSTALL 3 - 12" VEHICLE HEAD WITH MOUNTING	3	EA	$1,200	$3,600
	INSTALL PEDESTRIAN COUNTDOWN HEAD AND MOUNTING	2	EA	$1,600	$3,200
	INSTALL PEDESTRIAN PUSH BUTTON	1	EA	$1,325	$1,325
	INSTALL STREET NAME SIGN	2	EA	$1,500	$3,000
	INSTALL #6 PULL BOX	1	EA	$1,200	$1,200
	INSTALL DETECTOR LOOPS	2	EA	$500	$1,000
	INSTALL 3" CONDUIT	50	LF	$51	$2,550
	INSTALL WIRES/CABLES	1	LS	$5,000	$5,000
	INSTALL SIGN	8	EA	$500	$4,000
OTHER	***SIGNING AND STRIPING***				
	RESTRIPE EXISTING STRIPING WITH CONTRAST STRIPING	1	LS	$56,920	$56,920
S02	***TRAFFIC SIGNAL***				
	INSTALL 3 - 12" VEHICLE HEAD WITH MOUNTING	2	EA	$1,200	$2,400
S02	***TRAFFIC SIGNAL***				
	REPLACE VEHICLE HEAD BACKING PLATE WITH RETRO-REFLECTIVE BACKING PLATE	1	LS	$2,500	$2,500
				TOTAL FOR BASE BID ITEMS	**$46,075**
				MOBILIZATION & DEMOBILIZATION	**$4,608**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$18,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$9,400**
				PROJECT MANAGEMENT	**$4,608**
				30% CONTINGENCY	**$13,823**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$5,529**
				GRAND TOTAL	**$104,042**

CITY OF PASADENA LRSP
LAKE AVENUE AND WASHINGTON BOULEVARD
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	TRAFFIC SIGNAL				
	REMOVE VEHICLE HEAD	8	EA	$200	$1,600
OTHER	REMOVE SIGN	4	EA	$100	$400
	INSTALL 4 - 12" VEHICLE HEAD WITH MOUNTING	8	EA	$1,650	$13,200
	INSTALL SIGN	4	EA	$500	$2,000
	SIGNING AND STRIPING				
OTHER	INSTALL HIGH-VISIBILITY CROSSWALK	4	EA	$2,000	$8,000
				TOTAL FOR BASE BID ITEMS	**$25,200**
				MOBILIZATION & DEMOBILIZATION	**$2,520**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$3,000**
				FINAL DESIGN	**$14,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$5,640**
				PROJECT MANAGEMENT	**$2,520**
				30% CONTINGENCY	**$7,560**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$3,024**
				GRAND TOTAL	**$63,464**

CITY OF PASADENA LRSP

FAIR OAKS AVENUE AND WASHINGTON BOULEVARD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
OTHER	***TRAFFIC SIGNAL***				
	REMOVE VEHICLE HEAD	8	EA	$200	$1,600
	REMOVE SIGN	4	EA	$100	$400
	INSTALL 4 - 12" VEHICLE HEAD WITH MOUNTING	8	EA	$1,650	$13,200
	INSTALL SIGN	4	EA	$500	$2,000
OTHER	***SIGNING AND STRIPING***				
	INSTALL HIGH-VISIBILITY CROSSWALK	4	EA	$2,000	$8,000
				TOTAL FOR BASE BID ITEMS	**$25,200**
				MOBILIZATION & DEMOBILIZATION	**$2,520**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$3,000**
				FINAL DESIGN	**$14,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$5,640**
				PROJECT MANAGEMENT	**$2,520**
				30% CONTINGENCY	**$7,560**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$3,024**
				GRAND TOTAL	**$63,464**

CITY OF PASADENA LRSP

FAIR OAKS AVENUE AND ORANGE GROVE BOULEVARD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
OTHER	***TRAFFIC SIGNAL***				
	REMOVE VEHICLE HEAD	8	EA	$200	$1,600
	REMOVE SIGN	4	EA	$100	$400
	INSTALL 4 - 12" VEHICLE HEAD WITH MOUNTING	8	EA	$1,650	$13,200
	INSTALL SIGN	4	EA	$500	$2,000
OTHER	***STREET IMPROVEMENT***				
	INSTALL CURB EXTENSION	1	LS	$250,000	$250,000
				TOTAL FOR BASE BID ITEMS	$267,200
				MOBILIZATION & DEMOBILIZATION	$26,720
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$2,000
				CONSTRUCTION SURVEY AND MONUMENTATION	$10,000
				FINAL DESIGN	$20,000
				CONSTRUCTION MANAGEMENT AND INSPECTION	$22,560
				PROJECT MANAGEMENT	$26,720
				STORM WATER BEST MANAGEMENT PRACTICES (BMPs)	$2,500
				30% CONTINGENCY	$80,160
				12% INFLATION (2% PER YEAR @ 6 YEARS)	$32,064
				GRAND TOTAL	$489,924

CITY OF PASADENA LRSP

COLORADO BOULEVARD AND SIERRA MADRE BOULEVARD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
	TRAFFIC SIGNAL				
OTHER	REMOVE VEHICLE HEAD	8	EA	$200	$1,600
	REMOVE SIGN	4	EA	$100	$400
	INSTALL 4 - 12" VEHICLE HEAD WITH MOUNTING	8	EA	$1,650	$13,200
	INSTALL SIGN	4	EA	$500	$2,000
OTHER	***SIGNING AND STRIPING***				
	INSTALL HIGH-VISIBILITY CROSSWALK	4	EA	$2,000	$8,000
				TOTAL FOR BASE BID ITEMS	**$25,200**
				MOBILIZATION & DEMOBILIZATION	**$2,520**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$3,000**
				FINAL DESIGN	**$14,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$5,640**
				PROJECT MANAGEMENT	**$2,520**
				30% CONTINGENCY	**$7,560**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$3,024**
				GRAND TOTAL	**$63,464**

CITY OF PASADENA LRSP

ARROYO PARKWAY AND GREEN STREET

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
OTHER	***SIGNING AND STRIPING***				
	INSTALL HIGH-VISIBILITY CROSSWALK	4	EA	$2,000	$8,000
OTHER	***STREET IMPROVEMENT***				
	INSTALL CURB EXTENSION	1	LS	$250,000	$250,000
				TOTAL FOR BASE BID ITEMS	$258,000
				MOBILIZATION & DEMOBILIZATION	$25,800
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$2,000
				CONSTRUCTION SURVEY AND MONUMENTATION	$10,000
				FINAL DESIGN	$14,000
				CONSTRUCTION MANAGEMENT AND INSPECTION	$20,680
				PROJECT MANAGEMENT	$25,800
				STORM WATER BEST MANAGEMENT PRACTICES (BMPs)	$2,500
				30% CONTINGENCY	$77,400
				12% INFLATION (2% PER YEAR @ 6 YEARS)	$30,960
				GRAND TOTAL	$467,140

CITY OF PASADENA LRSP

LAKE AVENUE AND MAPLE STREET

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
OTHER	***SIGNING AND STRIPING***				
	INSTALL HIGH-VISIBILITY CROSSWALK	3	EA	$2,000	$6,000
				TOTAL FOR BASE BID ITEMS	$6,000
				MOBILIZATION & DEMOBILIZATION	$600
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$2,000
				FINAL DESIGN	$4,000
				CONSTRUCTION MANAGEMENT AND INSPECTION	$1,880
				PROJECT MANAGEMENT	$600
				30% CONTINGENCY	$1,800
				12% INFLATION (2% PER YEAR @ 6 YEARS)	$720
				GRAND TOTAL	$17,600

CITY OF PASADENA LRSP
EL MOLINO AVENUE AND VILLA STREET
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
OTHER	***SIGNING AND STRIPING***				
	INSTALL HIGH-VISIBILITY CROSSWALK	4	EA	$2,000	$8,000
				TOTAL FOR BASE BID ITEMS	$8,000
				MOBILIZATION & DEMOBILIZATION	$2,000
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$2,000
				FINAL DESIGN	$4,000
				CONSTRUCTION MANAGEMENT AND INSPECTION	$1,880
				PROJECT MANAGEMENT	$800
				30% CONTINGENCY	$2,400
				12% INFLATION (2% PER YEAR @ 6 YEARS)	$960
				GRAND TOTAL	$22,040

CITY OF PASADENA LRSP

ORANGE GROVE BOULEVARD AND SIERRA BONITA AVENUE

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
NS03	***TRAFFIC SIGNAL***				
	INSTALL NEW TRAFFIC SIGNAL	1	LS	$250,000	$250,000
				TOTAL FOR BASE BID ITEMS	$250,000
				MOBILIZATION & DEMOBILIZATION	$25,000
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$2,000
				FINAL DESIGN	$10,000
				CONSTRUCTION MANAGEMENT AND INSPECTION	$18,800
				PROJECT MANAGEMENT	$25,000
				30% CONTINGENCY	$75,000
				12% INFLATION (2% PER YEAR @ 6 YEARS)	$30,000
				GRAND TOTAL	$435,800

CITY OF PASADENA LRSP

WASHINGTON BOULEVARD FROM FOREST AVENUE TO CATALINA AVENUE

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
R32PB	***SIGNING AND STRIPING***				
	REMOVE STRIPING	14728	LF	$1	$14,728
	INSTALL STRIPING	28456	LF	$2	$56,912
	INSTALL SIGN AND SIGN POST	10	EA	$500	$5,000
OTHER	***SIGNING AND STRIPING***				
	REMOVE PAVEMENT MARKINGS	600	SF	$2	$1,200
	INSTALL PAVEMENT MARKINGS	600	SF	$4	$2,400
				TOTAL FOR BASE BID ITEMS	**$80,240**
				MOBILIZATION & DEMOBILIZATION	**$8,024**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$2,000**
				FINAL DESIGN	**$16,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$9,400**
				PROJECT MANAGEMENT	**$8,024**
				30% CONTINGENCY	**$24,072**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$9,629**
				GRAND TOTAL	**$157,389**

CITY OF PASADENA LRSP

LAKE AVENUE FROM MOUNTAIN STREET TO CALIFORNIA BOULEVARD

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
R26	***SIGNING AND STRIPING***				
	INSTALL DYNAMIC SPEED WARNING SIGN (SOLAR)	2	EA	$10,000	$20,000
OTHER	***SIGNING AND STRIPING***				
	REMOVE PAVEMENT MARKINGS	540	SF	$2	$1,080
	INSTALL PAVEMENT MARKINGS	540	SF	$4	$2,160
				TOTAL FOR BASE BID ITEMS	$23,240
				MOBILIZATION & DEMOBILIZATION	$2,324
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$2,000
				FINAL DESIGN	$12,000
				CONSTRUCTION MANAGEMENT AND INSPECTION	$3,760
				PROJECT MANAGEMENT	$2,324
				30% CONTINGENCY	$6,972
				12% INFLATION (2% PER YEAR @ 6 YEARS)	$2,789
				GRAND TOTAL	$55,409

CITY OF PASADENA LRSP

LOS ROBLES AVENUE FROM WASHINGTON BOULEVARD TO MAPLE STREET

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
R26	***SIGNING AND STRIPING***				
	INSTALL DYNAMIC SPEED WARNING SIGN (SOLAR)	2	EA	$10,000	$20,000
				TOTAL FOR BASE BID ITEMS	$20,000
				MOBILIZATION & DEMOBILIZATION	$2,000
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$2,000
				FINAL DESIGN	$4,000
				CONSTRUCTION MANAGEMENT AND INSPECTION	$1,880
				PROJECT MANAGEMENT	$2,000
				30% CONTINGENCY	$6,000
				12% INFLATION (2% PER YEAR @ 6 YEARS)	$2,400
				GRAND TOTAL	$40,280

CITY OF PASADENA LRSP

DEL MAR BOULEVARD FROM LOS ROBLES AVENUE TO EAST CITY LIMIT

PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
R32PB	***SIGNING AND STRIPING***				
	REMOVE STRIPING	38016	LF	$1	$38,016
	INSTALL STRIPING	38016	LF	$2	$76,032
	INSTALL SIGN AND SIGN POST	10	EA	$500	$5,000
OTHER	***SIGNING AND STRIPING***				
	REMOVE PAVEMENT MARKINGS	1920	SF	$2	$3,840
	INSTALL PAVEMENT MARKINGS	1920	SF	$4	$7,680
				TOTAL FOR BASE BID ITEMS	**$130,568**
				MOBILIZATION & DEMOBILIZATION	**$13,057**
				TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	**$5,000**
				FINAL DESIGN	**$40,000**
				CONSTRUCTION MANAGEMENT AND INSPECTION	**$9,400**
				PROJECT MANAGEMENT	**$13,057**
				30% CONTINGENCY	**$39,170**
				12% INFLATION (2% PER YEAR @ 6 YEARS)	**$15,668**
				GRAND TOTAL	**$265,920**

CITY OF PASADENA LRSP
SYSTEMIC SAFETY PROJECT
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	COUNTERMEASURE NAME	LOCATION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
S02	RETRO-REFLECTIVE BACKING PLATES	LAKE AVENUE & ORANGE GROVE BOULEVARD	1	LS	$2,500	$2,500
		CORSON STREET & LAKE AVENUE	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & WASHINGTON BOULEVARD	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & SIERRA MADRE BOULEVARD	1	LS	$2,500	$2,500
		ARROYO PARKWAY & GREEN STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & MAPLE STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & WASHINGTON BOULEVARD	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & ORANGE GROVE BOULEVARD	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & PASADENA AVENUE	1	LS	$2,500	$2,500
		LAKE AVENUE & VILLA STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & UNION STREET	1	LS	$2,500	$2,500
		RAYMOND AVENUE & WASHINGTON BOULEVARDVD	1	LS	$2,500	$2,500
		UNION STREET & WILSON AVENUE	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & GLENARM STREET	1	LS	$2,500	$2,500
		COLORADO BOULEVARDVD & SAN GABRIEL BOULEVARDVD	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & HAMMOND STREET	1	LS	$2,500	$2,500
		COLORADO BOULEVARDVD & ORANGE GROVE BOULEVARDVD	1	LS	$2,500	$2,500
		COLORADO BOULEVARDVD & FAIR OAKS AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARDVD & RAYMOND AVENUE	1	LS	$2,500	$2,500
		MARENGO AVENUE & VILLA STREET	1	LS	$2,500	$2,500
		MARENGO AVENUE & GREEN STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & MONTANA STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & W TREMONT STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & E TREMONT STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & HOWARD STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE (SOUTH OF HAMMOND STREET)	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & MOUNTAIN STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & PAINTER STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & PEORIA STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & VILLA STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & CORSON STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & WALNUT STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & HOLLY STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & UNION STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & GREEN STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & VALLEY STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & DEL MAR BOULEVARD	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & CALIFORNIA BOULEVARD	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & CONGRESS STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & FILLMORE STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & BELLEFONTAINE STREET	1	LS	$2,500	$2,500
		FAIR OAKS AVENUE & COLUMBIA STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & RIO GRANDE STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & CLAREMONT STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & BELVIDERE STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & MOUNTAIN STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & WALNUT STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & COLORADO BOULEVARD	1	LS	$2,500	$2,500
		LAKE AVENUE & GREEN STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & (SOUTH OF GREEN STREET)	1	LS	$2,500	$2,500
		LAKE AVENUE & CORDOVA STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & DEL MAR BOULEVARD	1	LS	$2,500	$2,500
		LAKE AVENUE & (SOUTH OF DEL MAR BOULEVARD)	1	LS	$2,500	$2,500
		LAKE AVENUE & SAN PASQUAL STREET	1	LS	$2,500	$2,500
		LAKE AVENUE & CALIFORNIA BOULEVARD	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & MELROSE AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & SAN RAFAEL AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & STREET JOHN AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & DE LACEY AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & ARROYO PARKWAY	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & MARENGO AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & GARFIELD AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & EUCLID AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & LOS ROBLES BOULEVARDS AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & OAKLAND AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & MADISON AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & EL MOLINO AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & OAK KNOLL AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & HUDSON AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & MENTOR AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & CATALINA AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & WILSON AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & S MICHIGAN AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & N MICHIGAN AVENUE	1	LS	$2,500	$2,500

CITY OF PASADENA LRSP
SYSTEMIC SAFETY PROJECT
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	COUNTERMEASURE NAME	LOCATION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
		COLORADO BOULEVARD & HILL AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & HARKNESS AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & MARION AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & SIERRA BONITA AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & BONNIE AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & MERIDITH AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & ALLEN AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & BERKELEY AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & CRAIG AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & ALTADENA DR	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & SUNNYSLOPE AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & KINNELOA AVENUE	1	LS	$2,500	$2,500
		COLORADO BOULEVARD & MADRE STREET	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & LINCOLN AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & GLEN AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & MARENGO AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & LOS ROBLES BOULEVARDS AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & EL MOLINO AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & CATALINA AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & HILL AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & SIERRA BONITA AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & SINALOA AVENUE	1	LS	$2,500	$2,500
		WASHINGTON BOULEVARD & ALLEN AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & ORANGE GROVE BOULEVARD	1	LS	$2,500	$2,500
		GREEN STREET & STREET JOHN AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & PASADENA AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & S DE LACEY AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & FAIR OAKS AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & RAYMOND AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & PASEO COLORADO	1	LS	$2,500	$2,500
		GREEN STREET & EUCLID AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & LOS ROBLES BOULEVARDS AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & OAKLAND AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & MADISON AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & EL MOLINO AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & OAK KNOLL AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & HUDSON AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & MENTOR AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & CATALINA AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & WILSON AVENUE	1	LS	$2,500	$2,500
		GREEN STREET & HILL AVENUE	1	LS	$2,500	$2,500

TOAL FOR BASE BID ITEMS	$287,500
MOBILIZATION & DEMOBILIZATION (10% MAX)	$28,750
TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$115,000
FINAL DESIGN	-
CONSTRUCTION MANAGEMENT AND INSPECTION	-
PROJECT MANAGEMENT	$28,750
30% CONTINGENCY	$138,000
12% INFLATION (2% PER YEAR @ 6 YEARS)	$71,760
GRAND TOTAL	$669,760

CITY OF PASADENA LRSP

SYSTEMIC SAFETY PROJECT

PRELIMINARY ENGINEER'S COSTREET ESTREETIMATE

COUNTER MEASURE	COUNTERMEASURE NAME	LOCATION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
S02	NEAR-SIDE SIGNAL HEADS	LAKE AVENUENUE & ORANGE GROVE BOULEVARD (ALL DIRECTIONS)	4	EA	$1,200	$4,800
		LAKE AVENUE & WASHINGTON BOULEVARD (ALL DIRECTIONS)	4	EA	$1,200	$4,800
		COLORADO BOULEVARD & PASADENA AVENUE	4	EA	$1,200	$4,800
		CORSON STREET & FAIR OAKS AVENUE (NORTH AND SOUTHBOUND APPROACH)	2	EA	$1,200	$2,400
		FAIR OAKS AVENUE & WASHINGTON BOULEVARD (ALL DIRECTIONS)	4	EA	$1,200	$4,800
		COLORADO BOULEVARD & SIERRA MADRE BOULEVARD (ALL DIRECTIONS)	4	EA	$1,200	$4,800
		ARROYO PARKWAY & GREEN STREET	4	EA	$1,200	$4,800
		UNION STREET & WILSON AVENUE	4	EA	$1,200	$4,800
		FAIR OAKS AVENUE & ORANGE GROVE BOULEVARD (ALL DIRECTIONS)	4	EA	$1,200	$4,800
		MARENGO AVENUE & GREEN STREET (SOUTHBOUND)	1	EA	$1,200	$1,200

TOAL FOR BASE BID ITEMS	$42,000
MOBILIZATION & DEMOBILIZATION (10% MAX)	$4,200
TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$10,000
FINAL DESIGN	$100,000
CONSTRUCTION MANAGEMENT AND INSPECTION	$9,400
PROJECT MANAGEMENT	$4,200
30% CONTINGENCY	$50,940
12% INFLATION (2% PER YEAR @ 6 YEARS)	$26,489
GRAND TOTAL	$247,229

CITY OF PASADENA LRSP

SYSTEMIC SAFETY PROJECT

PRELIMINARY ENGINEER'S COSTREET ESTREETIMATE

COUNTER MEASURE	COUNTERMEASURE NAME	LOCATION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
NS22PB	RECTANGULAR RAPID FLASHING BEACON (RRFB)	LOS ROBLES AVENUE & JACKSON STREET	1	EA	$30,000	$30,000
		MADRE STREET BETWEEN DEL MAR BOULEVAROAD & THORNDALE ROAD	1	EA	$30,000	$30,000
		HALSTEAD STREET BETWEEN ROSEMEAD BOULEVAROAD & FOOTHILL BOULEVAROAD	1	EA	$30,000	$30,000
		MARENGO AVENUE & WALLIS STREET	1	EA	$30,000	$30,000

TOAL FOR BASE BID ITEMS	$120,000
MOBILIZATION & DEMOBILIZATION (10% MAX)	$12,000
TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$8,000
FINAL DESIGN	$40,000
CONSTRUCTION MANAGEMENT AND INSPECTION	$15,040
PROJECT MANAGEMENT	$12,000
30% CONTINGENCY	$62,112
12% INFLATION (2% PER YEAR @ 6 YEARS)	$32,298
GRAND TOTAL	$301,450

CITY OF PASADENA LRSP

SYSTEMIC SAFETY PROJECT

PRELIMINARY ENGINEER'S COSTREET ESTREETIMATE

COUNTER MEASURE	COUNTERMEASURE NAME	LOCATION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
NS23PB	PEDESTRIAN HYBRID BEACON (HAWK)	BRESSE AVENUE & WASHINGON BOULEVARD (EAST LEG)	1	EA	$300,000	$300,000
		ATCHISON STREET & LAKE AVENUE (NORTH LEG)	1	EA	$300,000	$300,000
		ELIZABETH STREET & LAKE AVENUE (SOUTH LEG)	1	EA	$300,000	$300,000
		LINCOLN AVENUE & TOOLEN PLACE (NORTH LEG)	1	EA	$300,000	$300,000

TOAL FOR BASE BID ITEMS	$1,200,000
MOBILIZATION & DEMOBILIZATION (10% MAX)	$120,000
TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$8,000
FINAL DESIGN	$40,000
CONSTRUCTION MANAGEMENT AND INSPECTION	$15,040
PROJECT MANAGEMENT	$120,000
30% CONTINGENCY	$450,912
12% INFLATION (2% PER YEAR @ 6 YEARS)	$234,474
GRAND TOTAL	$2,188,426

CITY OF PASADENA LRSP
SYSTEMIC SAFETY PROJECT
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	COUNTERMEASURE NAME	LOCATION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
R22	REGULATORY SIGNS	DEL MAR BOULEVARD & HOLLISTON AVENUE (W11-8)	1	EA	$650	$650
		DEL MAR BOULEVARD, EAST OF HOLLISTON AVENUE (W11-8)	1	EA	$650	$650
		DEL MAR BOULEVARD, WEST OF HILL AVENUE (W11-8)	1	EA	$650	$650
		LAKE AVENUE, SOUTH OF SANTA BARBARA STREET ("FIRE STATION"SIGN)	1	EA	$650	$650
		FAIR OAKS AVENUE, SOUTH OF DAYTON STREET (W11-8)	1	EA	$650	$650
		FAIR OAKS AVENUE, NORTH OF VALLEY STREET (W11-8)	1	EA	$650	$650
		HAMMOND STREET, EAST OF FAIR OAKS AVENUE ("FIRE STATION, WATCH FOR TRUCKS" SIGN)	1	EA	$650	$650
		HAMMOND STREET & FAIR OAKS BOULEVARD NORTHEAST CORNER ("FIRE STATION, WATCH FOR TRUCKS" SIGN)	1	EA	$650	$650
		HAMMOND STREET, SOUTH OF FAIR OAKS AVENUE (NB) ("FIRE STATION, WATCH FOR TRUCKS" SIGN)	1	EA	$650	$650
		FAIR OAKS AVENUE, SOUTH OF CLAREMONT STREET (SB) ("FIRE STATION, WATCH FOR TRUCKS" SIGN)	1	EA	$650	$650
		LINCOLN AVENUE, EAST OF ORANGE GROVE BOULEVARDVD (EB) (PEDESTRIAN W11-2)	1	EA	$650	$650
		EL MOLINO AVENUE, WEST OF WASHINGTON BOULEVARDVD (EB) BIKE"SHARE THE ROAD" SIGN (W11-1 & W16-1P)	2	EA	$650	$1,300
		PALM TERRACE, EAST OF WASHINGTON BOULEVARDVD (EB) BIKE "SHARE THE ROAD" SIGN (W11-1 & W16-1P)	2	EA	$650	$1,300
		PRIME CT, WEST OF WASHINGTON BOULEVARDVD (WB) PEDESTRIAN (W11-2)	1	EA	$650	$650
		MENTOR AVENUE & WASHINGTON BOULEVARDVD (EB) SCHOOL PEDESTRIAN SIGN (S1-1 & W16-9P)	2	EA	$650	$1,300
		WASHINGTON BOULEVARD, WEST OF ROSEMONT AVENUE (EB) (S1-1)	1	EA	$650	$650
		WASHINGTON BOULEVARD, EAST OF ARROYO BOULEVARD (WB) (D11-1)	1	EA	$650	$650
		WASHINGTON BOULEVARD, WEST OF FOREST AVENUE (WB) (D11-1)	1	EA	$650	$650
		FOREST AVENUE & WASHINGTON BOULEVARD (NE CORNER) (W17-1 & W13-1P)	2	EA	$650	$1,300
		WASHINGTON BOULEVARD & WASHINGTON PLACE (EB) (W11-1 & W16-1P)	2	EA	$650	$1,300
		NAVARRO AVENUE & WASHINGTON BOULEVARD (NE CORNER) (W17-1 & W13-1P)	2	EA	$650	$1,300
		WASHINGTON BOULEVARD, WEST OF EL SERENO AVENUE (EB) (W11-1 & W16-1P)	2	EA	$650	$1,300
		WASHINGTON BOULEVARD, EAST OF NAVARRO AVENUE (WB) (W11-1 & W16-1P)	2	EA	$650	$1,300
		IOWA AVENUE & WASHINGTON BOULEVARD (NE CORNER) (W8-1 & W13-1P)	2	EA	$650	$1,300
		WASHINGTON BOULEVARD, WEST OF SUMMIT AVENUE (WB) (W11-1 & W16-1)	2	EA	$650	$1,300
		WASHINGTON BOULEVARD, EAST OF N MARENGO AVENUE (EB) (W11-1 & W 16-1)	2	EA	$650	$1,300
		N SUMMIT AVENUE & WASHINGTION BOULEVARD (SE CORNER) (W8-1 & W13-1P)	2	EA	$650	$1,300
		WASHINGTON BOULEVARD, EAST OF MENTOR AVENUE (EB) (SR4-1)	1	EA	$650	$650
		WASHINGTON BOULEVARD, WEST OF N WILSON AVENUE (WB) (SR4-1)	1	EA	$650	$650
		MAR VISTA AVENUE & WASHINGTON BOULEVARD (NE CORNER) (W8-1 & W13-1P)	2	EA	$650	$1,300
		FAIR OAKS AVENUE, NORTH OF FAIR OAKS DRIVE (NB & SB)("PED XING" SIGN)	2	EA	$650	$1,300
		FAIR OAKS AVENUE, SOUTH OF HAMMOND AVENUE (NB & SB)("PED XING" SIGN)	2	EA	$650	$1,300
		FAIR OAKS AVENUE & WALNUT STREET (SW CORNER) (R10-15)	1	EA	$650	$650
		ALESSANDRO PLACE & FAIR OAKS AVENUE (WB) (W14-2)	1	EA	$650	$650
		LAKE AVENUE, SOUTH OF ELIZABETH STREET (NB) (W11-1)	1	EA	$650	$650
		LAKE AVENUE, SOUTH OF GREEN STREET (NB & SB) ("PED XING" SIGN)	2	EA	$650	$1,300
		LAKE AVENUE SOUTH OF DEL MAR BOULEVARD (NB & SB) ("PED XING" SIGN)	2	EA	$650	$1,300
		LAKE AVENUE, NORTH OF ARDEN ROAD (SB) (W3-1)	1	EA	$650	$650
		LAKE AVENUE & ARDEN ROAD (SB) (W1-2 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD & COLUMBIA STREET (WB) ("WATCH OPPOSING TRAFFIC" SIGN)	1	EA	$650	$650
		ARBOR STREET & ORANGE GROVE BOULEVARD (WB) (W8-1 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD & DEL MAR BOULEVARD (WB) (W1-7)	1	EA	$650	$650
		ORANGE GROVE BOULEVARD, 4 SIGNS SOUTH OF DEL ROSA DRIVE (NB) (W1-8)	4	EA	$650	$2,600
		DEL ROSA DRIVE & ORANGE GROVE BOULEVARD (WB) (W8-1 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD, NORTH OF HOLLY STREET (NB) (W1-1 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD, NORTH (4 SIGNS) AND SOUTH (1 SIGN) OF LIVE OAKS AVENUE (NB & SB) (W1-8)	5	EA	$650	$3,250
		ORANGE GROVE BOULEVARD, SOUTH OF WALNUT STREET (SB)(W1-1 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD & WALNUT STREET (WB)(W1-7)	1	EA	$650	$650
		CYPRESS AVENUE & ORANGE GROVE BOULEVARD (SB)(W17-1 & W13-1P)	2	EA	$650	$1,300
		SUMMIT AVENUE & ORANGE GROVE BOULEVARD (SB)(W8-1 & W13-1P)	2	EA	$650	$1,300
		WORCESTER AVENUE & ORANGE GROVE BOULEVARD (NB) (W17-1 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD & OAKLAND AVENUE (NB) (SR4-1)	1	EA	$650	$650
		MAR VISTA AVENUE & ORANGE GROVE BOULEVARD (NB) (W17-1 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD, WEST OF OAK AVENUE (EB) (W1-4 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD & OAK AVENUE (EB) (W2-1)	1	EA	$650	$650
		ORANGE GROVE BOULEVARD & CRAIG AVENUE (WB) (W1-4 & W13-1P)	2	EA	$650	$1,300
		SUNNYSLOPE AVENUE & ORANGE GROVE BOULEVARD (SB) (W17-1 & W13-1P)	2	EA	$650	$1,300
		CANYON WASH DRIVE & ORANGE GROVE BOULEVARD (NB) (W17-1 & W13-1P)	2	EA	$650	$1,300
		ORANGE GROVE BOULEVARD, EAST OF CANYON WASH DRIVE (EB) (W11-1 & W16-1P)	2	EA	$650	$1,300
		DEL MAR BOULEVARD, WEST OF DE LACEY AVENUE (WB) (W73A)	1	EA	$650	$650
		RAYMOND AVENUE & DEL MAR BOULEVARD (EB) (W10-1 & W48)	2	EA	$650	$1,300
		DEL MAR BOULEVARD, WEST OF ARROYO PKWY (WB) (W82-1)	1	EA	$650	$650
		DEL MAR BOULEVARD & CHESTER AVENUE (SB) (W1-7)	1	EA	$650	$650
		DEL MAR BOULEVARD & GRAND OAKS AVENUE (WB) (W1-4)	1	EA	$650	$650
		DEL MAR BOULEVARD & BONITA AVENUE (WB) (S1-1)	1	EA	$650	$650
		DEL MAR BOULEVARD, EAST OF EL NIDO AVENUE (W11-2)	1	EA	$650	$650
		CALIFORNIA BOULEVARD & OAK KNOLL AVENUE (SB) (R3-5) "RIGHT TURN ONLY" WITH PEAK PERIOD RESTRICTION	1	EA	$650	$650

TOAL FOR BASE BID ITEMS	$68,900
MOBILIZATION & DEMOBILIZATION (10% MAX)	$6,890
TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY	$3,000
FINAL DESIGN	-
CONSTRUCTION MANAGEMENT AND INSPECTION	-
PROJECT MANAGEMENT	$6,890
30% CONTINGENCY	$25,704
12% INFLATION (2% PER YEAR @ 6 YEARS)	$13,366
GRAND TOTAL	$124,750

CITY OF PASADENA
LRSP SAFETY PROJECT
PRELIMINARY ENGINEER'S COST ESTIMATE

COUNTER MEASURE	COUNTERMEASURE NAME	LOCATION	ESTIMATED QUANTITY	UNIT OF MEASURE	UNIT PRICE	ITEM TOTAL
OTHER	RESTRIPING	FAIR OAKS AVENUE AND MAPLE STREET	1	LS	$56,620	$56,620
		CORSON STREET AND LAKE AVENUE	1	LS	$32,385	$32,385
		COLORADO BOULEVARD AND SIERRA MADRE BOULEVARD	1	LS	$23,500	$23,500
		LAKE AVENUE AND MAPLE STREET	1	LS	$11,395	$11,395
		FOOTHILL BOULEVARD AND SIERRA MADRE VILLA AVENUE	1	LS	$11,110	$11,110
		HILL AVENUE AND WALNUT STREET	1	LS	$8,360	$8,360
		FAIR OAKS AVENUE AND MOUNTAIN STREET	1	LS	$11,420	$11,420
		HOLLY STREET AND ORANGE GROVE BOULEVARD	1	LS	$9,900	$9,900
		MARENGO AVENUE AND UNION STREET	1	LS	$21,900	$21,900
		ALLEN AVENUE AND COLORADO BOULEVARD	1	LS	$12,635	$12,635
		DEL MAR BOULEVARD AND LAKE AVENUE	1	LS	$107,220	$107,220
		GREEN STREET AND LAKE AVENUE	1	LS	$2,440	$2,440
		MAPLE STREET AND MARENGO AVENUE	1	LS	$22,580	$22,580
		MARENGO AVENUE AND WALNUT STREET	1	LS	$18,495	$18,495
		COLORADO BOULEVARD AND HILL AVENUE	1	LS	$19,125	$19,125
		COLORADO BOULEVARD AND LOS ROBLES AVENUE	1	LS	$208,560	$208,560
		LAKE AVENUE AND WALNUT STREET	1	LS	$23,065	$23,065
		COLORADO BOULEVARD AND LAKE AVENUE	1	LS	$163,920	$163,920
		LA TIERRA STREET AND SAN GABRIEL BOULEVARD	1	LS	$25,770	$25,770
		DEL MAR BOULEVARD AND FAIR OAKS AVENUE	1	LS	$153,110	$153,110
		DEL MAR BOULEVARD AND SAN GABRIEL BOULEVARD	1	LS	$10,770	$10,770
		GREEN STREET AND MARENGO AVENUE	1	LS	$73,825	$73,825
		ALTADENA DRIVE AND FOOTHILL BOULEVARDVD	1	LS	$105,640	$105,640
		FAIR OAKS AVENUE AND HOWARD STREET	1	LS	$69,210	$69,210
		ARROYO PARKWAY AND DEL MAR BOULEVARD	1	LS	$15,745	$15,745
		FAIR OAKS AVENUE AND CALIFORNIA BOULEVARD	1	LS	$5,365	$5,365
		FOOTHILL BOULEVARD AND SAN GABRIEL BOULEVARD	1	LS	$33,310	$33,310
		CORSON STREET AND FAIR OAKS AVENUE	1	LS	$3,300	$3,300
		FAIR OAKS AVENUE AND WALNUT STREET	1	LS	$66,715	$66,715
		LOS ROBLES AVENUE AND MAPLE STREET	1	LS	$15,460	$15,460
		LOS ROBLES AVENUE AND VILLA STREET	1	LS	$10,000	$10,000

TOAL FOR BASE BID ITEMS	$1,352,850
MOBILIZATION & DEMOBILIZATION (10% MAX)	$135,285
TRAFFIC CONTROL, PUBOULEVARDIC CONVENIENCE AND SAFETY	$62,000
FINAL DESIGN	$124,000
CONSTRUCTION MANAGEMENT AND INSPECTION	$18,800
PROJECT MANAGEMENT	$135,285
30% CONTINGENCY	$548,466
12% INFLATION (2% PER YEAR @ 6 YEARS)	$285,202
GRAND TOTAL	$2,661,888

Appendix E
COLLISION BENEFIT ANALYSIS

APPENDIX E: SAFETY PROJECTS BENEFIT/COST RATIO ANALYSIS

RoadSafe Collision Database From 2015 to 2019

	Location	Type	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
1	Fair Oaks Ave & Maple St	Signalized	S08	Convert signal mast arm	Replace protected left turn signal with a protected left turn signal mast arm (northbound)	All	30%	20	52	$2,860,800	$3,432,960	$104,042	33.0	90%	$93,638	$10,404
			Other	Contrast Striping	Restripe the intersection with contrast striping. Extents of the restriping are as follows: - East leg 123ft - West leg 60ft - North leg 144ft - South leg 2035ft	-										
			S02	Nearside Signals	Install near side signal on the northbound and southbound approaches	All										
			S02	Retro-reflective backing plates	Upgrade all existing traffic signals with retro-reflective backing plates.	All										
2	Lake Ave & Washington Bl	Signalized	Other	Flashing yellow arrow[1]	Replace protected permissive signals with flashing yellow arrows on all directions	Left Turn	14%	20	17	$1,220,300	$698,012	$63,464	11.0	0%	$0	$63,464
			Other	High visibility crosswalks[1]	Install high visibility crosswalks	Vehicle/ Pedestrian										
3	Fair Oaks Ave & Washington Bl	Signalized	Other	High visibility crosswalks[1]	Install high visibility crosswalks	Vehicle/ Pedestrian	14%	20	7	$2,249,400	$1,259,664	$63,464	19.8	0%	$0	$63,464
			Other	Flashing Yellow Arrow[1]	Install flashing yellow arrows on all directions	Left Turn										
4	Fair Oaks Ave & Orange Grove Bl	Signalized	Other	Flashing Yellow Arrow[1]	Install flashing yellow arrows on all directions	Left Turn	14%	20	16	$1,198,400	$671,104	$489,924	1.4	0%	$0	$489,924
			Other	Curb Extensions	Install curb extension on the northwest corner of Orange Grove Blvd	P&B										
5	Colorado Bl & Sierra Madre Bl	Signalized	Other	High visibility crosswalks[1]	Install high visibility crosswalks	Vehicle/ Pedestrian	14%	20	11	$536,900	$300,664	$63,464	4.7	0%	$0	$63,464
			Other	Flashing Yellow Arrow[1]	Add flashing yellow arrows in all directions	Left Turn										
6	Arroyo Pkwy & Green St	Signalized	Other	High visibility crosswalks[1]	Install high visibility crosswalks	Vehicle/ Pedestrian	40%	10	2	$250,800	$200,640	$467,140	0.4	0%	$0	$467,140
			Other	Curb Extensions	Install curb extension on the northeast corner of Arroyo Pkwy	P&B										
7	Lake Ave & Maple St	Signalized	Other	High visibility crosswalks[1]	Install high visibility crosswalks	Vehicle/ Pedestrian	40%	10	0	$ -	$0	$17,600	0.0	0%	$0	$17,600
8	El Molino Ave & Villa St	Signalized	Other	High visibility crosswalks[1]	Install high visibility crosswalks	Vehicle/ Pedestrian	40%	10	2	$1,877,900	$1,502,320	$22,040	68.2	0%	$0	$22,040
9	Orange Grove Bl & Sierra Bonita Ave	Non-Signalized	NS03	Install Signal	Install traffic signal	All	14%	20	4	$280,600	$157,136	$435,800	0.4	90%	$392,220	$43,580
10	Washington Bl from Forest Ave to Catalina Ave	Roadway	R32PB	Install Bike Lane	Install buffered 5' bike lanes with 2' striped buffer from Lincoln Ave to El Molino Ave and a Class III bike route from Forest Ave to Lincoln Ave	P&B	35%	20	30	$10,513,300	$14,718,620	$157,389	93.5	90%	$141,650	$15,739
			Other	Striping	Replace pavement markers with thermo plastic of paint											
11	Lake Ave from Mountain St to California Bl	Roadway	Other	Install dynamic speed warning signs[1]	Install speed feedback signs -South of Orange Grove Blvd (southbound) -South of Villa St (northbound)	All	22%	10	415	$39,504,200	$17,381,848	$55,409	313.7	0%	$0	$55,409
			Other	Striping	Replace pavement markers with thermo plastic or paint from Colorado Bl to Walnut St											
12	Los Robles Ave from Washington Bl to Maple St	Roadway	Other	Install dynamic speed warning signs[1]	Install speed feedback signs -North of E Ashtabula St (northbound) -South of Mountain St (southbound)	All	22%	10	123	$16,065,100	$7,068,644	$40,280	175.5	0%	$0	$40,280
13	Del Mar Bl from Los Robles Ave to east City Limit	Roadway	R32PB	Install Bike Lane	Install Class II bike lanes and remove one travel lane from each direction.	P&B	35%	20	19	$4,497,200	$6,296,080	$265,920	23.7	90%	$239,328	$26,592
			Other	Striping	Replace pavement markers with thermo plastic or paint											
14	Multiple Locations	Signalized	S02	Retro-reflective backing plates	Upgrade existing traffic signals with retro-reflective backing plates	All	15%	10	2118	$180,900,900	$54,270,270	$669,760	81.0	90%	$602,784	$66,976
15	Multiple Locations	Signalized	S02	Nearside Signals	Install nearside signal heads	All	15%	10	418	$39,072,100	$11,721,630	$247,229	47.4	90%	$222,506	$24,723

APPENDIX E: SAFETY PROJECTS BENEFIT/COST RATIO ANALYSIS

RoadSafe Collision Database From 2015 to 2019

	Location	Type	CM #	Countermeasure Names	Description	Collision Type	CRF	Project Life (Years)	No. of Preventable Collisions	Collision Costs	Collision Benefits	Cost ($) Estimation	Benefit/Cost Ratio (BCR)	HSIP Max Share	HSIP Amount	Local Amount
16	Multiple Locations	Non-Signalized	NS22PB	Rectangular Rapid Flashing Beacon (RRFB)	Install Rectangular Rapid Flashing Beacons - Los Robles Ave & Jackson St - Madre St btwn Del Mar Bl & Thorndale Rd - Halstead St btwn Rosemead Bl & Foothill Bl - Marengo Ave & Wallis St	P&B	35%	20	5	$3,268,600	$4,576,040	$301,450	15.2	90%	$271,305	$30,145
17	Multiple Locations	Non-Signalized	NS23PB	HAWK Signal	- Bresse Ave & Washington Bl (east leg) - Atchison St & Lake Ave - Elizabeth St & Lake Ave (South leg) - Lincoln Ave & Toolen Place	P&B	55%	20	0	$0	$0	$2,188,426	0.0	90%	$1,969,583	$218,843
18	Multiple Locations	Roadway	R22	Regulatory Signs	Upgrade signs with new fluorescent sheeting	All	15%	10	488	$50,393,100	$15,117,930	$124,750	121.2	90%	$112,275	$12,475
19	Multiple Locations	-	Other	Restriping[2]	Restripe existing lanes with contrast striping on the light concrete	-	-	10	0	$0	$0	$2,661,888	-	0	$0	$2,661,888

1 CRF for this countermeasure was found through the Crash Modification Factors Clearinghouse, http://www.cmfclearinghouse.org/index.cfm

2 No CRF is available for this countermeasure