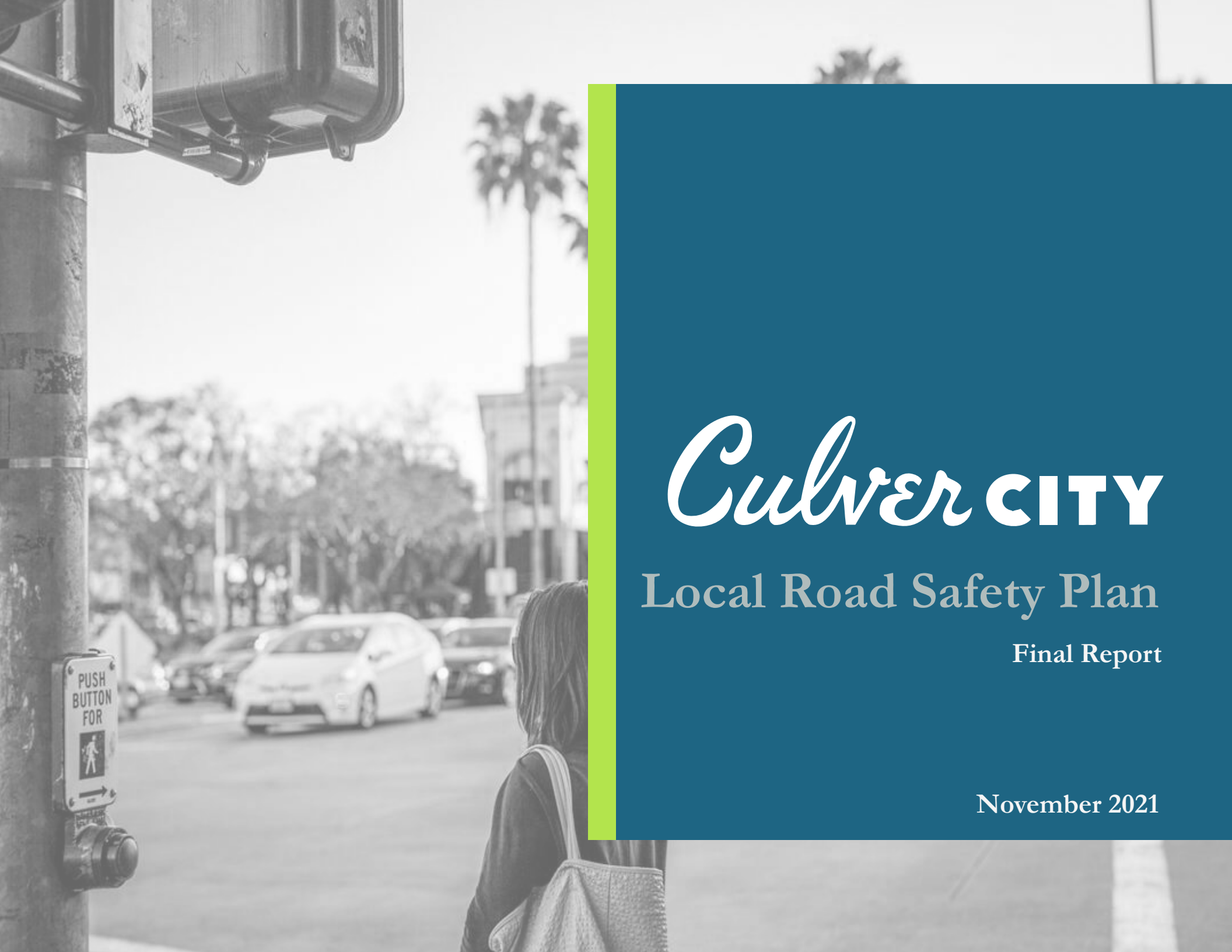

Culver CITY

Local Road Safety Plan

Final Report

November 2021

Prepared For:

Culver City Public Works Department

Prepared By:

TJKM Transportation Consultants

Final Report

November 2021

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Acknowledgements

The Culver City Local Road Safety Plan (LRSP) is integral to addressing traffic safety on roadways and intersections within the City. The LRSP starts with establishing goals and objectives and further entails a data driven systemic safety analysis conducted using collisions that have occurred in the City. The plan takes a proactive approach and sets a vision for continued safety for all modes of transportation through identification of strategies under the E's: Engineering, Education, Encouragement, Enforcement, Emerging Technologies and Evaluation. The plan will be essential for the City to qualify for future safety funding grants as well as to program future Capital Improvement Projects. Continued City efforts and investments towards implementation will ensure safety for all modes of transportation for users of all ages and abilities.

City Council

Alex Fisch, Mayor

Daniel Lee, Vice Mayor

Council Members: Göran Eriksson, Albert Vera and Yasmine-Imani Mcmorrin

City Manager

John M. Nachbar, City Manager

Public Works Department

Charles D. Herbertson, Public Works Director & City Engineer

Yanni Demitri, Public Works Director & City Engineer

Heba El-Guindy, Mobility & Traffic Engineering Manager

Gabriel Garcia, Traffic Engineer Analyst

Alicia Ide, Management Analyst

Bicycle and Pedestrian Advisory Committee (BPAC)

Michelle Weiner, Chair

Art Nomura, Vice Chair

BPAC Members: George Montgomery, Travis Morgan, Robyn Tenensap, Dane Twichell, Phillip Hernandez, and Zirwat Chowdhury

Consultant Team

TJKM Transportation Consultants: Ruta Jariwala, Divya Gandhi, Andrew Dickinson

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1. Introduction

Traffic safety is the top priority for the US Department of Transportation Federal Highway Administration (FHWA). Its goal is to reduce transportation related fatalities and severe injuries across the transportation system and it fully supports the vision of zero deaths and severe injuries. FHWA administers a performance-based Highway Safety Improvement Program (HSIP) which uses the traffic safety planning approach. Traffic safety planning is a comprehensive system-wide, multi-modal, data driven and proactive transportation planning process that integrates safety into surface transportation decision-making.

Federal regulations require each State to have a Strategic Highway Safety Plan (SHSP). A Local Road Safety Plan (LRSP) provides local and rural road owners with an opportunity to address unique highway safety needs in their jurisdictions. Culver City was allocated a grant by Caltrans to develop its first LRSP. In the future HSIP Call-for-Projects, a LRSP will be required for an agency to be eligible to apply for the HSIP funds.

Aligned with this vision and goal, the Culver City's LRSP will enable the City to identify potential traffic safety improvements tailored to its traffic related needs and issues. The plan is a living document that plays a critical role in identifying the conditions that contribute to collisions within the City.

The objective of this plan is to utilize a data driven approach by using historic collision database and identifying high-risk intersections and roadway segments/ mid-block locations to develop appropriate safety improvements. The plan identifies key emphasis areas and strategies that impact roadways and provides a framework to accomplish safety enhancements at the City level. The multi-disciplinary approach entails identifying safety measures under the various E's of Engineering, Education, Encouragement, Enforcement, Emerging Technologies, and Evaluation, customized according to the most pressing needs of the City. In addition, the plan will develop a prioritized list of improvements that will help the City apply for future funding opportunities.

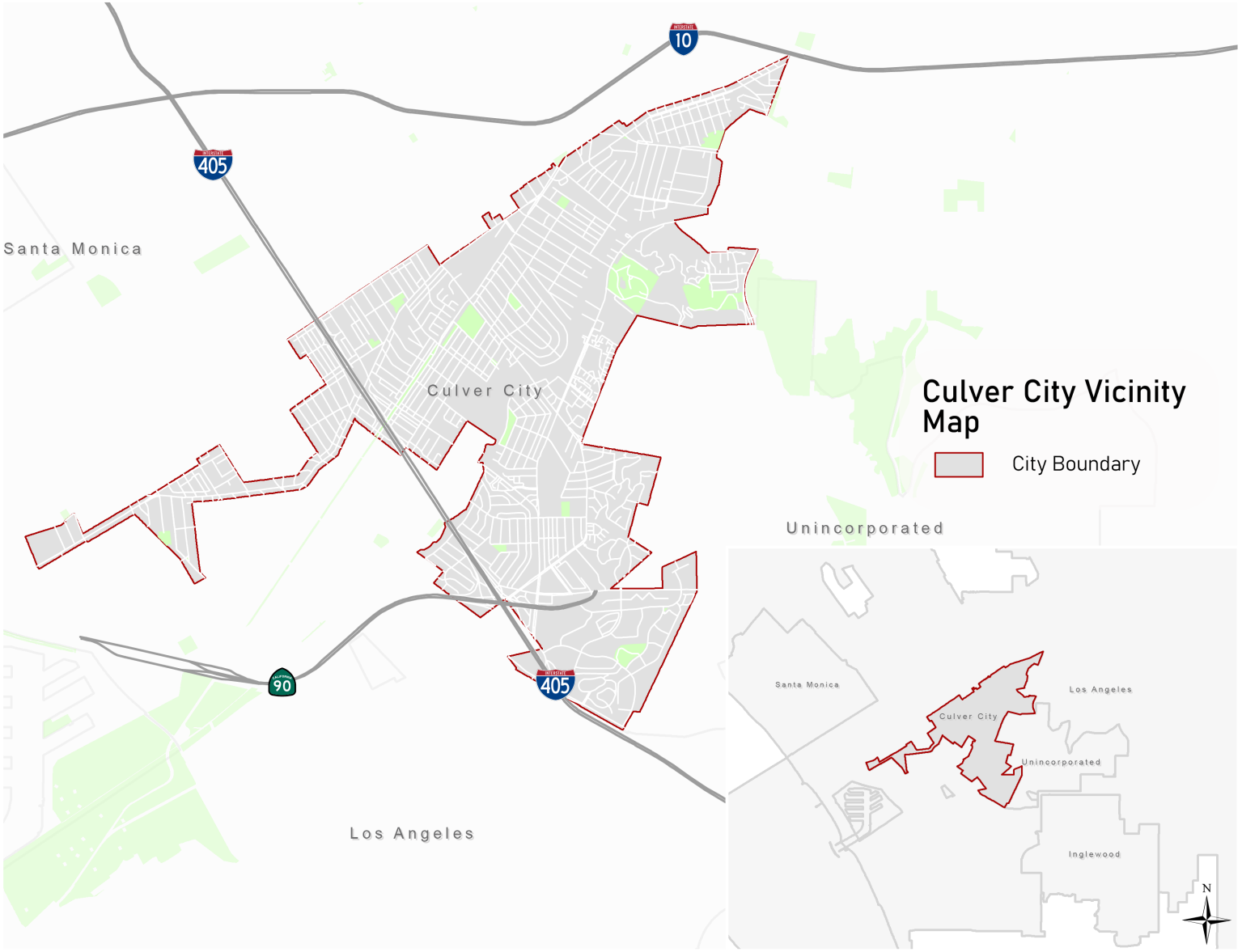
Safety Partners

A LRSP provides a framework for organizing stakeholders to identify, analyze, and prioritize roadway safety improvements on local and rural roads. The City identified organizations in the community that were engaged as potential stakeholders and safety partners in plan development and implementation. The organizations involved included Culver City Unified School District, West Los Angeles College, City departments including the Police, Community Development, and the Transportation Departments, the City's Bicycle and Pedestrian Advisory Committee, Walk n Roller School Safety Program, Women on Bikes, Bike Culver City, and various community associations.

Study Area

Culver City is located in western Los Angeles County. It is mostly surrounded by the City of Los Angeles, but also shares a border with unincorporated areas of Los Angeles County. The City of Santa Monica is located to its north west and the City of Inglewood is located to its south. According to the United States Census Bureau, the City has an estimated population of 39,185 (July, 2019). It has a land area of 5.11 square miles. **Figure 1** illustrates a vicinity map for Culver City.

Figure 1. Vicinity Map



Report Organization

The Local Roadway Safety Plan for Culver City is organized into 7 Chapters.

Chapter 1: Introduction - This chapter introduces the project and the study area. It entails a detailed description of the organization of this report and also the list of Safety Partners serving as Stakeholders throughout the development of this plan.

Chapter 2: Goals and Objectives - This chapter describes the vision, goals and objectives of the Local Roadway Safety Plan.

Chapter 3: Existing Planning Efforts - This chapter describes the current planning efforts and development projects that are planned for Culver City.

Chapter 4: Collision Data Collection and Analysis - This chapter summarizes collisions occurred in Culver City from the year 2014-2018. It describes the collision distribution based on the severity and facility type. It also entails a detailed trend analysis focused on all collisions as well as collisions of high-severity including fatal and severe injury collisions.

Chapter 5: High-Risk Roadway Segments and Intersections - This chapter describes the methodology used to analyze collisions and presents a list of high-risk roadway segments and intersections as determined.

Chapter 6: Emphasis Areas and Countermeasures - The chapter entails six emphasis areas identified as a result of the observed trends from collision analysis. These key emphasis areas help identify goals and strategies that provide a framework for accomplishing safety enhancements in Culver City.

Chapter 7: Safety Projects and Implementation - This chapter summarizes the list of applicable countermeasures and viable safety projects for each high-risk roadway segment and intersection as identified previously, along with the project cost, benefit and the resultant Benefit-Cost Ratio (BCR). It also entails next steps for implementation and a list of potential funding sources.

2. Goals and Objectives

This chapter presents the goals and objectives for the Culver City Local Roadway Safety Plan. All goals and objectives were reviewed to ensure consistency with the existing Culver City planning documents, and regional, state and federal safety goals.

The vision for the Culver City LRSP is to systemically identify roadway safety issues within Culver City, and address them through a holistic approach using the E's: Engineering, Education, Encouragement, Enforcement, Emerging Technologies, and Evaluation. Roadway fatalities and serious injuries are preventable incidents and can be addressed through the E's strategies. Safety and protecting human life is the highest priority.

The following are the proposed goals and objectives for the Culver City LRSP:

Goal 1: Systematically identify and analyze roadway safety issues and recommend appropriate improvements

Objective 1: Use the Systemic Safety Analysis data-driven process to identify risk factors and conditions leading to fatal and severe injury collisions in Culver City; where they are occurring, and implement appropriate and proven countermeasures

Objective 2: Improve roadway planning, design, operations, maintenance and connectivity to enhance safety and mobility for users of all ages and abilities

Objective 3: Implement traffic calming strategies to discourage speeding and other unsafe driving behaviors

Objective 4: Ensure that all recommended improvements are consistent with City of Culver City goals, as well as State and Federal plans and goals (such as, but not limited to: California Strategic Highway Safety Plan, and the FHWA Local and Rural Road Safety Program). The LRSP will be responsive to and address the City's Vision Zero goals

Objective 5: Develop a mechanism for continually reviewing traffic accident records on a continuous basis to identify new problem locations or hot spots that may arise, as well as assessing the effectiveness of implemented countermeasures

Objective 6: Create a mechanism that monitors and evaluates the effectiveness of multi-modal safety improvements

Goal 2: Improve the safety of pedestrians and bicyclists by using proven effective countermeasures

Objective 1: Identify safety issues and locations/hot spots where bicycle and pedestrian collisions occur in Culver City, and treat with appropriate and effective engineering countermeasures

Objective 2: Provide educational programs for bicyclists, pedestrians, and motorists to inform on how to be safe in the public right-of-way; either through the Culver City Safe Routes to School program, Culver City Police Department programs, or other public/private sponsored programs

Objective 3: Improve sidewalks, walkways, and crossings to be free of hazards and to minimize conflicts with vehicular traffic

Objective 4: Prioritize improvements that promote Safe Routes to School efforts or are located near schools

Goal 3: Ensure coordination of key stakeholders to implement roadway safety improvements & response within Culver City

Objective 1: Coordinate between Public Works, Police Department, Fire Department, and EMS agencies to ensure a coordinated response to traffic safety, including:

- Development of an LRSP Working Group
- Implementation of safety improvements
- Public education on safely traveling in the public right-of-way, regardless of mode
- Enforcement of traffic safety laws in the public right-of-way
- Response to emergency situations
- Fostering leadership by identifying safety champion advocates

Objective 2: Coordinate with local, regional, and state partners (such as Culver City Bus, LA Metro, or Caltrans), to identify and address traffic safety issues and ensure a coordinated response

Goal 4: Continually seek funding for safety improvements

Objective 1: Ensure the LRSP meets Highway Safety Improvement Program (HSIP) guidelines in order to apply for funding for identified countermeasures

Objective 2: Provide a list of prioritized improvements that guide City investments and grant funding applications

Objective 3: Continually seek funding sources to implement engineering, education, enforcement, and emergency response solutions to roadway safety issues in Culver City

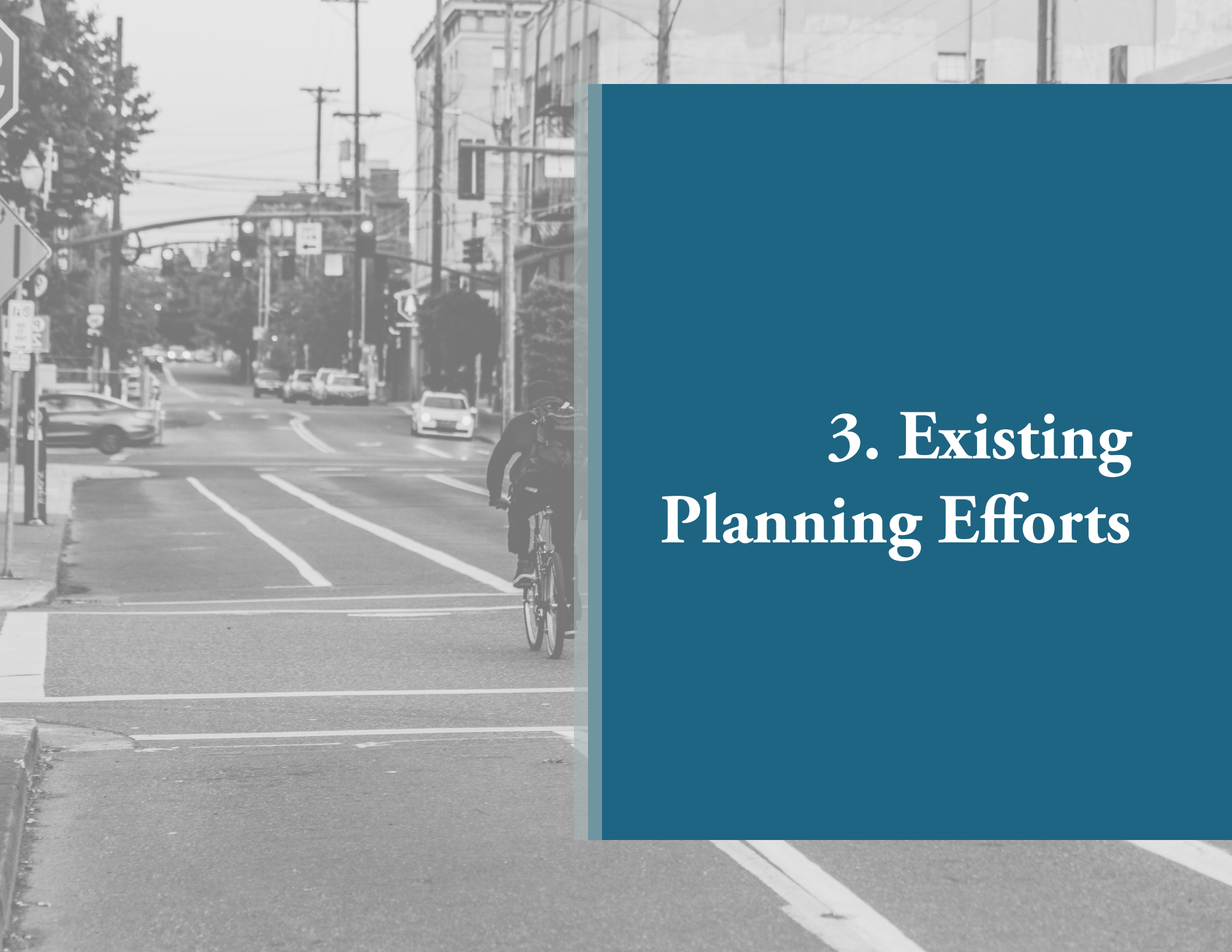
Goal 5: Ensure that safety improvements are made in a manner that is fair and equitable for all Culver City residents

Objective 1: Where feasible, implement community outreach to inform the public about upcoming safety improvements and seek their input

Objective 2: Provide a forum for residents to submit traffic safety related complaints; and for City staff officials to respond to such complaints

Objective 3: Ensure that equity is a primary factor in selecting where to make traffic safety improvements

Objective 4: Provide educational programs and engagement for both students and adults on traffic safety



3. Existing Planning Efforts

This chapter summarizes the planning documents, with projects and studies underway for Culver City. The purpose of reviewing existing planning efforts is to ensure the LRSP goals and objectives along with recommended improvements are aligned with prior planning efforts, planned transportation projects and non-infrastructure programs. The following are the documents that were reviewed:

1. Culver City 2045 General Plan (anticipated for Fall 2022 adoption), including Mobility + Transportation Existing Conditions Report (2019);
2. Bicycle and Pedestrian Action Plan (2020);
3. TOD Visioning Study and Recommendations (2017);
4. Culver, Washington, and South Robertson Boulevard Bicycle Improvements;
5. Culver City Strategic Plan 2016-2021 (2016) and 2018 Update;
6. Culver City Five Year Capital Improvement Plan Fiscal Years 2019/2020-2023/2024;
7. Culver City Safe Routes to School Program; and
8. Southern California Association of Governments (SCAG) Regional Transportation Plan 2012-2035 (2012)

The following is a summary of each document:

Culver City 2045 General Plan (anticipated for Fall 2022 adoption) and Mobility + Transportation Existing Conditions Report (2019)

The General Plan presents a consolidated framework of decisions for guiding where and how development should occur in Culver City. The General Plan recognizes that the Circulation Element is crucial to improve the overall quality of life and create a sustainable and thriving community. It emphasizes the need to revitalize primary transportation corridors and build new transportation infrastructure. The plan presents standards and policies for roadway networks, bicycle networks, and pedestrian networks aligned to this vision. The goals and policies stated in the General Plan will inform the countermeasure selection and proposed safety projects for the Culver City LRSP report. Currently, the City is updating the General Plan as a new long-range planning document for development through 2045, anticipated for adoption in Fall 2022. The existing General Plan elements span from 1968 to 2014. The Circulation Element was adopted in 1995 with amendments through 2004, and has a 2010 horizon year. The Mobility and Transportation Existing Conditions Report of the General Plan Update details the existing mode share, functional classifications of roadway facilities, traffic signals and speed limits, traffic collisions, bicycle and pedestrian facilities, transit facilities, and parking conditions as of 2019. This will help the LRSP in supporting the recommended safety projects along with the mobility and transportation needs of the City.

Bicycle and Pedestrian Action Plan (2020)

The Bicycle and Pedestrian Action Plan (BPAP) states that active transportation is integral to the identity of Culver City. This plan establishes a long-term vision for improving walking and bicycling in Culver City by updating the previous Bicycle and Pedestrian Master Plan adopted by the City Council in 2010. It provides a guide for the future development of bicycle and pedestrian facilities, as well as education, enforcement, and encouragement programs for Culver City. The plan proposes prioritization of 23 miles of new bikeways. The plan also details design standards for new bikeways and pedestrian facilities. The guidelines and policies described in this plan related to complete streets and road geometry improvements are crucial. They will help inform the safety projects considered for the LRSP report.

TOD Visioning Study and Recommendations (2017)

The Culver City TOD Visioning Study and Recommendations focuses on mobility planning in the TOD (Transit-Oriented Development) area for all modes of transportation. The current TOD area encompasses a one-mile radius (ten-minute walking distance) area centers the LA Metro Expo Line Culver City Station. Recommendations in this document are based on a framework of connected mobility networks to allow people to drive less and walk, bicycle, and take transit more, categorized through physical intervention. One of the primary goals for the TOD area is to provide a safe and protected network

for bicycling and establishing a pedestrians-first environment. In addition, the document summarizes the improvements in all these areas to enhance the transit services in the region. The recommendations listed in this document related to the development of pedestrian facilities, bicycle networks, and vehicular infrastructure are essential and will help inform the safety projects considered for the LRSP report.

Culver, Washington, and South Robertson Boulevard Bicycle Improvements

The Culver Boulevard, Washington Boulevard, and South Robertson Boulevard bicycle improvements focus on developing multiple bikeway options for the study corridors and provide safety for bicyclists, pedestrians, transit users, and drivers. The improvements are consistent with the TOD Visioning 2017 recommendations. The recommendations include installation of a two-way protected bike lane on Washington Boulevard connecting to the Expo Bike Path at Wesley Street, the Expo Line station, and Town Plaza in Downtown Culver City. Other recommendations include installation of a two-way protected bike lane on Robertson Boulevard from Washington to Venice Boulevard in order to connect the Washington facility to the Expo Phase II Bike Path north of Venice. The study aims to connect Expo Station to Downtown Culver City with a high-quality bike facility, paving a way to reduce travel lanes, add separate transit lanes, medians, and develop infrastructure for a safe walking and biking environment.

Culver City Strategic Plan 2016-2021 (2016) and 2018 Update

The Culver City Strategic Plan (2016) identified challenges with the City's transportation infrastructure as an important topic for discussion. The plan suggested finding ways to build the bicycle infrastructure, and encouraged small connections to support cyclists, or establishing protective bike lanes as a pilot to resolve concerns for cyclists. This document provides an implementation strategy for projects for each fiscal year from 2016 to 2021.

In 2018, a Retreat Summary and Strategic Plan was adopted, which included a summary of the transportation planning priority to move forward in year 2018 to 2023. It strategically focused on improving circulation by providing alternative modes of transportation, including bicycles, motorized scooters, pedestrians, and microtransit. The need for more comprehensive analysis of transportation challenges was highlighted. It was suggested that a study that assesses both bicycle access and opportunities for microtransit be conducted.

The LRSP goals and objectives will be consistent with the aforementioned priorities discussed at the City Council.

Culver City Five Year Capital Improvement Plan FY 2019/2020–2023/2024

The aim of the Five Year Capital Improvement Plan for Fiscal Years 2019/2020 – 2023/2024 is to assist the City is achieving the broad and comprehensive goals of the General Plan. The document consists of detailed project information, funded and unfunded, across a five year period. The projects listed under the sections of Parks & Park Facilities, Street & Alley Improvements, and Traffic Signal & Lighting Improvements will help to confirm traffic safety solutions for the LRSP.

Culver City Safe Routes to School Program

The Culver City Safe Routes to School (SRTS) Program was originally funded through a federal non-infrastructure SRTS grant, which ended in 2017. Currently, the City and the Unified School District have jointly funded the continuation of the Safe Routes to School program through June 2020. The primary goals of the program include increasing the number of children walking or biking to school, reduce traffic around school, and create a safe environment. The program conducts challenges such as "Take the 3 Block Challenge," where parents are encouraged to park three blocks away from school and walk to drop their kids off, or "Car Free Fridays" where kids are encouraged to walk, bike, take transit or carpool on Fridays. This program will help the LRSP to integrate existing educational programs as part of the E's strategies.

Southern California Association of Governments (SCAG) Regional Transportation Plan 2012-2035 (2012)

Southern California Association of Governments (SCAG) has prepared Regional Transportation Plans (RTP) with the primary goal of increasing mobility for the region's residents and visitors. One of the focuses on the transportation element is to lower collision rates. The RTP contains a host of improvements to our multimodal transportation system. These improvements include closures of critical gaps in the network that hinder access to certain parts of the region, and other measures and requirements for reducing the occurrence of fatal and severe injury collisions in the City. An implementation plan has listed specific improvements for gradual execution from 2012 to 2035.The improvement recommendations listed in the documents will help to confirm countermeasures considered for the LRSP report.

The matrix of planning goals, policies and projects can be found in **Appendix A**.

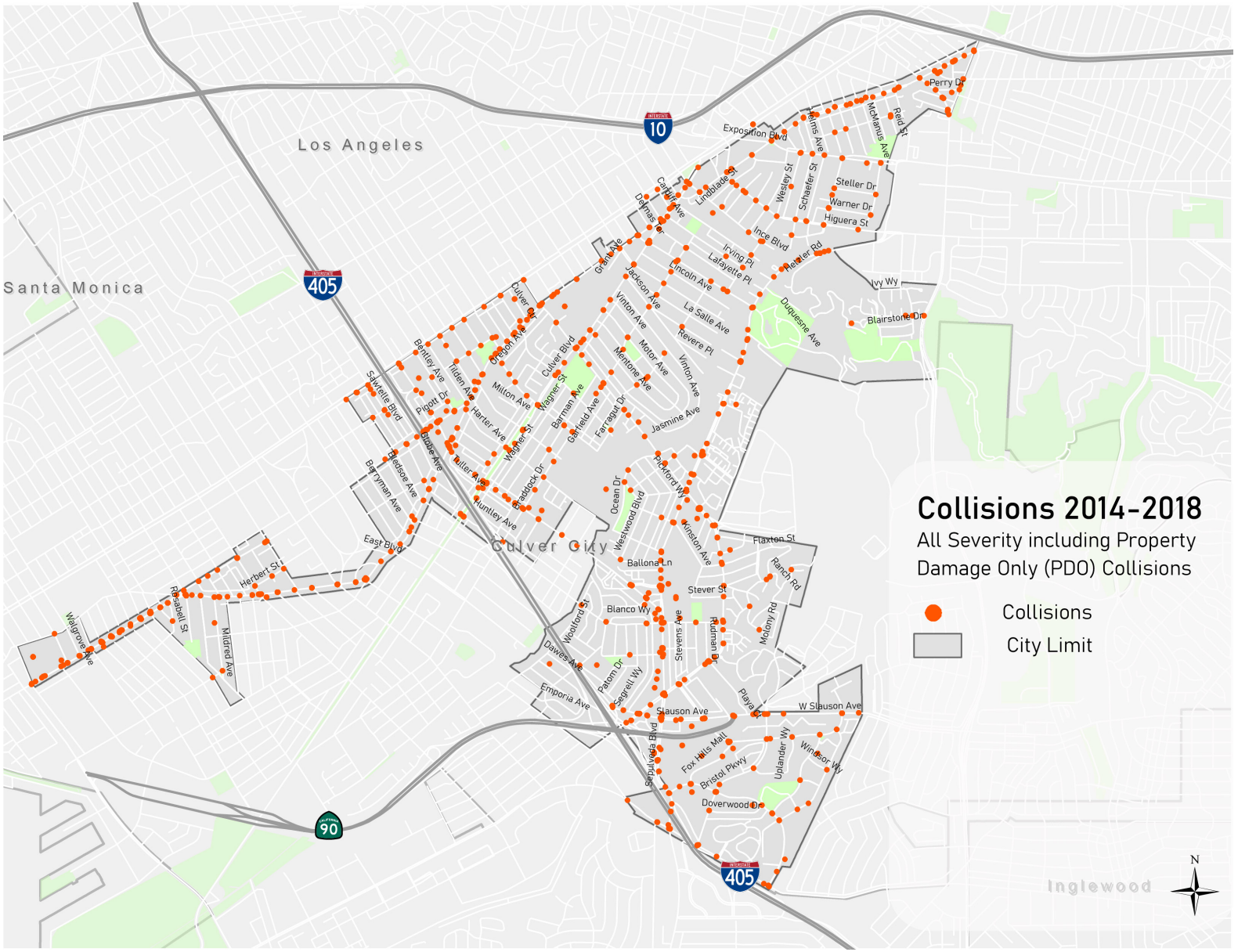
4. Data Collection and Analysis

This chapter starts with an overview of City-wide collisions of all types and severity, including Property Damage Only (PDO) collisions. It is followed by a breakdown of collisions according to the level of severity. Following this, the F+SI collisions were segregated by facility type, i.e. based on collisions occurring at intersections and roadway segments, as the geometrics of roadway segment and intersections differ and are affected varyingly by different factors. A comprehensive evaluation was conducted for collisions occurring at intersections and roadway segments based on factors such as collision severity, type of collision, primary collision factor, lighting, weather and time of the day. Detailed technical memorandum of the collision analysis can be found in **Appendix B**.

Data Collection

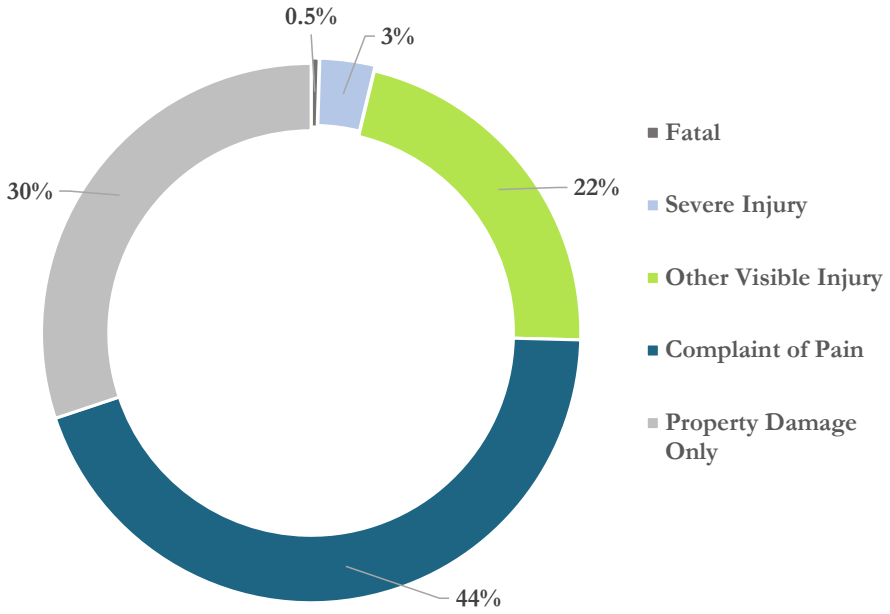
For the purpose of this analysis, a five-year City-wide collision data (2014-2018) was provided by the City. The collision data was analyzed and plotted in ArcMap to identify high-risk intersections and roadways segments. Collision data for the same period was also retrieved from Transportation Injury Mapping System (TIMS) and Statewide Integrated Traffic Records System (SWITRS) for verification. There were a total of 1,909 collisions reported City-wide from 2014 to 2018. These collisions are shown in **Figure 2**. Out of these 1,909 collisions, 575 collisions (30%) were Property Damage Only (PDO) collisions.

Figure 2. All Collisions on City Roadways (2014-2018)



Severity Breakdown

There were a total of 1,909 collisions reported City-wide from 2014 to 2018. Out of these 1,909 collisions, 575 collisions (30%) were PDO collisions. In terms of the collision severity, 413 collisions (22%) led to a visible injury and 849 collisions (44%) led to complaint of pain. There were 72 F+SI collisions (4% of total) out of which, 63 collisions (3%) led to a severe injury and nine collisions (0.5%) led to a fatality. The following chart illustrates the classification of all collisions based on severity:



Collisions by Severity in Culver City

Intersection Collisions vs. Roadway Segment Collisions

The collision data was segregated by facility type, i.e. based on collisions occurring on intersections and roadway segments. For the purposes of the analysis, a collision was said to have occurred at an intersection if it occurred within 250 feet of it. The reported collisions categorized by facility type and collision severity are presented in **Table 1**.

Table 1. Collisions by Severity and Facility Type in Culver City

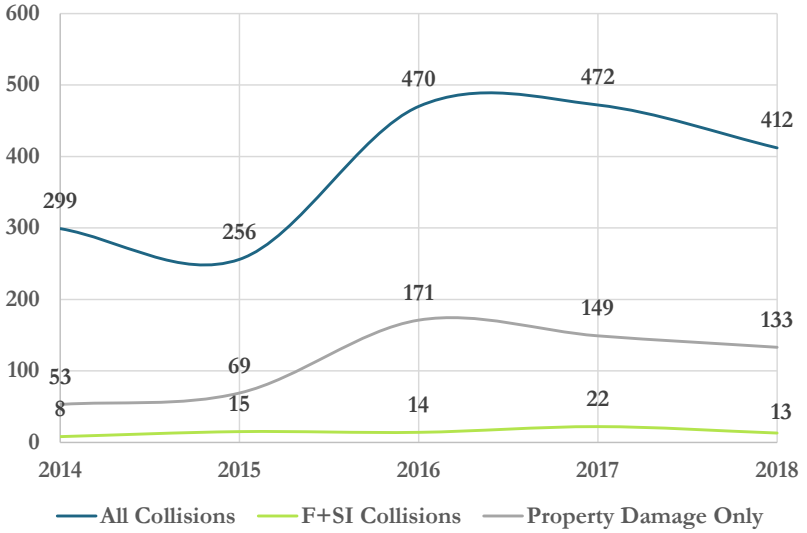
Collision Severity	Roadway Segment	Intersection	Total
Fatal	0	9	9
Severe Injury	4	59	63
Visible Injury	44	369	413
Complaint of Pain	117	732	849
Property Damage Only (PDO)	75	500	575
Total	240	1,669	1,909

Collision Trend Summary

The analysis starts with a comparative evaluation between all collisions and F+SI collisions, based on various factors including but on limited to the collision trend, primary collision factor, collision type, facility type, motor vehicle involved with, weather, lighting, and time of the day. F+SI collisions cause the most damage to those affected, infrastructure damage and the aftermath of these collisions leads to great expenses for City administration. Thus, a comprehensive analysis was conducted for only F+SI collisions. The LRSP process focuses on these high-risk collision locations to proactively identify and counter their respective safety issues.

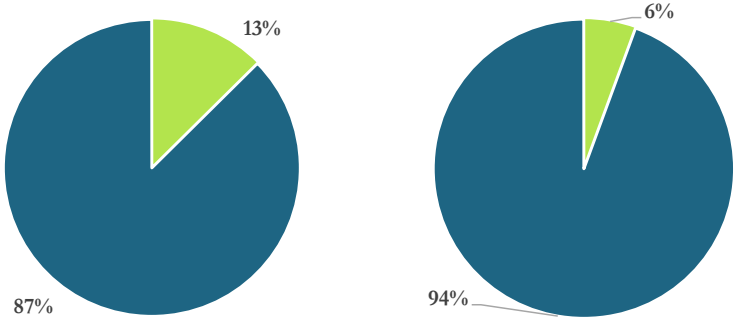
All Collisions

- For collisions of all severity, the total number of collisions have increased from 2014 to 2017 and then decreased in 2018.



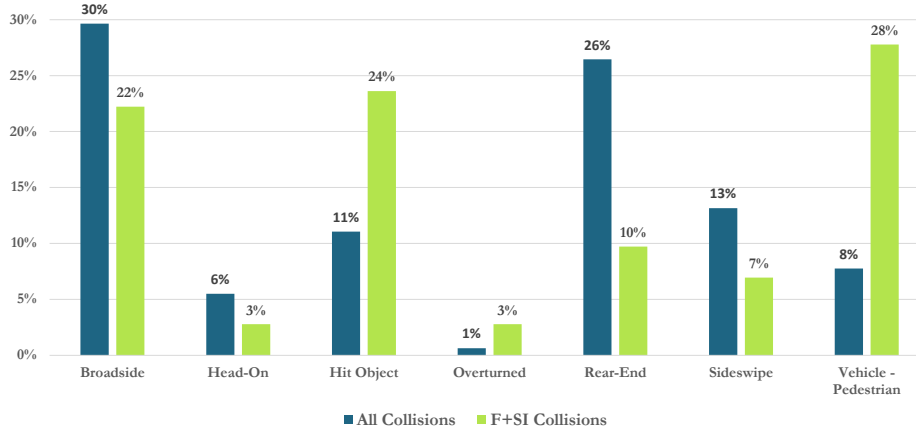
Collision Trend (2014-2018)

- For collisions of all severity, including PDO collisions, 87% collisions have occurred at intersections. For F+SI collisions, 94% collisions have occurred at intersections.



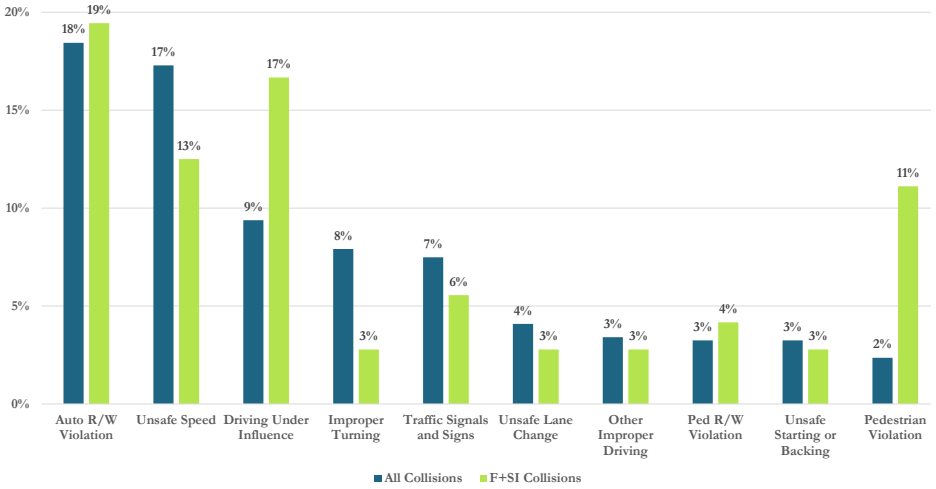
All Collisions (2014-2018) F+SI Collisions (2014-2018)

- Considering all collisions, the most commonly occurring collision type was broadside collisions (30%), rear-end collisions (26%) and sideswipe collisions (13%). When only F+SI collisions were considered, the most commonly occurring collision type was vehicle-pedestrian (28%), hit object (24%) and broadside (22%).



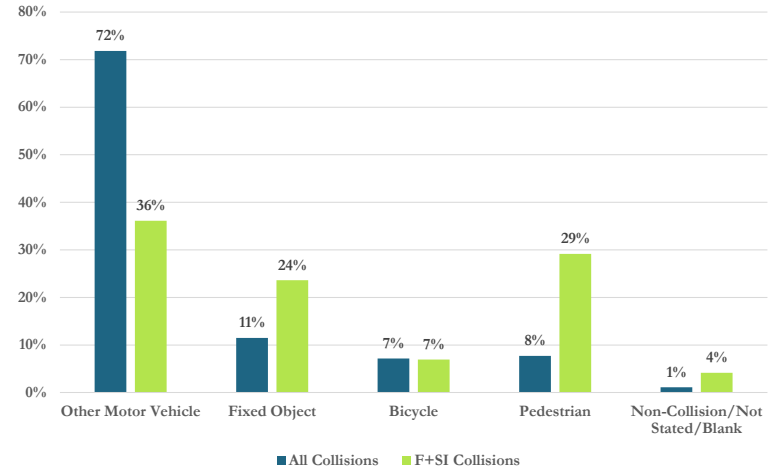
Collision Type - All vs. F+SI collisions

- Considering all collisions, the most common primary collision factor was observed to be auto right of way violation (18%), unsafe speed (17%) and driving under influence (9%). Similar collision factors were observed for F+SI collisions.



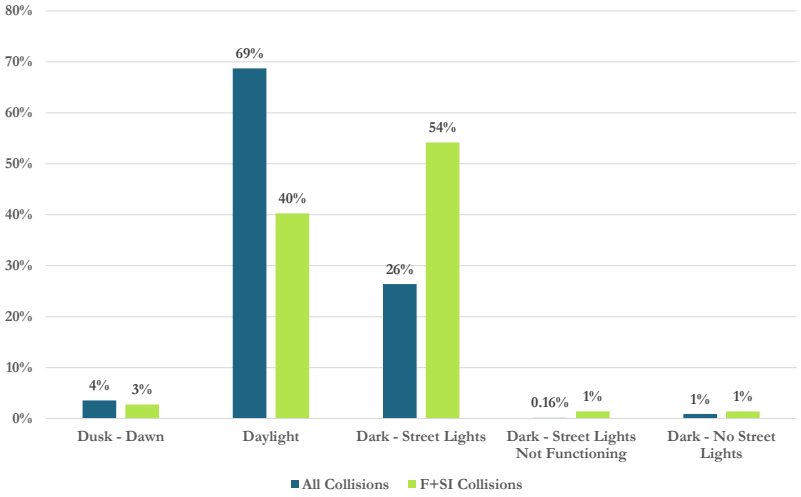
Primary Collision Factor - All vs. F+SI collisions

- Considering all collisions, 72% of the collisions are motor vehicle involved with other motor vehicle collisions. The remaining collisions include motor vehicle involved with fixed object (11%), motor vehicle involved with pedestrian (8%) and motor vehicle involved with a bicyclist (7%). For all the F+SI collisions, 36% of the collisions have occurred where motor vehicles are involved with other motor vehicles, 29% of the collisions have involved pedestrians and 24% of the collisions have involved fixed objects.



Motor Vehicle Involved With - All vs. F+SI collisions

- For collisions of all severity, 69% collisions have occurred in daylight and 26% collisions have occurred in the dark hours on streets with street lights. For F+SI collisions, 54% collisions have occurred in the dark hours on streets with street lights and 40% collisions have occurred in daylight.



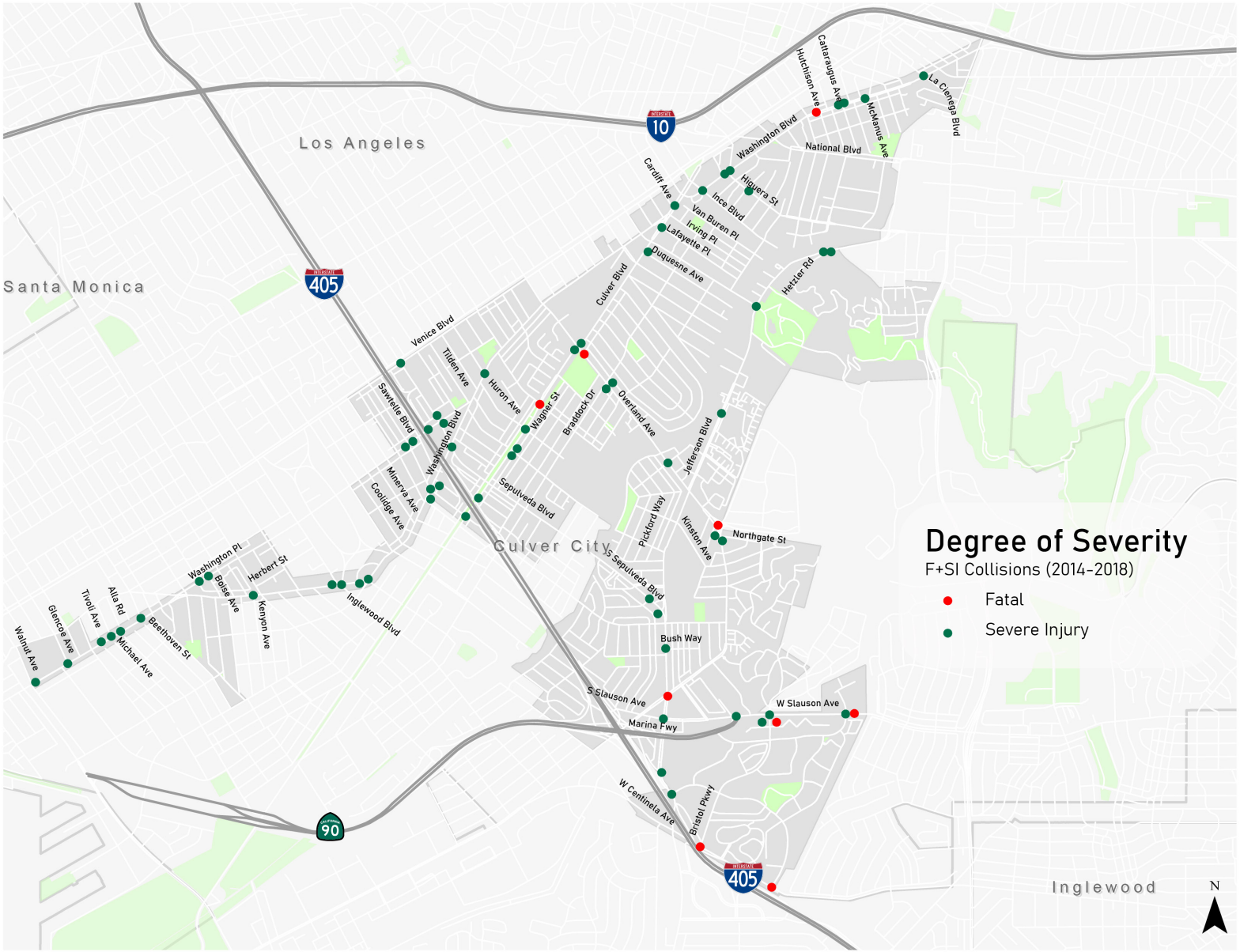
Lighting Conditions - All vs. F+SI collisions

Fatal and Severe Injury (F+SI) Collisions

- 4 percent of all the collisions that have occurred in the City in the past five years (2014-2018) have led to a fatality or a severe injury.
- Most of the F+SI collisions have occurred on Washington Boulevard, Culver Boulevard, Sepulveda Boulevard, Slauson Ave and Washington Place.
- About 28% of F+SI collisions are vehicle-pedestrian collisions. The maximum number of vehicle-pedestrian collisions have been observed on Washington Boulevard and Culver Boulevard. This calls for an evaluation of pedestrian conditions at these corridors that have high number of F+SI collisions involving pedestrians. Improvements such as installing pedestrian crossings, pedestrian countdown signal heads, pedestrian signal or HAWK (**H**igh-Intensity **A**ctivated Cross**W**al**K**), and flashing beacons as advance warning can help improve safety for pedestrians.

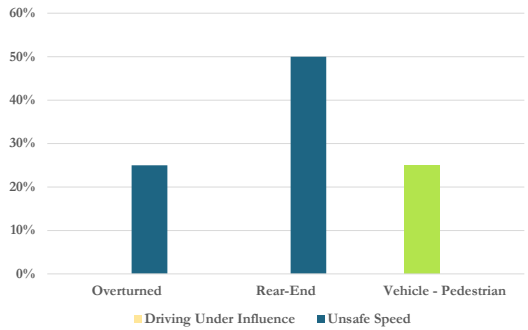
Figure 3 shows all the F+SI collisions that have occurred in the City from 2014-2018.

Figure 3. Collisions by Degree of Severity - F+SI Collisions



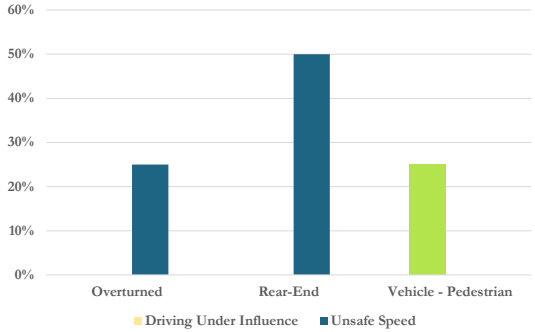
Fatal and Severe Injury (F+SI) Collisions on Roadway Segments

- A total of four F+SI collisions occurred at roadway segments or mid-block locations between 2014-2018.
- All the roadway segment collisions led to a severe injury. There were two rear-end collisions (50%), one overturned collision (25%) and one vehicle pedestrian collision (25%) which occurred on roadway segment or mid-block locations.



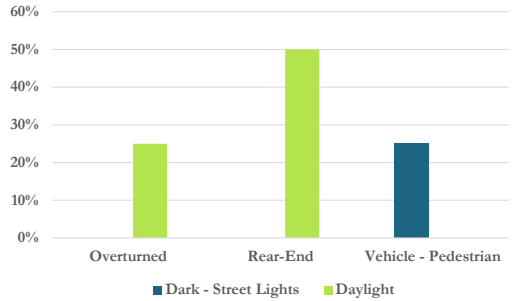
Collision Type for F+SI Collisions on Roadway Segments

- For all the roadway segment collisions, it was observed that three collisions (75%) occurred due to unsafe speed and one (25%) occurred due to driving under influence violation.



Primary Collision Factor for F+SI Collisions on Roadway Segments

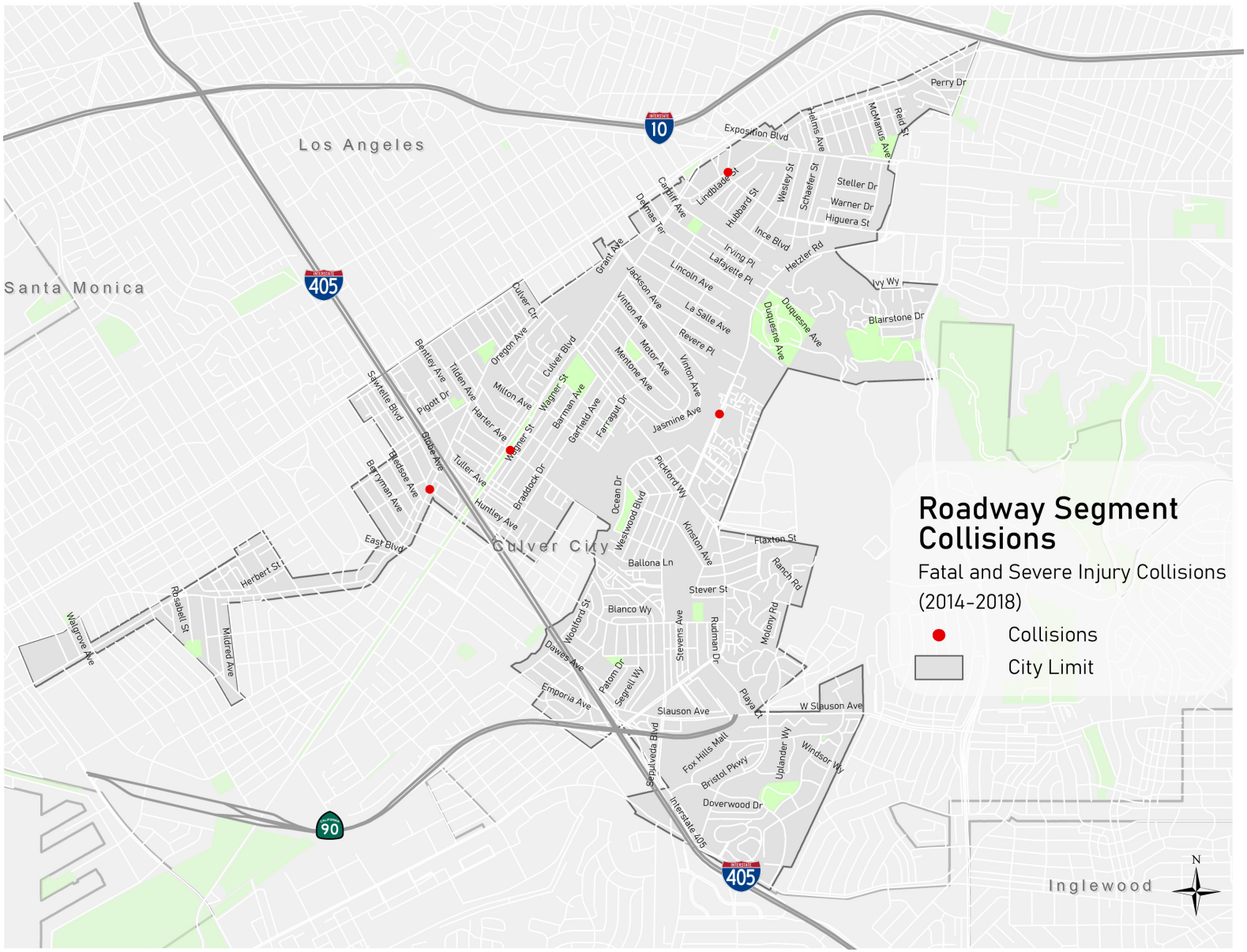
- For all F+SI collisions occurring at roadway segments, three (75%) of them occurred during daylight and one collision (25%) of them occurred in the dark hour at a location with street lights.



Lighting Conditions for F+SI Collisions on Roadway Segments

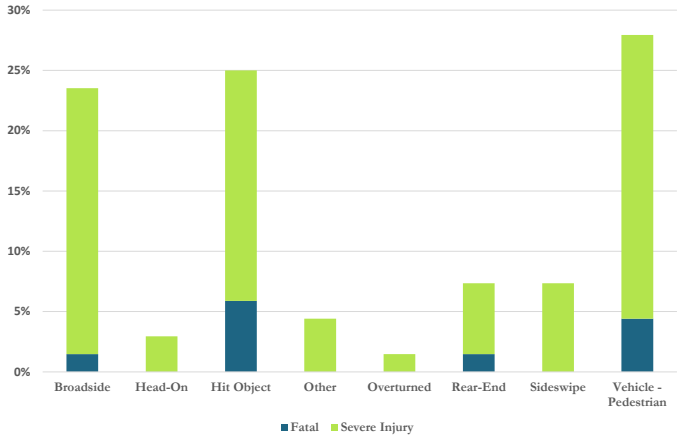
Figure 4 illustrates the F+SI collisions on roadway segments.

Figure 4. F+SI Collisions on Roadway Segments in Culver City



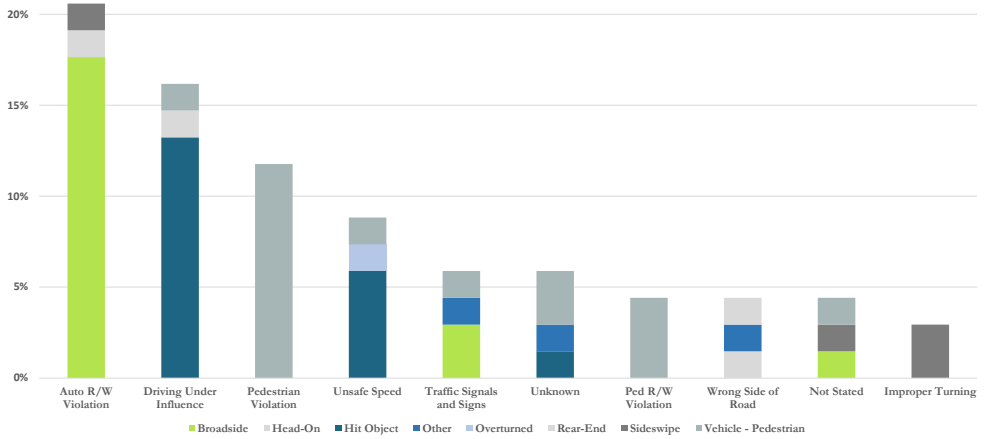
Fatal and Severe Injury (F+SI) Collisions at Intersections

- A total of 66 F+SI collisions occurred at intersections in the City between 2014 to 2018. Please note that when geocoded, two FSI collisions that occurred at intersection were outside the jurisdiction of Culver City and hence removed from the analysis.
- Vehicle pedestrian collisions (28%) followed by hit-object collisions (25%) were the most prominent collision types that led to F+SI collisions. Hit-object, vehicle-pedestrian, broadside and rear-end collisions have led to a fatality.



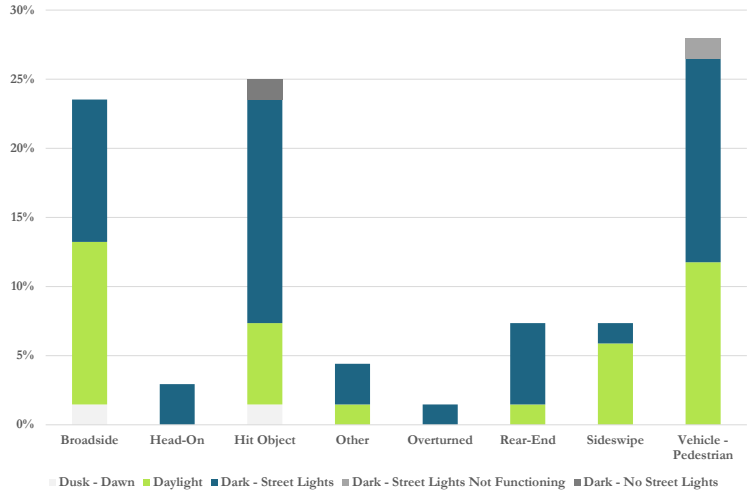
Collision Type for F+SI Collisions on Intersections

- The violation category that caused the highest number of F+SI collisions at intersections was auto right-of-way violation. It resulted in broadside, head-on and sideswipe collisions. Driving under influence was the second most common violation leading to hit-object, rear-end and vehicle-pedestrian collisions. Pedestrian violation was also observed to be common, leading to about 12% vehicle-pedestrian collisions at intersections.



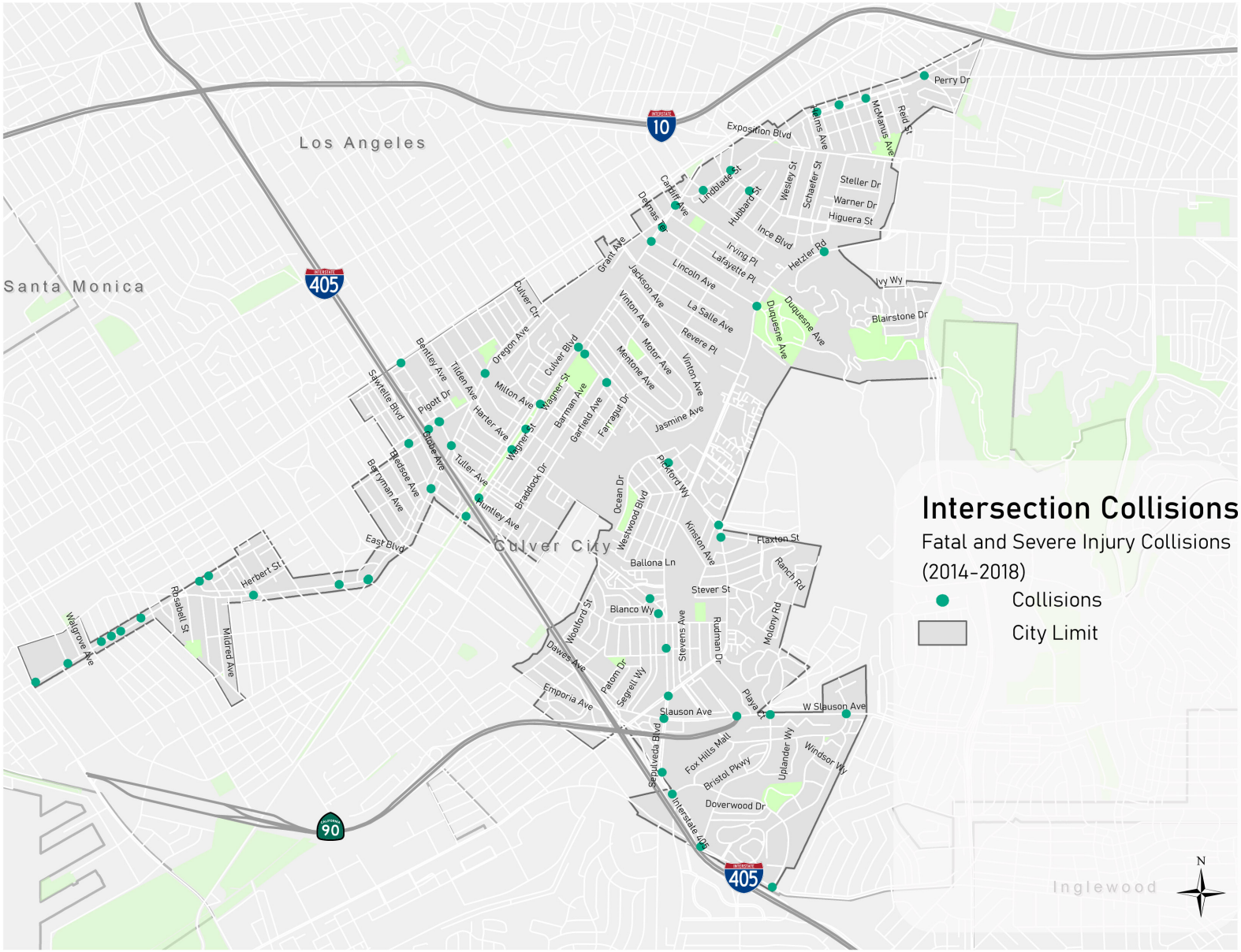
Primary Collision Factor for F+SI Collisions on Intersections

- For all F+SI collisions at intersections, 38% occurred during daylight, 56% occurred during dark hours with street lights and 3% occurred during dusk-dawn. The most commonly occurring collisions, i.e., vehicle-pedestrian, hit-object and broadside have majorly occurred during daylight or in the dark hours at locations with street lights.



Lighting Conditions for F+SI Collisions on Intersections

Figure 5. F+SI Collisions on Intersections in Culver City



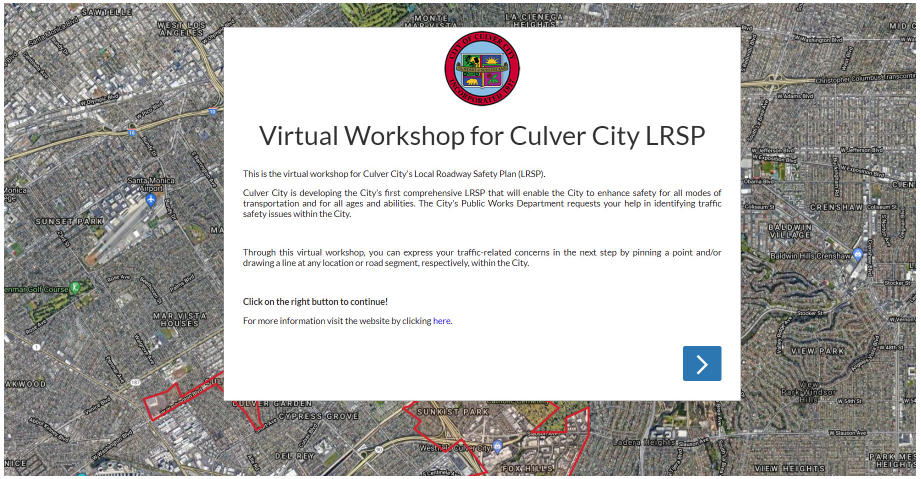
Community and Stakeholder Outreach

To gathering valuable public input on traffic-related safety concerns, fostering communication with the stakeholders and the general public was an important part of the development of this plan. The community had an early awareness of this project and was informed of the purpose, objectives and the timeline of the project.

To obtain maximum public input, a project website was established in April 2020, https://www.culvercitysafestreets.com/ which provided the public and stakeholders an accessible information portal for project status updates. In addition, the website also entailed a virtual map input platform, which enabled the public to give their feedback in a convenient way. The map input platform was used to identify areas of concerns within the City. In order to maximize public input, the project website and related information was also publicized on the City's website. In addition, representatives from Bicycle and Pedestrian Advisory Committee (BPAC), Culver City Unifed School District (CCUSD), Walker n Roller, Bike Culver City, Women on Bikes, City's Police Department, City's Community Development Department, City's Transportation Department (operates Culver CityBus), and different divisions within the Public Works Department were involved.

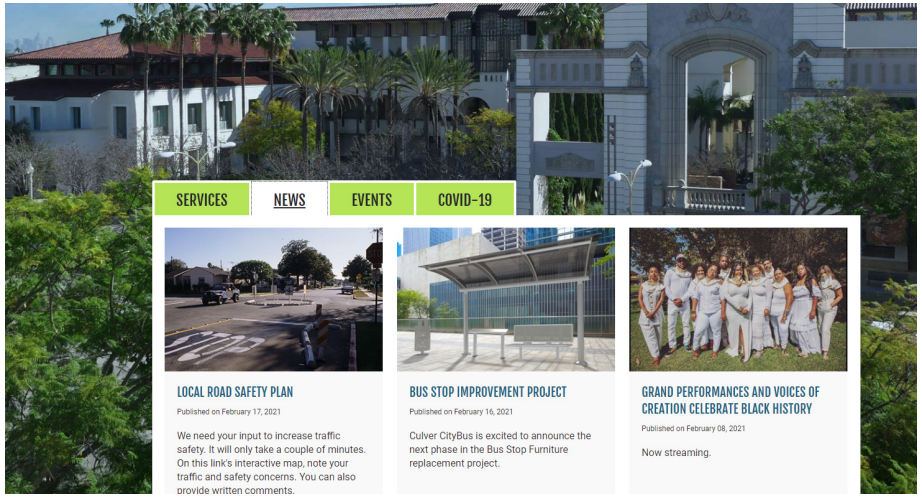
The outreach efforts including the project website, map input and the comments as received have been summarized in **Appendix C**.

Culver City LRSP Project Website



Culver City LRSP - Virtual Workshop

Culver City website posting



Culver City website posting

5. High-Risk Roadway Segments and Intersections

Following the detailed collision analysis for all and high-injury collisions, this chapter details the process of identification and ranking of high-risk locations in Culver City. High-risk locations are intersections or roadway segments where fatal or severe injury (F+SI) collisions have occurred. This quantitative analysis starts with the calculation of crash frequency which highlights the number of F+SI collisions on the City's major arterials. These arterial corridors are then ranked according to the number of F+SI collisions occurring on them. Non-motorized traffic including pedestrians and bicyclists are the most vulnerable roadway users and account for 37% of the F+SI collisions that have occurred in the City in the past five years. Crash frequency observing the number of F+SI collisions involving pedestrians and bicyclists on the City's major arterials has been calculated.

Following this, a collision rate analysis was conducted for each of the locations where F+SI collisions are observed - considering additional factors like number of collisions, Average Daily Traffic (ADT) and the number of years of the collision data. The results of this analysis include a ranked list of roadway segments and intersections, ranked from high-risk to low-risk as per the collision rates. This ranking will further inform prioritization of safety improvements at these locations for all modes of transportation.

Preliminary Overview: Crash Frequency

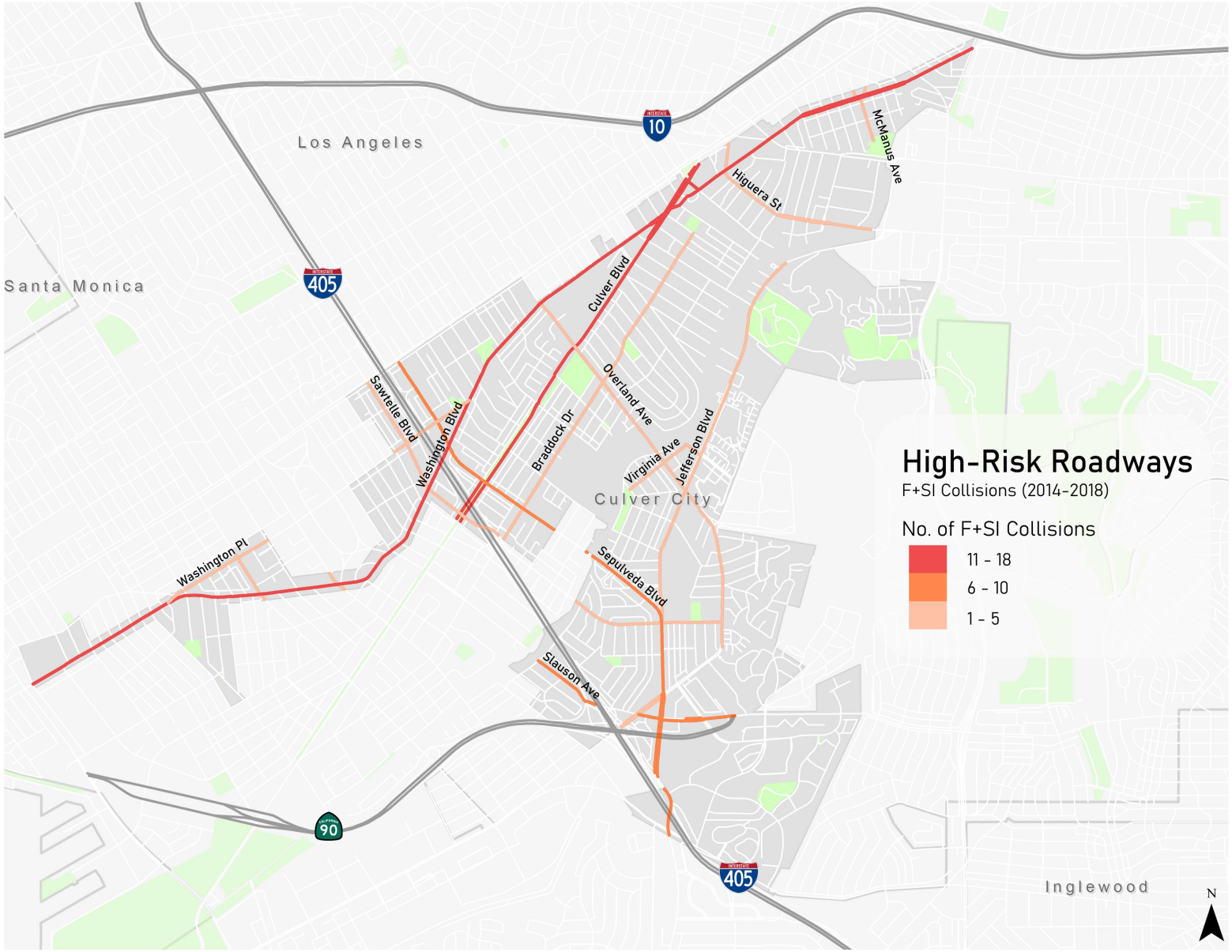
F+SI Collisions Per Corridor

Crash frequency which is the number of F+SI collisions that have occurred on each corridor has been calculated to determine corridor with most high injury collisions. **Table 2** lists the number of F+SI collisions that have occurred per corridor segment. The highest number of F+SI collisions have occurred on Washington Boulevard followed by Culver Boulevard and Sepulveda Boulevard. Note that the top three corridors have an Average Daily Traffic (ADT) between 25,000-50,000 vehicles per day (ADT Counts, Culver City, 2019). **Figure 7** shows the corridors by the number of F+SI collisions.

Table 2. Corridor Ranking by No. of F+SI Collisions

Rank	Corridor	No. of Collisions
1	Washington Blvd	18
2	Culver Blvd	11
3	Sepulveda Blvd	9
4	Slauson Ave	6
5	Overland Ave; Washington Pl	5
6	Jefferson Blvd	4
7	Centinela Ave; Inglewood Blvd; Sawtelle Blvd	2
8	Braddock Dr; Higuera St; La Cienega Blvd; McManus Ave; Robertson Blvd; Virginia Ave	1

Figure 6. No. of F+SI Collisions per corridor



Pedestrian and Bicyclist Collisions Per Corridor

Crash frequency of pedestrian and bicyclist collisions has been calculated to determine corridors that are at high-risk for the non-motorized roadway users. Out of the total 70 F+SI collisions, 26 collisions (37%) have involved a pedestrian (21 collisions) or a bicyclist (five collisions). Three of the nine fatal collisions have involved pedestrians. All five bicyclist collisions have led to a severe injury. **Table 3** lists the number of pedestrian and bicyclist collisions that have occurred, by the degree of severity.

Table 3. F+SI Collisions involving Pedestrians and Bicyclists

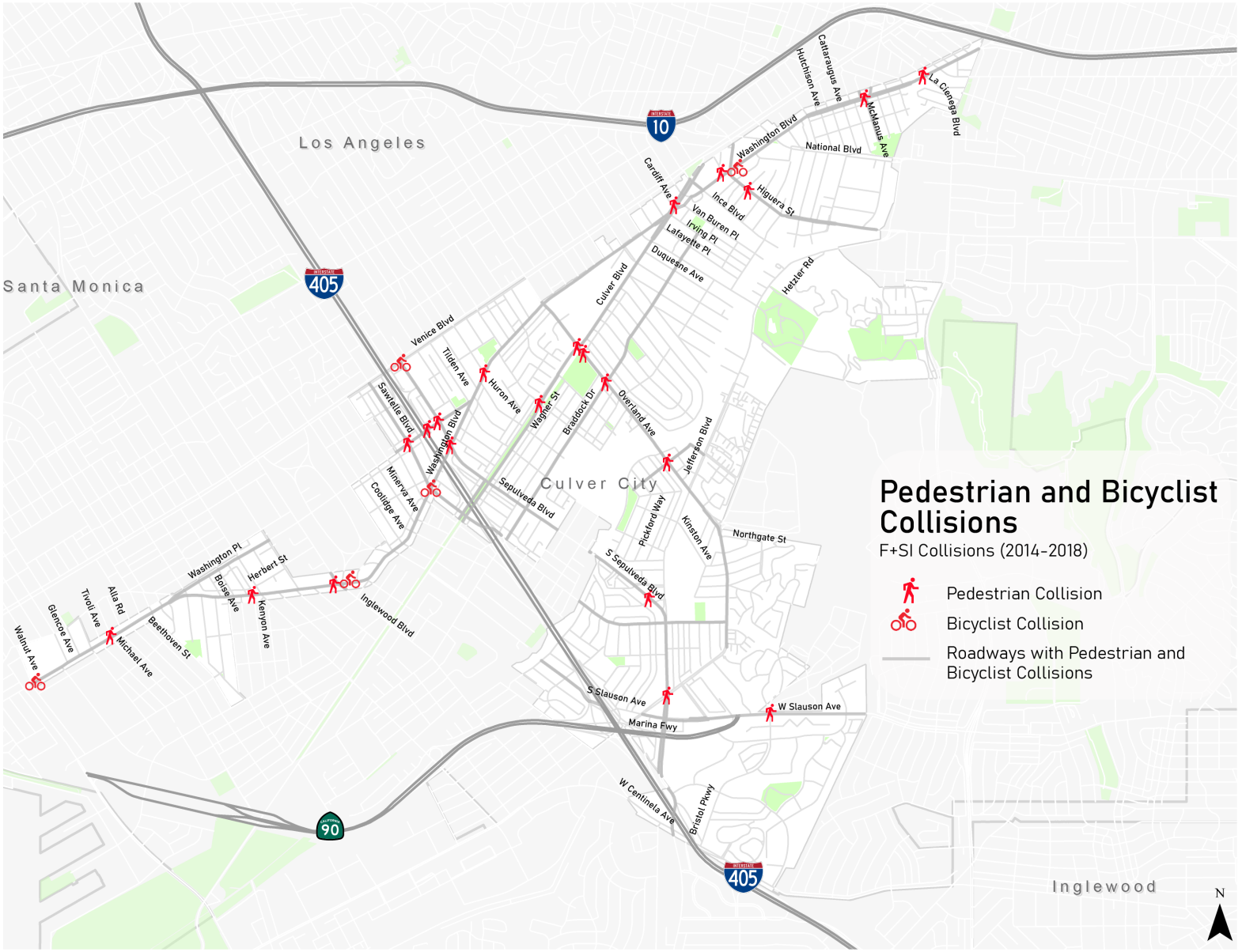
Pedestrian/Bicyclist	Fatal	Severe Injury	Total
Bicycle	0	5	5
Pedestrian	3	18	21
Total	3	23	26

The maximum number of pedestrian and bicyclist collisions have occurred on Washington Boulevard, followed by Culver Boulevard and Sepulveda Boulevard. Four out of the total five F+SI collisions involving bicyclists have occurred on Washington Boulevard. **Table 4** lists the number of pedestrian and bicyclist F+SI collisions that have occurred in the City. **Figure 7** maps the locations where pedestrian and bicyclist F+SI collisions have occurred.

Table 4. Corridors by No. of Pedestrian and Bicyclist F+SI Collisions

Rank	Corridor	No. of Collisions
1	Washington Blvd	7
2	Culver Blvd; Sepulveda Blvd	3
3	Inglewood Blvd; Washington Pl	2
4	Braddock Dr; Higuera St; La Cienega Blvd; McManus Ave; Overland Ave; Robertson Blvd; Sawtelle Blvd; Slauson Ave; Virginia Ave	1

Figure 7. Pedestrian and Bicyclist F+SI Collisions



Collision Rate Analysis

The collision rate analysis was performed city-wide, for all roadway segments and intersections where F+SI collisions have occurred. The rate as calculated was then used to rank roadway segments and intersections, from high-risk to low-risk locations. This detailed analysis was performed to identify and prioritize high-risk locations, considering factors such as Average Daily Traffic (ADT), length of the roadway segment, the number of collisions that have occurred at that location and the duration of the study period.

Methodology

This section describes the identification of high-risk roadway segments and intersections within Culver City using the network screening method illustrated in the Highway Safety Manual (HSM). High-risk roadway segments are the facilities where fatal and severe injury collisions have occurred. To identify the high-risk facilities throughout the City's roadway network, a spatial analysis is performed incorporating collision data for roadway segments and intersections. Network screening, as described in the HSM, is the process of identifying and ranking sites from most risky to least risky, to reduce the number of collisions by implementing an appropriate countermeasure. High-risk roadway segments were identified using the sliding window screening method. The performance measure of collision rate was selected and used in both screening method, because a simple count of the number of collisions per site is not adequate when comparing multiple similar sites with varying traffic volume and facility type.

Roadway Segment Collision Rate

For roadway segments, the sliding window screening method where a 0.3-mile long window conceptually moves along each corridor/street in increments of 0.1 mile using the street centerline database was used. High-risk windows shorter than 0.3 mile may exist when the length of a street is less than 0.3 mile or not divisible to 0.3 mile. Five years of roadway segment and intersection collisions were then associated with each window using ArcGIS, based on their proximity to the nearest street.

The Collision rate for each window for roadway segments was calculated using the formula below:

$$R=(C \times 1{,}000{,}000) / (V \times 365 \times N \times L)$$

where,

- R = Collision rate for the road segment expressed as Collisions per million entering vehicles (MEV),
- C = Total number of F+SI Collisions in the study period,
- V = Traffic volume in ADT,
- N = Number of years of data, and
- L = Length of the roadway segment in miles.

Intersection Collision Rate

For intersections, the fatal and severe injury collision locations were identified and associated with their location as well as collision characteristics. Additional reviews were conducted to make sure that the "Primary Road" and "Secondary Road" of collisions were consistent with the street names of intersection approaches.

The collision rate for each intersection location was calculated using the formula below:

$$R=(C \times 1{,}000{,}000) / (V \times 365 \times N)$$

where,

- R = Collision rate for the intersection expressed as Collisions per million entering vehicles (MEV),
- C = Total number of intersection-related F+SI Collisions in the study period,
- V = Traffic volumes entering the intersection daily, and
- N = Number of years of data

City-Wide Ranking of High-Risk Locations

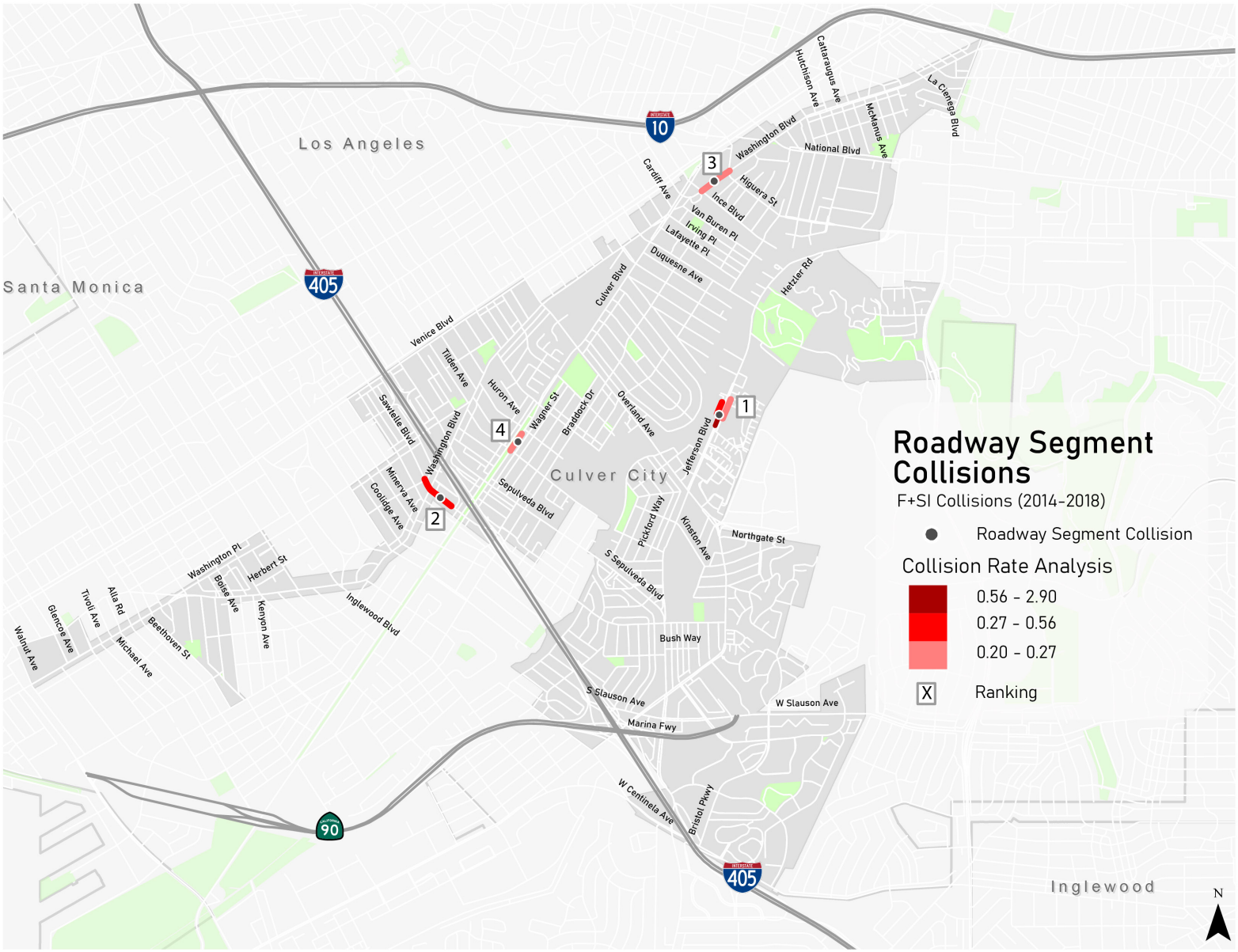
Roadway Segment Ranking

There were a total of four F+SI collisions that occurred on roadway segments in Culver City. All of these collisions were severe injury collisions. Jefferson Boulevard, in the vicinity of Raintree Circle was observed to have the highest collision rate. **Table 5** lists all the high-risk locations along with their collision rate. **Figure 8** illustrates the collision locations with the calculated collision rate.

Table 5. City-Wide Collision Rate Analysis for Roadway Segments

Rank	Roadway Segment Collisions Location	No. of Collisions	Collision Rate
1	Jefferson Boulevard, 152 feet E and 375 feet W of Raintree Cir	1	2.9
2	Sawtelle Blvd, between Herbert St and 470 feet N of Culver Blvd	1	0.515
3	Washington Blvd, between Ince Blvd and Higuera St	1	0.250
4	Culver Blvd, between Harter Ave and 138 feet W of Huron Ave	1	0.203

Figure 8. City-wide Collision Rate Analysis for Roadway Segments



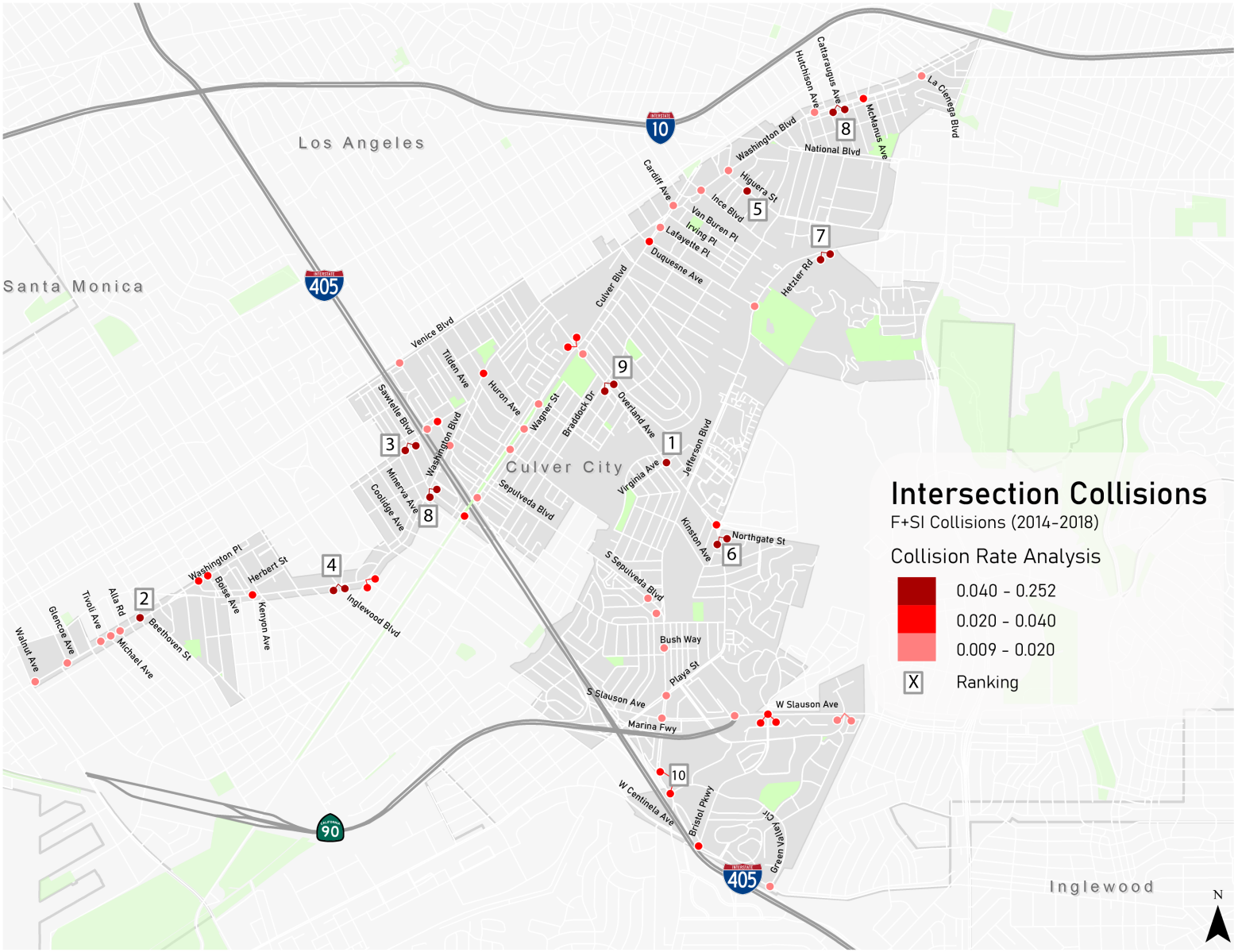
Intersection Ranking

There were a total of 66 collisions that occurred at intersections, out of which nine of them led to fatalities and 57 collisions led to a severe injury. The intersection of Virginia Avenue and Overland Avenue had the highest collision rate. **Table 6** lists the collision rate of the top 30 identified high-risk intersections. **Figure 9** illustrates the collision locations along with the calculated collision rate and highlights top ten high-risk intersections.

Table 6. City-Wide Collision Rate Analysis for Intersections

Rank	Intersections	No. of Collisions	Collision Rate
1	Virginia Ave/Overland Ave	1	0.2523
2	Washington Blvd/Beethoven St	1	0.1417
3	Sawtelle Blvd/Washington Pl	2	0.1217
4	Inglewood Blvd/Washington Blvd	2	0.0620
5	Higuera St/Krueger St	1	0.0475
6	Overland Ave/Northgate St	2	0.0446
7	Jefferson Blvd/Hetzler Rd	2	0.0437
8	Washington Blvd/Sawtelle Blvd; Washington Blvd/Cattaraugus Ave (W) (E)	2; 2	0.0410
9	Overland Ave/Braddock Dr	2	0.0409
10	Sepulveda Blvd/Green Valley Cir; 6000 Sepulveda Blvd/4th Level Parking Structure	1; 1	0.0358
11	Washington Blvd/Kensington Rd	2	0.0346
12	Culver Blvd/Sawtelle Blvd	1	0.0313
13	Slauson Ave/Bristol Pky	3	0.0286
14	Washington Blvd/Prospect Ave	1	0.0274
15	Sepulveda Blvd/Washington Pl	2	0.0272
16	Washington Blvd/Kenyon Ave	1	0.0263
17	Culver Blvd/Overland Ave	2	0.0235
18	Overland Ave/Freshman Dr	1	0.0223
19	Culver Blvd/Duquesne Ave	1	0.0222
20	Washington Pl/Boise Ave	1	0.0221
21	Washington Pl/Frances Ave	1	0.0215
22	Mcmanus Ave/Washington Blvd (E)	1	0.0205
23	Centinela Ave/Bristol Pky	1	0.0203
24	Slauson Ave/Buckingham Pky; Sepulveda Blvd/Vera Way	2; 1	0.0190
25	Washington Blvd/Hutchison Ave	1	0.0184
26	Washington Pl/Tuller Ave	1	0.0180
27	La Cienega Blvd/Washington Blvd; Washington Blvd/Ince Blvd	1; 1	0.0177
28	Culver Blvd/Elenda St; Culver Blvd/ Huron Ave; Culver Blvd/Harter Ave	1; 1; 1	0.0172
29	Robertson Blvd/Washington Blvd	1	0.0170
30	Washington Blvd/Glencoe Ave (W); Washington Blvd/Tivoli Ave; Washington Blvd/Michael Ave; Washington Blvd/Alla Rd (W); Washington Blvd/Del Rey Ave	1; 1; 1; 1; 1	0.0164

Figure 9. City-wide Collision Rate Analysis for Intersections



6. Emphasis Areas and Countermeasures

An emphasis area is an area of opportunity to improve traffic safety. Emphasis areas help in identifying appropriate safety strategies and countermeasures with the greatest potential to reduce collisions occurring at roadway segments and intersections. The emphasis areas identified for developing safety improvements and programs in Culver City are aligned and consistent with the trends of crashes identified as a part of the collision data analysis. Each of these emphasis areas will help identify appropriate improvements and help meet the plan's overall goal by establishing strategies, actions and performance measures. These improvements are identified through a comprehensive approach, following the various E's of traffic safety: Engineering, Education, Encouragement, Enforcement, Emerging Technologies, and Evaluation. Combining multiple strategies under the various E's increases the likelihood of success in improving traffic safety.

For the implementation of the strategies identified under the various E's of traffic safety, the City's Public Works Department, Culver City Unified School District, City's Police Department and various other organizations will likely be involved. For the past 4 years, City's Public Works Department and the Culver City Unified School District has sponsored the Walk N Rollers, which is the City's Safe Routes to School Program. The Public Works Department has also received OTS grants two years in a row (2020-21 and 2021-22), that has been instrumental in the expansion of the traffic safety program to perform Citywide outreach and traffic safety education for seniors, working adults and unhoused community members.

In addition, the City coordinates regularly with the Police Department in circulating safety education brochures as well as organizing workshops and other safety events.

Emphasis Areas

Emphasis Area 1: Safe Mobility for Vulnerable Users - Pedestrians and Bicyclists

About 37 percent of F+SI collisions in the City have involved pedestrians and seven percent have involved bicyclists. Among these vulnerable road users, some like seniors, disabled and children are even more vulnerable than others. For the pedestrian collisions that led to a fatality or a severe injury, 20 out of the total 21 collisions occurred at intersections. Thus, pedestrian safety enhancements and awareness towards non-motorized modes of transportation is a pressing need for the corridors in the City. 13 out of these 21 pedestrian collisions have occurred at dark hours at locations with street lighting. Appropriate quality and placement of lighting can help enhance an environment and increase comfort and safety.

All five bicyclist collisions have led to a severe injury and have occurred at intersections in the City. Four of these collisions have occurred on Washington Boulevard. Hence, to ensure safe mobility for bicyclists on both roadway segments and intersections, it is critical to provide for traffic conditions that create a sense of comfort for the bicyclists. The following table lists the goals, strategies, actions and the subsequent output of various actions to ensure pedestrian and bicyclist safety in Culver City.

GOALS

To encourage the use of non-motorized mode of transport, the provision for safe facility for all types of bicyclists - strong and fearless, enthused and confident, interested but concerned and no way no how

To reduce pedestrian and bicyclists fatalities and severe injuries to zero in 5 years

To increase pedestrian and bicyclists counts at both controlled and uncontrolled intersections

Objectives		Success Indicators	
To ensure a comfortable and safe road network for bicyclists		**Decrease in the number of bicyclist collisions; Increase in the average number of cycle trips and average miles of cycling per capita per year.**	
Actions	**Target Output**	**Performance Measures**	**Monitoring and Evaluation**
EDUCATION			
Educational programs on bicycle safety in schools, community centers and senior center; -education programs based on the knowledge, skills and behavioral attributes of different groups of riders; education programs with extra focus on groups at higher risk of injury; bicycle clinics with training and repair coalations serving the needs of bicyclists	Regularly held workshops for bicyclists as well as motorists to keep bicyclists and pedestrians safe; bicycle rodeos; bike to work day	Increase in the average number of bicycle trips; successful organization of events and community workshops	Periodic organization of bicycle safety workshops
ENFORCEMENT			
Educational programs based on awareness around equitable traffic enforcement practices - rules, violations, best practices; basic traffic laws and safety rules as enforced	Awareness and common knowledge of City's bike facilities; safe mobility of non-motorised vehicles on high-volume motorised vehicles	Behavioral changes; Number of biyclist violations; number of collisions involving bicyclists	Trend tracking of the number of bicyclist violations;
ENGINEERING			
S20PB - Install advance stop bar before crosswalk (bicycle box); S1 Add intersection lighting; S9 Install raised pavement markers and striping(through intersection); sign improvements for bicyclists; bicycle signal heads	Enhancement of both pedestrian and bicyclist safety; Stopping cars well before the crosswalk provides a buffer between vehicles; allow and facilitate a dedicated space for bicyclists to make them more visible to drivers	Number of motor vehicle-bicyclist, motor vehicle-pedestrian collisions; number of bicyclist and pedestrian violations	Trend tracking of the umber of motor vehicle-bicyclist, motor vehicle-pedestrian collisions; number of bicyclist and pedestrian violations; pedestrian and bicyclist volumes at intersections

Actions	Target Output	Performance Measures	Monitoring and Evaluation
ENCOURAGEMENT			
Bicyclist and pedestrian safety related workshops and events; bicycle and pedestrian wayfinding signs; community-driven or coalition driven workshops	Events such as Walk or Bike to School Day; Yearlong contests and clubs dedicated to keeping track of and celebrating students and residents walking and biking like mileage clubs; wayfinding systems to help encourage people to walk and bike	Number of events conducted per quarter; level of participation and engagement	Periodic organization of bicycle safety workshops
EMERGING TECHNOLOGIES			
Optimized signal timing for Bicyclists; Bike activated signal detection - loop detectors; bicycle signal heads	Adjustments to minimum green, red time intervals; facilitate safe and convenient bicycle crossing at intersections; guidance and ROW control to bicyclists	Number of protected intersections, number of bicycle and pedestrian detections installed	Safe, comfortable and convenient crossings at intersections; minimized delay; periodic surveys
EVALUATION			
Walking and biking audits; parents and students surveys in schools	Feedback on various programs and systems geared towards safety and awareness of bicyclists	Feedback participation levels	Periodic evaluation

Objectives		Success Indicators	
Reduce pedestrian fatal and severe injury collisions from 21 to less than 5 in the next 5 years		**Reduction of pedestrian fatalities and severe injuries to less than 5 in the next 5 years and increase in pedestrian counts at both controlled and uncontrolled intersections**	
Actions	**Target Output**	**Performance Measures**	**Monitoring and Evaluation**
EDUCATION			
Conduct public education and outreach to motorists to raise their awareness of pedestrian safety needs	Increased awareness of the presence of pedestrians and other non-motorized modes of transportation	Before/after trend analysis of the number of walking trips	Annual evaluation of collision analysis of collisions involving pedestrians
ENFORCEMENT			
Educate the judiciary on the importance of penalites for violation of pedestrian laws	Awareness around pedestrians laws and equitable traffic enforcement practices in case of violations	Pedestrian related violation and tickets - number and frequency; Public comments	Annual evaluation of pedestrian related violations
ENGINEERING			
Implement effective CM's for problem areas as determined by roadway safety assessments; S1 - Add intersection lighting; S9 - Install raised pavement markers and striping; S17PB - Install Pedestrian countdown signals; S18PB - Install Pedestrian Crossing; NS19PB - Install raised medians/refuge islands, NS20PB - Install pedestrian crossings at uncontrolled locations (new signs and marking); NS21PB - Install pedestrian crossings at uncontrolled locations (with enhanced safety features); IN pedestrian crossing signs	Implementation of engineering improvements	Before/after pedestrian counts, pedestrian related collisions and violations, near misses	Annual evaluation of pedestrian counts and collisions; public input and comments post implementation

Actions	Target Output	Performance Measures	Monitoring and Evaluation
ENCOURAGEMENT			
Identify opportunties for alternate funding; for instance the Safe Routes to School Program; One-time events, Walk to School Day; Year-long contests and clubs tracking and rewardng students that are walking	Successful implementation of one-day and year-long programs	Before/after - Survey on mode of transportation to school; pedestrian-related collisions, violations and near-missed in the vicinity of schools	Monitoring of successful programs as conducted every semester
EMERGING TECHNOLOGIES			
PUFFIN Crossing - Pedestrian User Friendly Intelligent Intersection - active detection of pedestrian's presence in crosswalk to determine whether pedestrian phase of a traffic signal or beacon should be extended or cancelled; protected intersection with scramble phase; contactless pedestrian actuated push buttons	Safe pedestrian crossing for signalized intersections targetting seniors and pedestrians with disabilities (slower walking speeds)	Collisions involving seniors and pedestrians with disabilities	Collision data - party data; collision diagrams
EVALUATION			
Conduct periodic safety assessments of locations with growing traffic and pedestrian volumes and locations at greater risk for pedestrian fatalities and severe injuries, and share information with local partners	Continous evaluation and identification of most pertinent issues around pedestrian safety	Before/after result of strategies; record of pedestrian related collision histories	Annual review of public input and complaints, police reports, on-site observations

Emphasis Area 2: Automobile right-of-way violations

About 20 percent (14 collisions) of F+SI collisions have occurred due to automobile right-of-way violations. All of these collisions have occurred at intersections in the City. 12 of these collisions are broadside collisions, one is sideswipe and the other is a head-on collision. Six of these collisions have occurred on Washington Boulevard, a total of six collisions (two each) have occurred on Culver Boulevard, Sepulveda Boulevard and Washington Place and a total of two collisions (one each) have occurred on Centinela Avenue and La Cienega Boulevard. For 12 out of these 14 locations, right-of-way controls were present and functioning and at the rest of the locations, no controls were present.

Automobile right-of-way collisions can occur at intersections where lane designations are not clearly visible to approaching motorists or intersections that are noted as being complex and experiencing crashes that could be attributed to a driver's unsuccessful attempt to navigate the intersection. Confusion can exist with regards to choosing the proper turn path or where through lanes do not line up. This issue is relevant at intersections where the overall pavement area is large and multiple turning lanes are involved. Right-of-way violations are especially common at signalized intersections as a result of failure to yield. The following table lists the goals, strategies and actions and the subsequent output of various actions to decrease automobile right of way violations and collisions in the City.

GOALS

To decrease the number of right-of-way violations and collisions that occur due to failure to yield at an intersection

To reduce the number of right-of-way violations and resulting FSI collisions to zero by 2030

Objectives		Success Indicators	
To reduce the number of right-of-way violations that occurr due to failure to yield at an intersection		**Reduction in the number of right of way violations leading to F+SI collisions to zero by 2030.**	
Actions	**Target Output**	**Performance Measures**	**Monitoring and Evaluation**
EDUCATION			
Inform the public of the dangers of right-of-way violations and establish resources to educate the public on attentive driving and appropriate safety enhancement controls to follow; focus group discussion within neighborhoods as a means to educate and learn more about violations; road safety orientation at schools and universities	Increased awareness around enhancements used to call drivers attention to intersection control signs and devices; continually improve the road system constantly seeking to reduce the number of collisions	Number of right-of-way violations and collisions due to failure to yield at intersections	Data collection, analysis and monitoring of the number of right-of-way violations and collisions per year
ENFORCEMENT			
Strengthen local enforcement by implementing equitable traffic enforcement practices	Strict tracking of right-of-way violations; downward trend in the number of right-of-way violations at intersections	Number of right-of-way violations and collisions due to failure to yield at intersections	Data collection, analysis and monitoring of the number of right-of-way violations and collisions per year
ENGINEERING			
S3 Improve signal timing; S9 Install raised pavement markers and striping(through intersections); S10 Install Flashing Beacons as advance warning; S12 Install raised median on approaches; S14 Create directional median openings to allow (and restrict) left turns and U-turns	Reduce intersection clutter and highten driver awareness; increase conspicuity of key road signs and signal heads; to increase operational efficiency	Evaluation of traffic operations; number of lanes on approach, lane use type (shared vs. exclusive), presence of add/drop lanes, free-flow movements, storage lengths for turn bays, and distance to nearby driveways and intersections	Data collection, analysis and monitoring of the number of right-of-way violations and collisions per year

Actions	Target Output	Performance Measures	Monitoring and Evaluation
ENCOURAGEMENT			
Develop support community programs to identify several behavioral strategies with low and moderate cost and short to medium implementation timeframes; focused advertisements on major pedestrian generators or transit hubs and via social media	Motor vehicle drive awareness and safety messages for at-risk populations of non-motorized road users like bicyclists and pedestrians	Number of right-of-way violations and collisions due to failure to yield at intersections	Data collection, analysis and monitoring of the number of right-of-way violations and collisions per year
EMERGING TECHNOLOGIES			
Develop support community programs to identify several behavioral strategies with low and moderate cost and short to medium implementation timeframes; focused advertisements on major pedestrian generators or transit hubs and via social media	Motor vehicle drive awareness and safety messages for at-risk populations of non-motorized road users like bicyclists and pedestrians	Number of right-of-way violations and collisions due to failure to yield at intersections	Data collection, analysis and monitoring of the number of right-of-way violations and collisions per year
EVALUATION			
Establishment of a monitoring program to evaluate the impact of countermeasures that are selected and implemented -- focusing on right of way collisions	Guide drivers approaching intersection as providing more effective guidance through an intersection will minimize the likelihood of a vheicle leaving it's appropropriate lane and it's own right of way	Number of right-of-way violations and collisions due to failure to yield at intersections	Data collection, analysis and monitoring of the number of right-of-way violations and collisions per year

Emphasis Area 3: Driving Under Influence (DUI)

About 16 percent of F+SI injury collisions have occurred due to the motorist driving under influence of alchohol or drugs. Four motorists were killed and seven were severely injured in the City. All of these collisions happened in the dark hours or low-light conditions, between 8 pm in the evening to 6 am in the morning. Eight of these collisions were with fixed objects, two of them were vehicle-pedestrian collisions and one with another motor vehicle. Major roadways where DUI collisions have occurred include Washington Boulevard (four), Slauson Avenue (two), Overland Avenue (two), Culver Boulevard (one), Centinela Boulevard (one) and Sepulveda Boulevard (one). 10 of the 11 collisions occurred at intersections and one occurred at a roadway segment/ mid-block location. The following table lists the goals, strategies and actions and the subsequent output of various strategies to decrease driving under influence or drug impaired driving in the City.

GOALS

To reduce alcohol impaired driving and citations

To reduce the number of fatal and severe injury collisions due to DUI violations

Objectives	Success Indicators
To decrease the number of collisions caused due to DUI violations	**Reduction in alchohol impaired driving and subsequent decrease in the number of collisions due to DUI**

Actions	Target Output	Performance Measures	Monitoring and Evaluation
EDUCATION			
Inform the public of the dangers of impaired driving and establish positive social norms that make driving while impaired unacceptable	Awareness and education of the effects of being under influence of drugs while driving or cycling	Reduction in the number of DUI related violations and crashes	Annual trend analysis of number of DUI related violations and crashes
ENFORCEMENT			
Enact, publicize, enforce, and adjudicate laws prohibiting impaired driving so that people choose not to drive impaired; Publicized Sobriety Checkpoints; training and education for law enforcement, prosecutors, judges, and probation officers; Administrative License Revocation and Suspension(ALR/ALS); Minimum drinking age laws	Educate and create awareness; to design, develop and to operate a system with stricter and equitable traffic enforcement practices	Track record systems that are accurate, up-to-date, easily accessible, and able to track each DUI; checkpoint sobriety survey; ALR and ALS	Two track systems - driver facing both administrative and criminal actions for driving under influence

Actions	Target Output	Performance Measures	Monitoring and Evaluation
ENGINEERING			
NS7 - Upgrade Intersection pavement markings; NS9 - Install Flashing Beacons as advance warning	Reduction in the # of DUI violations and collisions	Track record systems that are accurate, up-to-date, easily accessible, and able to track each DUI	Annual trend analysis of number of DUI related violations and crashes
ENCOURAGEMENT			
Enforcement activities should be publicized extensively to be effective in deterring driving under influence offenses; Provision of alternative modes of transportation; Designated Drivers	To implement strategies that discourage driving under influence	Track record systems that are accurate, up-to-date, easily accessible, and able to track each DUI	Organization of workshops and introducing cooperative activities between traditional highway safety organizations; such as law enforcement and motorvehicle departments, health and edicational organizations
EMERGING TECHNOLOGIES			
Ignition Interlock Devices - installed to prevent the vehicles from starting if alcohol is detected in the driver's breath; advance alchohol detection system	Decrease in the number of impaired drivers	Mandate interlock device; record systems that are accurate, up-to-date, easily accessible, and able to track each DUI offender	Require devices for individuals convicted of DUI, including first time offenders; Annual trend analysis of number of DUI related violations and crashes.
EVALUATION			
Anonymous roadside survey collecting voluntary breath, oral fluid and blood samples periodically; strategize system to reduce driving with a suspended or revoked license	Decrease the number of DUI offenders	Survey results and trend analysis	Trend Analysis and development of reports to evaluate the effectiveness of roadside survey; ALR, etc

Emphasis Area 4: Unsafe Driving Speed

About 11 percent of F+SI collisions that have occurred in the City have been due to over-speeding vehicles. Three of these collisions occurred at roadway segment/mid-block locations and five of them occurred at intersections. All of these intersections were un-signalized intersections. Three of these F+SI collisions led to a hit-object collision, two of them overturned, two were rear-end collisions and one was a vehicle pedestrian collision. These collisions have occurred on Overland Avenue (three), Culver Boulevard (three), Jefferson Boulevard (one) and Sawtelle Boulevard (one). The following table lists the goals, strategies and actions and the subsequent output of various strategies to decrease over-speeding violations and collisions in the City.

GOALS

To reduce the number of speeding related violations and citations

To reduce the number of collisions caused due to over speeding of vehicles

Objectives	Success Indicators
To ensure strict enforcement targeting speed related violations	**Program implementation emphasizing the interdisiplinary nature of effective speed management, leading to a significant reduction in speeding related violations and F+SI collisions**

Actions	Target Output	Performance Measures	Monitoring and Evaluation
EDUCATION			
"Change driver culture by conducting and supporting public education and outreach activities that elevate the awareness of the dangers of aggressive driving; Educate the judiciary and elected officials on the risks associated with aggressive driving; Increase the level of enforcement for speed-related violations "	Increased awareness around enhancements used to call drivers attention to intersection and roadway segment control signs and devices; continually improve the road system constantly seeking to reduce the number of collisions	Reduce the number of collisions that are caused due to aggressive speeding by 2025	Number of speed-related violations; participation and engagement in public education and outreach activities

Actions	Target Output	Performance Measures	Monitoring and Evaluation
ENFORCEMENT			
Increase enforcement targeting aggressive driving; enforcement actions for speeding violations to be consistent with local and state statutues; sustainable levels of widespread randomized but targeted enforcement; automated speed and red light enforcements	Enforcement of traffic laws and attentiveness to traffic safety as a core value; successful implementation of equitable traffic safety enforcement practices	Reduce the number of collisions that are caused due to aggressive speeding by 2025	Number of speed-related violations and fatal and severe injury collisions caused due to speed-related violations
ENGINEERING			
RS - Install Raised Medians; NS8 - Flashing Beacons at Stop Controlled Intersection; NS7 - Upgrade intersection pavement marking; Speed humps and raised platforms; Gateway infrastructure treatments indicating speed changes; Roundabouts; traffic calming measures; dynamic/variable speed warning signs	To support fair, defensible and reasonable enforcement of speeds through appropriate engineering practices	Reduce the number of collisions that are caused due to aggressive speeding by 2025	Roadway Safety Audits to measure effectiveness of the implemented countermeasures
ENCOURAGEMENT			
Communicate the factors associated with aggressive driving to the transportation engineering and planning communities; initiate and conduct neighborhood traffic calming activities and events using art and social media	Increased awareness towards non-motorized modes	Reduce the number of collisions that are caused due to aggressive speeding by 2025	Monitor and evaluate engagement and participation observed in these programs; number of speed related violations and fatal and severe injury collisions caused due to speed-related violations

Actions	Target Output	Performance Measures	Monitoring and Evaluation
EMERGING TECHNOLOGIES			
Spot camera, variable speed limits, variable message signs and traffic control warning devices and other systems that provide motorists with information and respond to changing traffic and environmental conditions; Intelligent Speed Assistance	Increased driver awareness of speeding in real time	Speeding violations	Monitor speeding violations before/after implementation
EVALUATION			
Conduct a speed survey; or install dynamic speed feedback signs on roadway segment where over speeding is observed;	Constant evaluation on the effectiveness of education, enforcement, engineering and encouragement strategies; economic and feaibility analyses to prioritize among alternate solutions and develop implementation plans	Reduce the number of collisions that are caused due to aggressive speeding by 2025	Periodic Speed Survey and evaluation to increase/decrease posted speed limit and make appropriate recommendations

Emphasis Area 5: Safety at Intersections

About 94 percent of F+SI collisions have occurred at intersections in the City. 39 out of the 66 intersection collisions have occurred at signalized intersections and the rest have occurred at un-signalized intersections. The highest number of these collisions occurred on Washington Boulevard (17) followed by Culver Boulevard (10) and Sepulveda Boulevard (nine). About 33 percent of these collisions were motor-motor vehicle collisions, 30 percent were vehicle-pedestrian collisions and 23 percent were fixed object collisions. About 21 percent of these collisions were due to automobile right-of-way violation, 15 percent due to DUI and 12 percent were pedestrian-violation collisions.

The following table lists the goals, strategies and actions and the subsequent output of various strategies to increase safety at intersections for all modes of transportation in Culver City.

GOALS

To enhance intersection safety for all motorized as well as non-motorized modes of transportation

To reduce the number of collisions occurring at signalized and un-signalized intersections in Culver City

Objectives	Success Indicators
Enhance Intersection safety for all motorized as well as non-motorized modes of transportation	**Reduction in the number of collisions occurring at signalized and unsignalized intersections**

Actions	Target Output	Performance Measures	Monitoring and Evaluation
EDUCATION			
Change driver culture by conducting and supporting public education and outreach activities that elevate the awareness of the dangers of aggressive driving, DUI, auto right-of-way violations; Educate the judiciary and elected officials on the risks associated with aggressive driving; Increase the level of enforcement for speed-related violations	Increased awareness around enhancements used to call drivers attention to intersection control signs and devices; continually improve the road system constantly seeking to reduce the number of intersection collisions	Number of collisions at intersections; number of violations at intersections	Periodic data collection, analysis and monitoring of the number of collisions occurring at intersections

Actions	Target Output	Performance Measures	Monitoring and Evaluation
ENFORCEMENT			
Increase equitable traffic enforcement targeting aggressive driving; auto right of way violations and DUI; sustainable levels of widespread randomized but targeted enforcement; automated speed and red light enforcements	Increased safety at intersections - both signalized and unsignalized	Number of collisions at intersections; number of violations at intersections	Periodic data collection, analysis and monitoring of the number of violations occurring at intersections
ENGINEERING			
S1 - Intersection Segment Lighting; S9 - install raised pavement markers and striping; S11 - Improve Pavement Fricton	Reduce intersection clutter and highten driver awareness; increase conspicuity of key road signs and signal heads; to increase operational efficiency	Number of collisions at intersections; number of violations at intersections	Periodic data collection, analysis and monitoring of the number of violations occurring at intersections
ENCOURAGEMENT			
Encourage more multidisciplinary collaboration at the State an local level on intersection safety; motor vehicle drive awareness and safety messages for at-risk populations of non-motorized road users like bicyclists and pedestrians	Increased awareness around traffic safety particularly at intersections	Trend analysis of collisions occurring at intersections along with their severity, collision type and violation category	Periodic data collection, analysis and monitoring of the number of violations occurring at intersections
EMERGING TECHNOLOGIES			
All-Red clearance intervals and larger signal lenses	Crash reductions	Trend analysis of collisions occurring at intersections along with their severity, collision type and violation category	Before/after collision data analysis

Actions	Target Output	Performance Measures	Monitoring and Evaluation
EVALUATION			
Develop a system to track and evaluate countermeasure effectiveness at high-risk intersections	To evaluate the possible countermeasures to determine the potential for imporvement to ensure safe traffic operation at intersections	Before after number of collisions at high-crash intersections, pre and post implementation of improvements	Periodic data collection, analysis and monitoring of the number of violations occurring at intersections

Emphasis Area 6: Motorists and Non-Motorists Safety Near Schools, Parks, Commercial Areas, Senior Center, and Bus Stops

Land uses like schools, parks, commercial areas and shopping centers, senior center and bus stops are major activity centers and hence are major motorized and non-motorized traffic generators in a City. Motorists and non-motorists are extremely vulnerable around these land uses. High number of F+SI collisions in Culver City have been observed around these land uses. The following table lists the goals, strategies and actions and the subsequent output of various strategies to increase traffic safety around these high activity land uses in Culver City.

GOALS

To identify major activity generators and ensure appropriate traffic safety improvements

To ensure smooth and safe motorised and non-motorised traffic flow around major activity zones

Objectives	Success Indicators
To provide for continous and connected pedestrian facility to access schools, parks and bus stops	**Increase in the number of walking and biking trips to schools and parks**

Actions	Target Output	Performance Measures	Monitoring and Evaluation
EDUCATION			
Schools to work with local agencies and develop a "Safe Routes to School" Plan	Designated walkways and bikeways facilitating direct connectivity to schools	Before/after trend analysis of the number of walking trips to schools	Monitor participation and success of these initiatives
ENFORCEMENT			
School Zone Improvements; Clearly marked area where parents are permitted to drop-off and pick-up their children; drop-off and pick-up regulations; parents drop-off zones must be separated from bus drop-off zones; loading zones at commercial locations; implement equitable traffic enforcement practices	To ensure smooth and safe flow of motorized and non-motorized modes of transportation accessing schools	Pedestrian related violation and tickets - number and frequency; Public comments	Monitor driver behavior in these zones

Actions	Target Output	Performance Measures	Monitoring and Evaluation
ENGINEERING			
Implement effective CM's for problem areas as determined by roadway safety assessments; S1 - Add intersection lighting; S9 - Install raised pavement markers and striping; S17PB - Install Pedestrian countdown signals; S18PB - Install Pedestrian Crossing; NS19PB - Install raised medians/refuge islands, NS20PB - Install pedestrian crossings at uncontrolled locations (new signs and marking); NS21PB - Install pedestrian crossings at uncontrolled locations (with enhanced safety features); increasing the size of traffic signal lamps from 8 to 12 inches; adding additional signal heads; having an all-red clearance interval of 1-3 seconds; having advanced warning signs/flashing lights	Implementation of advanced engineering improvements	Before/after pedestrian counts, pedestrian related collisions and violations, near misses	Before/after collision analysis focusing on collisions involving non-motorized modes of transportation; annual pedestrian and bicyclists counts
ENCOURAGEMENT			
Identify opportunties for alternate funding; for instrance the Safe Routes to School Program; One-time events, Walk to School Day; Year-long contests and clubs tracking and rewarding students that are walking or biking to school; incentivize owners of older shopping centers to improve and include multiple safe access points for both pedestrians and bicyclists	Successful implementation of one-day and year-long programs	Before/after - Survey on mode of transportation to school; pedestrian-related collisions, violations and near-missed in the vicinity of schools	Monitor increases/decreases in the number of pedestrian tips; origin-destination of school trips

Actions	Target Output	Performance Measures	Monitoring and Evaluation
EMERGING TECHNOLOGIES			
Touchless pedestrian push-buttons; Make-shift street furniture; Speed-Monitoring Trailers; automated enforcement systems like red light cameras ad automated speed enforcement cameras	Pedestrian and bicyclist safety around activity zones and major landmarks	Collisions and near-misses involving pedestrians and bicyclists; pedestrian and bicyclists counts	Before/after pedestrian and bicyclist counts; before/after pedestrian and bicyclist collision counts
EVALUATION			
Conduct periodic safety assessments of locations with growing traffic and pedestrian volumes and locations at greater risk for pedestrian fatalities and severe injuries, and share information with local partners	Continous evaluation and identification of most pertinent issues around pedestrian safety	Before/after result of strategies; Record of pedestrian related collision histories	Annual review of public input and complaints, police reports, on-site observations

Countermeasures

The following is the list of HSIP-eligible countermeasures identified for enhancing safety improvements at various high-risk intersections and roadway segments in Culver City. For each countermeasure, the following information has been provided:

- Crash Reduction Factor (CRF): the expected reduction of crashes associated with the countermeasure
- Expected Life (in years): the expected life of a countermeasure post-implementation
- Baseline Cost: a planning level material cost estimate for each countermeasure improvement, based on 2020 dollar amounts

In addition, an excerpt from the Local Roadway Safety Manual (LRSM), 2020, detailing each available HSIP countermeasure, is included as **Appendix D**.

Countermeasures for Signalized Intersections

S01 - Add Intersection Lighting

Provision of lighting at the intersection and on it's approaches.

CRF: 40%
Expected Life (in years): 20
Baseline Cost: $130,400

S02 - Improve signal hardware: lenses, back-plates, mounting, size, and number

Includes New LED lighting, signal back plates, retro-reflective tape outlining the back plates, or visors to increase signal visibility, larger signal heads, relocation of the signal heads, or additional signal heads.

CRF: 15%
Expected Life (in years): 10
Baseline Cost: $32,000

S03 - Improve signal timing (coordination, phases, red, yellow, or operation)

Includes adding phases, lengthening clearance intervals, eliminating or restricting higher-risk movements, and coordinating signals at multiple locations.

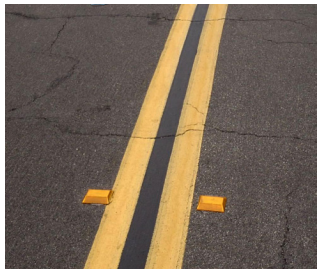
CRF: 15%
Expected Life (in years): 10
Baseline Cost: $52,800

S07 - Provide protected left turn phase (left turn lane already exists)

Includes addition of a propoerly timed protected left-turn phase, consideration of MUTCD guidelines on implementation of protected left-turn phases.

CRF: 20%
Expected Life (in years): 20
Baseline Cost: $128,100

S09 - Install raised pavement markers and striping (Through Intersection)



Addition of clear pavement markings, raised pavement marking to help guide motorists through complex intersections.

CRF: 10%
Expected Life (in years): 10
Baseline Cost: $2,160

S10 - Install flashing beacons as advance warning (S.I.)

Addition of advance warning to increase driver awareness for an upcoming intersection; used to supplement and call driver's attention to intersection control signs.

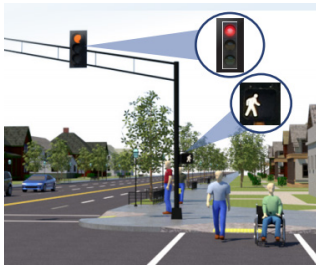
CRF: 30%
Expected Life (in years): 10
Baseline Cost: $15,000

S12 - Install raised median on approaches (S.I.)

Addition of raised medians next to left-turn lanes at intersections, directly over existing pavement.

CRF: 25%
Expected Life (in years): 20
Baseline Cost: $200,500

S21PB - Modify signal phasing to implement a Leading Pedestrian Interval (LPI)



Addition of LPI gives pedestrians the opportunity to enter an intersection 3-7 seconds before vehicles are given a green indication; only minor signal timing alteration is required.

CRF: 60%
Expected Life (in years): 10
Baseline Cost: $7,500

Countermeasures for Unsignalized Intersections

NS01 - Add intersection lighting (NS.I.)

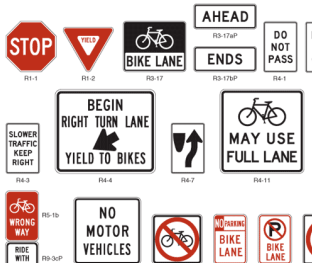
Provision of lighting at the intersection and all it's approaches

CRF: 40%
Expected Life (in years): 20
Baseline Cost: $62,000

NS06 - Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs

Additional regulatory and warning signs at or prior to intersections will help enhance the ability of approaching drivers to percieve them

CRF: 15%
Expected Life (in years): 10
Baseline Cost: $9,000



NS07 - Upgrade intersection pavement markings (NS.I.)

Addition of appropriate pavement delineation in advance of and at intersections will help approaching motorists direct attention to the presence of an intersection

CRF: 25%
Expected Life (in years): 10
Baseline Cost: $3,300

NS09 - Install flashing beacons as advance warning (NS.I.)

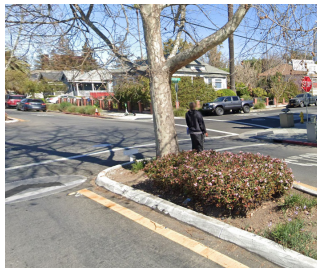
Addition of flashing beacons provide a visible signal to the presence of an intersection

CRF: 30%
Expected Life (in years): 10
Baseline Cost: $15,000

NS14 - Install raised median on approaches (NS.I.)

Addition of raised medians upstream and downstream of an intersection imrpove safety and operation of an intersection.

CRF: 25%
Expected Life (in years): 20
Baseline Cost: $200,500



NS20PB - Install pedestrian crossing at uncontrolled locations (new signs and markings only)

Includes addition of improvements like pavement markings, advanced "stop" or "yield" markings, aesthetic enhancements like stamped concrete/ asphalt at non-signalized intersections.

CRF: 25%
Expected Life (in years): 10
Baseline Cost: $10,000

Countermeasures for Roadway Segments

R08 - Install raised median

Adding raised medians entails incorporating a rigid barrier between opposing traffic.

CRF: 25%
Expected Life (in years): 20
Baseline Cost: $310,100

R21 - Improve pavement friction (High Friction Surface Treatments)

Improves pavement friction at locations where pavement friction available is significantly less than actual roadway speeds.

CRF: 40%
Expected Life (in years): 10
Baseline Cost: $312,900

R35PB - Install/Upgrade pedestrian crossing (with enhanced safety features)

Addition of pedestrian crossing with safety features like flashing beacons, curb extentions, medians and pedestrian crossing islands.

CRF: 30%
Expected Life (in years): 10
Baseline Cost: $20,000

7. Safety Projects and Implementation

Safety Projects for High-Risk Intersections

The next step after the identification of high-risk locations, emphasis areas and applicable countermeasures is to identify location specific safety improvements for all high-risk intersections and roadway segments. **Table 7** lists the priority safety improvements identified for each high-risk intersection, along with the total base planning level cost (2020 dollar amounts) and the resultant Benefit-Cost Ratio. The "Total Benefit" estimates for the proposed improvements being calculated and evaluated in the proactive safety analysis. This is divided by the "Total Cost per Location" estimates for the proposed improvements, giving the resultant B/C Ratio. The B/C Ratio Calculation follows the methodology as mentioned in the Local Roadway Safety Manual (2020) and the details are attached in **Appendix E**. Additional countermeasures, cost, benefit and B/C Ratio calculation spreadsheet can be found in **Appendix F.**

Table 7. Safety Projects for High-risk Intersections

Rank	Intersections	Controls	CM 1	CM 2	CM 3	Total Cost per Location*	B/C Ratio	Additional CMs
1	Virginia Ave/Overland Ave	Signalized	S09	S12	S21PB	$294,224	17.2	S02, S03, S07
2	Washington Blvd/Beethoven St	Signalized	S07	S09		$182,364	14.8	S02, S03
3	Sawtelle Blvd/Washington Pl	Signalized	S09	S12	S21PB	$294,224	32.9	S02, S03
4	Inglewood Blvd/Washington Blvd	Signalized	S09	S12	S21PB	$294,224	31.4	S02, S03, S07
5	Higuera St/Krueger St	Unsignalized	NS01	NS06	NS07	$104,020	58.7	NS20PB
6	Overland Ave/Northgate St	Unsignalized	NS06	NS07	NS20PB	$31,220	233.0	
7	Jefferson Blvd/Hetzler Rd	Signalized	S02	S09	S21PB	$58,324	118.3	S03, S06
8	Washington Blvd/Sawtelle Blvd	Signalized	S02	S09	S12	$328,524	21.6	S03, S10
	Washington Blvd/Cattaraugus Ave (W)	Signalized	S02	S03	S09	$121,744	13.3	S10, S12
	Washington Blvd/Cattaraugus Ave (E)	Unsignalized	NS01	NS06	NS07	$104,020	62.1	NS15
9	Overland Ave/Braddock Dr	Signalized	S02	S07	S09	$227,164	30.4	S03, S21PB
10	Sepulveda Blvd/Green Valley Cir	Signalized	S02	S09	S12	$328,524	8.6	
	6000 Sepulveda Blvd/Parking Structure	Unsignalized	NS06	NS07	NS20PB	$31,220	194.5	
11	Washington Blvd/Kensington Rd	Unsignalized	NS01	NS06	NS07	$104,020	73.7	NS13
12	Culver Blvd/Sawtelle Blvd	Signalized	S01	S07	S09	$364,924	35.2	S02, S03
13	Slauson Ave/Bristol Pky	Signalized	S02	S09	S21PB	$58,324	165.5	S12

*Includes material costs, contingency cost (10%), environmental cost (5%), PS&E (10%) and construction cost (15%).

Rank	Intersections	Controls	CM 1	CM 2	CM 3	Total Cost per Location*	B/C Ratio	Additional CMs
14	Washington Blvd/Prospect Ave	Unsignalized	NS06	NS07	NS20PB	$31,220	118.0	
15	Sepulveda Blvd/Washington Pl	Signalized	S09	S12		$283,724	17.7	S10
16	Washington Blvd/Kenyon Ave	Unsignalized	NS01	NS06	NS07	$104,020	68.7	NS20PB
17	Culver Blvd/Overland Ave	Signalized	S09	S21PB		$13,524	503.9	S02, S03
18	Overland Ave/Freshman Dr	Signalized	S09			$3,024	1810.6	
19	Culver Blvd/Duquesne Ave	Signalized	S01	S07	S09	$364,924	20.6	
20	Washington Pl/Boise Ave	Unsignalized	NS06	NS07	NS20PB	$31,220	108.7	
21	Washington Pl/Frances Ave	Unsignalized	NS06	NS07	NS20PB	$31,220	109.3	
22	McManus Ave/Washington Blvd (E)	Signalized	S09	S10	S21PB	$34,524	105.8	
23	Centinela Ave/Bristol Pky	Signalized	S02	S09	S10	$68,824	37.8	
24	Slauson Ave/Buckingham Pky	Signalized	S01	S09	S10	$206,584	48.7	
	Sepulveda Blvd/Vera Way	Unsignalized	NS06	NS07		$17,220	135.4	
25	Washington Blvd/Hutchison Ave	Unsignalized	NS06	NS07	NS08	$38,220	77.9	
26	Washington Pl/Tuller Ave	Unsignalized	NS06	NS07	NS20PB	$31,220	124.5	
27	Washington Blvd/Ince Blvd	Signalized	S09	S10	S12	$294,924	13.3	S02, S03
	La Cienega Blvd/Washington Blvd;	Signalized	S09	S10	S12	$304,724	18.8	S02, S03
28	Culver Blvd/Huron Ave;	Signalized	S09	S10	S12	$304,724	15.0	S02, S03
	Culver Blvd/Harter Ave	Unsignalized	NS06	NS07	NS09	$38,220	121.7	
	Culver Blvd/Elenda St;	Signalized	S02	S09	S21PB	$58,324	64.0	
29	Robertson Blvd/Washington Blvd	Signalized	S02	S09	S12	$328,524	9.6	
30	Washington Blvd/Glencoe Ave (W)	Signalized	S07	S09	S12	$463,064	17.8	S02, S21PB
	Washington Blvd/Tivoli Ave;	Unsignalized	NS01	NS06	NS07	$104,020	72.6	NS14, NS15
	Washington Blvd/Michael Ave;	Unsignalized	NS01	NS06	NS07	$104,020	62.0	NS14
	Washington Blvd/Alla Rd (W)	Unsignalized	NS01	NS06	NS07	$104,020w	65.4	NS14
	Washington Blvd/Del Rey Ave	Unsignalized	NS06	NS07		$17,220	134.5	

*Includes material costs, contingency cost (10%), environmental cost (5%), PS&E (10%) and construction cost (15%).

Safety Projects for High-Risk Roadway Segments

Table 8 lists the priority safety improvements identified for each high-risk roadway segment along with the total base planning level cost (2020 dollar amounts) and the resultant Benefit-Cost Ratio. The complete cost, benefit and B/C Ratio calculation spreadsheet can be found in **Appendix F.**

Table 8. Safety Projects for High-risk Roadway Segments

Rank	Roadway Segments	CM1	CM2	CM3	Total Cost per Location*	B/C Ratio	Additional CMs
1	Jefferson Boulevard, 152 feet E and 375 feet W of Raintree Cir	R21			$438,060	4.6	R26
2	Sawtelle Blvd, between Herbert St and 470 feet N of Culver Blvd	R8	R21		$872,200	16.9	R26
3	Washington Blvd, between Ince Blvd and Higuera St	R8	R21	R35PB	$900,200	7.8	R26
4	Culver Blvd, between Harter Ave and 138 feet W of Huron Ave	R21			$438,060	8.9	R26

*Includes material costs, contingency cost (10%), environmental cost (5%), PS&E (10%) and construction cost (15%).

Evaluation and Implementation

This section describes the steps the City may take to for the success of this plan and steps needed to update the plan in the future. The LRSP is a living document and requires periodic updates to assess its efficacy and re-evaluate potential solutions. It is recommended to update the plan every two to five years in coordination with the identified safety partners and stakeholders. This plan was developed based on the current traffic safety needs of the community and the collisions that have occurred in the last five years to identify various trends and determine priority emphasis areas throughout the City. The implementation of strategies under each emphasis area would aim to reduce fatal and severe injury collisions in the coming years.

Implementation

The LRSP document provides engineering, education, enforcement, emergency medical service and emerging technologies related countermeasures that can be implemented throughout the City to reduce F+SI collisions. It is recommended that the City implement the selected improvements at high-risk locations in coordination with other projects proposed for the City's infrastructure development in their future Capital Improvement Plans. The success of the LRSP can be achieved by fostering communication among the City and the safety partners. Funding is a critical component of implementing any safety project. While the HSIP program is a common source of funding for safety projects, there are numerous other funding sources that could be pursued for such projects. A number of them are listed below in **Table 9**. Note that for many of these funding sources, the City should work with the Southern California Association of Governments (SCAG) to program the project in the Federal Transportation Improvement Program (FTIP) or State Transportation Improvement Program (STIP).

Table 9. List of Potential Funding Sources

Funding Source	Funding Agency	Amount Available	Next Estimated Call for Projects	Applicable E's	Notes
Active Transportation Program	Caltrans, California Transportation Commission	~$223 million per year	2022	Engineering, Education	Can use used for most active transportation related safety projects as well as education programs
Highway Safety Improvement Program	Caltrans		Early 2022	Engineering	Most common grant source for safety projects
Surface Transportation Block Group Program	FHWA (Administered through TCAG)	~$4.8 million programmed in FY 20/21-21/22	TBD	Engineering	Typically used for roadway projects

Funding Source	Funding Agency	Amount Available	Next Estimated Call for Projects	Applicable E's	Notes
Congestion Mitigation and Air Quality (CMAQ)	FHWA (Administered through TCAG)	$6.1 million annually	TBD	Engineering	Focused on projects that improve air quality
Office of Traffic Safety Grants	California Office of Traffic Safety	Varies by grant	Closes January 31st annually	Education, Enforcement, Emergency Response	10 grants available to address various components of traffic safety
Affordable Housing and Sustainable Communities Program	Strategic Growth Council and Dept. of Housing and Community Development	~$405 million	2022	Engineering, Education	Must be connected to affordable housing projects; typically focuses on bike/ped infrastructure/programs
Urban Greening	California Natural Resources Agency	$28.5 million	2022	Engineering	Focused on bike/pedestrian infrastructure and greening public spaces
Local Streets and Road Maintenance and Rehabilitation	CTC (distributed to local agencies)	$1.5 billion statewide	N/A; distributed by formula	Engineering	Typically pays for road maintenance type projects
RAISE Grant	USDOT	~$1 billion	2022	Engineering	Typically used for larger infrastructure projects
Sustainable Transportation Equity Project	California Air Resources Board	~$19.5 million	TBD; most recent call in 2020	Engineering, Education	Targets projects that will increase transportation equity in disadvantaged communities
Transformative Climate Communities	Strategic Growth Council	~$90 million	TBD; most recent call in 2020	Engineering	Funds community-led projects that achieve major reductions in greenhouse gas emissions in disadvantaged communities.

Monitoring and Evaluation

For the success of the LRSP, it is crucial to monitor and evaluate the four E-strategies continuously. Monitoring and evaluation help provide accountability, ensures the effectiveness of the countermeasures for each emphasis area, and help making decisions on the need for new strategies. The process would help the City make informed decisions regarding the implementation plan's progress and accordingly, update the goals and objectives of the plan.

After implementing countermeasures, the strategies should be evaluated annually as per their performance measures. The evaluation should be recorded in a before-after study to validate the effectiveness of each countermeasure as per the following observations:

- Number of fatal and severe injury collisions
- Number of police citations
- Number of public comments and concerns

Evaluation should be conducted during similar time periods and durations each year. The most important measure of success of the LRSP should be reduction in fatal and severe injury collisions throughout the City. If the number of F+SI collisions doesn't decrease initially, then the countermeasures should be evaluated as per the other observations, as mentioned above. The effectiveness of the countermeasures should be compared to the goals for each emphasis area.

LRSP Update

The LRSP is a living document and is recommended to be updated every two-five years after adoption. After monitoring performance measures focused on the status and progress of the E's strategies in each emphasis area, the next LRSP update can be tailored to resolve any continuing safety problems. An annual stakeholder meeting with the safety partners is also recommended to discuss the progress for each emphasis area and oversee the implementation plan. The document should then be updated as per the latest collision data, emerging trends, and the E's strategies' progress and implementation.

Appendix A

Planning Document Review

TECHNICAL MEMORANDUM

Date: April 16, 2020 (Updated 09/07/21)

To: Heba El-Guindy
Mobility & Transportation Engineering Manager
City of Culver City

From: Ruta Jariwala
Principal
TJKM Transportation Consultants

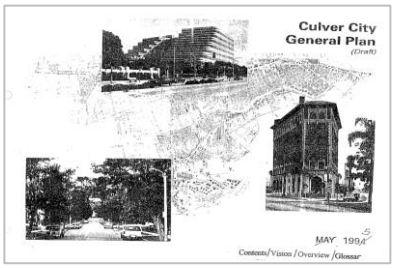
Subject: ***Document Review for Local Roadway Safety Plan***

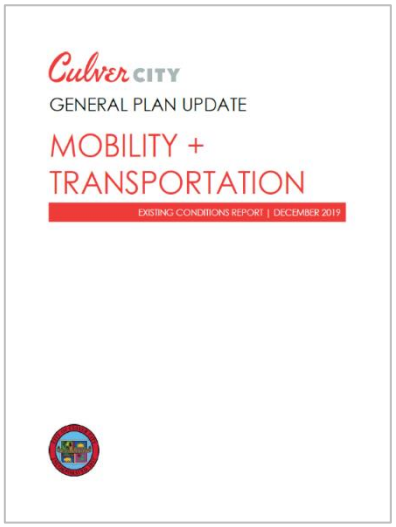
This technical memorandum summarizes the planning documents, projects underway, and studies reviewed for Culver City Local Roadway Safety Plan (LRSP). The purpose of this memorandum is to ensure the LRSP vision, goals, and E's strategies are aligned with prior planning efforts, planned transportation projects and non-infrastructure programs. The documents reviewed are listed below:

1. Culver City 2045 General Plan (anticipated for Fall 2022 adoption) including Mobility + Transportation Existing Conditions Report (2019);
2. Bicycle and Pedestrian Action Plan (2020);
3. TOD Visioning Study and Recommendations (2017);
4. Culver, Washington, and South Robertson Boulevard Bicycle Improvements;
5. Culver City Strategic Plan 2016-2021 (2016) and 2018 Update;
6. Culver City Five Year Capital Improvement Plan Fiscal Years 2019/2020-2023/2024;
7. Culver City Safe Routes to School Program; and
8. Southern California Association of Governments (SCAG) Regional Transportation Plan 2012-2035 (2012)

The following sections include brief descriptions of these documents and how they inform the development of the LRSP. A list of relevant goals, projects, and policies from each document is summarized in **Table 1**.

1. Culver City 2045 General Plan (anticipated for Fall 2021 adoption) and Mobility + Transportation Existing Conditions Report (2019)





The General Plan presents a consolidated framework of decisions for guiding where and how development should occur in Culver City through 2035. The General Plan recognizes that the Circulation Element is crucial to improve the overall quality of life and create a sustainable and thriving community. It emphasizes the need to revitalize primary transportation corridors and build new transportation infrastructure. The plan presents standards and policies for roadway networks, bicycle networks, and pedestrian networks aligned to this vision. The goals and policies stated in the General Plan will inform the countermeasure selection and proposed safety projects for the Culver City LRSP report. Currently, the City is updating the General Plan as a new long-range planning document for development through 2045, anticipated for adoption in Fall 2022. The existing General Plan elements span frm 1968 to 2014. The Circulation Element was adopted in 1995 with amendments through 2004, and has a 2010 horizon year. The Mobility and Transportation Existing Conditions Report of the General Plan Update details, the existing mode share, functional classifications of roadway facilities, traffic signals and speed limits, traffic collisions, bicycle and pedestrian facilities, transit facilities, and parking conditions as of 2019. This will help the LRSP in supporting the recommended safety projects along with the mobility and transportation needs of the City.

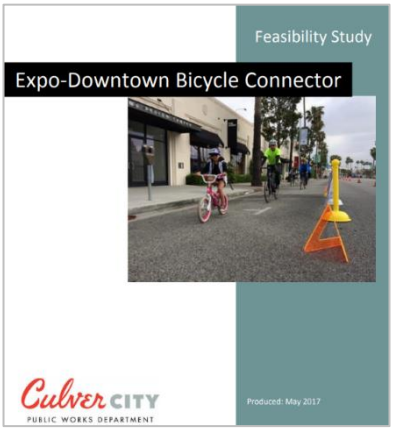
2. Bicycle and Pedestrian Action Plan (2020)

The Bicycle and Pedestrian Action Plan (BPAP) states that active transportation is integral to the identity of Culver City. This plan establishes a long-term vision for improving walking and bicycling in Culver City by updating the previous Bicycle and Pedestrian Master Plan adopted by the City Council in 2010. It provides a guide for the future development of bicycle and pedestrian facilities, as well as education, enforcement, and encouragement programs for Culver City. The plan proposes prioritization of 23 miles of new bikeways. The plan also details design standards for new bikeways and pedestrian facilities. The guidelines and policies described in this plan related to complete streets and road geometry improvements are crucial. They will help inform the safety projects considered for the LRSP report.

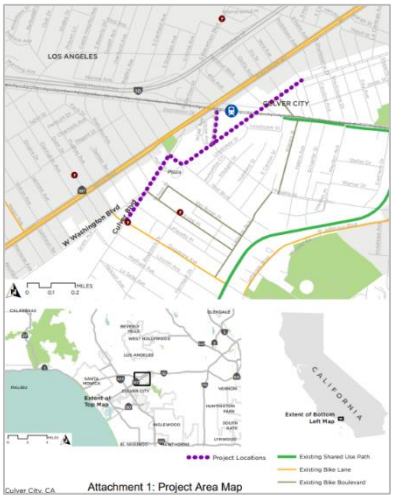
3. TOD Visioning Study and Recommendations (2017)

The Culver City TOD Visioning Study and Recommendations focuses on mobility planning in the TOD (Transit-Oriented Development) area for all modes of transportation. The current TOD area encompasses a one-mile radius (ten-minute walking distance) area centers the LA Metro Expo Line Culver City Station. Recommendations in this document are based on a framework of connected mobility networks to allow people to drive less and walk, bicycle, and take transit more, categorized through physical intervention. One of the primary goals for the TOD area is to provide a safe and protected network for bicycling and establishing a pedestrians-first environment. In addition, the document summarizes the improvements in all these areas to enhance the transit services in the region. The recommendations listed in this document related to the development of pedestrian facilities, bicycle networks, and vehicular infrastructure are essential and will help inform the safety projects considered for the LRSP report.

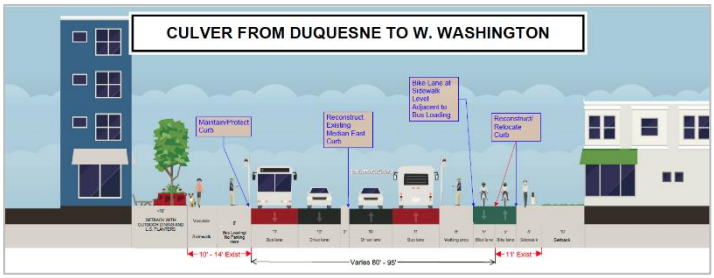
4. Culver, Washington, and South Robertson Boulevard Bicycle Improvements



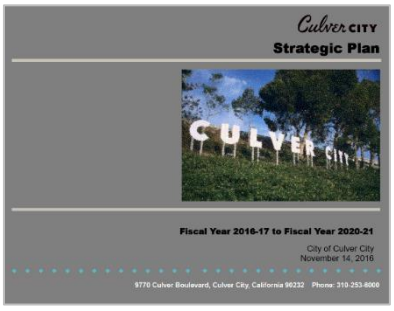
The Culver Boulevard, Washington Boulevard, and South Robertson Boulevard bicycle improvements focus on developing multiple bikeway options for the study corridors and provide safety for bicyclists, pedestrians, transit users, and drivers. The improvements are consistent with the TOD Visioning 2017 recommendations. The recommendations include installation of a two-way protected bike lane on Washington Boulevard connecting to the Expo Bike Path at Wesley Street, the Expo Line station, and Town Plaza in Downtown Culver City.

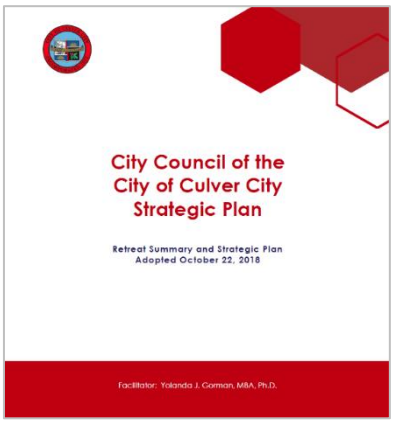


Other recommendations include installation of a two-way protected bike lane on Robertson Boulevard from Washington to Venice Boulevard in order to connect the Washington facility to the Expo Phase II Bike Path north of Venice. The study aims to connect Expo Station to Downtown Culver City with a high-quality bike facility, paving a way to reduce travel lanes, add separate transit lanes, medians, and develop infrastructure for a safe walking and biking environment.



5. Culver City Strategic Plan 2016-2021 (2016) and 2018 Update



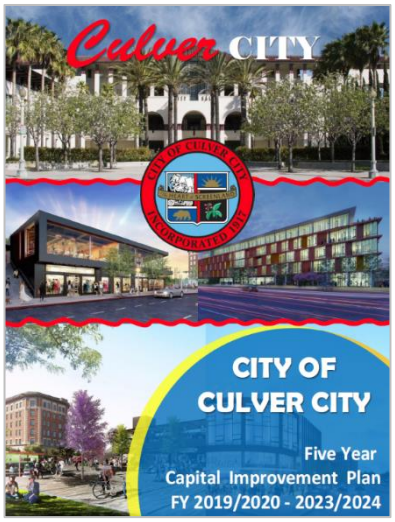


The Culver City Strategic Plan (2016) identified challenges with the City's transportation infrastructure as an important topic for discussion. The plan suggested finding ways to build the bicycle infrastructure, and encouraged small connections to support cyclists, or establishing protective bike lanes as a pilot to resolve concerns for cyclists. This document provides an implementation strategy for projects for each fiscal year from 2016 to 2021.

In 2018, a Retreat Summary and Strategic Plan was adopted, which included a summary of the transportation planning priority to move forward in year 2018 to 2023. It strategically focused on improving circulation by providing alternative modes of transportation, including bicycles, motorized scooters, pedestrians, and microtransit. The need for more comprehensive analysis of transportation challenges was highlighted. It was suggested that a study that assesses both bicycle access and opportunities for microtransit be conducted.

The LRSP goals and objectives will be consistent with the aforementioned priorities discussed at the City Council.

6. Culver City Five Year Capital Improvement Plan FY 2019/2020–2023/2024



The aim of the Five Year Capital Improvement Plan for Fiscal Years 2019/2020 – 2023/2024 is to assist the City is achieving the broad and comprehensive goals of the General Plan. The document consists of detailed project information, funded and unfunded, across a five year period. The projects listed under the sections of Parks & Park Facilities, Street & Alley Improvements, and Traffic Signal & Lighting Improvements will help to confirm traffic safety solutions for the LRSP.

7. Culver City Safe Routes to School Program

The Culver City Safe Routes to School (SRTS) Program was originally funded through a federal non-infrastructure SRTS grant, which ended 2017. Currently, the City and the Unified School District have jointly funded the continuation of the Safe Routes to School program through June 2020. The primary goals of the program include increasing the number of children walking or biking to school, reduce traffic around school, and create a safe environment. The program conducts challenges such as "Take the 3 Block Challenge," where parents are encouraged to park three blocks away from school and walk to drop their kids off, or "Car Free Fridays" where kids are encouraged to walk, bike, take transit or carpool on Fridays. This program will help the LRSP to integrate existing educational programs as part of the E's strategies.

8. Southern California Association of Governments (SCAG) Regional Transportation Plan 2012-2035 (2012)

Southern California Association of Governments (SCAG) has prepared Regional Transportation Plans (RTP) with the primary goal of increasing mobility for the region's residents and visitors. One of the focuses on the transportation element is to lower collision rates. The RTP contains a host of improvements to our multimodal transportation system. These improvements include closures of critical gaps in the network that hinder access to certain parts of the region, and other measures and requirements for reducing the occurrence of fatal and severe injury collisions in the City. An implementation plan has listed specific improvements for gradual execution from 2012 to 2035.The improvement recommendations listed in the documents will help to confirm countermeasures considered for the LRSP report.

Table 1: Matrix of Planning Goals, Policies, and Projects

Document	Relevant Goals, Policies, and Projects
Culver City 2045 General Plan (Anticipated For Fall 2022 Adoption) and Mobility + Transportation Existing Conditions Report (2019) ***General Plan will be updating Goals and Objectives***	**The 2019 Existing Conditions report documents the existing conditions and has been assessed for the updated element. Issues and opportunities highlighted are listed below:** *A jobs and housing imbalance contributes to local congestion. *Rapid Development needs to mitigate transportation impacts. *High vehicle volumes and speeds detract from a comfortable environment for walking and biking. *Adapting to emerging trends in mobility. **Goals and Objectives - (1995)** **Goal: Integrated local and regional transportation systems that serve residential and business needs** • **Objective 1.** Improve traffic flow, reduce traffic congestion throughout the City ○ Policy (1.D) Assign high priority to roadway improvements which facilitate traffic flow without adding right-of-way or widening roadways ○ Policy (1.E) Improve traffic flow in areas of high traffic volume by assigning high priority to roadway improvements, transit links, and bikeways which serve these areas • **Objective 3.** Bikeways. Provide a system of safe and enjoyable bikeways and support facilities ○ Policy (3.F) Encourage the inclusion of a bike path within the Exposition Right-of-Way and any future

Document	Relevant Goals, Policies, and Projects
	transit corridors with adequate right-of-way to safely support both users ○ Policy (3.J) Promote public education programs regarding bicycle safety and the City's bicycle resources • **Objective 4.** Pedestrian Access. Provide convenient and pleasant pedestrian access ○ **Policy (4.B)** Enhance the user friendliness of pedestrian staging areas at transit links throughout the City ○ **Policy (4.C)** Provide safe and attractive pedestrian walkways/sidewalks which link streets and parking areas to the entrances of major developments ○ **Policy (4.G)** Establish pedestrian access across existing barriers such as freeways, Ballona Creek, and long, uninterrupted blocks, and require pedestrian links across potential future access barriers ○ **Policy (4.H)** Promote public education programs regarding the City's pedestrian resources and pedestrian safety, especially the use of pedestrian signals at street intersections ○ **Policy (4.J)** Where feasible, add curb extensions and medians or other safety measures along arteries to shorten the pedestrian crossing. • **Objective 7.** Traffic Safety. Minimize traffic hazards and accidents.

Document	Relevant Goals, Policies, and Projects
	○ **Policy (7.A)** Review traffic accident records on a regular basis to identify and address problem locations ○ **Policy (7.B)** Minimize potential traffic hazards at new developments
Bicycle and Pedestrian Action Plan (2020)	**Goal 2 – Health and Safety** • **Objective HS-1. Reduce collisions involving bicyclists and pedestrians through safe and comfortable bicycle and pedestrian facilities.** ○ **Action HS-1.1.** Prioritize quick implementation of active transportation facilities on Culver City's high-injury network to rapidly address known safety issues. ○ **Action HS-1.2.** Adopt active transportation design guidelines that guide planners and engineers in designing streets with facilities such as separated bikeways and high visibility crossings. ○ **Action HS-1.3.** Fund education programs for people driving, biking, and walking that encourage safe behaviors. ○ **Action HS-1.4.** Adopt a policy that establishes a 15-mph speed limit when children are present, and expand 25-mph school zones, in accordance with California AB 321. ○ **Action HS-1.5.** Expand data analysis for project and program prioritization to include additional sources beyond that of roadway collision data. Other sources could include, but are not limited to, pedestrian

Document	Relevant Goals, Policies, and Projects
	counts, emergency medical services and hospital data, and citation data. ○ **Action HS-1.6.** At intersections with a history of bicyclist- and pedestrian involved collisions resulting from right-turning vehicles, evaluate the prohibition of right-turns on red. • **Objective HS-2. Enhance the active transportation experience by updating intersection crossings and implementing traffic calming measures.** ○ **Action HS-2.1.** Adopt updated engineering and planning design standards that consider the guidelines from the NACTO Urban Streets Design Guide, nearby agencies, and other best practices to ensure bicyclist- and pedestrian-friendly designs. ○ **Action HS-2.2.** Install Leading Pedestrian Intervals (LPI) at intersections with high rates of pedestrian activity. ○ **Action HS-2.3.** Install bicycle-sensitive loop detectors with pavement markings to improve timing of crossings for bicyclists. ○ **Action HS-2.4.** Establish criteria to determine if/which locations would best be served by pedestrian scrambles and/or pedestrian-only signal phases.
TOD Visioning Study and	**Pedestrian Recommendations** • Redesign street intersections in the district for pedestrian priority

Document	Relevant Goals, Policies, and Projects
Recommendations (2017)	• Initiate the Neighborhood Traffic Management Program (NTMP). process for neighborhood protection interventions • Redesign sidewalks on major streets (e.g., Washington, National, • Robertson) to meet minimum width standards of 10 feet. **Bicycle Recommendations** • Establish the Washington/Culver corridor as the major local east/west bike spine with a south side alignment to serve the residential neighborhoods to the south • Establish a network of bike lanes, paths, and sharrows to connect local and regional systems and initiate a bikeshare program with appropriately located mobility hubs • Add connections to the Ballona Creek bike path **Automobile Recommendation** • Implement traffic disincentives to discourage through-traffic and protect • the neighborhoods • Initiate N.T.M.P. process for neighborhood protection interventions **Recommendations to Improve Washington Boulevard:** **Pedestrian Network** • All intersections are redesigned to minimize pedestrian crossing time. Curb radii are redesigned to 10 to 15′.

Document	Relevant Goals, Policies, and Projects
	• Sidewalks are widened to a minimum of 10' or more by using road diet or set-backs from new developments. • The network of mid-block paseos is extended to create more porosity and access points for pedestrians to and from the Expo Station. • Mid-blocks crossings are introduced to reinforce the network of mid-block paseos and break long blocks (more than 300'). • Additional public space is created by streets reconfiguration. **Bicycle Network** • A separated two-way cycle track coming from the west on the south side of Culver Boulevard and extending to meet Venice Boulevard future Class IV bike lanes. • A separated two-way cycle track on the south side of Washington Boulevard extending from Culver Boulevard to La Cienega Boulevard and connecting to the Ballona Creek Bike Path. • A separated two-way cycle track on Robertson Boulevard connecting Washington Boulevard to the Expo Bike Path north of Venice. Enhance bikes and pedestrians crossing. **Vehicular Movement** • Washington Boulevard with median extension to downtown along with left turn opportunity and refuge for pedestrian crossing. Other measure include removing median at certain locations and add a traffic lane.

Document	Relevant Goals, Policies, and Projects
	• National Boulevard median is also extended on the north portion to Venice Boulevard. • Robertson Boulevard is reduced in vehicular capacity by providing one lane south and two lanes north to allow for transit movement. • Intersection at Higuera and Ince on Washington are redesigned to improve pedestrian crossing and reduce vehicular capacity and car speed. **Considerations for TOD-adjacent Neighborhoods** • Consider redesign of mini-roundabouts on Higuera Street to proper engineering standards to slow traffic and discourage volume. • Consider additional curb-extensions or bulb-outs at intersections in the Rancho Higuera, Hayden Tract and Arts District to slow traffic, discourage traffic volume, and enhance pedestrian mobility and safety. • Consider prohibiting through traffic at the intersection of Higuera Street/Robertson Boulevard at Washington Boulevard. • Consider installing high visibility cross-walks. • Consider raised cross-walks to slow vehicles and enhance pedestrian safety on Lucerne, Ince, Higuera and other streets. • Consider turn restrictions at select intersections on National Boulevard and other streets.

Document	Relevant Goals, Policies, and Projects

Culver, Washington, and South Robertson Boulevard Bicycle Improvements	**Recommended Projects**
	• Washington Boulevard from Ince Boulevard to Robertson Boulevard
	  ○ Two-way protected bike lanes
	  ○ Bike signals
	  ○ Removal of existing center turn lane
	  ○ Removal of parking in north side
	• Washington Boulevard from Robertson Boulevard/Higuera Street to Landmark Street
	  ○ Two-way protected bike lanes
	  ○ Bike signals
	  ○ Removal of existing center turn lane
	  ○ Removal of parking in north side
	• Robertson Boulevard from Washington Boulevard to Venice Boulevard
	  ○ Two-way protected bike lanes
	  ○ Bike signals
	  ○ Protected intersection
	  ○ Removal of one drive lane (1) in westbound direction
	• Washington Boulevard under Rail Overpass
	  ○ Two-way protected bike lanes
	  ○ Bus islands
	  ○ Parking-protected bike lanes
	  ○ Removal of center turn lane
	  ○ Driveway conflict zone markings
	  ○ Removal of drive lane (1) in northbound direction

Document	Relevant Goals, Policies, and Projects

	• Washington Boulevard from Rail Overpass to National Boulevard
	  ○ Two-way protected bike lanes
	  ○ Bus islands
	  ○ Parking-protected bike lanes
	  ○ Removal of drive lane (1) in both directions
	• Washington Boulevard from National Boulevard to Wesley Street
	  ○ Two-way protected bike lanes
	  ○ Bus islands
	  ○ Parking-protected bike lanes
	  ○ South-bound bike lane
	  ○ Addition of parking lane in north side

Culver City Strategic Plan 2016-2021 (2016) and 2018 Update	**2016-2021** **Goal 3: Improve Transportation Circulation and Reduce Traffic Congestion** • Objective 1: Work Toward No Overall Growth in Average Daily Traffic (ADT) Citywide (Zero ADT Growth) while Enhancing Traffic Safety ○ g. Evaluate the Vision Zero initiative and other programs, policies, or initiatives that prioritize transportation safety and pursue the elimination of death and severe injury crashes on our roadways. **2018 Update:** **Next Steps:**

Document	Relevant Goals, Policies, and Projects
	Staff will issue an RFP for a consultant to assess microtransit and bike access (within the next 6-7 months). The study will include: • Findings from the assessment along with TOD visioning to provide a framework for recommendations for changes to the transportation infrastructure • A community summit to present issues, options and recommendations • Incorporation of Vision Zero resolution into the planning • Information/findings from the Traffic Demand Forecast Study
Culver City Five Year Capital Improvement Plan FY 2019/2020-2023/2024	**Parks & Park Facilities Projects** • **NW003 - Upgrade Vet's Ball Field Lighting** This project will provide for ball field light tower upgrades at Veterans Memorial Park. • **PP001 - Hetzler Road Pedestrian Trail** This project is to construct a separate pedestrian walking and jogging trail approximately 10 feet wide and 1500 feet long. The trail will allow pedestrians to avoid use of the portion of the roadway for residential access to Hetzler Road. This project is complete. • **PP004 - Media Park Lighting** This project will be used to skirt vandalism of existing lights at Media Park, which are currently susceptible to defacement and can be made more vandal deterrent by replacing poles and fixtures. • **PZ551 - Interpretive Nature Trail**

Document	Relevant Goals, Policies, and Projects
	This project is provided to refurbish the Culver City Nature Trail (i.e. "The Boardwalk"). Dry rotted structural members, decking, and guard rails in dire need of replacement were afforded these upgrades over the course of 2018 in part due to funding awarded through a Baldwin Hills Conservancy Grant. A grand opening ceremony celebrating the project's completion was held on January 25, 2019. **Street & Alley Improvements Projects** • **PL006 - Wash-Culver Pedestrian & Cyc Safety** In 2015, the City received $2,772,000 in federal grants through the Active Transportation Program (ATP) Cycle 2 Grant. The project is focused on safety improvements along Washington Boulevard, Matteson Avenue, Girard Avenue, Tilden Avenue and Elenda Street near La Ballona Elem School with corner curb extensions and high visibility crosswalks. The project will include a protected cycle track on Elenda Street from Culver Boulevard to Washington Boulevard. Along with the construction of the separated bike lane, new canopy street trees will be added on Elenda Street as well as lighting. The project will also create new high visibility pedestrian crossings with a pedestrian-activated signal at two locations: Washington Boulevard and Huron 2) Washington Place and Bentley Avenue at Tellefson Park. Several Outreach and engagement meetings have been conducted to solicit feedback from the surrounding community. The design is

Document	Relevant Goals, Policies, and Projects
	anticipated to end May 2019 and construction is set to begin in summer of 2019. • **PS001 - Concrete Street Rehabilitation** This project is created to fund concrete street repairs by patching and local replacement. • **PS002 - City Traffic Sign Retroreflectivity** Federal and State legislation has set standards of retroreflectivity for signs in the public-right-of-way. In order to determine which signs comply and which do not, a citywide sign survey is required. Non-compliant signs will be replaced with compliant signs. A separate sign-replacement budget enhancement may be requested after the survey is complete. To this end, and for the benefits beyond meeting this requirement, a digital sign survey database will be built, compiled and populated. The field data collected will include all the necessary information required for the database. A computerized sign survey system will be delivered that may be maintained by staff. As part of the Citywide Speed survey, all speed-related signs on the arterial streets were surveyed relative to the retroreflectivity requirements. • **PS005 - Annual Street Pavement Rehabilitation Project** This project is for ongoing street pavement and rehabilitation projects. Current planned projects include Overland Ave from Washington Blvd to Jefferson Blvd, including localized dig outs along Culver Blvd from Overland Ave to Madison Ave.

Document	Relevant Goals, Policies, and Projects
	Construction is underway is scheduled to be completed by June 2019. • **PS007 - Duquesne Slurry Seal & Bike Lane** This project was established for the slurry seal (including local pavement repairs) Duquesne Ave and stripe a bike lane. Project limits are on Duquesne Avenue from Washington Boulevard to Lucerne Avenue. • **PS011 - CDBG Sidewalk Barrier Removal & Repair Project** This capital improvement project will repair sloping or damaged sidewalks that may present a hindrance or risk to elderly or disabled residents and reconstruct wheelchair ramps as necessary to meet ADA standards. Capital projects to make ADA-compliant repairs are CDBG-eligible City-wide and are not subject to blight or area income restrictions. • **PS014 - Jackson Avenue Pedestrian Walkway Renovation** The project includes demolition of the existing improvements, in-house architectural design, a new concrete pad walkway, replacing the streetlights with illuminated bollards, installation of a new irrigation system, new landscaping, benches and commissioning of a mural to be painted. • **PZ428 - Curb, Gutter, Sidewalk Replacement** As identified by field inspections, this recurring capital project is established to replace uplifted sidewalks, curbs, gutters, and driveway approaches throughout the City and complement Maintenance Operations' concrete repair activities. A citywide inspection was completed In FY2011/2012 documenting all

Document	Relevant Goals, Policies, and Projects
	sidewalk displacements. Temporary repair work (i.e. grinding and AC ramping) of uplifted sidewalk was completed in FY 2013/2014. Replacement of significantly uplifted and damaged sidewalks was scheduled for FY 2016-17 and a citywide sidewalk survey to be conducted in FY 2019/2020. • **PZ460 - Culver Blvd Realignment** This project will be used for the realignment of Culver Boulevard from Commonwealth Ave to Elenda Street. • **PZ553 - Higuera Street Bridge Replacement** This project will replace the existing Higuera Bridge across Ballona Creek channel. The design includes replacement of the existing bridge with a new bridge with two lanes of traffic in each direction, bike lanes, and sidewalks • **PZ554 - Minor Pavement & Concrete Improve** This project is used for minor repairs of street/alley asphalt and concrete failures as necessary. • **PZ638 - Median Island Rehabilitation** This project is to rehabilitate median islands along E. Washington for a more consistent look, including irrigation system installation, trees, shrubs, ground cover and mulch. • **PZ950 - Ped Improve-Intersects w/Bus Stops** The project involves the design, construction, and installation of various pedestrian related public improvements and amenities at eight existing signalized intersections along major arterials within the City. The improvements and amenities consist of safety and aesthetic-related

Document	Relevant Goals, Policies, and Projects
	enhancements at intersections that include stops for one or more heavily-traveled transit corridors. Proposed improvements include: traffic signal equipment, crosswalk markings, pavement treatments, and ADA curb ramps and treatments. • **PZ964 - Higuera Bridge Ramp - Ballona Creek** This project will be used to construct a new bicycle ramp from the new Higuera Bridge to the Ballona Creek Bike Path. **Traffic Signal & Lighting Improvements Projects** • **NW010 - Signalized Pedestrian Crossing at Library** A signalized pedestrian crossing is needed at the Julian Dixon Public Library. • **PL003 - Traffic Signal Washington Bl/Cattaraugus** New traffic signal at the intersection of Washington Blvd. and Cattaraugus Ave. • **PL009 - Left Turn Lane Improvements** This project will construct: 1. A second left turn lane on Overland Bl southbound to Jefferson Bl eastbound; this was included in the Overland Ave Resurfacing Project, PS-005, construction is expected to be completed in June 2019; 2. A third left turn lane on Jefferson Bl./Playa St. eastbound to Sepulveda Bl northbound to alleviate congestion. Funded by Cumulus traffic mitigation fund. • **PS003 - Traffic Signal Left-Turn Phasing**

Document	Relevant Goals, Policies, and Projects
	Install left-turn phasing at seven signalized intersections. Construction for this project has been completed. • **PZ684 - Street Light Upgrades** This project is to upgrade existing high voltage series circuit streetlights to low voltage parallel circuit streetlights, and replace with energy efficient light fixtures. **Other Improvement Projects** • **PS008 – Ped and Bicycle Programs** This project will fund traffic studies for proposed bicycle friendly streets, as well as future matching funds for Safe Routes to School, and other safety-improvements related grants
Culver City Safe Routes to School Program	**Culver City Unified School District:** El Marino Language School, El Rincon Elementary School, Farragut Elementary School, La Ballona Elementary School, Linwood E. Howe Elementary School, and Culver City Middle School, and Culver City High School. The program involved coordination between several groups, including City staff, Culver City Unified School District, local stakeholders, bicycle and pedestrian advocates, and a program-funded SRTS Coordinator. This SRTS coalition became known as the Walk n' Rollers. The Walk n' Rollers' goal is to establish an environment in Culver City where walking and riding bikes to school is a widely accepted means of transport.

Document	Relevant Goals, Policies, and Projects
	The Walk n' Rollers focus on four of the five SRTS "E's": Education, Encouragement, Evaluation, and Enforcement in their programming, using opportunities on- and off-campus to employ the E's. Activities include on-campus workshops, community classes, educational and promotional materials, group rides, incentive programs, coordination with the Culver City Police Department, and stakeholder outreach.
Southern California Association of Governments (SCAG) Regional Transportation Plan 2012-2035 (2012)	**Vision on Mobility:** A successful transportation plan allows the residents of the region to access daily needs, including work, school, shopping, and recreation, without undue burdens of cost, time, or physical danger. This includes the pressing need to preserve and maintain our infrastructure at adequate levels. Residents should be able to rely on their ability to get from one place in the region to another in a safe and timely manner. They should be able to choose from a variety of transportation modes that suit their preferences and needs, including active, non-motorized modes such as biking and walking that allow for physical activity and greater health. RTP Goals: • Maximize mobility and accessibility for all people and goods in the region • Ensure travel safety and reliability for all people and goods in the region

Document	Relevant Goals, Policies, and Projects
	• Protect the environment and health of our residents by improving air quality and encouraging active transportation (non-motorized transportation, such as bicycling and walking) RTP Policies • Transportation investments shall be based on SCAG's adopted regional Performance Indicators • Ensuring safety, adequate maintenance, and efficiency of operations on the existing multimodal transportation system should be the highest RTP/SCS priorities for any incremental funding in the region • Transportation demand management (TDM) and non-motorized transportation will be focus areas • Monitoring progress on all aspects of the Plan, including the timely implementation of projects, programs, and strategies, will be an important and integral component of the Plan SCAG has two main safety and security goals: • Ensure transportation safety, security, and reliability for all people and goods in the region. • Prevent, protect, respond to, and recover from major human-caused or natural events in order to minimize the threat and impact to lives, property, the transportation network, and the regional economy.

Appendix B

Collision Analysis Technical Memorandum

TECHNICAL MEMORANDUM

Date: May 11, 2020

To: Heba El-Guindy
Mobility & Transportation Engineering Manager
City of Culver City

From: Ruta Jariwala
Principal
TJKM Transportation Consultants

Subject: ***Culver City Local Road Safety Plan Collision Data Analysis***

This technical memorandum summarizes the collision analysis conducted for collisions that have occurred on Culver City streets. This analysis is a part of the safety analysis performed for the Local Road Safety Plan (LRSP) for Culver City. The LRSP focuses on systemically analyzing and identifying safety issues and recommends appropriate safety improvements.

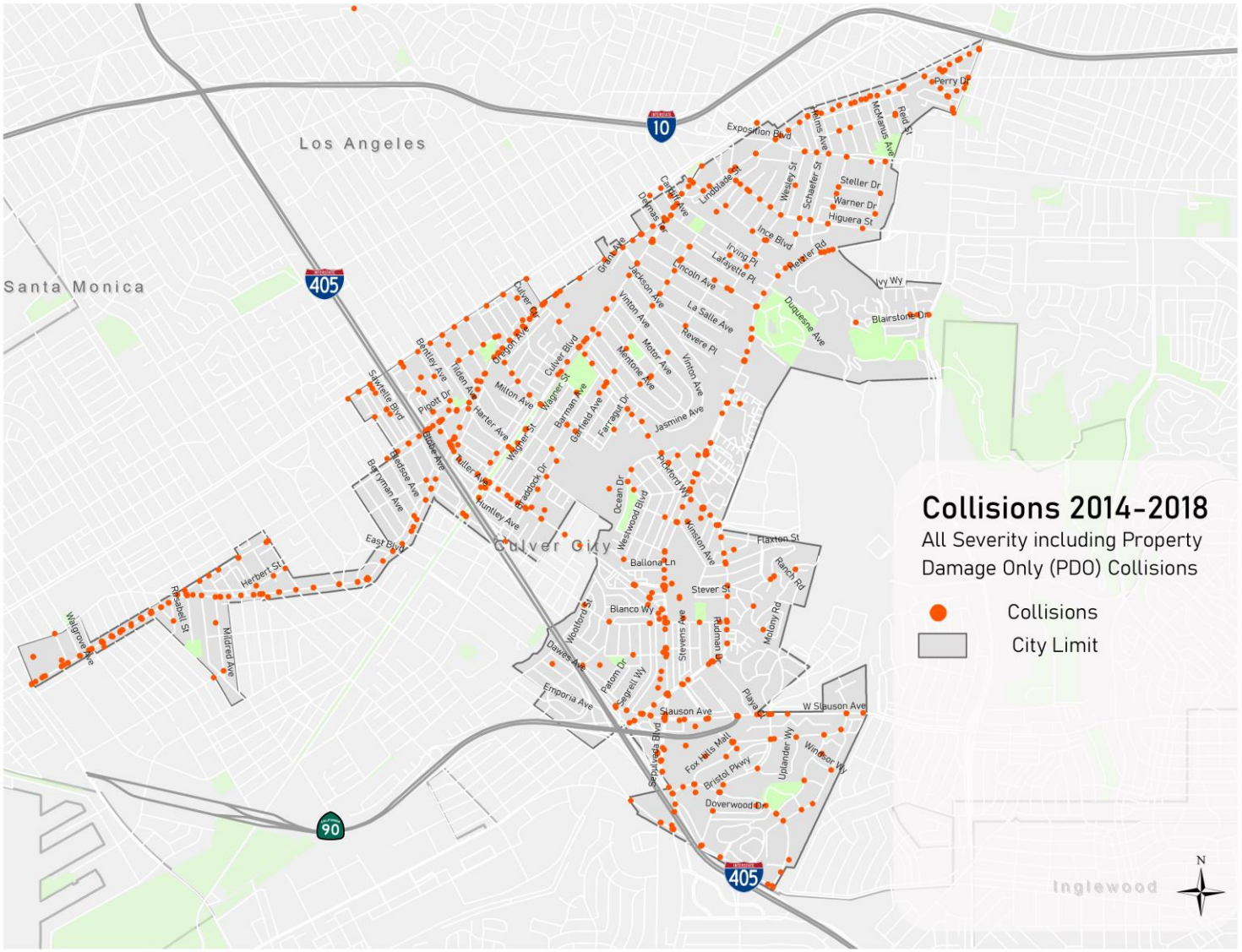
This memorandum includes collision data collection, a preliminary analysis of all the collisions occurring in the City from the year 2014 through 2018, as well as an in-depth analysis focusing on fatal and severe injury (F+SI) collisions.

1. INTRODUCTION

This memo starts with an analysis of City-wide collisions of all severity, including Property Damage Only (PDO) collisions. It is followed by an analysis of F+SI collisions that have occurred on Culver City's roadways. For the purpose of this analysis, the F+SI collisions were segregated by facility type, i.e. based on collisions occurring at intersections and roadway segments, as the geometrics of roadway segment and intersections differ and are affected varyingly by different factors.

After this data was segregated, a comprehensive evaluation was conducted based on factors such as collision severity, type of collision, primary collision factor, lighting, weather and time of the day. **Figure 1** illustrates all the collisions that have occurred in Culver City from 2014 to 2018.

Figure 1 All Collisions on City Roadways (2014-2018)



1. DATA COLLECTION

1.1 Collision Data

Collision data helps understand collision patterns and factors that influence occurrence of collisions in a given area. For the purpose of this analysis, a five-year City-wide collision data, from 2014 to 2018 was provided by the City. The collision data was analyzed and plotted in ArcMap to identify high-risk intersections and roadways segments. Collision data for the same period was also retrieved from Transportation Injury Mapping System (TIMS)[1] and Statewide Integrated Traffic Records System (SWITRS) for verification.

2. COLLISION DATA ANALYSIS RESULTS

2.1 Summary of Findings

All Collisions

- For collisions of all severity, including PDO collisions, 87% collisions have occurred at intersections.
- The collisions that have occurred at intersections have been majorly broadside and rear-end collisions.
- The most prominent primary collision factor for collisions occurring at intersections is auto R/W violation and unsafe speed.
- Of the collisions that have occurred at intersections, about 14% of broadside collisions have occurred due to auto R/W violation and 12% of rear-end collisions have occurred due to unsafe speed.
- 73% of all collisions have involved motor vehicles.

Fatal and Severe Injury (F+SI) Collisions

- Though the total number of collisions that have occurred in the City has constantly increased, about 4% of all collisions have led to a fatality or a severe injury.
- Most of the F+SI collisions have occurred on Washington Boulevard, Culver Boulevard, Sepulveda Boulevard, Slauson Ave and Washington Place.
- Auto R/W violation, DUI and unsafe speed have been observed to be the top primary collision factors for the F+SI collisions occurring on these streets in the City.
- More than 50% of the F+SI collisions have been observed to have occurred in the dark, at locations with street lights. Visibility is observed to be an issue, and thus improvements that enhance visibility for motorists as well as non-motorists will help make these locations safer.

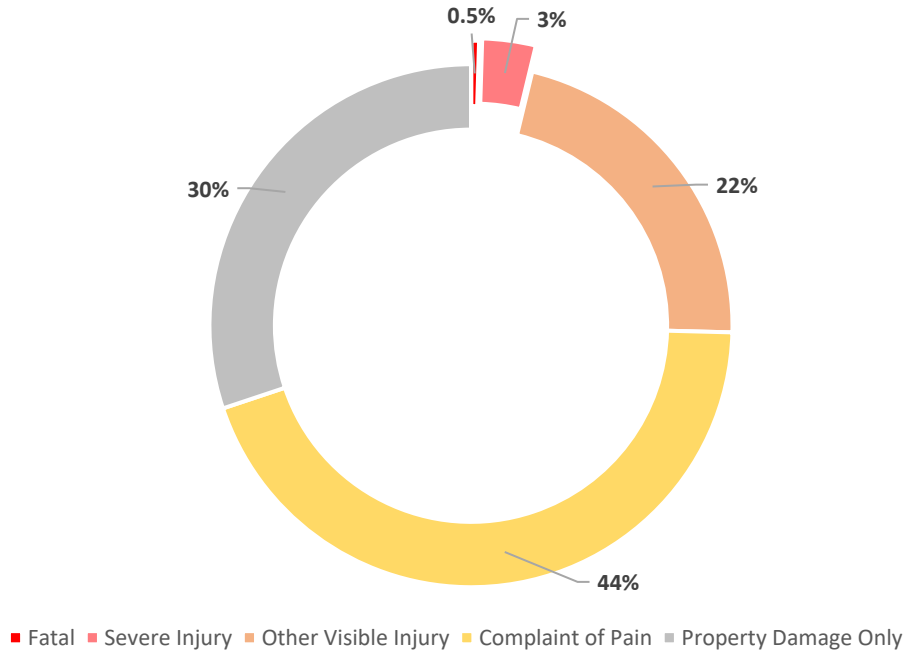
[1] "TIMS - Transportation Injury Mapping System", 2020, https://tims.berkeley.edu/, Accessed on 10 April, 2020

- About 28% of F+SI collisions are vehicle-pedestrian collisions. The maximum number of vehicle-pedestrian collisions have been observed on Washington Boulevard and Culver Boulevard. This calls for an evaluation of pedestrian conditions at these corridors that are highly unsafe for pedestrians. For example, improvements like installing pedestrian crossings, pedestrian countdown signal heads, pedestrian signal or HAWK, and flashing beacons as advance warning can help make these locations safer for pedestrians.

2.2 Collision Classification

There were a total of 1,909 collisions reported City-wide from 2014 to 2018. Out of these 1,909 collisions, 575 collisions (30%) were PDO collisions. In terms of the collision severity, 413 collisions (22%) led to a visible injury and 849 collisions (44%) led to complaint of pain. There were 72 F+SI collisions (4% of total) out of which, 63 collisions (3%) led to a severe injury and nine collisions (0.5%) led to a fatality. **Figure 2** illustrates the classification of all collisions based on severity.

Figure 2 Collisions by Severity in Culver City



The analysis starts with a comparative evaluation between all collisions and F+SI collisions, based on various factors including but on limited to the collision trend, primary collision factor, collision type, facility type, motor vehicle involved with, weather, lighting, and time of the day. F+SI collisions cause the most damage to those affected, infrastructure and the aftermath of these collisions leads to great expenses for City administration. Thus, a comprehensive analysis was conducted for only F+SI collisions. The LRSP process focuses on these high-risk collision locations to proactively identify and counter their respective safety issues.

The collision data was segregated by facility type, i.e. based on collisions occurring on intersections and roadway segments. For the purposes of the analysis, a collision was said to have occurred at an intersection if it occurred within 250 feet of it. The reported collisions categorized by facility type and collision severity are presented in **Table 1**.

Table 1 Collisions by Severity and Facility Type in Culver City

Collision Severity	Roadway Segment	Intersection	Total
Fatal	0	9	9
Severe Injury	4	59	63
Visible Injury	44	369	413
Complaint of Pain	117	732	849
Property Damage Only (PDO)	75	500	575
Total	**240**	**1,669**	**1,909**

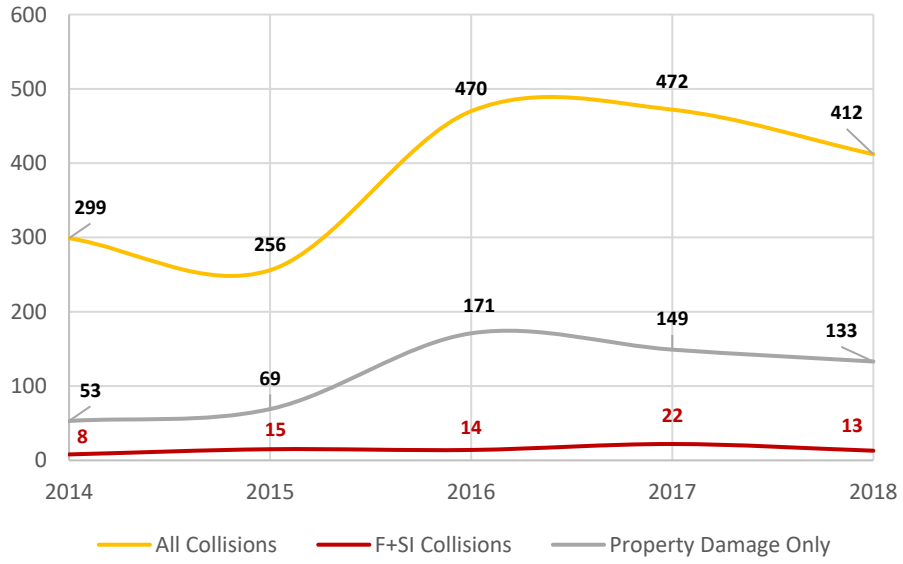
2.3 Preliminary Analysis

Year Trend

For collisions of all severity, the number of collisions decreased from 2014 to 2015 and then rose in 2016. The number of collisions were observed in the same range in 2017, and a decrease by 50 collisions was observed in 2018. The highest number of collisions (472 collisions) were observed in 2017 and the lowest number of collisions (256) were observed in 2015.

A total of 72 F+SI collisions occurred in the City during the study period. They were observed to be the lowest (eight collisions) in 2014. Overall, F+SI collisions were observed to nearly double from 2014 to 2015, rising consistently until 2017. The highest number of F+SI collisions (22 collisions) occurred in the year 2017. **Figure 3** illustrates the five-year collision trend for all collisions, F+SI collisions and PDO collisions.

Figure 3 Five-Year Collision Trend



Intersection vs. Roadway Collisions

Considering all collisions, it was observed that 13% (240 collisions) occurred on roadway segments whereas 87% (1,669 collisions) occurred at intersections. When only F+SI collisions are considered, it was observed that 6% (four collisions) occurred on roadway segments whereas 94% (68 collisions) occurred at intersections. This classification by facility type can be observed in **Figure 4** and **Figure 5**.

Figure 4 Intersection vs. Roadway Segment Collisions – All Collisions

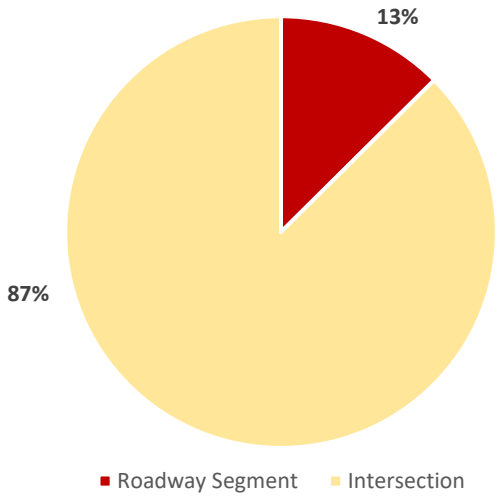
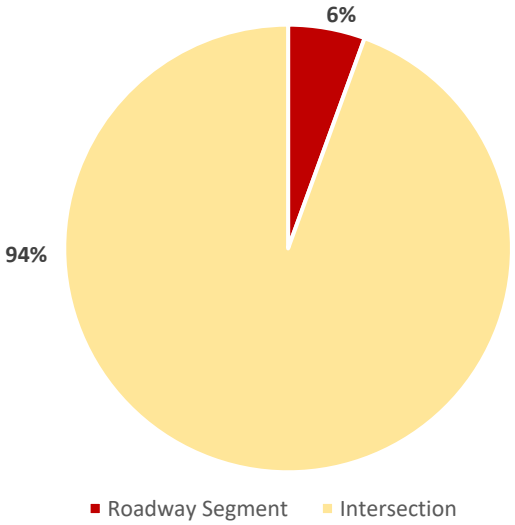


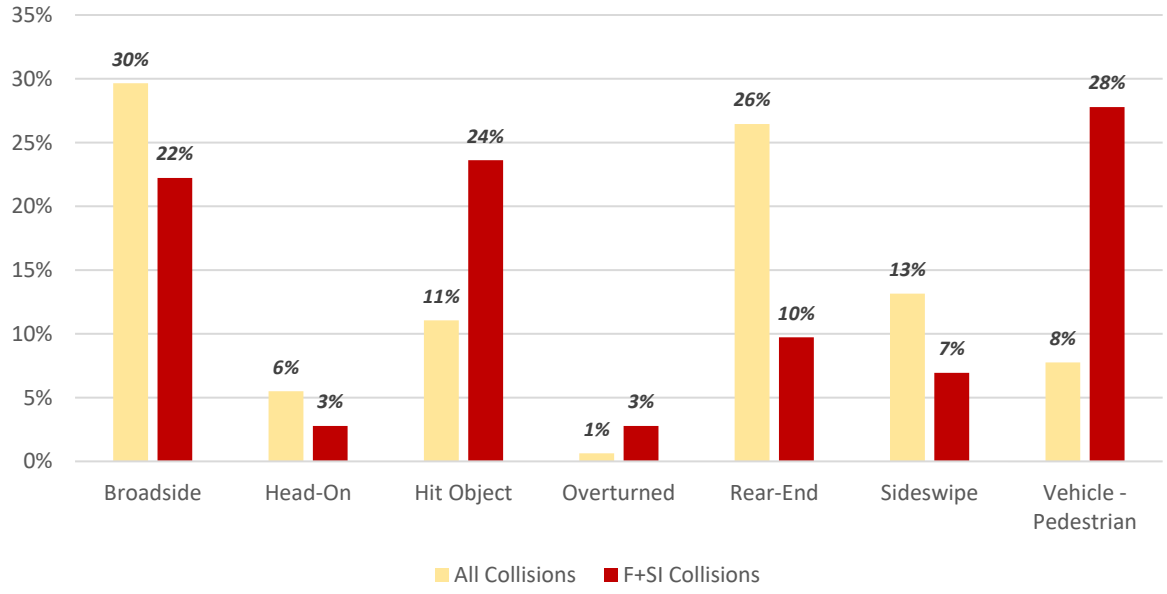
Figure 5 Intersection vs. Roadway Segment Collisions – F+SI Collisions



Collision Type

Considering all collisions, the most commonly occurring collision type was broadside collisions (30%), rear-end collisions (26%) and sideswipe collisions (13%). When only F+SI collisions were considered, the most commonly occurring collision type was vehicle-pedestrian (28%), hit object (24%) and broadside (22%). **Figure 6** illustrates the collision type for all collisions as well as F+SI collisions.

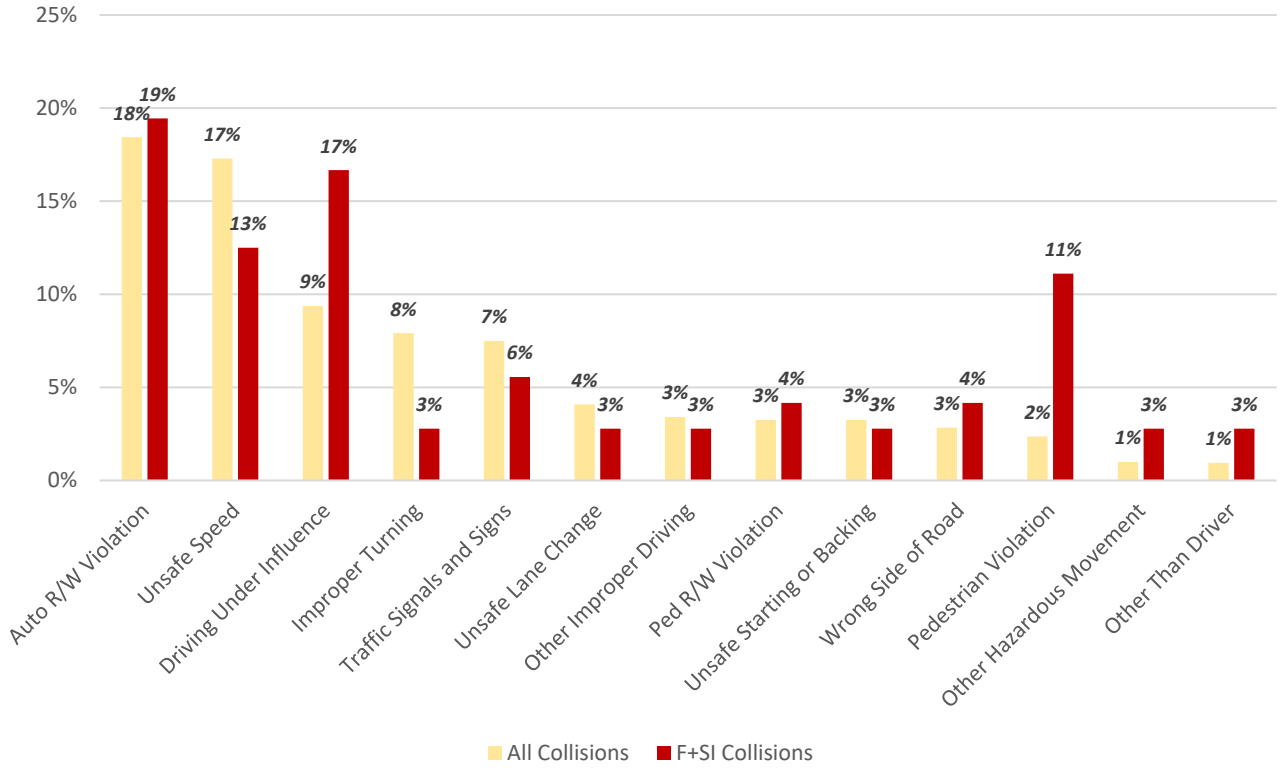
Figure 6 Collision Type: All Collisions vs. F+SI Collisions



Primary Collision Factor

Considering all collisions, the most common primary collision factor was observed to be auto right of way violation (18%), unsafe speed (17%) and driving under influence (9%). Similar collision factors were observed for F+SI collisions. Additionally, pedestrian violation was also one of the major collision factors observed for F+SI collisions. **Figure 7** illustrates the primary collision factor for all collisions and F+SI collisions.

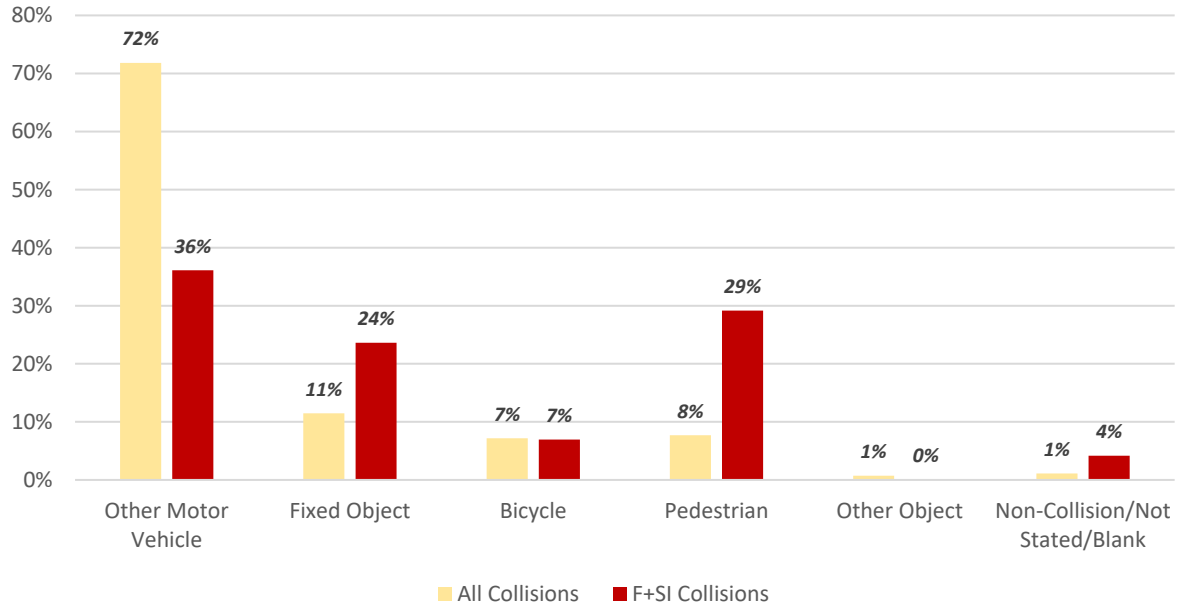
Figure 7 Primary Collision Factor: All Collisions vs. F+SI Collisions



Motor Vehicle Involved With

Considering all collisions, 72% of the collisions are motor vehicle involved with other motor vehicle collisions. The remaining collisions include motor vehicle involved with fixed object (11%), motor vehicle involved with pedestrian (8%) and motor vehicle involved with a bicyclist (7%). For all the F+SI collisions, 36% of the collisions have occurred where motor vehicles are involved with other motor vehicles, 29% of the collisions have involved pedestrians and 24% of the collisions have involved fixed objects. **Figure 8** illustrates this distribution for all collisions as well as F+SI collisions.

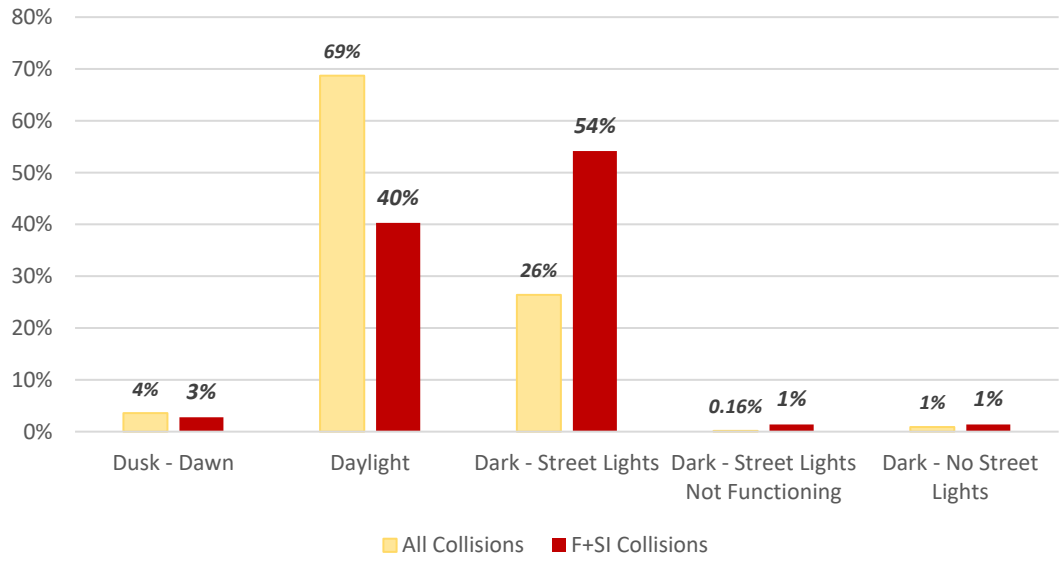
Figure 8 Motor Vehicle Involved With: All Collisions vs. F+SI Collisions



Lighting

For collisions of all severity, 69% collisions have occurred in daylight and 26% collisions have occurred in the dark on streets with street lights. For F+SI collisions, 54% collisions have occurred in the dark on streets with street lights and 40% collisions have occurred in daylight. **Figure 9** illustrates the lighting condition for all collisions and F+SI collisions.

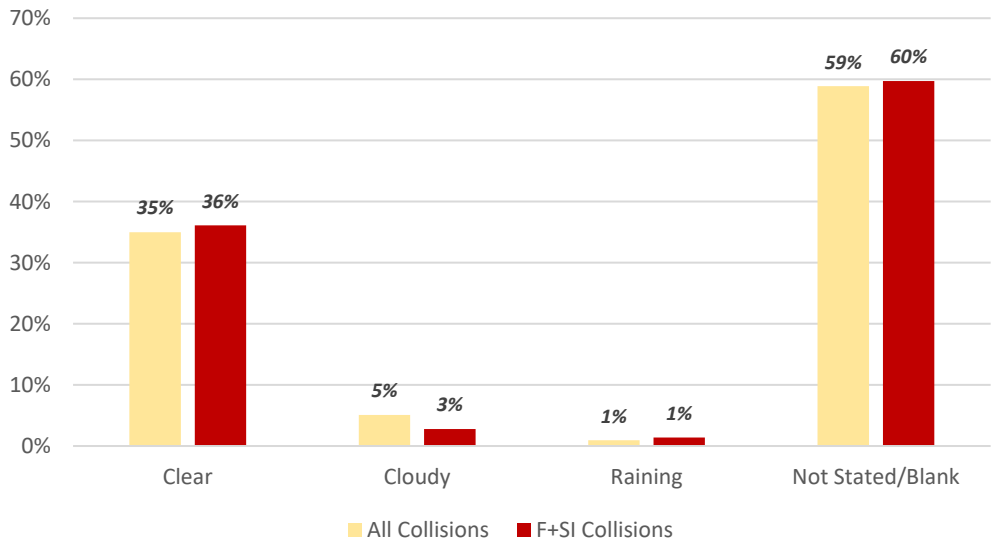
Figure 9 Lighting Conditions: All Collisions vs. F+SI Collisions



Weather

For all collisions, 35% of the collisions have occurred during clear weather conditions and 5% collisions have observed to occur during cloudy weather conditions. For F+SI collisions, 36% of the collisions have occurred during clear weather conditions and 3% of the collisions have occurred in cloudy conditions. For about 59% of the collision data, this condition was not stated. **Figure 10** illustrates the percent distribution of weather conditions during occurrence of collisions of all severity as well as F+SI collisions.

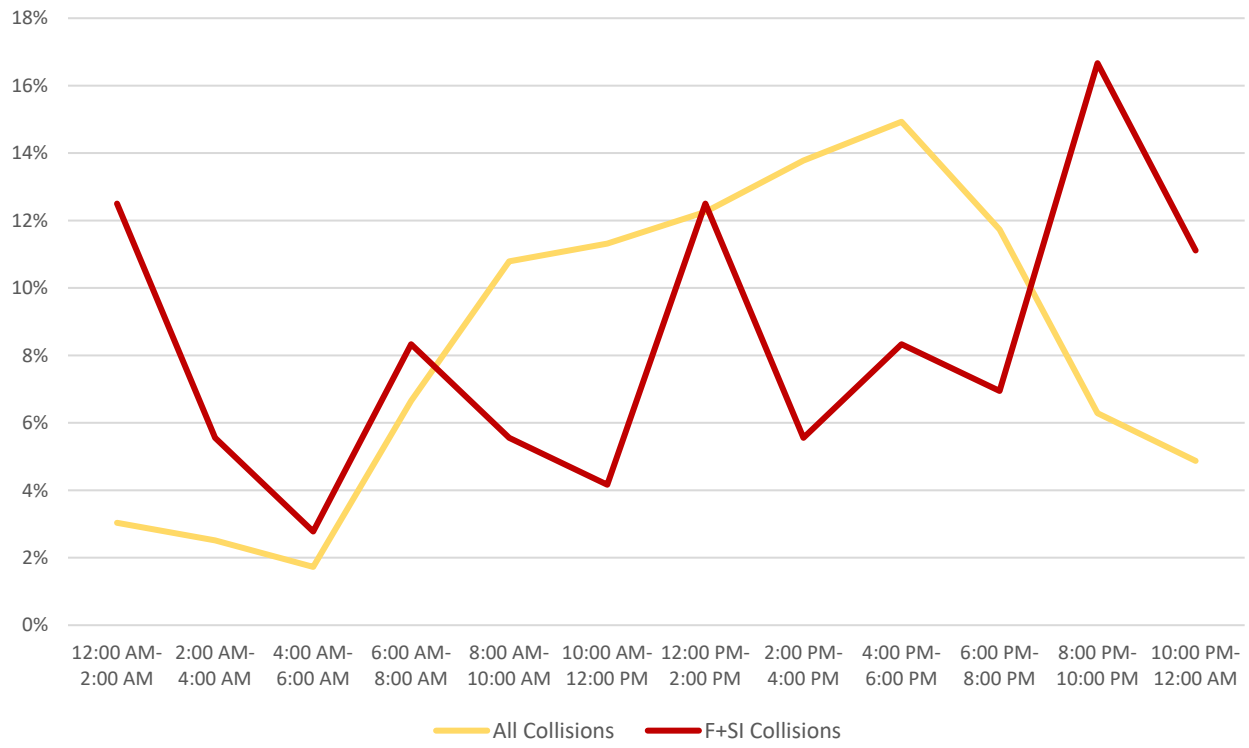
Figure 10 Weather Conditions: All Collisions vs. F+SI Collisions



Time of the Day

For collisions of all severity, maximum number of collisions have occurred between 4:00 p.m. to 6:00 p.m. (15%) and the minimum number of collisions have occurred between 4:00 a.m. to 6:00 a.m. (<2%). For all F+SI collisions, maximum number of collisions have occurred between 8:00 p.m. to 10:00 p.m. (17%) and the minimum number of collisions have occurred between 4:00 am to 6:00 a.m. (3%). **Figure 11** illustrates the percent distribution of collisions by the time of the day for all collisions as well as F+SI collisions.

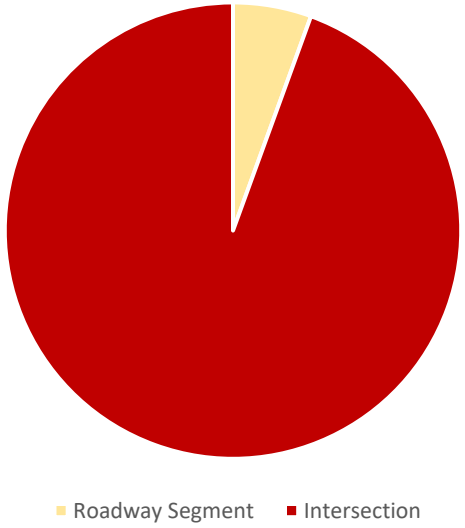
Figure 11 Time of the Day: All Collisions vs. F+SI Collisions



2.4 Analysis with an Emphasis on Fatal and Severe Injury Collisions

This section describes a detailed collision analysis performed for F+SI collisions occurring at 1) roadway segments; and 2) intersections. Of all 72 F+SI collisions that occurred in the City, 68 collisions (94%) occurred at intersections and four collisions (6%) occurred at roadway segment locations. This distribution is illustrated in **Figure 12**.

Figure 12 F+SI Collisions: Roadway Segments and Intersections



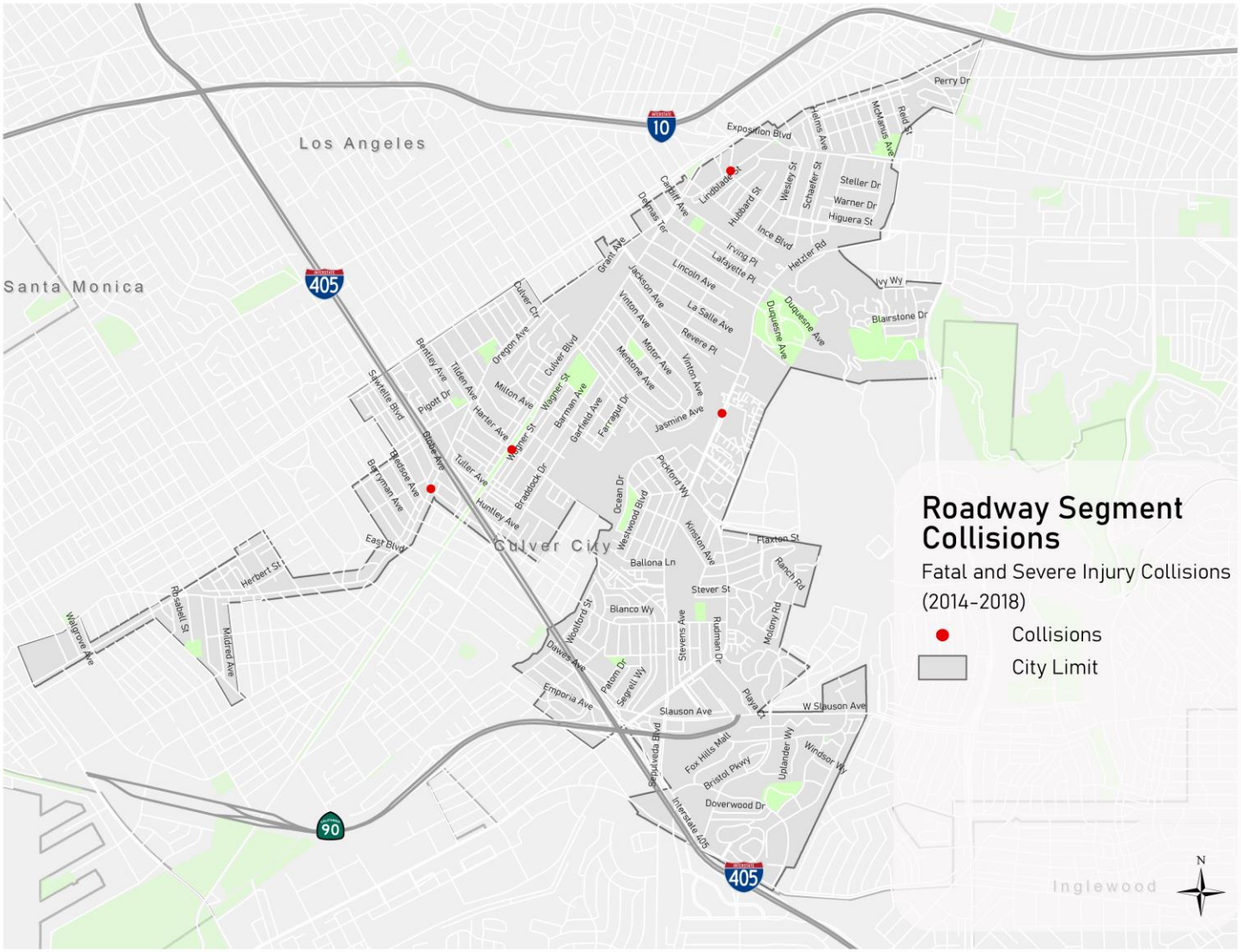
The detailed collision analysis is effective for identifying high-risk locations by evaluating a shorter list of collisions that have led to a fatality or a severe injury. Collisions have been segregated by facility type and further analyzed taking into account the following five collision attributes:

- Violation Category
- Collision Type
- Lighting Conditions
- Weather Conditions
- Time of the Day

Roadway Segment Analysis

A total of four F+SI collisions occurred on roadway segments between 2014 and 2018. These collisions are shown in **Figure 13**.

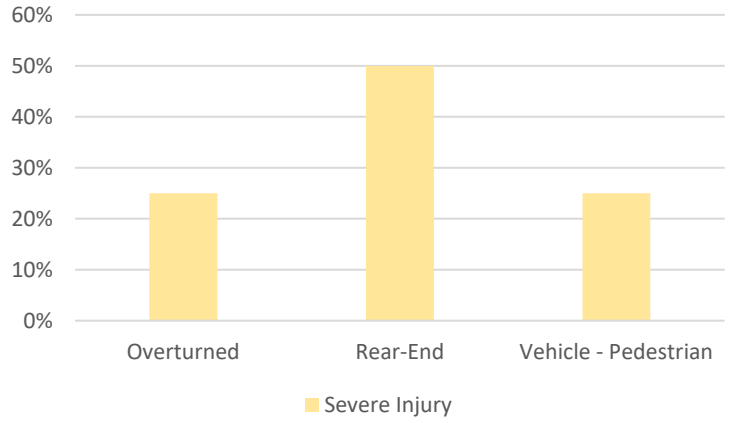
Figure 13 F+SI Collisions on Roadway Segments



Collision Type

All the roadway segment collisions led to a severe injury. There were two rear-end collisions (50%), one overturned collision (25%) and one vehicle pedestrian collision (25%) which occurred on roadway segment or mid-block locations. **Figure 14** illustrates the type of collision as well as the resulting severity for F+SI collisions on roadway segments.

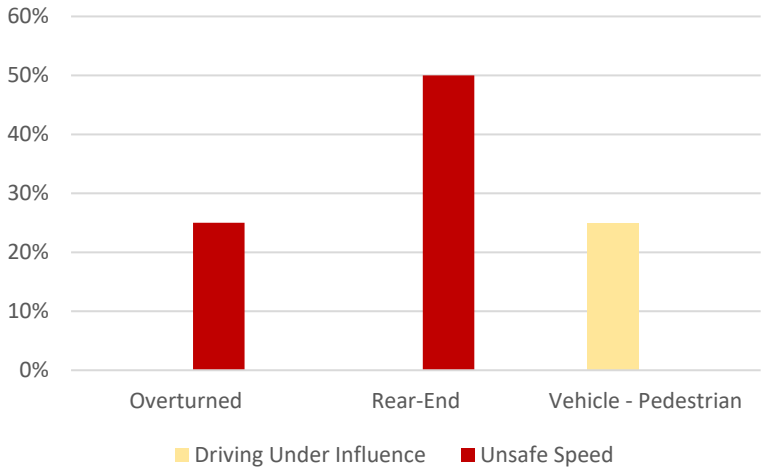
Figure 14 Collision Type for F+SI Collisions on Roadway Segments



Violation Category and Collision Type

Examining the violation category in combination with the collision type can help understand the human error that resulted in the collision and further help identify which countermeasures are most appropriate. For all the roadway segment collisions, it was observed that three collisions (75%) occurred due to unsafe speed and the rest occurred due to driving under influence. The results, with collision type, are shown in **Figure 15.**

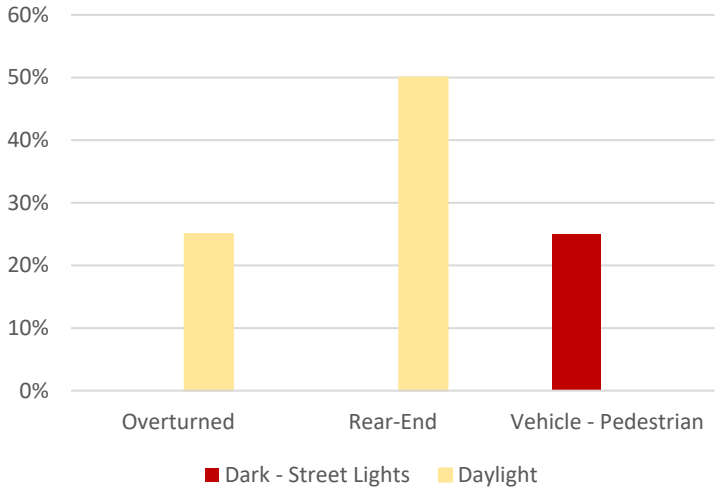
Figure 15 Violation Categories for F+SI Collisions on Roadway Segments



Lighting Condition and Collision Type

For all F+SI collisions occurring at roadway segments, three (75%) of them occurred during daylight and one collision (25%) of them occurred in the dark at a location with street lights. **Figure 16** illustrates the lighting condition and the collision type as observed for F+SI collisions occurring on roadway segments.

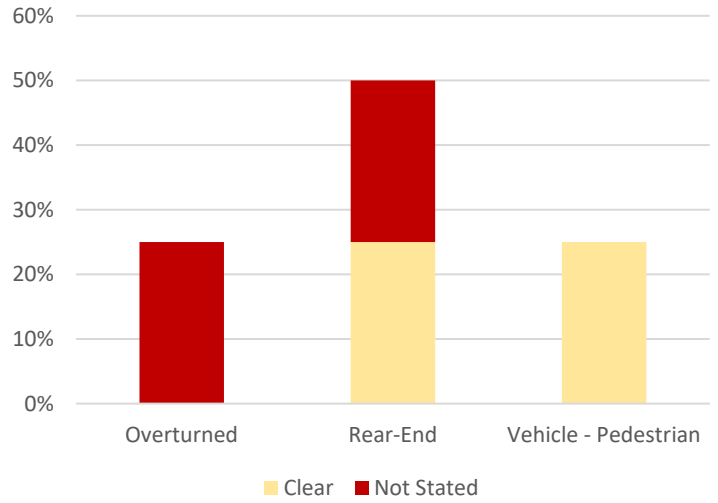
Figure 16 Lighting Conditions for F+SI Collisions on Roadway Segments



Weather Condition and Collision Type

For all F+SI collisions occurring at roadway segments, two (50%) of them occurred during clear weather conditions. The weather conditions for the rest of the collisions was not stated. **Figure 17** illustrates the weather condition and the type of collision for F+SI collisions that occurred on roadway segments.

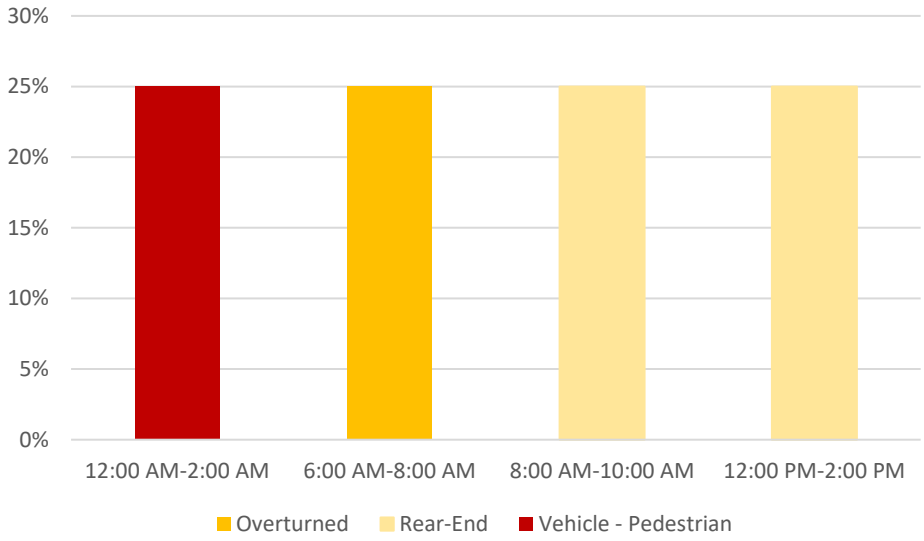
Figure 17 Weather Conditions for F+SI Collisions on Roadway Segments



Time of the Day and Collision Type

For all the F+SI collisions that occurred on roadway segments, two of them occurred between 6:00 a.m. to 10:00 a.m., leading to an overturned and a rear-end collision. One vehicle-pedestrian collision occurred between 12:00 a.m. to 2:00 a.m. One rear-end collision also occurred between 12:00 p.m. to 2:00 p.m. **Figure 18** illustrates the collision type by the time of the day for all roadway segment collisions.

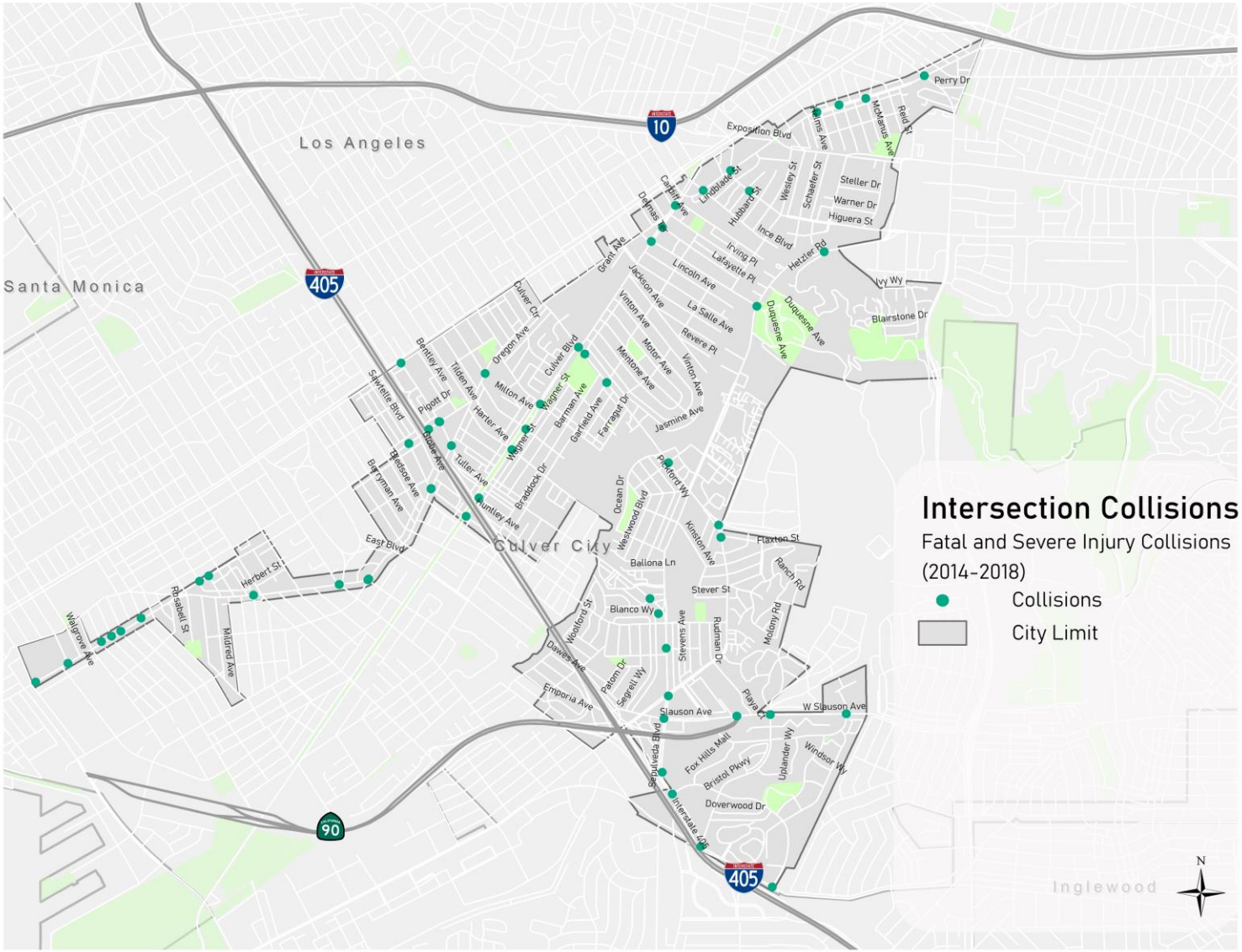
Figure 18 F+SI Collisions on Roadway Segments by Time of the Day



Intersection Collision Analysis

There were a total of 68 F+SI collisions that occurred at intersections. These collisions are shown in **Figure 19**.

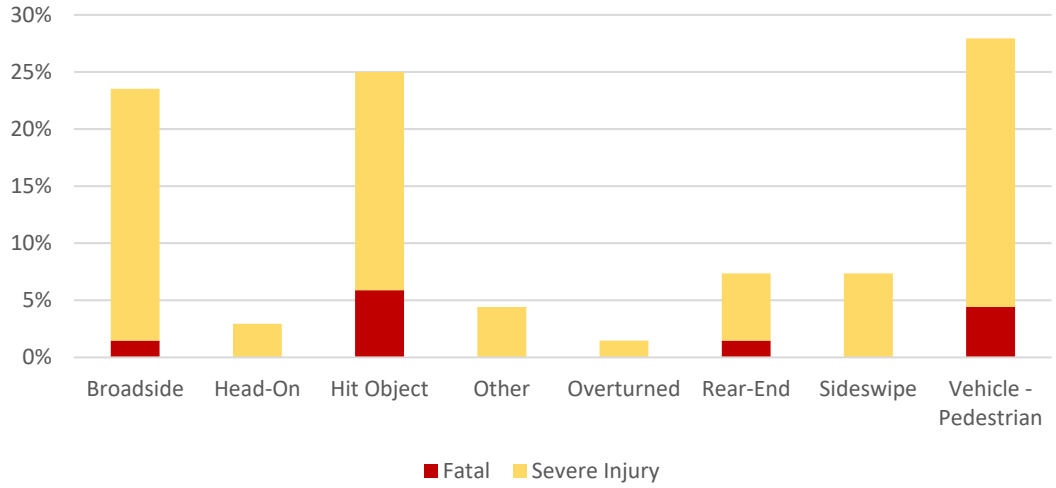
Figure 19 F+SI Collisions at Intersections



Collision Type

Examining which collision types led to F+SI collisions can help to identify the appropriate countermeasures. Vehicle pedestrian collisions (28%) followed by hit-object collisions (25%) were the most prominent collision types that led to F+SI collisions, as shown in **Figure 20**. Hit-object, vehicle-pedestrian, broadside and rear-end collisions have led to a fatality.

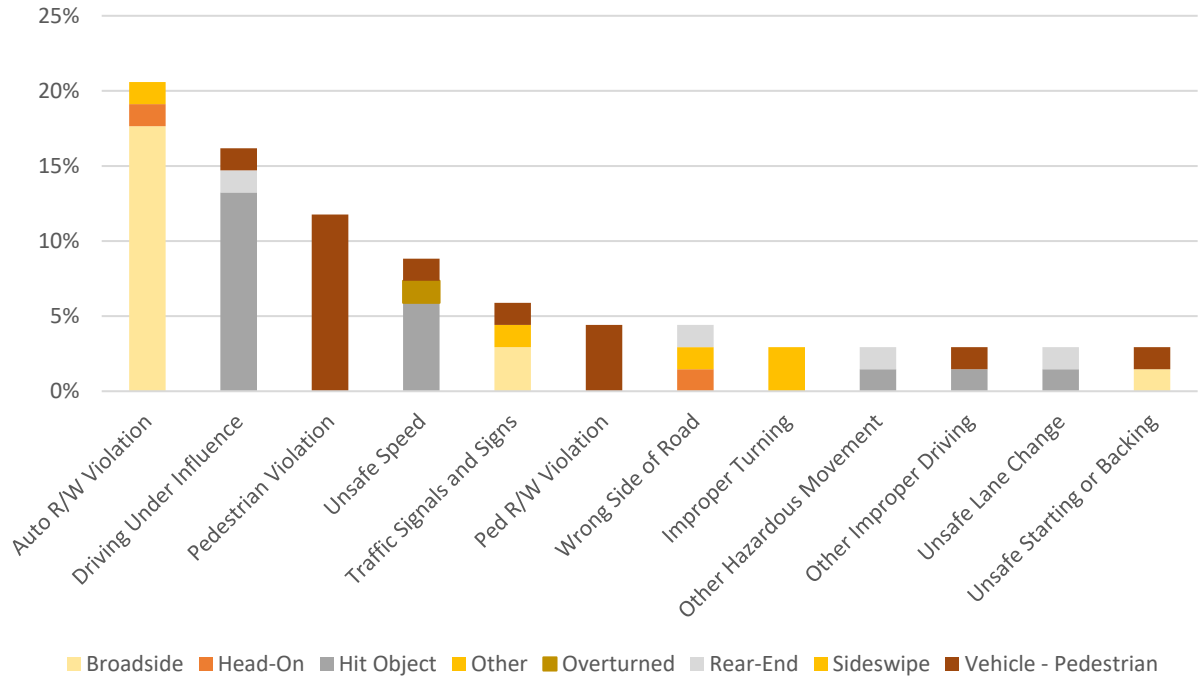
Figure 20 Collision Type with Severity for F+SI Collisions at Intersections



Violation Category and Collision Type

Examining the violation category with the collision type can help understand the human errors that resulted in the collision. The violation category that caused the highest number of F+SI collisions at intersections was auto right-of-way violation. It resulted in broadside, head-on and sideswipe collisions. Driving under influence was the second most common violation leading to hit-object, rear-end and vehicle-pedestrian collisions. Pedestrian violation was also observed to be common, leading to about 12% vehicle-pedestrian collisions at intersections. The results, compared with collision type, are shown in **Figure 21**.

Figure 21 Violation Categories for F+SI Collisions at Intersections

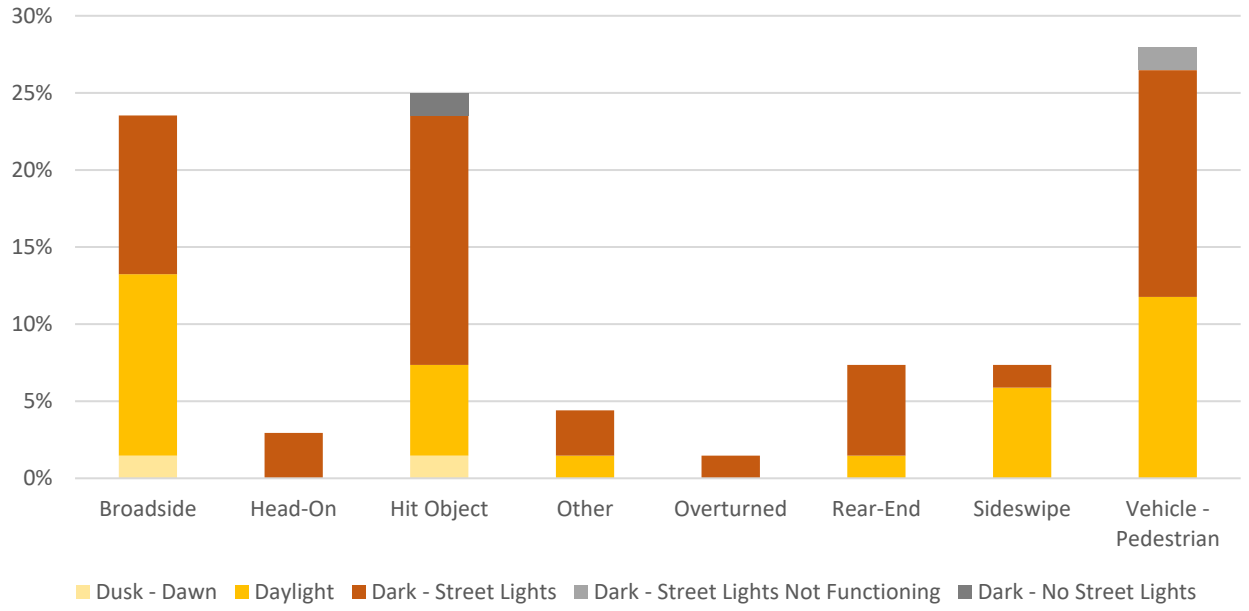


Lighting Condition and Collision Type

Lighting conditions affect the visibility at intersections for approaching vehicles. For all F+SI collisions at intersections, 38% occurred during daylight, 56% occurred in the dark with street lights and 3% occurred during dusk-dawn. The most commonly occurring collisions, i.e., vehicle-pedestrian, hit-object and broadside have majorly occurred during daylight or in the dark at locations with street lights. **Figure 22** represents the distribution of collision type according to the lighting conditions present.

It was observed that the majority of F+SI collisions occurred during dark at locations with street lights. It's worth noting that vehicle-pedestrian collisions occurred in the dark at locations with functioning and non-functioning streetlights when visibility of the object or pedestrian may have been obscured.

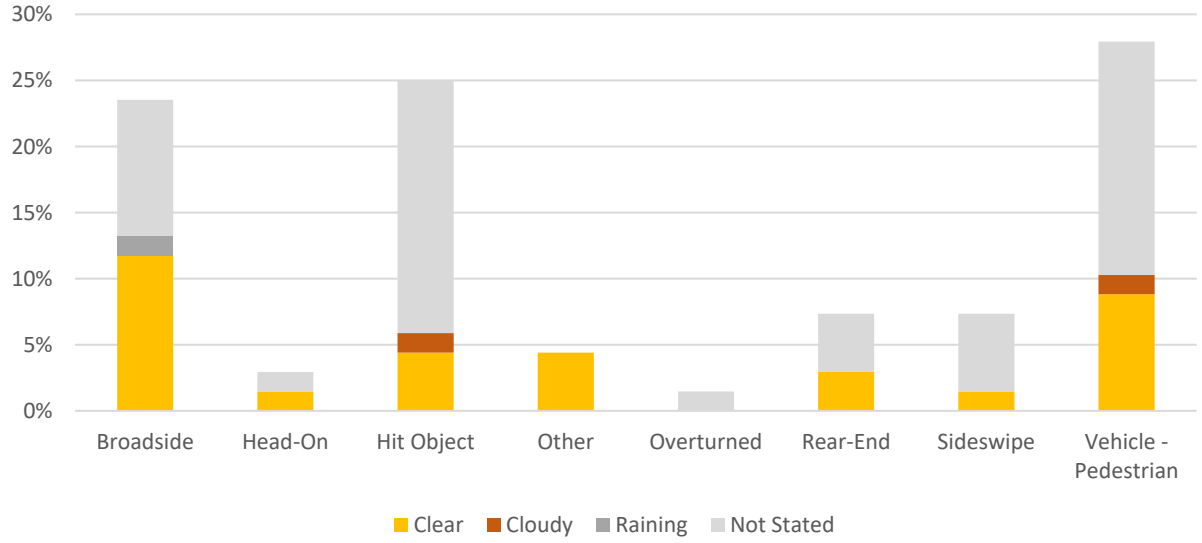
Figure 22 Lighting Conditions for F+SI Collisions at Intersections



Weather Condition and Collision Type

A total of 35% collisions occurred during clear weather conditions, 3% of collisions occurred during cloudy weather, and 2% collisions occurred during rainy weather conditions, as shown in **Figure 23**. The weather condition attribute was not stated for about 60% of the F+SI collisions occurring at intersections.

Figure 23 Weather Conditions for F+SI Collisions at Intersections

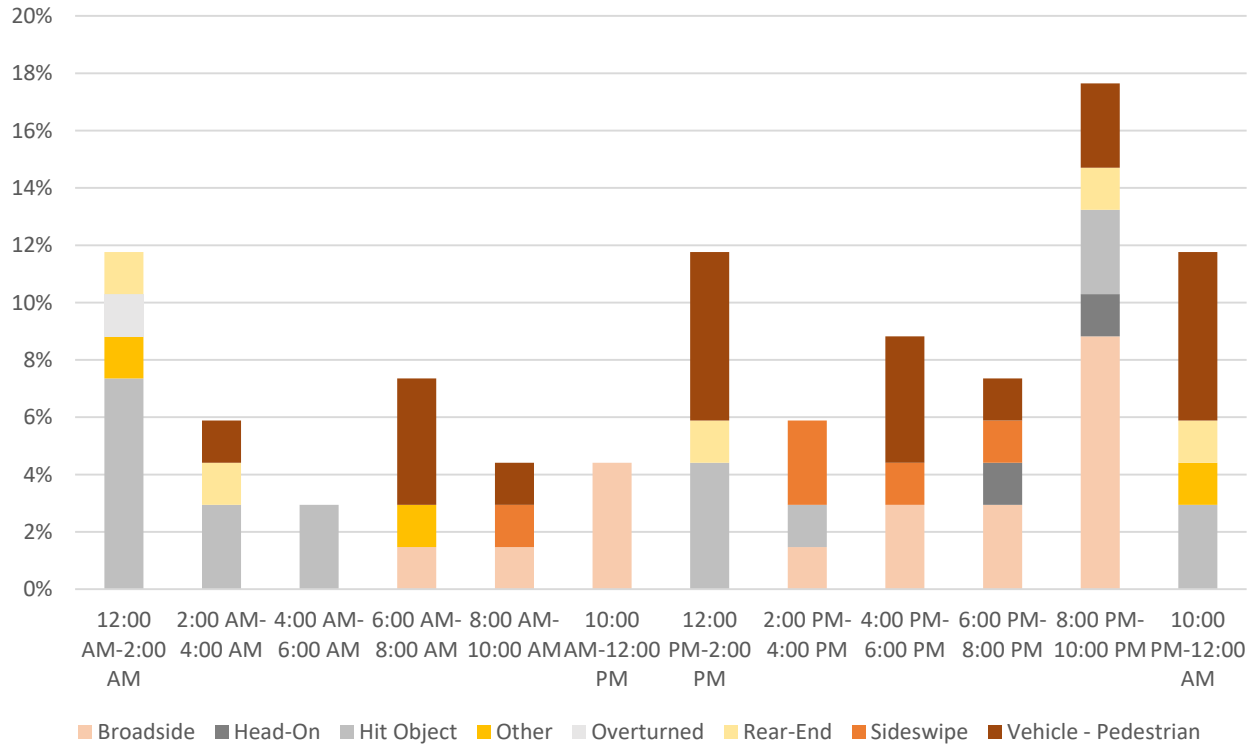


Time of the Day and Collision Type

The most prominent time period for F+SI collisions at intersections was observed to be between 8:00 p.m. to 10:00 p.m. (18%) as shown in **Figure 24**. Other prominent collision times were between 10:00 p.m. to 2:00 a.m. (24%) and 12:00 p.m. to 2:00 p.m. (12%). Broadside, vehicle-pedestrian and hit-object were the most prominently observed collision type during hours when maximum number of collisions have occurred.

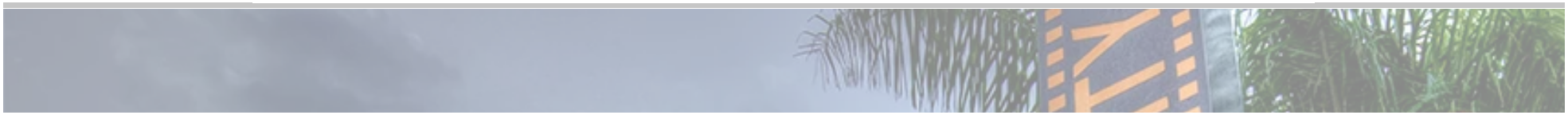
About 57% collisions have occurred between 6 p.m. in the evening to 6 a.m. in the morning. Hit-object, broadside and vehicle-pedestrian collisions were the most prominent collisions observed during this time, which can be due to low visibility conditions.

Figure 24 F+SI Collisions at Intersections by Time of the Day



Appendix C

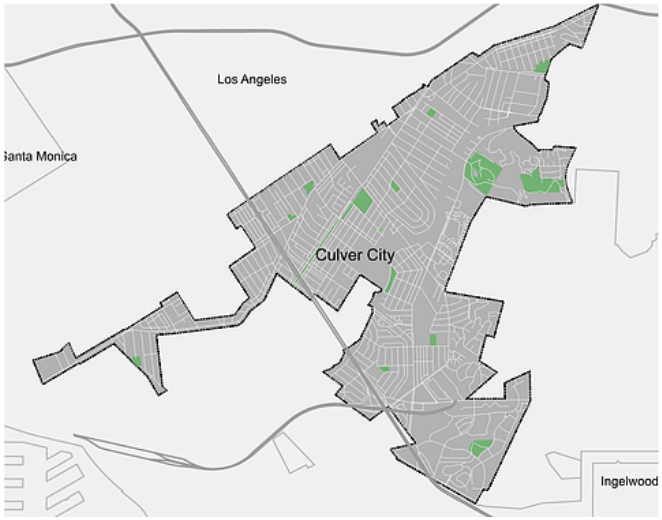
Project Website, Survey and Results

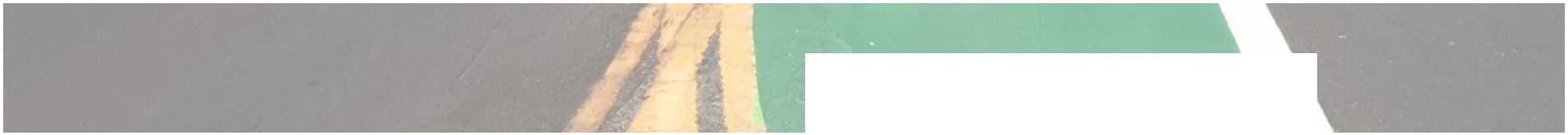


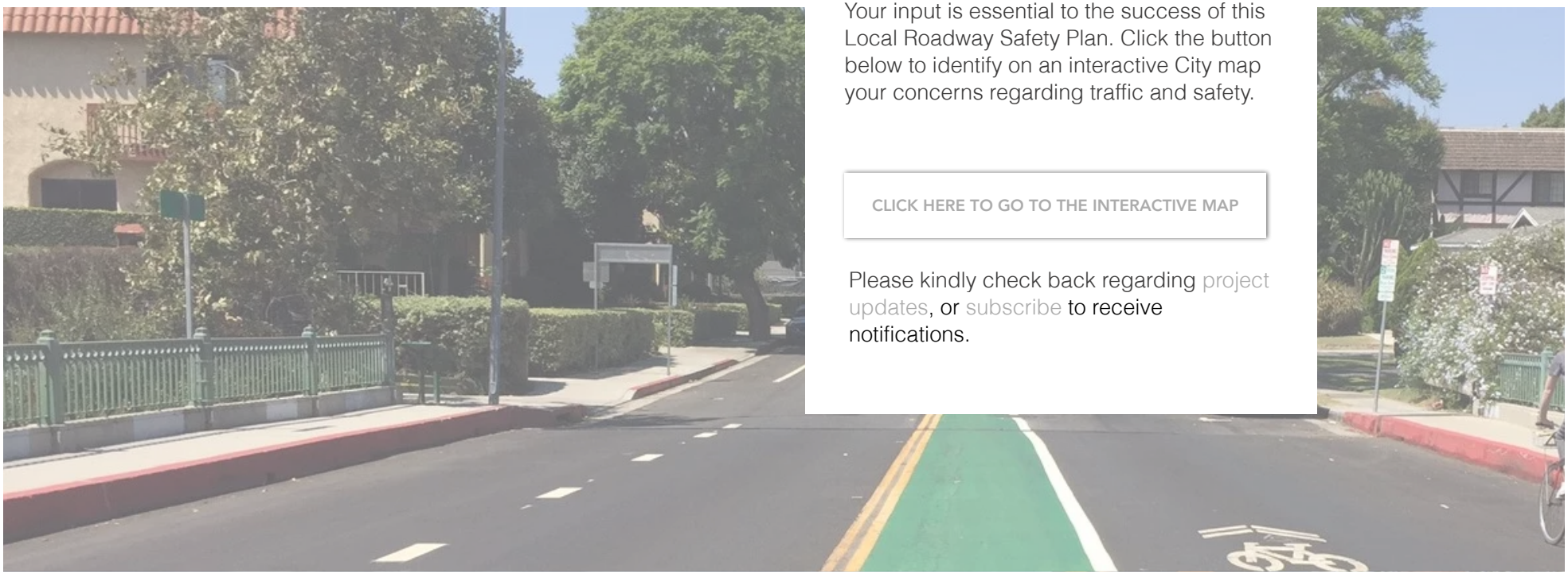
CULVER CITY
LOCAL ROADWAY SAFETY PLAN

Culver City is developing a comprehensive Local Roadway Safety Plan (LRSP) that will enable the City to determine potential traffic safety projects. As an effort to reduce fatal and severe injury collisions to zero, the City is conducting a comprehensive collisions analysis through the LRSP to identify high-risk corridors and intersections with the highest collisions frequency and severity.

The LRSP aims to develop the safety measures under the various “Es” of traffic safety: Engineering, Education, Encouragement, Enforcement, Emerging technologies, and Evaluation, through public and stakeholder participation.







Your input is essential to the success of this Local Roadway Safety Plan. Click the button below to identify on an interactive City map your concerns regarding traffic and safety.

CLICK HERE TO GO TO THE INTERACTIVE MAP

Please kindly check back regarding project updates, or subscribe to receive notifications.

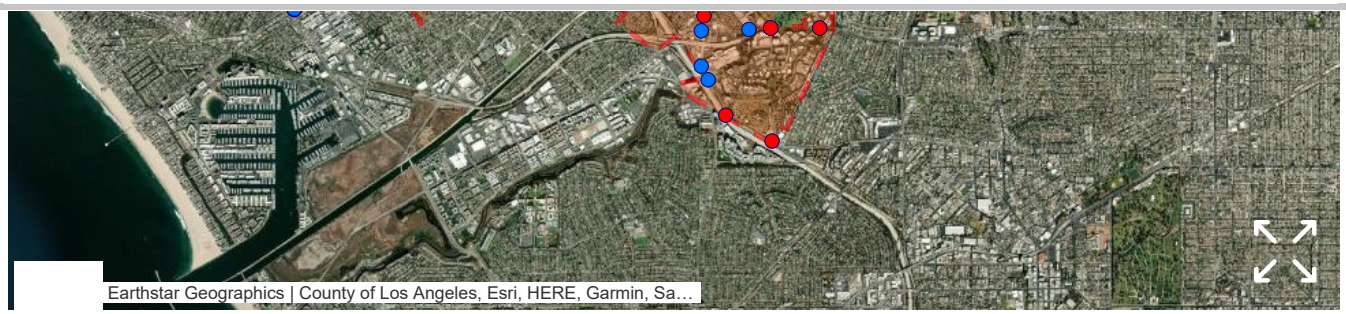
PROJECT UPDATE

4/13/2020: View the collision history locating the fatal and severe injury collisions that occurred in the City from 2014 to 2018. We are regularly updating the interactive map as the project moves forward.

COLLISION HISTORY

The map below shows the fatal and severe injury collisions that occurred in Culver City from 2014 to 2018. For any comments or suggestions, please provide feedback.

Updated on 4/13/2020. We are regularly updating this interactive map to display the most up-to-date collisions data and findings.



PROVIDE FEEDBACK

Let us know if you have any comments or suggestions about the project by filling the feedback form below.

Name

Email

Subject

Submit

SUBSCRIBE & CONTACT

Subscribe to receive notifications on website updates!

Name *Email* *Phone* Subscribe

For more information, please contact:

Heba El-Guindy
Mobility & Transportation Engineering Manager, City of Culver City
Heba.El-Guindy@culvercity.org
310-253-5628
9770 Culver Boulevard
Culver City, CA 90230-0507

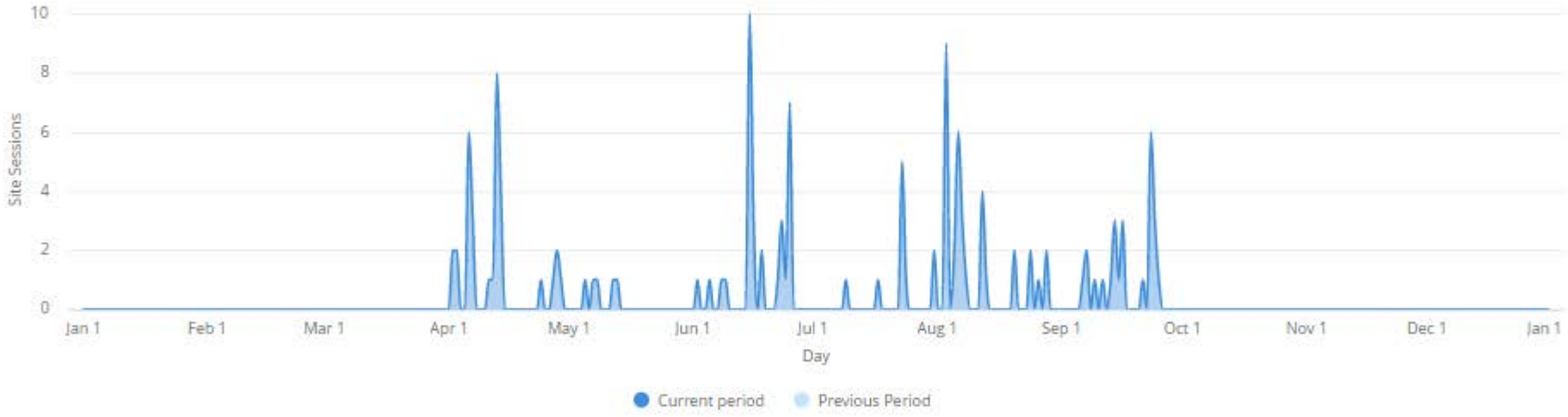

CULVER CITY
THE HEART OF SCREENLAND

Date

Year To Date

135	60	03m 29s
Total Site Sessions	Unique Visitors	Average Session Duration
Ø	Ø	Ø

Traffic over Time



Top Referring Sites

Visitor Retention

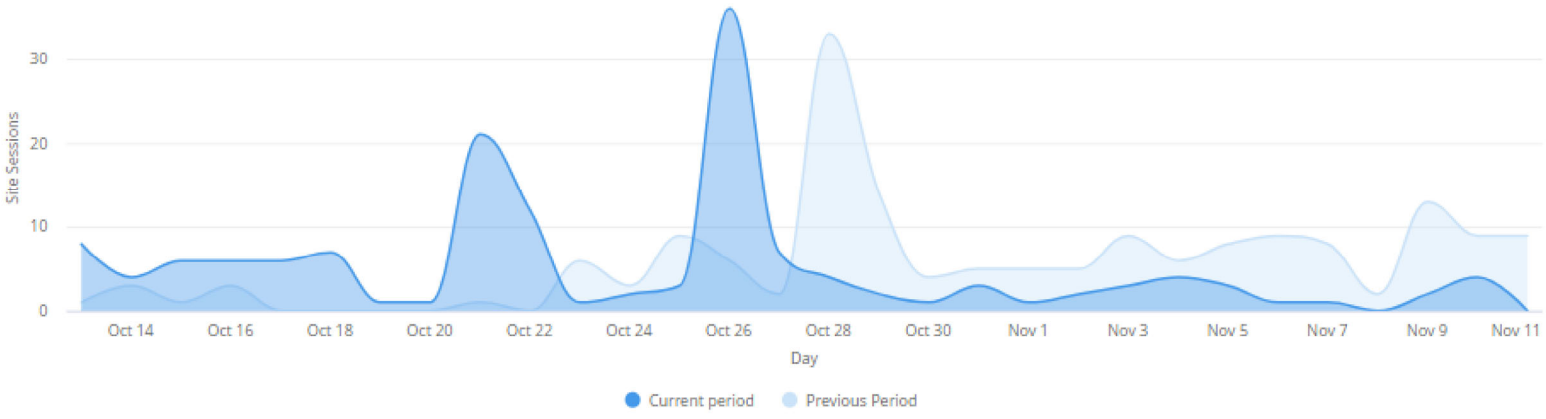
Oct 13 - Nov 11, 2020 Compared to: Sep 13 - Oct 12, 2020

Date

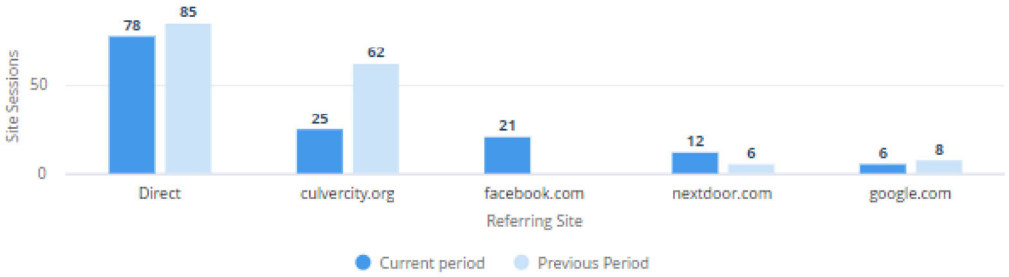
Last 30 Days

152	110	00m 50s
Total Site Sessions	Unique Visitors	Average Session Duration
▼ -13%	▼ -13%	▲ 108%

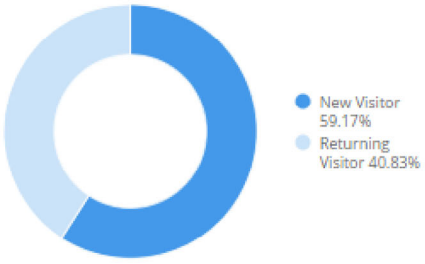
Traffic over Time



Top Referring Sites



Visitor Retention



Virtual Workshop for Culver City LRSP

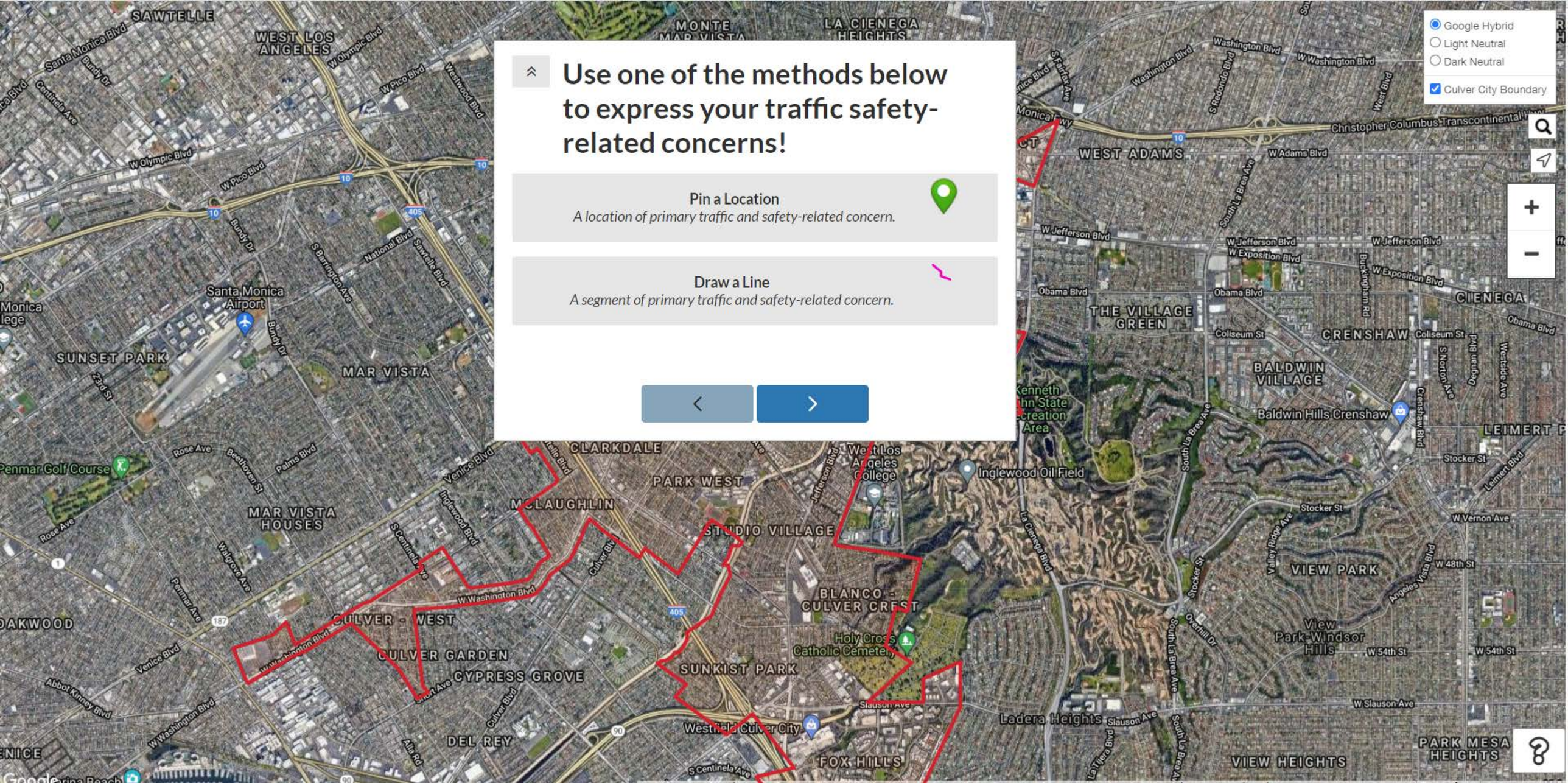
This is the virtual workshop for Culver City's Local Roadway Safety Plan (LRSP).

Culver City is developing the City’s first comprehensive LRSP that will enable the City to enhance safety for all modes of transportation and for all ages and abilities. The City's Public Works Department requests your help in identifying traffic safety issues within the City.

Through this virtual workshop, you can express your traffic-related concerns in the next step by pinning a point and/or drawing a line at any location or road segment, respectively, within the City.

Click on the right button to continue!

For more information visit the website by clicking here.


Use one of the methods below to express your traffic safety-related concerns!
Pin a Location
A location of primary traffic and safety-related concern.
Draw a Line
A segment of primary traffic and safety-related concern.
Google Hybrid
Light Neutral
Dark Neutral
Culver City Boundary
SAWTELLE
WEST LOS ANGELES
MONTE MAR VISTA
LA CIENEGA HEIGHTS
WEST ADAMS
THE VILLAGE GREEN
CRENSHAW
BALDWIN VILLAGE
CIENEGA
LEIMERT
SUNSET PARK
MAR VISTA
MAR VISTA HOUSES
CLARKDALE
PARK WEST
MCLAUGHLIN
STUDIO VILLAGE
BLANCO - CULVER CREST
CULVER - WEST
CULVER GARDEN
CYPRESS GROVE
SUNKIST PARK
DEL REY
FOX HILLS
Ladera Heights
VIEW PARK
VIEW HEIGHTS
PARK MESA HEIGHTS
Santa Monica Airport
Penmar Golf Course
Inglewood Oil Field
Baldwin Hills Crenshaw
West Los Angeles College
Holy Cross Catholic Cemetery
Westfield Culver City
Christopher Columbus Transcontinental Hwy
Santa Monica Blvd
W Olympic Blvd
W Pico Blvd
Bundy Dr
Centinela Ave
Westwood Blvd
National Blvd
Sawtelle Blvd
S Barrington Ave
23rd St
Rose Ave
Beethoven St
Palms Blvd
Venice Blvd
Inglewood Blvd
S Centinela Ave
Culver Blvd
W Washington Blvd
Walgrove Ave
Penmar Ave
Abbot Kinney Blvd
Short Ave
Alla Rd
S Centinela Ave
Slauson Ave
W Jefferson Blvd
W Exposition Blvd
Obama Blvd
Coliseum St
Buckingham Rd
S Norton Ave
Crenshaw Blvd
Westside Ave
Stocker St
Leimert Blvd
W Vernon Ave
W 48th St
W 54th St
Valley Ridge Ave
Angeles Vista Blvd
Overhill Dr
South La Brea Ave
La Cienega Blvd
Washington Blvd
W Washington Blvd
West Blvd
S Redondo Blvd
S Fairfax Ave
W Adams Blvd
South La Brea Ave
Slauson Ave
W Slauson Ave
S La Tijera Blvd
Kenneth Hahn State Recreation Area
View Park-Windsor Hills
Google
Marina Peach
ENICE
OAKWOOD

Thank you for your participation!

TJKM

For more information visit the website by clicking here. For inquiries, please contact:

Heba El-Guindy

Mobility & Transportation Engineering Manager, City of Culver City

Heba.El-Guindy@culvercity.org

310-253-5628

9770 Culver Boulevard, Culver City, CA 90230-0507

Please share the virtual workshop with your friends and family!

Done

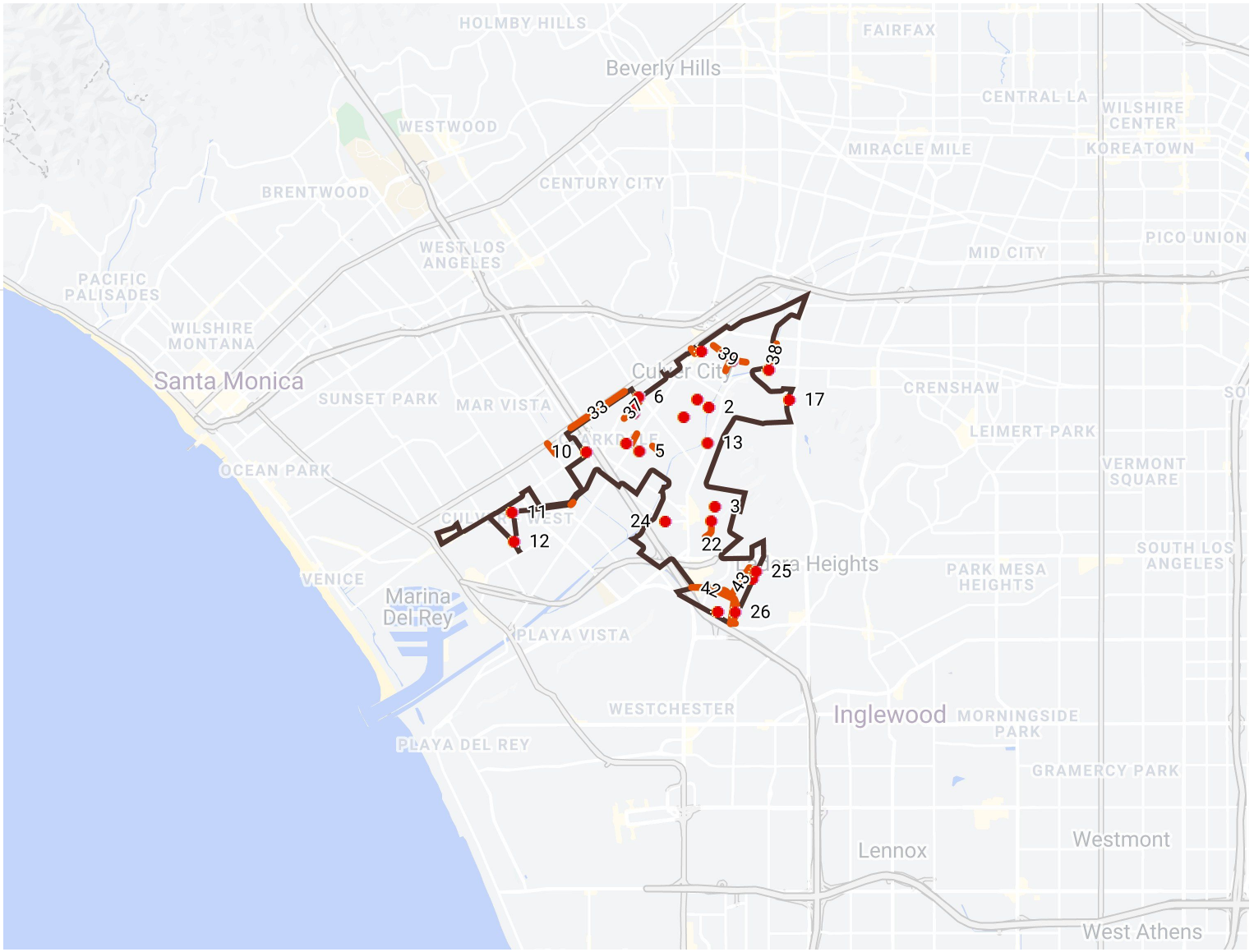
Culver City LRSP - Public Comments

City Limit

- Culver City

Map_input_CulverCity

- Pin a Location
- Draw a Line



Culver City LRSP - Public Comments

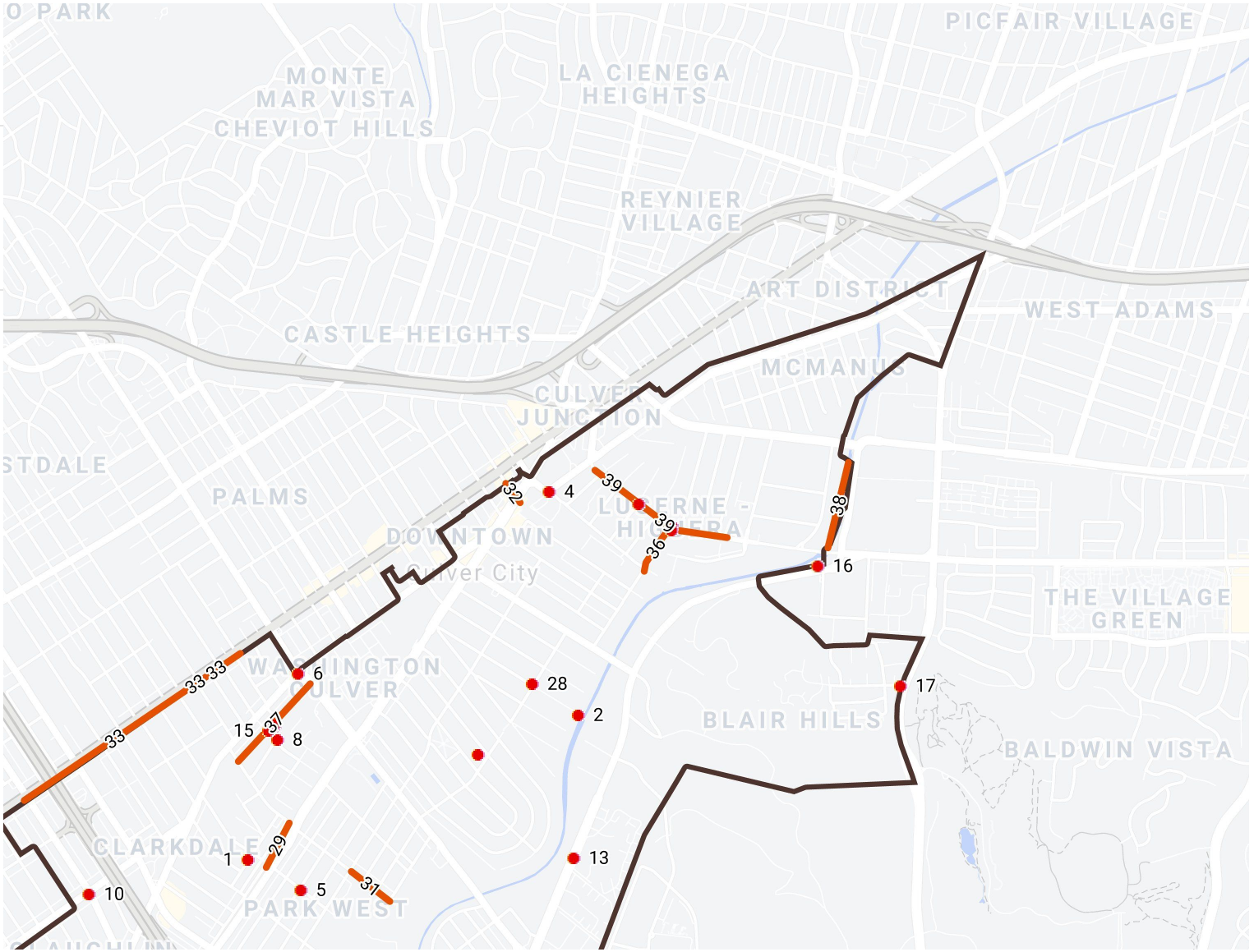
City Limit

Culver City

Map_input_CulverCity

Pin a Location

Draw a Line



Culver City LRSP - Public Comments

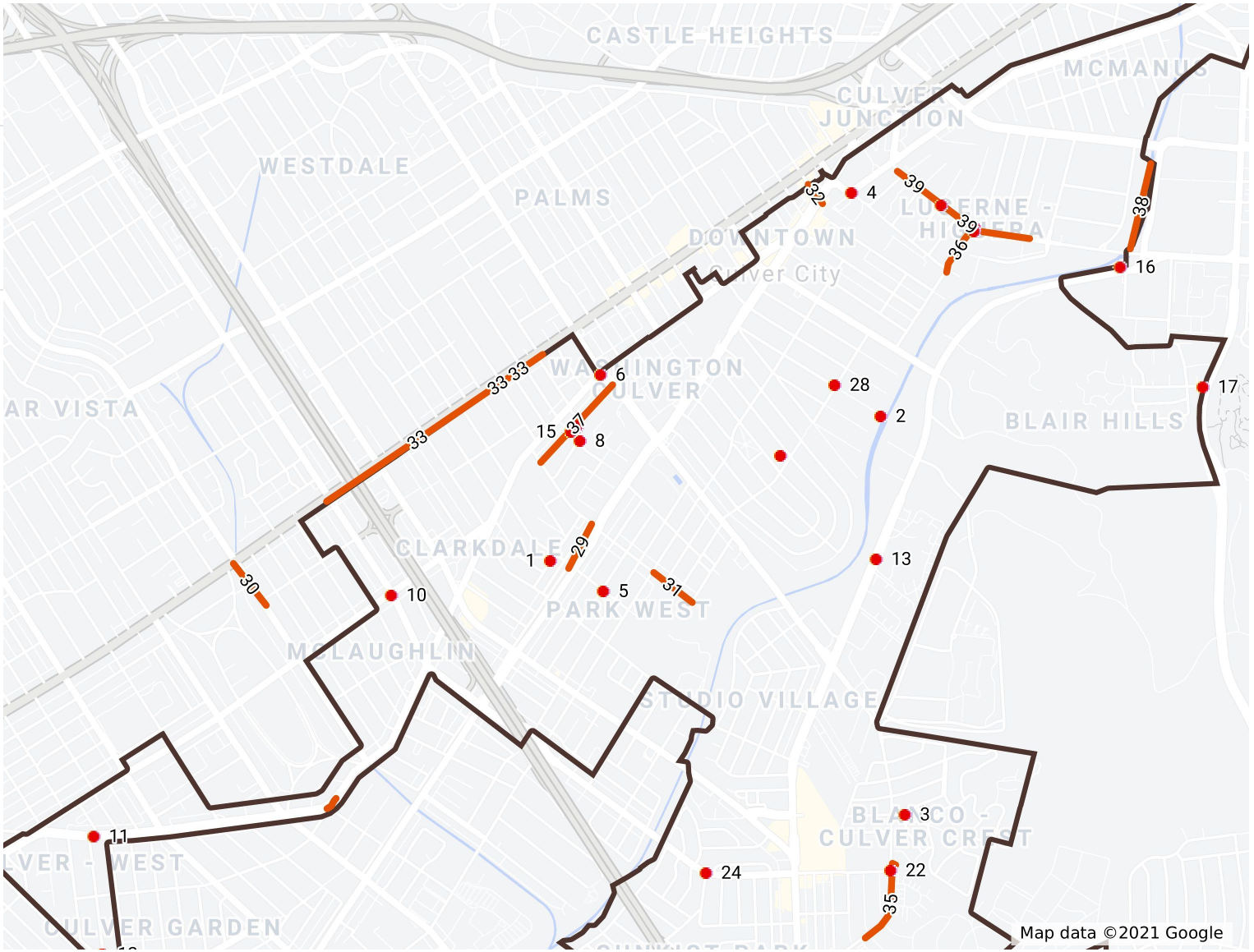
City Limit

Culver City

Map_input_CulverCity

Pin a Location

Draw a Line



Culver City LRSP - Public Comments

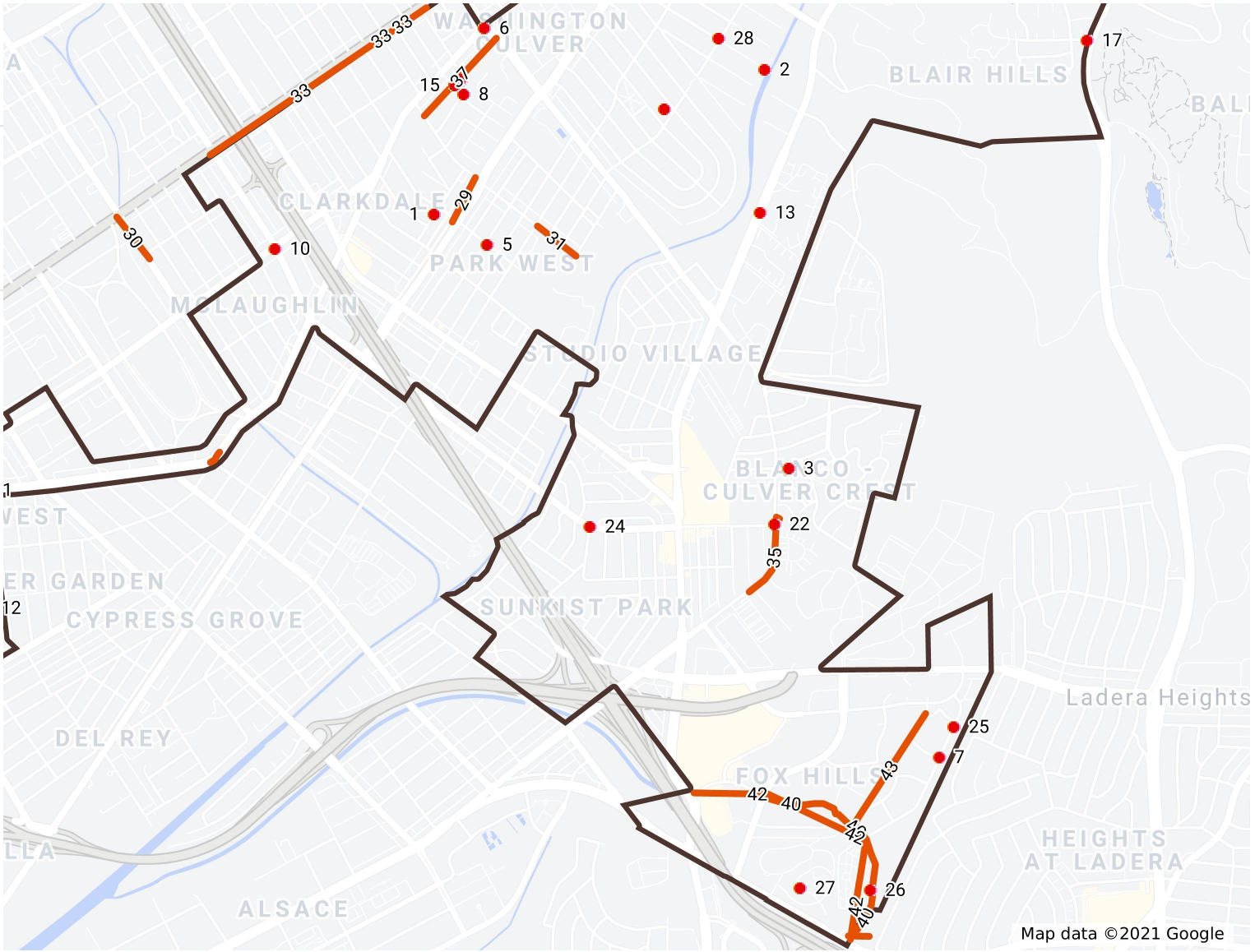
City Limit

Culver City

Map_input_CulverCity

Pin a Location

Draw a Line



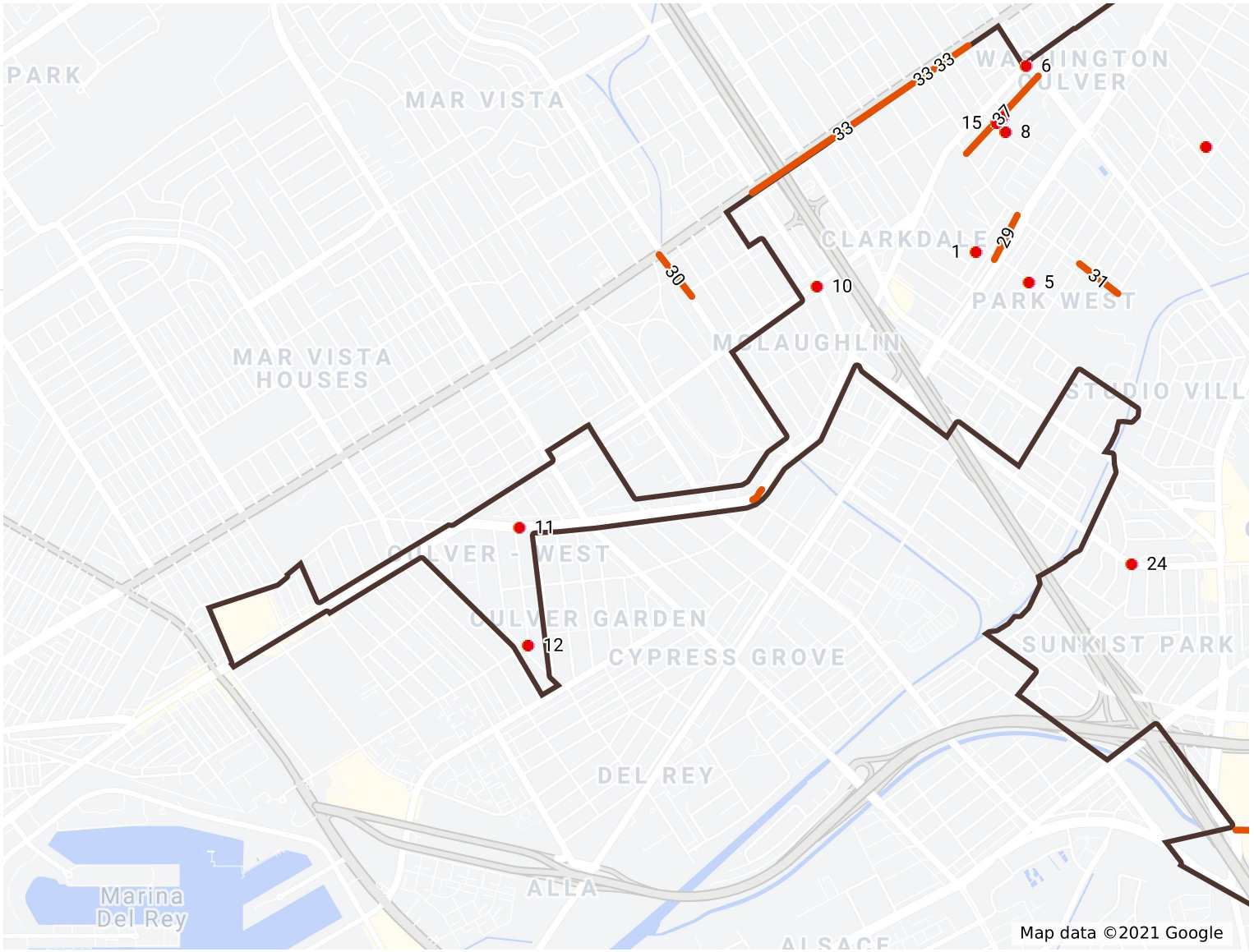
Culver City LRSP - Public Comments

City Limit

- Culver City

Map_input_CulverCity

- Pin a Location
- Draw a Line



Sr. No.	respondent	createtime	wkt	What are your major concerns for this location?
1	4	2020-04-06T17:39:20.663Z	LINESTRING (-118.406010 34.010266, -118.407211 34.008345)	Vehicles at high speeds.
2	4	2020-04-06T17:40:19.724Z	LINESTRING (-118.424721 34.008558, -118.423004 34.006744)	High veh speeds
3	4	2020-04-24T18:17:37.553Z	LINESTRING (-118.402770 34.008162, -118.400763 34.006873)	School crossing
4	27	2020-09-28T20:57:38.787Z	LINESTRING (-118.394696 34.024974, -118.393940 34.024134)	The traffic light while waiting on Main Street, facing toward Culver studios (currently not applicable with the street closed to car traffic) goes green at the same time it turns green for people exiting the new underground parking structure. From Main Street, cars turn right or left, carefully avoiding pedestrians, and now cars come shooting out of a complete blind spot into head on traffic. It's bad, it's really really bad, back before the streets shut down I witnessed multiple close calls. Honestly, I wish there were a pedestrian foot bridge, or several of them in this area, and more thought put into the light patterns. If no foot bridge, why not a multi-way crosswalk the way they do it in Beverly Hills on Rodeo, or in downtown Santa Monica near the promenade.
5	32	2020-09-28T23:10:37.645Z	LINESTRING (-118.419850 34.011244, -118.408563 34.017611)	This does not feel like a safe biking area: poor road quality, cars parked on the side and open door without checking for cyclist, pedestrian jailwalking.
6	40	2020-09-29T04:56:07.122Z	LINESTRING (-118.419828 33.997947, -118.419614 33.998045, -118.419453 33.998285, -118.419356 33.998383)	Eastbound traffic - this curve has been the site of several cars jumping the curb at the apex of the curve and running in to the front of the church on the south side of the street. This may improve now that the landscaped medians are in place, but worth watching to see.
7	45	2020-09-30T00:07:27.585Z	LINESTRING (-118.391719 33.992334, -118.390903 33.992868, -118.390517 33.993295, -118.390388 33.993864, -118.390346 33.994896, -118.390303 33.995572, -118.390131 33.995501)	Drivers take the turn at Overland/Playa way too fast and there have been many accidents
8	45	2020-09-30T00:08:38.602Z	LINESTRING (-118.387460 34.021168, -118.387406 34.021328, -118.387374 34.021533, -118.387223 34.021764, -118.387063 34.021933, -118.386923 34.022093, -118.386676 34.022422, -118.386558 34.022591, -118.386387 34.022760, -118.386215 34.023000, -118.386129 34.023107)	too much traffic

Sr. No.	respondent	createtime	wkt	What are your major concerns for this location?
9	47	2020-09-30T21:27:52.346Z	LINESTRING (-118.408660 34.012925, -118.404915 34.016295)	Oregon Ave is home to families with 30+ children, often walking as pedestrians. Cars use it as a shortcut between Overland and Elenda, and for cars trying to get off Washington Blvd when it gets backed up. Delivery trucks, Ubers and nonresidents speed down Oregon at very high speeds, often running or rolling through the stop sign at Midway. We really need speed bumps (like on Braddock) and the stop sign intersection repainted, or preferably a roundabout added. Our proximity to La Ballona Elementary, the amount of pedestrian foot traffic and the children on the street should make this a high priority.
10	51	2020-10-02T20:58:40.486Z	LINESTRING (-118.376806 34.025881, -118.377879 34.022182)	There needs to be a bike lane on this stretch of Jefferson to help people get to the metro. The bike lane on Jefferson just ends at Holdrege. There's no safe way to bike here given the traffic and speeds. And it's so close to the metro. Let's connect people to public transit.
11	63	2020-10-21T22:23:48.862Z	LINESTRING (-118.390045 34.025552, -118.385925 34.022965, -118.383136 34.022627)	Too many too fast cars in off peak, too many cars bumper to bumper in peak.
12	69	2020-10-26T17:25:19.030Z	LINESTRING (-118.385453 33.977424, -118.386548 33.977442, -118.386247 33.977531, -118.386054 33.977727, -118.385775 33.978065, -118.385346 33.978777, -118.385282 33.979168, -118.385260 33.979738, -118.385206 33.980120, -118.385121 33.980547, -118.385357 33.981019, -118.385603 33.981615, -118.386161 33.982175, -118.386537 33.982291, -118.387073 33.982709, -118.387223 33.982727, -118.387299 33.982958, -118.387846 33.983163, -118.388339 33.983172, -118.388844 33.983118, -118.389938 33.983207, -118.390775 33.983403)	Speeds in both directs are excessive especially during workday commute rush hours. While driving, I've often been passed by vehicles that have speeds over 50 mph. This is especially dangerous due to frequency of vehicles parallel parking on both sides of street, frequent exit and entry of vehicles at Heather Village driveways and heavy pedestrian and bicycle traffic accessing Fox Hills Park. Due to vehicular speeds, bicycle traffic is forced onto narrow sidewalks which are heavily used by dog walkers and families with strollers, etc. Slowing traffic by allowing local traffic only, increasing available safe parking with back-in angled parking and addition of bike lanes in each direction would improve safety, promote healthy walking and biking and reduce traffic in this high population condominium area
13	77	2020-10-26T22:06:09.220Z	LINESTRING (-118.386047 33.990383)	Buckingham Parkway has become a raceway. It was nice to put a crosswalk light at Sumner and Buckingham but it's rare for people to even slow down. Something needs to be done.
14	78	2020-10-26T23:25:29.281Z	LINESTRING (-118.386440 33.977286, -118.385625 33.981577, -118.390740 33.983577, -118.394594 33.983634)	Speeds and cut-through traffic on Green Valley Circle have gotten worse each year. Car speeds are dangerously high. I'm now seeing fully-loaded semi trailers hauling Teslas barreling down GVC. In addition, delivery vehicles using the center turn lane for parking make for dangerous blind spots. I would encourage significant traffic calming measures, similar to Racho Higuera. Roundabouts at GVC and Doverwood, GVC and Canterbury, and the south entrances to Heather Village/Meadows would be a huge help. A restricted right turn from WB Centinela to NB GVC that restricts right during AM rush hour would dramatically reduce cut-through traffic.
15	61	2020-11-10T07:57:14.248Z	LINESTRING (-118.382514 33.987068, -118.386333 33.982175, -118.386333 33.982220)	Buckingham from Hannum to GVC all of GVC from Sepulveda to Centinela , all of Bristol Parkway from Hannum to Centinela and all of Canterbury Drive have continuous speeding of cars down them. This line system is not user friendly at all. Traffic engineering has been aware of the speeding problems for quite some time.
16	4	2020-04-06T17:40:55.578Z	POINT (-118.408155 34.008700)	crossing

Sr. No.	respondent	createtime	wkt	What are your major concerns for this location?
17	11	2020-06-16T20:10:02.581Z	POINT (-118.390903 34.014961)	Right hand turns from LaSalle onto Jefferson. Can't see well and cars come fast.
18	25	2020-09-28T20:55:11.266Z	POINT (-118.389646 33.997713)	Rolling stops, people not stopping for the red light. Had to be very careful with crossing the intersection with my daughter. Had a few close calls. I Believe a warning crossing would be good.
19	27	2020-09-28T21:05:43.189Z	POINT (-118.392422 34.024641)	Again, massive issues for pedestrian safety and right of way. This entire intersection should be a multi-way crosswalk, having a light dedicated to allow people to simultaneously walk to any corner they need. I live just down Ince, and am SO grateful that the right lane moving southbound is now a "straight only" lane with a dedicated light, but the intersection is very confusing for most, and my husband and I routinely (almost daily) tend to witness a vehicle nearly hit another vehicle or a pedestrian. I feel the entire downtown area needs to focus on how to cleanly allow the flow of pedestrians across the areas where Culver and Washington merge. It's a pedestrian focused area that seems to have left out the need for people to make it across the street, and especially here cars like to come around the corner fast. I wish the city would bring in all the talented artists and architects who live and work here and ask them to imagine mural laden pedestrian bridges. Or heck, a gondola? All of the scary near misses we see both at the Ince/Washington intersection and the Culver hotel intersection are all happening before our neighbor, Amazon studios, begins bringing thousands more vehicles into these intersections.
20	30	2020-09-28T21:46:06.116Z	POINT (-118.405377 34.007384)	There should be a stop sign here on Huron. It's difficult to pull out and hard to see traffic due to cars parked on the street. This can also be difficult spot for kids to cross the street.
21	35	2020-09-28T23:18:01.669Z	POINT (-118.405538 34.016758)	Traffic photo cameras cause many traffic collisions. Sometimes the light changes from yellow to red and causes people to slam on their breaks or speed up to avoid getting a photo ticket. It's an extremely dangerous intersection due to those photo cameras.
22	36	2020-09-29T00:01:59.973Z	POINT (-118.381784 33.985200)	There has been an increase of drivers speeding down the street. Often hearing cars revving up their engines and driving down in really high speeds all the way down either towards green valley or to Slauson.
23	38	2020-09-29T03:00:53.715Z	POINT (-118.406600 34.013894)	Cars coming out of studio estates do not always stop.
24	38	2020-09-29T03:02:29.039Z	POINT (-118.406771 34.014486)	Odd angled intersection with many cars rolling through the stop sign. Suggest better marked cross walks and placing the stop signs far enough back from the crosswalk. this neighborhood is 95+ walk-ability and when traffic picks up again on Washington Blvd., Oregon and Midway will turn back into a Waze cut through again.
25	40	2020-09-29T04:53:52.970Z	POINT (-118.416460 34.007215)	Left turn safety - not sure why, but this intersection seems to have more collisions than comparable volume intersections.
26	41	2020-09-29T05:22:38.849Z	POINT (-118.431995 33.996764)	The crosswalk should be a red flashing light, not yellow. Drivers more often than not do not stop for the pedestrians even w/ the flashing yellow light
27	41	2020-09-29T05:25:06.321Z	POINT (-118.431555 33.991667)	Drivers going east bound on Maxella always assume there is a stop sign (north & south) on Mildred at this T intersection and turn to go north, nearly causing accidents every day.
28	46	2020-09-30T01:40:20.474Z	POINT (-118.391140 34.008772)	Too much traffic on Jefferson Blvd. Traffic lights do not seem to respond to pedestrians in a timely manner when buttons are pushed.
29	47	2020-09-30T21:24:27.851Z	POINT (-118.406782 34.014539)	The stop signs have very poor visibility, and the stripes on the street are very faded and need to be repainted. The angled nature of the intersection adds to the poor visibility, and cars often speed directly through the stop. Oregon Ave is home to families with 30+ children, often walking as pedestrians through this intersection. The street needs to be repainted, and ultimately a roundabout would safely slow traffic.
30	48	2020-10-01T15:43:14.000Z	POINT (-118.407077 34.014290)	Oregon Avenue desperately needs speed bumps. Cars use it as a convenient way to bypass traffic on Washington Blvd and routinely speed down the street, endangering local kids.
31	51	2020-10-02T20:52:10.195Z	POINT (-118.378394 34.021417)	Before Covid the left turn from west bound Jefferson onto Holdrege at rush hour was so dangerous. There is no turn signal and people going on east bound on Jefferson block the intersection.
32	51	2020-10-02T20:54:29.518Z	POINT (-118.374070 34.016233)	I'd like to see the exit to La Cienega from Wrightcrest closed. Before Covid Blair Hills was packed at rush hour with people cutting through to get to La Cienega. This is a neighborhood full of kids and the cut through traffic runs the stop signs.
33	53	2020-10-06T20:40:48.961Z	POINT (-118.396139 34.013254)	High speed traffic on segrell way and in LA streets with traffic bumps have limited to 15 miles and our streets its 25 miles ? Why why and Why
34	53	2020-10-06T20:45:13.904Z	POINT (-118.396139 34.013254)	High speed traffic on segrell way and speed bumps is not stopping as the speed should be 15 not 25

Sr. No.	respondent	createtime	wkt	What are your major concerns for this location?
35	54	2020-10-07T19:15:09.119Z	POINT (-118.386011 34.023143)	Prior to Coveid-19 We had over 8500 cars daily using Higuera as a cut-through. We had support from the Council to remedy this with a Neighborhood Transit Management Plan. There has not been any progress since 2019 to begin work on this solution. We know a HUGE project is coming to the neighborhood(Amazon Music/Film)at the Culver Studios site. This will bring another wave of cars up to 10,000 estimated! We need humps to slow the speedy cars down and to deter from our streets being inundated and unsafe with this cut through activity!
36	63	2020-10-21T22:25:37.175Z	POINT (-118.386033 34.022965)	Too many too fast cars in off peak, too many cars bumper to bumper in peak. Too many rolling stops in all directions
37	65	2020-10-21T23:12:27.792Z	POINT (-118.390399 33.995279)	This is in front of El Rincon and often it is difficult for parents to cross the street safely to get to/from school.
38	65	2020-10-21T23:15:52.867Z	POINT (-118.387744 34.024103)	Cars often do not stop for pedestrians to safely cross the street.
39	72	2020-10-26T20:44:09.747Z	POINT (-118.400026 33.995181)	Drivers don't see pedestrians in the cross walk and nearly hit them.. Even though most drivers are very conscientious about coming to a complete stop, for some reason they seem not to see pedestrians already in the crosswalk. I have experienced this a pedestrian and also as a driver, most recently when a woman with a child in stroller was cut off by a vehicle N/B on Sawtelle, making a left into Hayter Ave.
40	71	2020-10-26T20:46:27.823Z	POINT (-118.381034 33.986518)	Many cars speed down this street. Some seems up to 40 mph.
41	73	2020-10-26T21:04:05.412Z	POINT (-118.385396 33.979452)	Speeding cars , and not enough pedesrian crosswalks .
42	80	2020-10-27T05:26:13.803Z	POINT (-118.389052 33.979544)	Speed of traffic on Green Valley Circle makes exiting my building at 6565 unsafe.
43	85	2020-11-12T21:46:51.148Z	POINT (-118.393307 34.016313)	The Slow Traffic Safety signs are dangerous. They are not making things safer but rather more unpredictable and dangerous. I can't imagine that there have been traffic studies done to indicate this is safe. They should be removed.

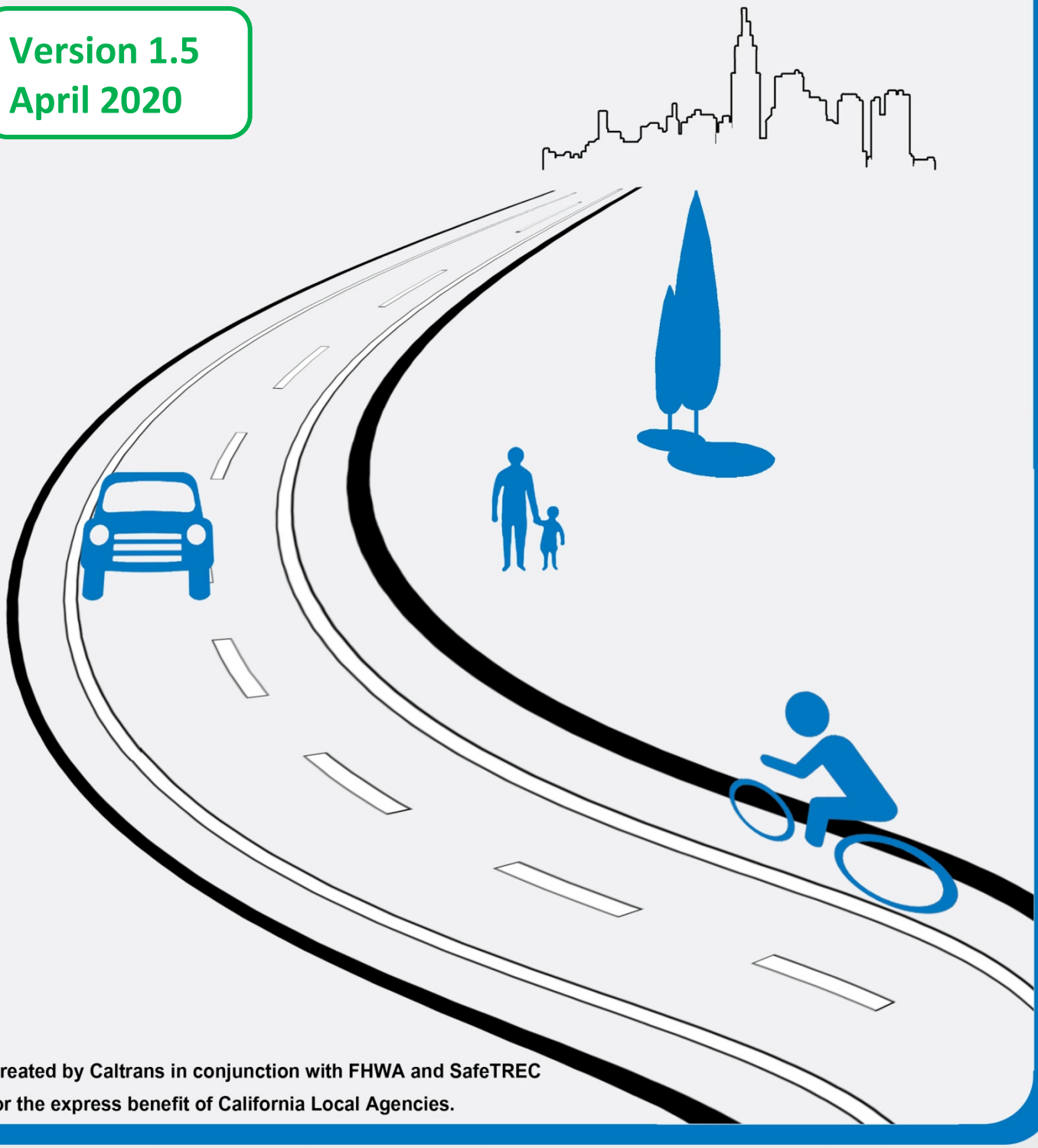
Appendix D

LRSM Countermeasures

Local Roadway Safety

A Manual for California's Local Road Owners

Version 1.5
April 2020



Created by Caltrans in conjunction with FHWA and SafeTREC
for the express benefit of California Local Agencies.

Caltrans

U. S. Department of Transportation
Federal Highway Administration

Safe Transportation
Research & Education Center
SafeTREC

Table of Contents

B.1 Intersection Countermeasures – Signalized

S01, Add intersection lighting (Signalized Intersection => S.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	"night" crashes	40%	20 years
Notes:	This CM only applies to "night" crashes (all types) occurring within limits of the proposed roadway lighting 'engineered' area.		

General information
Where to use:
Signalized intersections that have a disproportionate number of night-time crashes and do not currently provide lighting at the intersection or at its approaches. Crash data should be studied to ensure that safety at the intersection could be improved by providing lighting (this strategy would be supported by a significant number of crashes that occur at night).
Why it works:
Providing lighting at the intersection itself, or both at the intersection and on its approaches, improves the safety of an intersection during nighttime conditions by (1) making drivers more aware of the surroundings at an intersection, which improves drivers' perception-reaction times, (2) enhancing drivers' available sight distances, and (3) improving the visibility of non-motorists. Intersection lighting is of particular benefit to non-motorized users. Lighting not only helps them navigate the intersection, but also helps drivers see them better.
General Qualities (Time, Cost and Effectiveness):
A lighting project can usually be completed relatively quickly, but generally requires at least 1 year to implement because the lighting system must be designed and the provision of electrical power must be arranged. The provision of lighting involves both a fixed cost for lighting installation and an ongoing maintenance and power cost which results in a moderate to high cost. Some locations can result in high B/C ratios, but due to higher costs, these projects often result in medium to low B/C ratios.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Night, All	CRF:	20-74%

S02, Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	15%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the upgraded signals. This CM does not apply to improvements like "battery backup systems", which do not provide better intersection/signal visibility or help drivers negotiate the intersection (unless applying past crashes that occurred when the signal lost power). If new signal mast arms are part of the proposed project, CM "S2" should not be used and the signal improvements would be included under CM "S7".		

General information
Where to use:
Signalized intersections with a high frequency of right-angle and rear-end crashes occurring because drivers are unable to see traffic signals sufficiently in advance to safely negotiate the intersection being approached. Signal intersection improvements include new LED lighting, signal back plates, retro-reflective tape outlining the back plates, or visors to increase signal visibility, larger signal heads, relocation of the signal heads, or additional signal heads.
Why it works:
Providing better visibility of intersection signals aids the drivers' advance perception of the upcoming intersection. Visibility and clarity of the signal should be improved without creating additional confusion for drivers.
General Qualities (Time, Cost and Effectiveness):
Installation costs and time should be minimal as these type strategies are classified as low cost and implementation does not typically require the approval process normally associated with more complex projects. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in low to moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Rear-End, Angle	CRF:	0-46%

S03, Improve signal timing (coordination, phases, red, yellow, or operation)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
50%	All	15%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new signal timing. For projects coordination signals along a corridor, the crashes related to side-street movements should not be applied. This CM does not apply to projects that only 'study' the signal network and do not make physical timing changes, including corridor operational studies and improvements to Traffic Operation Centers (TOCs). In Caltrans calls for projects, this CM has a HSIP reimbursement ratio of 50%, considering that it will improve the signal operation rather than merely the safety.		

General information				
Where to use:				
Locations that have a crash history at multiple signalized intersections. Signalization improvements may include adding phases, lengthening clearance intervals, eliminating or restricting higher-risk movements, and coordinating signals at multiple locations. Understanding the corridor or roadway's crash history can provide insight into the most appropriate strategy for improving safety.				
Why it works:				
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. Corridor improvements often have the highest benefit but may take longer to implement. Projects focused on capacity improvements (without a separate focus on signal timing safety needs) may not result in a reduction in future crashes.				
General Qualities (Time, Cost and Effectiveness):				
In general, these low-cost improvements to multiple signalized intersections can be implemented in a short time. Typically these low cost improvements are funded through local funding by local maintenance crews. However, some projects requiring new interconnect infrastructure can have moderate to high costs making them more appropriate to seek state or federal funding. The expected effectiveness of this CM must be assessed for each individual project.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	0 - 41%

S04, Provide Advanced Dilemma-Zone Detection for high speed approaches

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	40%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new detection and signal timing.		

General information				
Where to use:				
More rural/remote areas that have a high frequency of right-angle and rear-end crashes. The Advanced Dilemma-Zone Detection system enhances safety at signalized intersections by modifying traffic control signal timing to reduce the number of drivers that may have difficulty deciding whether to stop or proceed during a yellow phase. This may reduce rear-end crashes associated with unsafe stopping and angle crashes due to illegally continuing into the intersection during the red phase.				
Why it works:				
Clearance times provide safe, orderly transitions in ROW assignment between conflicting streams of traffic. An Advanced Dilemma-Zone Detection system has several benefits relative to traditional multiple detector systems, which have upstream detection for vehicles in the dilemma zone but do not take the speed or size of individual vehicles into account. These benefits include: Reducing the frequency of red-light violations; Reducing the frequency of crashes associated with the traffic signal phase change (for example, rear-end and angle crashes); Reducing delay and stop frequency on the major road and a reduction in overall intersection delay.				
General Qualities (Time, Cost and Effectiveness):				
Installation costs should be low and the time to implement short. Additional modifications to the traffic signal controller may also necessary. In general, This CM can be very effective and can be considered on a systematic approach. Video detection equipment is now available for this purpose, making installation and maintenance more efficient.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	39%

S05, Install emergency vehicle pre-emption systems

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Emergency Vehicle - only	70%	10 years
Notes:	This CM only applies to "E.V." crashes occurring on the approaches / influence area of the new pre-emption system.		

General information
Where to use:
Corridors that have a history of crashes involving emergency response vehicles. The target of this strategy is signalized intersections where normal traffic operations impede emergency vehicles and where traffic conditions create a potential for conflicts between emergency and nonemergency vehicles. These conflicts could lead to almost any type of crash, due to the potential for erratic maneuvers of vehicles moving out of the paths of emergency vehicles
Why it works:
Providing emergency vehicle preemption capability at a signal or along a corridor can be a highly effective strategy in two ways; any type of crash could occur as emergency vehicles try to navigate through intersections and as other vehicles try to maneuver out of the path of the emergency vehicles. In addition, a signal preemption system can decrease emergency vehicle response times therefore decreasing the time in receiving emergency medical attention, which is critical in the outcome of any crash. When data is not available for past crashes with emergency vehicles, an agency may consider combining the E.V. pre-emption improvements into a comprehensive project that also makes significant signal hardware and/or signal timing improvements.
General Qualities (Time, Cost and Effectiveness):
Costs for installation of a signal preemption system will vary from medium to high, based upon the number of signalized intersections at which preemption will be installed and the number of emergency vehicles to be outfitted with the technology. The number of detectors, a requirement for new signal controllers, and the intricacy of the preemption system could increase costs. This CM is considered systemic as it is usually implemented on a corridor-basis.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Emergency Vehicle - only	CRF:	70%

S06, Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	55%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new left turn lanes. This CM does NOT apply to converting a single-left into double-left turn.		

General information
Where to use:
Intersections that do not currently have a left turn lane or a related left-turn phase that are experiencing a large number of crashes. Many intersection safety problems can be traced to difficulties in accommodating left-turning vehicles, in particular where there is currently no accommodation for left turning traffic. A key strategy for minimizing collisions related to left-turning vehicles (angle, rear-end, sideswipe) is to provide exclusive left-turn lanes and the appropriate signal phasing, particularly on high-volume and high-speed major-road approaches. Agencies need to document their consideration of the MUTCD, Section 4D.19 guidelines; the section on implementing protected left-turn phases.
Why it works:
Left-turn lanes allow separation of left-turn and through-traffic streams, thus reducing the potential for rear-end collisions. Left-turn phasing also provides a safer opportunity for drivers to make a left-turn. The combination of left-turn storage and a left turn signal has the potential to reduce many collisions between left-turning vehicles and through vehicles and/or non-motorized road users.
General Qualities (Time, Cost and Effectiveness):
Implementation time may vary from months to years. At some locations, left-turn lanes can be quickly installed simply by restriping the roadway. At other locations, widening of the roadway, acquisition of additional right-of-way, and extensive environmental processes may be needed. Such projects require a substantial time for development and construction. Costs are highly variable and range from very low to high. Installing a protected left turn lane and phase where none exists results in a high Crash Reduction Factor and is often highly effective.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	17 - 58 %

S07, Provide protected left turn phase (left turn lane already exists)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	30%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new left turn phases. This CM does NOT apply to converting a single-left into double-left turn (unless the single left is unprotected and the proposed double left will be protected).		

General information				
Where to use:				
Signalized intersections (with existing left turns pockets) that currently have a permissive left-turn or no left-turn protection that have a high frequency of angle crashes involving left turning, opposing through vehicles, and non-motorized road users. A properly timed protected left-turn phase can also help reduce rear-end and sideswipe crashes between left-turning vehicles and the through vehicles as well as vehicles behind them. Protected left-turn phases are warranted based on such factors as turning volumes, delay, visibility, opposing vehicle speed, distance to travel through the intersection, presence of non-motorized road users, and safety experience of the intersections. Agencies need to document their consideration of the MUTCD, Section 4D.19 guidelines; the section on implementing protected left-turn phases.				
Why it works:				
Left turns are widely recognized as the highest-risk movements at signalized intersections. Providing Protected left-turn phases (i.e., the provision for a specific phase for a turning movement) for signalized intersections with existing left turn pockets significantly improve the safety for left-turn maneuvers by removing the need for the drivers to navigate through gaps in oncoming/opposing through vehicles. Where left turn pockets are not protected, the pedestrian and bicyclist crossing phase often conflicts with these left turn maneuvers. Drivers focused on navigating the gaps of oncoming cars may not anticipate and/or perceive the non-motorized road users.				
General Qualities (Time, Cost and Effectiveness):				
If the existing traffic signal only requires a minor modification to allow for a protected left-turn phase, then the cost would also be low. The time to implement this countermeasure is short because there is no actual construction that has to take place. In-house signal maintainers can perform this operation once the proper signal phasing is determined so the cost is low. In addition, the countermeasure is tried and proven to be effective. Has the potential of being applied on a systemic/systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Rear-End, Sideswipe, Broadside	CRF:	16 - 99%

S08, Convert signal to mast arm (from pedestal-mounted)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	30%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the converted signal heads that are relocated from median and/or outside shoulder pedestals to signal heads on master arms over the travel-lanes. Projects using CM "S7" should not also apply "S2" in the B/C calc.		

General information				
Where to use:				
Intersections currently controlled by pedestal mounted traffic signals (in medians and/or on outside shoulder) that have a high frequency of right-angle and rear-end crashes occurring because drivers are unable to see traffic signals in advance to safely negotiate the intersection. Intersections that have pedestal-mounted signals may have poor visibility and can result in vehicles not being able to stop in time for a signal change. Care should be taken to place the new signal heads (with back plates) as close to directly over the center of the travel lanes as possible.				
Why it works:				
Providing better visibility of intersection signs and signals aids the drivers' advance perception of the upcoming intersection. Visibility and clarity of the signal should be improved without creating additional confusion or distraction for drivers.				
General Qualities (Time, Cost and Effectiveness):				
Dependent on the scope of the project. Costs are generally moderate for this type of project. There is usually no right-of-way costs, minimal roadway reconstruction costs, and a shorter project development timeline. At the same time, new mast arms can be expensive. Some locations can result in high B/C ratios, but due to moderate costs, some locations may result in medium to low B/C ratios.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Rear-End, Angle	CRF:	12 - 74%

S09, Install raised pavement markers and striping (Through Intersection)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	10%	10 years
Notes:	This CM only applies to crashes occurring in the intersection and influence areas of the new pavement markers and/or markings.		

General information
Where to use:
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. Driver confusion can exist in regard to choosing the proper turn path or where through-lanes do not line up. This is especially relevant at intersections where the overall pavement area of the intersection is large, and multiple turning lanes are involved or other unfamiliar elements are presented to the driver.
Why it works:
Adding clear pavement markings can guide motorists through complex intersections. When drivers approach and traverse through complex intersections, drivers may be required to perform unusual or unexpected maneuvers. Providing more effective guidance through an intersection will minimize the likelihood of a vehicle leaving its appropriate lane and encroaching upon an adjacent lane.
General Qualities (Time, Cost and Effectiveness):
Costs of implementing this strategy will vary based on the scope and number of applications. Applying raised pavement markers is relatively low cost but can be variable and determined largely by the material used for pavement markings (paint, thermoplastic, epoxy, RPMs etc.). When using this type delineators, an issue of concern is the cost-to-service-life of the material. (Note: When HSIP safety funding is used for these installations in high-wear-locations, the local agency is expected to maintain the improvement for a minimum of 10 years.) When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Wet, Night, All	CRF:	10 - 33%

S10, Install flashing beacons as advance warning (S.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	30%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new flashing beacons.		

General information
Where to use:
At signalized intersections with crashes that are a result of drivers being unaware of the intersection or are unable to see the traffic control device in time to comply.
Why it works:
Increased driver awareness of an approaching signalized intersection and an increase in the driver's time to react. Driver awareness of both downstream intersections and traffic control devices is critical to intersection safety. Crashes often occur when the driver is unable to perceive an intersection, signal head or the back of a stopped queue in time to react. Advance flashing beacons can be used to supplement and call driver attention to intersection control signs. Most advance warning flashing beacons can be powered by solar, thus reducing the issues relating to power source.
General Qualities (Time, Cost and Effectiveness):
Before choosing this CM, the agency needs to confirm the ability to provide power to the site (solar may be an option). Flashing beacons can be constructed with minimal design, environmental and right-of-way issues and have relatively low costs. This combined with a relatively high CRF, can result in high B/Cs for locations with a history of crashes and lead to a high effectiveness.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Rear End, Angle	CRF:	36 - 62%

S11, Improve pavement friction (High Friction Surface Treatments)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	55%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the improved friction overlay. This CM is not intended to apply to standard chip-seal or open-graded maintenance projects for long segments of corridors or structure repaving projects intended to fix failed pavement.		

General information				
Where to use:				
Nationally, this countermeasure is referred to as "High Friction Surface Treatments" or HFST. Signalized Intersections noted as having crashes on wet pavements or under dry conditions when the pavement friction available is significantly less than needed for the actual roadway approach speeds. This treatment is intended to target locations where skidding and failure to stop is determined to be a problem in wet or dry conditions and the target vehicle is unable to stop due to insufficient skid resistance.				
Why it works:				
Improving the skid resistance at locations with high frequencies of wet-road crashes and/or failure to stop crashes can result in reductions of 50 percent for wet-road crashes and 20 percent for total crashes. Applying HFST can double friction numbers, e.g. low 40s to high 80s. This CM represents a special focus area for both FHWA and Caltrans, which means there are extra resources available for agencies interested in more details on High Friction Surface Treatment projects.				
General Qualities (Time, Cost and Effectiveness):				
This strategy can be relatively inexpensive and implemented in a short timeframe. The installation would be done by either agency personnel or contractors and can be done by hand or machine. In general, This CM can be very effective and can be considered on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Wet, Night, ALL	CRF:	10 - 62 %

S12, Install raised median on approaches (S.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	25%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new raised median. All new raised medians funded with HSIP funding must not include the removal of the existing roadway structural section and must be doweled into the existing roadway surface. This new requirement is being implemented to maximize the safety-effectiveness of the limited HSIP funding and to minimize project impacts.		

General information				
Where to use:				
Intersections noted as having turning movement crashes near the intersection as a result of insufficient access control. Application of this CM should be based on current crash data and a clearly defined need to restrict or accommodate the movement.				
Why it works:				
Raised medians next to left-turn lanes at intersections offer a cost-effective means for reducing crashes and improving operations at higher volume intersections. The raised medians prohibit left turns into and out of driveways that may be located too close to the functional area of the intersection.				
General Qualities (Time, Cost and Effectiveness):				
Raised medians at intersections may be most effective in retrofit situations where high volumes of turning vehicles have degraded operations and safety, and where more extensive CMs would be too expensive because of limited right-of-way and the constraints of the built environment. The result is This CM can be very effective and can be considered on a systematic approach. Raised medians can often be installed directly over the existing pavement. When agencies opt to install landscaping in conjunction with new raised medians, the portion of the cost for landscaping and other non-safety related items that exceeds 10% of the project total cost is not federally participated and must be funded by the applicant.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Angle	CRF:	21 -55 %

S13PB, Install pedestrian median fencing on approaches

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring on the approaches/influence area of the new pedestrian median fencing.		

General information				
Where to use:				
Signalized Intersections with high pedestrian-generators nearby (e.g. transit stops) may experience a high volumes of pedestrians J-walking across the travel lanes at mid-block locations instead of walking to the intersection and waiting to cross during the walk-phase. When this safety issue cannot be mitigated with signal timing and shoulder/sidewalk treatments, then installing a continuous pedestrian barrier in the median may be a viable solution.				
Why it works:				
Adding pedestrian median fencing has the opportunity to enhance pedestrian safety at locations noted as being problematic involving pedestrians running/darting across the roadway outside the intersection crossings. Pedestrian median fencing can significantly reduce this safety issue by creating a positive barrier, forcing pedestrians to the designated pedestrian crossing.				
General Qualities (Time, Cost and Effectiveness):				
Costs associated with this strategy will vary widely depending on the type and placement of the median fencing. Impacts to transit and other land uses may need to be considered and controversy can delay the implementation. In general, this CM can be effective as a spot-location approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	25- 40%

S14, Create directional median openings to allow (and restrict) left-turns and U-turns (S.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	50%	20 years
Notes:	This CM only applies to crashes occurring in the intersection / influence area of the new directional openings.		

General information				
Where to use:				
Crashes related to turning maneuvers include angle, rear-end, pedestrian, and sideswipe (involving opposing left turns) type crashes. If any of these crash types are an issue at an intersection, restriction or elimination of the turning maneuver may be the best way to improve the safety of the intersection.				
Why it works:				
Restricting turning movement into and out of an intersection can help reduce conflicts between through and turning traffic. The number of access points, coupled with the speed differential between vehicles traveling along the roadway, contributes to crashes. Affecting turning movements by either allowing them or restricting them, based on the application, can ensure safe movement of traffic.				
General Qualities (Time, Cost and Effectiveness):				
Turn prohibitions that are implemented by closing a median opening can be implemented quickly. The cost of this strategy will depend on the treatment. Impacts to businesses and other land uses must be considered and controversy can delay the implementation. In general, This CM can be very effective and can be considered on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	51%

S15, Reduced Left-Turn Conflict Intersections (S.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	50%	20 years
Notes:	This CM only applies to crashes occurring in the intersection / influence area of the new Reduced Left-Turn Conflict.		

General information

Where to use and Why it works:

Reduced left-turn conflict intersections are geometric designs that alter how left-turn movements occur in order to simplify decisions and minimize the potential for related crashes. Two highly effective designs that rely on U-turns to complete certain left-turn movements are known as the restricted crossing U-turn (RCUT) and the median U-turn (MUT).

Restricted Crossing U-turn (RCUT):

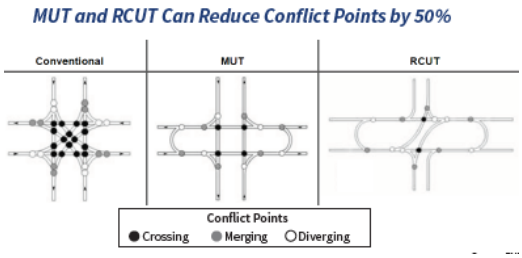
The RCUT intersection modifies the direct left-turn and through movements from cross-street approaches. Minor road traffic makes a right turn followed by a U-turn at a designated location (either signalized or unsignalized) to continue in the desired direction.

The RCUT is suitable for a variety of circumstances, including along rural, high-speed, four-lane, divided highways or signalized routes. It also can be used as an alternative to signalization or constructing an interchange. RCUTs work well when consistently used along a corridor, but also can be used effectively at individual intersections.

Median U-turn (MUT)

The MUT intersection modifies direct left turns from the major approaches. Vehicles proceed through the main intersection, make a U-turn a short distance downstream, followed by a right turn at the main intersection. The U-turns can also be used for modifying the cross-street left turns.

The MUT is an excellent choice for heavily traveled intersections with moderate left-turn volumes. When implemented at multiple intersections along a corridor, the efficient two-phase signal operation of the MUT can reduce delay, improve travel times, and create more crossing opportunities for pedestrians and bicyclists.



General Qualities (Time, Cost and Effectiveness):

Implementing this strategy may take from months to years, depending on whether additional R/W is required. Such projects require a substantial time for development and construction. Costs are highly variable and range from very low to high. The expected effectiveness of this CM must be assessed for each individual location.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Angle/Left-turn/Rear-End/All	CRF:	34.8-100%

S16, Convert intersection to roundabout (from signal)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	Varies	20 years
Notes:	This CM only applies to crashes occurring in influence area of the new roundabout. This CM is not intended for mini-roundabouts. The benefit of this CM is calculated using Caltrans procedure. The CRF is dependent on the ADT, project location (Rural/Urban) and the roundabout type (1 lane or 2 lanes). The benefit comes from both the reduction in the number and the severity of the crashes.		

General information				
Where to use:				
Signalized intersections that have a significant crash problem and the only alternative is to change the nature of the intersection itself. Roundabouts can also be very effective at intersections with complex geometry and intersections with frequent left-turn movements.				
Why it works:				
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. This helps keep the range of vehicle speed narrow, which helps reduce the severity of crashes when they do occur. Pedestrians only have to cross one direction of traffic at a time at roundabouts, thus reducing their potential for conflicts.				
General Qualities (Time, Cost and Effectiveness):				
Provision of a roundabout requires substantial project development. The need to acquire right-of-way is likely and will vary from site to site and depends upon the geometric design. These activities may require up to 4 years or longer to implement. Mini-roundabouts may be able to be built more expediently with signs and markings, but do not have the same CRFs as those shown in this CM. Costs are variable, but construction of a roundabout to replace an existing signalized intersection are relatively high. The result is this CM may have reduced relative-effectiveness compared to other CMs.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	35 - 67%

S17PB, Install pedestrian countdown signal heads

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	25%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the intersection/crossing with the new countdown heads.		

General information				
Where to use:				
Signals that have signalized pedestrian crossing with walk/don't walk indicators and where there have been pedestrian vs. vehicle crashes.				
Why it works:				
A pedestrian countdown signal contains a timer display and counts down the number of seconds left to finish crossing the street. Countdown signals can reassure pedestrians who are in the crosswalk when the flashing "DON'T WALK" interval appears that they still have time to finish crossing. Countdown signals begin counting down either when the "WALK" or when the flashing "DON'T WALK" interval appears and stop at the beginning of the steady "DON'T WALK" interval. These signals also have been shown to encourage more pedestrians to use the pushbutton rather than jaywalk.				
General Qualities (Time, Cost and Effectiveness):				
Costs and time of installation will vary based on the number of intersections included in this strategy and if it requires new signal controllers capable of accommodating the enhancement. When considered at a single location, these low cost improvements are usually funded through local funding by local crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	25%

S18PB, Install pedestrian crossing (S.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	25%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the intersection/crossing with the new crossing. This CM is not intended to be used for high-cost aesthetic enhancements to intersection crosswalks (i.e. stamped concrete or stamped asphalt).		

General information				
Where to use:				
Signalized Intersections with no marked crossing and pedestrian signal heads, where pedestrians are known to be crossing intersections that involve significant turning movements. They are especially important at intersections with (1) multiphase traffic signals, such as left-turn arrows and split phases, (2) school crossings, and (3) double-right or double-left turns. At signalized intersections, pedestrian crossings are often safer when the left turns have protected phases that do not overlap the pedestrian walk phase.				
Why it works:				
Adding pedestrian crossings has the opportunity to enhance pedestrian safety at locations noted as being problematic. Nearly one-third of all pedestrian-related crashes occur at or within 50 feet of an intersection. Of these, 30 percent may involve a turning vehicle. Another 22 percent of pedestrian crashes involve a pedestrian either running across the intersection or darting out in front of a vehicle whose view was blocked just prior to the impact. Finally, 16 percent of these intersection-related crashes occur because of a driver violation (e.g., failure to yield right-of-way). When agencies opt to install aesthetic enhancement to intersection crosswalks like stamped concrete/asphalt, the project design and construction costs can significantly increase. For HSIP applications, these costs must be accounted for in the B/C calculation, but these costs (over standard crosswalk markings) must be tracked separately and are not federally reimbursable and will increase the agency's local-funding share for the project costs.				
General Qualities (Time, Cost and Effectiveness):				
Costs associated with this strategy will vary widely, depending if curb ramps and sidewalk modifications are required with the crossing. When considered at a single location, these low cost improvements may be funded through local funding by local crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate to high cost projects that are appropriate to seek state or federal funding.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	25%

S19PB, Pedestrian Scramble

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	40%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the intersection with the new pedestrian crossing.		

General information				
Where to use:				
Pedestrian Scramble is a form of pedestrian "WALK" phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians/bicyclists to safely cross through the intersection in any direction, including diagonally. Pedestrian Scramble may be considered at signalized intersections with very high pedestrian/bicycle volumes, e.g. in an urban business district.				
Why it works:				
Pedestrian Scramble has been shown to reduce injury risk and increase bicycle ridership due to its perceived safety and comfort.				
General Qualities (Time, Cost and Effectiveness):				
Not involving any additional R/W, Pedestrian Scramble should not require a long development process and should be implemented reasonably soon. A systemic approach may be used in implementing this CM, resulting in cost efficiency with low to moderate cost.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	-10% to 51%

S20PB, Install advance stop bar before crosswalk (Bicycle Box)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	15%	10 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the intersection-crossing with the new advanced stop bars.		

General information
Where to use:
Signalized Intersections with a marked crossing, where significant bicycle and/or pedestrians volumes are known to occur.
Why it works:
Adding advance stop bar before the striped crosswalk has the opportunity to enhance both pedestrian and bicycle safety. Stopping cars well before the crosswalk provides a buffer between the vehicles and the crossing pedestrians. It also allows for a dedicated space for cyclists, making them more visible to drivers (This dedicated space is often referred to as a bike-box.)
General Qualities (Time, Cost and Effectiveness):
Costs and time of installation will vary based on the number of intersections included in this strategy and if it requires new signal controllers capable of accommodating the enhancement. When considered at a single location, these low cost improvements are usually funded through local funding by local crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	35%

S21PB, Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	60%	10 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the intersections with signalized pedestrian crossing with the newly implemented Leading Pedestrian Interval (LPI).		

General information
Where to use:
Intersections with signalized pedestrian crossing that have high turning vehicles volumes and have had pedestrian vs. vehicle crashes.
Why it works:
A leading pedestrian interval (LPI) 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. LPIs provide (1) increased visibility of crossing pedestrians; (2) reduced conflicts between pedestrians and vehicles; (3) Increased likelihood of motorists yielding to pedestrians; and (4) enhanced safety for pedestrians who may be slower to start into the intersection.
General Qualities (Time, Cost and Effectiveness):
Costs for implementing LPIs are very low, since only minor signal timing alteration is required. This makes it an easy and inexpensive countermeasure that can be incorporated into pedestrian safety action plans or policies and can become routine agency practice. When considered at a single location, the LPI is usually local-funded. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	59%

B.2 Intersection Countermeasures – Non-signalized

NS01, Add intersection lighting (NS.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Night	40%	20 years
Notes:	This CM only applies to "night" crashes (all types) occurring within limits of the proposed roadway lighting 'engineered' area.		

General information				
Where to use:				
Non-signalized intersections that have a disproportionate number of night-time crashes and do not currently provide lighting at the intersection or at its approaches. Crash data should be studied to ensure that safety at the intersection could be improved by providing lighting (this strategy would be supported by a significant number of crashes that occur at night).				
Why it works:				
Providing lighting at the intersection itself, or both at the intersection and on its approaches, improves the safety of an intersection during nighttime conditions by (1) making drivers more aware of the surroundings at an intersection, which improves drivers' perception-reaction times, (2) enhancing drivers' available sight distances, and (3) improving the visibility of non-motorists. Intersection lighting is of particular benefit to non-motorized users as lighting not only helps them navigate the intersection, but also helps drivers see them better.				
General Qualities (Time, Cost and Effectiveness):				
A lighting project can usually be completed relatively quickly, but generally requires at least 1 year to implement because the lighting system must be designed and the provision of electrical power must be arranged. The provision of lighting involves both a fixed cost for lighting installation and an ongoing maintenance and power cost. For rural intersections, studies have shown the installation of streetlights reduced nighttime crashes at unlit intersections and can be more effective in reducing nighttime crashes than either rumble strips or overhead flashing beacons. Some locations can result in high B/C ratios, but due to higher costs, these projects often result in medium to low B/C ratios.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Night, All	CRF:	25- 50%

NS02, Convert to all-way STOP control (from 2-way or Yield control)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	50%	10 years
Notes:	This CM only applies to crashes occurring in the intersection and/or influence area of the new control. CA-MUTCD warrant must be met.		

General information				
Where to use:				
Unsignalized intersection locations that have a crash history and have no controls on the major roadway approaches. However, all-way stop control is suitable only at intersections with moderate and relatively balanced volume levels on the intersection approaches. Under other conditions, the use of all-way stop control may create unnecessary delays and aggressive driver behavior. MUTCD warrants should always be followed.				
Why it works:				
All-way stop control can reduce right-angle and turning collisions at unsignalized intersections by providing more orderly movement at an intersection, reducing through and turning speeds, and minimizing the safety effect of any sight distance restrictions that may be present. Advance public notification of the change is critical in assuring compliance and reducing crashes.				
General Qualities (Time, Cost and Effectiveness):				
The costs involved in converting to all-way stop control are relatively low. All-way stop control can normally be implemented at multiple intersections with just a change in signing on intersection approaches, and typically are very quick to implement. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Left-turn, Angle	CRF:	6 - 80%

NS03, Install signals

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	30%	20 years
Notes:	This CM only applies to crashes occurring in the intersection and/or influence area of the new signals. **All new signals must meet MUTCD "safety" warrants: 4, 5 or 7.** Given the over-arching operational changes that occur when an intersection is signalized, no other intersection CMs can be applied to the intersection crashes in conjunction with this CM.		

General information				
Where to use:				
Traffic signals can be used to prevent the most severe type crashes (right-angle, left-turn). Consideration to signalize an unsignalized intersection should only be given after (1) less restrictive forms of traffic control have been utilized as the installation of a traffic signal often leads to an increased frequency of crashes (rear-end) on major roadways and introduces congestion and (2) signal warrants have been met. Refer to the CA MUTCD, Section 4C.01, Studies and Factors for Justifying Traffic Control Signals.				
Why it works:				
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.				
General Qualities (Time, Cost and Effectiveness):				
Typical traffic signal costs fall in the medium to high category and are affected by application, type of signal and right-of-away considerations. Projects of this magnitude should only be considered after alternate and lesser means of correction have been evaluated. Some locations can result in high B/C ratios, but due to higher costs, these projects often result in medium to low B/C ratios.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	0 - 74%

NS04, Convert intersection to roundabout (from all way stop)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	Varies	20 years
Notes:	This CM only applies to crashes occurring in the intersection and/or influence area of the new control. The benefit of this CM is calculated using Caltrans procedure. The CRF is dependent on the ADT, project location (Rural/Urban) and the roundabout type (1 lane or 2 lanes). The benefit comes from both the reduction in the number and the severity of the crashes.		

General information				
Where to use:				
Intersections that have a high frequency of right-angle and left-turn type crashes. Whether such intersections have existing crash patterns or not, a roundabout provides an alternative to signalization. The primary target locations for roundabouts should be moderate-volume unsignalized intersections. Roundabouts may not be a viable alternative in many suburban and urban settings where right-of-way is limited.				
Why it works:				
Roundabouts provide an important alternative to signalized and all-way stop-controlled intersections. Modern roundabouts differ from traditional traffic circles in that they operate in such a manner that traffic entering the roundabout must yield the right-of-way to traffic already in it. Roundabouts can serve moderate traffic volumes with less delay than all-way stop-controlled intersections and provide fewer conflict points. Crashes at roundabouts tend to be less severe because of the speed constraints and elimination of left-turn and right-angle movements.				
General Qualities (Time, Cost and Effectiveness):				
Construction of roundabouts are usually relatively costly and major projects, requiring the environmental process, right-of-way acquisition, and implementation under an agency's long-term capital improvement program. (For this reason, roundabouts may not be appropriate for California's Federal Safety Programs that have relatively short delivery requirements.) Even with roundabouts higher costs, they still can have a relatively high effectiveness.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Left-turn, Angle	CRF:	12 - 78 %

NS05, Convert intersection to roundabout (from 2-way stop or Yield control)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	Varies	20 years
Notes:	This CM only applies to crashes occurring in the intersection and/or influence area of the new control. The benefit of this CM is calculated using Caltrans procedure. The CRF is dependent on the ADT, project location (Rural/Urban) and the roundabout type (1 lane or 2 lanes). The benefit comes from both the reduction in the number and the severity of the crashes.		

General information				
Where to use:				
Intersections that have a high frequency of right-angle and left-turn type crashes. Whether such intersections have existing crash patterns or not, a roundabout provides an alternative to signalization. The primary target locations for roundabouts should be moderate-volume unsignalized intersections. Roundabouts may not be a viable alternative in many suburban and urban settings where right-of-way is limited.				
Why it works:				
Roundabouts provide an important alternative to signalized and all-way stop-controlled intersections. Modern roundabouts differ from traditional traffic circles in that they operate in such a manner that traffic entering the roundabout must yield the right-of-way to traffic already in it. Roundabouts can serve moderate traffic volumes with less delay than all-way stop-controlled intersections and provide fewer conflict points. Crashes at roundabouts tend to be less severe because of the speed constraints and elimination of left-turn and right-angle movements.				
General Qualities (Time, Cost and Effectiveness):				
Construction of roundabouts are usually relatively costly and major projects, requiring the environmental process, right-of-way acquisition, and implementation under an agency's long-term capital improvement program. (For this reason, roundabouts may not be appropriate for California's Federal Safety Programs that have relatively short delivery requirements.) Even with roundabouts higher costs, they still can have a relatively high effectiveness.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Left-turn, Angle	CRF:	12 - 78 %

NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	15%	10 years
Notes:	This CM only applies to crashes occurring in the influence area of the new signs. The influence area must be determined on a location by location basis.		

General information				
Where to use:				
The target for this strategy should be approaches to unsignalized intersections with patterns of rear-end, right-angle, or turning collisions related to lack of driver awareness of the presence of the intersection.				
Why it works:				
The visibility of intersections and, thus, the ability of approaching drivers to perceive them can be enhanced by installing larger regulatory and warning signs at or prior to intersections. A key to success in applying this strategy is to select a combination of regulatory and warning sign techniques appropriate for the conditions on a particular unsignalized intersection approach.				
General Qualities (Time, Cost and Effectiveness):				
Signing improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number of signs. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	11 - 55%

NS07, Upgrade intersection pavement markings (NS.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	25%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new pavement markings. This CM is not intended to be used for general maintenance activities (i.e. the replacement of existing pavement markings in-kind) and must include upgraded safety features over the existing pavement markings and striping.		

General information
Where to use:
Unsignalized intersections that are not clearly visible to approaching motorists, particularly approaching motorists on the major road. The strategy is particularly appropriate for intersections with patterns of rear-end, right-angle, or turning crashes related to lack of driver awareness of the presence of the intersection. Also at minor road approaches where conditions allow the stop bar to be seen by an approaching driver at a significant distance from the intersection. Typical improvements include "Stop Ahead" markings and the addition of Centerlines and Stop Bars.
Why it works:
The visibility of intersections and, thus, the ability of approaching drivers to perceive them can be enhanced by installing appropriate pavement delineation in advance of and at intersections will provide approaching motorists with additional information at these locations. Providing visible stop bars on minor road approaches to unsignalized intersections can help direct the attention of drivers to the presence of the intersection. Drivers should be more aware that the intersection is coming up, and therefore make safer decisions as they approach the intersection.
General Qualities (Time, Cost and Effectiveness):
Pavement marking improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number of markings. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding. Note: When federal safety funding is used for these installations in high-wear-locations, the local agency is expected to maintain the improvement for a minimum of 10 years.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	13 - 60%

NS08, Install Flashing Beacons at Stop-Controlled Intersections

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	15%	10 years
Notes:	This CM only applies to crashes occurring on the stop-controlled approaches / influence area of the new beacons.		

General information
Where to use:
Flashing beacons can reinforce driver awareness of the Non-Signalized intersection control and can help mitigate patterns of right-angle crashes related to stop sign violations. Post-mounted advanced flashing beacons or overhead flashing beacons can be used at stop-controlled intersections to supplement and call driver attention to stop signs.
Why it works:
Flashing beacons provide a visible signal to the presence of an intersection and can be very effective in rural areas where there may be long stretches between intersections as well as locations where night-time visibility of intersections is an issue.
General Qualities (Time, Cost and Effectiveness):
Flashing beacons can be constructed with minimal design, environmental and right-of-way issues and have relatively low costs. Before choosing this CM, the agency needs to confirm the ability to provide power to the site (solar may be an option). In general, This CM can be very effective and can be considered on a systematic approach.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Angle, Rear-End	CRF:	5-34%

NS09, Install flashing beacons as advance warning (NS.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	30%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new beacons placed in advance of the intersection.		

General information				
Where to use:				
Non-Signalized Intersections with patterns of crashes that could be related to lack of a driver's awareness of approaching intersection or controls at a downstream intersection.				
Why it works:				
Advance flashing beacons can be used to supplement and call driver attention to intersection control signs. Flashing beacons are intended to reinforce driver awareness of the stop or yield signs and to help mitigate patterns of crashes related to intersection regulatory sign violations. Most advance warning flashing beacons can be powered by solar, thus reducing the issues relating to power source.				
General Qualities (Time, Cost and Effectiveness):				
Use of flashing beacons requires minimal development process, allowing flashing beacons to be installed within a short time period. Before choosing this CM, the agency needs to confirm the ability to provide power to the site (solar may be an option). In general, This CM can be very effective and can be considered on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Angle, Rear-End	CRF:	36 - 62%

NS10, Install transverse rumble strips on approaches

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	20%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new rumble strips.		

General information				
Where to use:				
Transverse rumble strips are installed in the travel lane for the purposes of providing an auditory and tactile sensation for each motorist approaching the intersection. They can be used at any stop or yield approach intersection, often in combination with advance signing to warn of the intersection ahead. Due to the noise generated by vehicles driving over the rumble strips, care must be taken to minimize disruption to nearby residences and businesses.				
Why it works:				
When motorists are traveling along the roadway, they are sometimes unaware they are approaching an intersection. This is especially true on rural roads, as there may be fewer clues indicating an intersection ahead. Transverse rumble strips warn motorists that something unexpected is ahead that they need to pay attention to.				
General Qualities (Time, Cost and Effectiveness):				
Use of transverse rumble strips requires minimal development process, allowing transverse rumble strips to be installed within a short time period. In general, This CM can be very effective and can be considered on a systematic approach, although care should be taken to not over-use this CM. Note: When federal safety funding is used for these installations in high-wear-locations, the local agency is expected to maintain the improvement for a minimum of 10 years.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	0 - 35%

NS11, Improve sight distance to intersection (Clear Sight Triangles)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	20%	10 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the significantly improved new sight distance. Minor/incidental improvements to sight distance would not likely result in the CRF shown below.		

General information				
Where to use:				
Unsignalized intersections with restricted sight distance and patterns of crashes related to lack of sight distance where sight distance can be improved by clearing roadside obstructions without major reconstruction of the roadway.				
Why it works:				
Adequate sight distance for drivers at stop or yield-controlled approaches to intersections has long been recognized as among the most important factors contributing to overall safety at unsignalized intersections. By removing sight distance restrictions (e.g., vegetation, parked vehicles, signs, buildings) from the sight triangles at stop or yield-controlled intersection approaches, drivers will be able see approaching vehicles on the main line, without obstruction and therefore make better decisions about entering the intersection safely.				
General Qualities (Time, Cost and Effectiveness):				
Projects involving clearing sight obstructions on the highway right-of-way can typically be accomplished quickly, assuming the objects are readily moveable. Clearing sight obstructions on private property requires more time for discussions with the property owner. Costs will generally be low, assuming that in most cases the objects to be removed are within the right-of-way. In general, this CMs can be very effective and can be implemented by agencies' maintenance staff and/or implemented on a systematic approach. Usually only high-cost removals would be good candidates for Caltrans Federal Safety Funding. Note: When federal safety funding is used to remove vegetation that has the potential to grow back, the local agency is expected to maintain the improvement for a minimum of 10 years.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	11 - 56%

NS12, Improve pavement friction (High Friction Surface Treatments)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	55%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the improved friction overlay. This CM is not intended to apply to standard chip-seal or open-graded maintenance projects for long segments of corridors or structure repaving projects intended to fix failed pavement.		

General information				
Where to use:				
Nationally, this countermeasure is referred to as "High Friction Surface Treatments" or HFST. Non-signalized Intersections noted as having crashes on wet pavements or under dry conditions when the pavement friction available is significantly less than needed for the actual roadway approach speeds. This treatment is intended to target locations where skidding and failure to stop is determined to be a problem in wet or dry conditions and the target vehicle is unable to stop due to insufficient skid resistance.				
Why it works:				
Improving the skid resistance at locations with high frequencies of wet-road crashes and/or failure to stop crashes can result in reductions of 50 percent for wet-road crashes and 20 percent for total crashes. Applying HFST can double friction numbers, e.g. low 40s to high 80s. This CM represents a special focus area for both FHWA and Caltrans, which means there are extra resources available for agencies interested in more details on High Friction Surface Treatment projects.				
General Qualities (Time, Cost and Effectiveness):				
This strategy can be relatively inexpensive and implemented in a short timeframe. The installation would be done by either agency personnel or contractors and can be done by hand or machine. In general, This CM can be very effective and can be considered on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Wet, Night, ALL	CRF:	10 - 62 %

NS13, Install splitter-islands on the minor road approaches

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	40%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of **the new splitter island on the minor road approaches.**		

General information
Where to use:
Minor road approaches to unsignalized intersections where the presence of the intersection or the stop sign is not readily visible to approaching motorists. The strategy is particularly appropriate for intersections where the speeds on the minor road are high. In creation of a splitter island allows for an additional stop sign to be placed in the median for the minor approach.
Why it works:
The installation of splitter islands allows for the addition of a stop sign in the median to make the intersection more conspicuous. Additionally, the splitter island on the minor-road provides for a positive separation between turning vehicles on the through road and vehicles stopped on the minor road approach.
General Qualities (Time, Cost and Effectiveness):
Splitter islands at non-signalized intersections can usually be installed with minimal roadway reconstruction and relatively quickly. In general, This CM can be very effective and can be considered on a systematic approach.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Angle, Rear-End	CRF:	35 - 100 %

NS14, Install raised median on approaches (NS.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	25%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new raised median. All new raised medians funded with federal HSIP funding must not include the removal of the existing roadway structural section and must be doweled into the existing roadway surface. This new requirement is being implemented to maximize the safety-effectiveness of the limited HSIP funding and to minimize project impacts.		

General information
Where to use:
Where related or nearby turning movements affect the safety and operation of an intersection. Effective access management is key to improving safety at, and adjacent to, intersections. The number of intersection access points coupled with the speed differential between vehicles traveling along the roadway often contributes to crashes. Any access points within 250 feet upstream and downstream of an intersection are generally undesirable.
Why it works:
Raised medians with left-turn lanes at intersections offer a cost-effective means for reducing crashes and improving operations at higher volume intersections. The raised medians also prohibit left turns into and out of driveways that may be located too close to the functional area of the intersection.
General Qualities (Time, Cost and Effectiveness):
Raised medians at intersections may be most effective in retrofit situations where high volumes of turning vehicles have degraded operations and safety, and where more extensive approaches would be too expensive because of limited right-of-way and the constraints of the built environment. Because raised medians limit property access to right turns only, the need for providing alternative access ways should be considered. In general, This CM can be very effective and can be considered on a systematic approach. When agencies opt to install landscaping in conjunction with new raised medians, the portion of the cost for landscaping and other non-safety related items that exceeds 10% of the project total cost is not federally participated and must be funded by the applicant.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	20 - 39 %

NS15, Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	50%	20 years
Notes:	This CM only applies to crashes occurring in the intersection / influence area of the new directional openings.		

General information				
Where to use:				
Crashes related to turning maneuvers include angle, rear-end, pedestrian, and sideswipe (involving opposing left turns) type crashes. If any of these crash types are an issue at an intersection, restriction or elimination of the turning maneuver may be the best way to improve the safety of the intersection. Because raised medians limit property access to right turns only, they should be used in conjunction with efforts to provide alternative access ways and promote driveway spacing objectives.				
Why it works:				
Agencies are increasingly using access management techniques on urban and suburban arterials to manage the number of conflicts experienced at an intersection. A key element of access management is to restrict certain movements, create directional median openings, or close median openings that are deemed too close to an intersection.				
General Qualities (Time, Cost and Effectiveness):				
Turn prohibitions that are implemented by closing a median opening can usually be implemented quickly. Costs are highly variable but in many cases could be considered low. In some cases this strategy may involve acquiring access or constructing replacement access; those actions will significantly increase the cost of the project. Impacts to businesses and other land uses must be considered and controversy can delay the implementation. In general, This CM can be very effective and can be considered on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	51%

NS16, Reduced Left-Turn Conflict Intersections (NS.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	50%	20 years
Notes:	This CM only applies to crashes occurring in the intersection / influence area of the new Reduced Left-Turn Conflict.		

General information

Where to use and Why it works:

Reduced left-turn conflict intersections are geometric designs that alter how left-turn movements occur in order to simplify decisions and minimize the potential for related crashes. Two highly effective designs that rely on U-turns to complete certain left-turn movements are known as the restricted crossing U-turn (RCUT) and the median U-turn (MUT).

Restricted Crossing U-turn (RCUT):

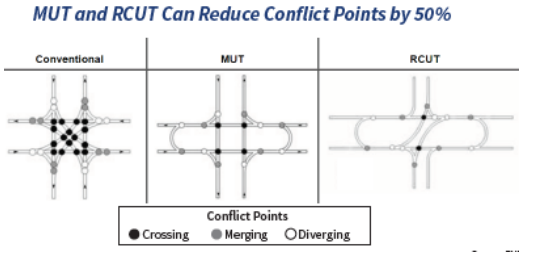
The RCUT intersection modifies the direct left-turn and through movements from cross-street approaches. Minor road traffic makes a right turn followed by a U-turn at a designated location (either signalized or unsignalized) to continue in the desired direction.

The RCUT is suitable for a variety of circumstances, including along rural, high-speed, four-lane, divided highways or signalized routes. It also can be used as an alternative to signalization or constructing an interchange. RCUTs work well when consistently used along a corridor, but also can be used effectively at individual intersections.

Median U-turn (MUT)

The MUT intersection modifies direct left turns from the major approaches. Vehicles proceed through the main intersection, make a U-turn a short distance downstream, followed by a right turn at the main intersection. The U-turns can also be used for modifying the cross-street left turns.

The MUT is an excellent choice for heavily traveled intersections with moderate left-turn volumes. When implemented at multiple intersections along a corridor, the efficient two-phase signal operation of the MUT can reduce delay, improve travel times, and create more crossing opportunities for pedestrians and bicyclists.



General Qualities (Time, Cost and Effectiveness):

Implementing this strategy may take from months to years, depending on whether additional R/W is required. Such projects require a substantial time for development and construction. Costs are highly variable and range from very low to high. The expected effectiveness of this CM must be assessed for each individual location.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Angle/Left-turn/Rear-End/All	CRF:	34.8-100%

NS17, Install right-turn lane (NS.I.)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	20%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new right-turn lanes. This CM is not eligible for use at existing all-way stop intersections.		

General information				
Where to use:				
Many collisions at unsignalized intersections are related to right-turn maneuvers. A key strategy for minimizing such collisions is to provide exclusive right-turn lanes, particularly on high-volume and high-speed major-road approaches. When considering new right-turn lanes, potential impacts to non-motorized users should be considered and mitigated as appropriate. When considering new right-turn lanes, potential impacts to non-motorized users should be considered and mitigated as appropriate.				
Why it works:				
The strategy is targeted to reduce the frequency of rear-end collisions resulting from conflicts between vehicles turning right and following vehicles and vehicles turning right and through vehicles coming from the left on the cross street. Right-turn lanes also remove slow vehicles that are decelerating to turn right from the through-traffic stream, thus reducing the potential for rear-end collisions. Right-turn lanes can increase the length of the intersection crossing and create an additional potential conflict point for non-motorized users.				
General Qualities (Time, Cost and Effectiveness):				
Implementing this strategy may take from months to years. At some locations, right-turn lanes can be quickly and simply installed by restriping the roadway. At other locations, widening of the roadway, acquisition of additional right-of-way, and extensive environmental processes may be needed. Such projects require a substantial time for development and construction. Costs are highly variable and range from very low to high. The expected effectiveness of this CM must be assessed for each individual location.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	14 - 26 %

NS18, Install left-turn lane (where no left-turn lane exists)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	35%	20 years
Notes:	This CM only applies to crashes occurring on the approaches / influence area of the new left-turn lanes. This CM does NOT apply to converting a single-left into double-left turn. This CM is not eligible for use at existing all-way stop intersections.		

General information				
Where to use:				
Many collisions at unsignalized intersections are related to left-turn maneuvers. A key strategy for minimizing such collisions is to provide exclusive left-turn lanes, particularly on high-volume and high-speed major-road approaches. When considering new left-turn lanes, potential impacts to non-motorized users should be considered and mitigated as appropriate.				
Why it works:				
Adding left-turn lanes remove vehicles waiting to turn left from the through-traffic stream, thus reducing the potential for rear-end collisions. Because they provide a sheltered location for drivers to wait for a gap in opposing traffic, left-turn lanes may encourage drivers to be more selective in choosing a gap to complete the left-turn maneuver. This strategy may reduce the potential for collisions between left-turn and opposing through vehicles.				
General Qualities (Time, Cost and Effectiveness):				
Implementing this strategy may take from months to years. At some locations, left-turn lanes can be quickly and simply installed by restriping the roadway. At other locations, widening of the roadway, acquisition of additional right-of-way, and extensive environmental processes may be needed. Such projects require a substantial time for development and construction. Costs are highly variable and range from very low to high. The expected effectiveness of this CM must be assessed for each individual location.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	9 -55 %

NS19PB, Install raised medians (refuge islands)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	45%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the crossing with the new islands. All new raised medians funded with federal HSIP funding must not include the removal of the existing roadway structural section and must be doweled into the existing roadway surface. This new requirement is being implemented to maximize the safety-effectiveness of the limited HSIP funding and to minimize project impacts.		

General information
Where to use:
Intersections that have a long pedestrian crossing distance, a higher number of pedestrians, or a crash history. Raised medians decrease the level of exposure for pedestrians and allow pedestrians to concentrate on (or cross) only one direction of traffic at a time.
Why it works:
Raised pedestrian refuge islands, or medians at crossing locations along roadways, are another strategy to reduce exposure between pedestrians and motor vehicles. Refuge islands and medians that are raised (i.e., not just painted) provide pedestrians more secure places of refuge during the street crossing. They can stop partway across the street and wait for an adequate gap in traffic before completing their crossing.
General Qualities (Time, Cost and Effectiveness):
Median and pedestrian refuge areas are a low-cost countermeasure to implement. This cost can be applied to retrofit improvements or if it is a new construction project, implementing this countermeasure is even more cost-effective. In general, This CM can be very effective and can be considered on a systematic approach. When agencies opt to install landscaping in conjunction with new raised medians, the portion of the cost for landscaping and other non-safety related items that exceeds 10% of the project total cost is not federally participated and must be funded by the applicant.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian and Bicycle	CRF:	30 - 56 %

NS20PB, Install pedestrian crossing at uncontrolled locations (signs and markings only)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	25%	10 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the intersection/crossing with the new crossing. This CM is not intended to be used for high-cost aesthetic enhancements to intersection crosswalks (i.e. stamped concrete or stamped asphalt).		

General information
Where to use:
Non-signalized intersections without a marked crossing, where pedestrians are known to be crossing intersections that involve significant vehicular traffic. They are especially important at school crossings and intersections with right and/or left turns pockets. See Zegeer study (Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations) for additional guidance regarding when to install a marked crosswalk.
Why it works:
Adding pedestrian crossings has the opportunity to enhance pedestrian safety at locations noted as being problematic. Pavement markings delineate a portion of the roadway that is designated for pedestrian crossing. These markings will often be different for controlled verses uncontrolled locations. The use of "ladder", "zebra" or other enhanced markings at uncontrolled crossings can increase both pedestrian and driver awareness to the increased exposure at the crossing. Incorporating advanced "stop" or “yield" markings provides an extra safety buffer and can be effective in reducing the 'multiple-threat' danger to pedestrians. Nearly one-third of all pedestrian-related crashes occur at or within 50 feet of an intersection. Of these, 30 percent may involve a turning vehicle. There are several types of pedestrian crosswalks, including: continental, ladder, zebra, and standard. When agencies opt to install aesthetic enhancement to intersection crosswalks like stamped concrete/asphalt, the project design and construction costs can significantly increase. For HSIP applications, these costs must be accounted for in the B/C calculation, but these costs (over standard crosswalk markings) must be tracked separately and are not federally reimbursable and will increase the agency's local-funding share for the project costs.
General Qualities (Time, Cost and Effectiveness):
Costs associated with this strategy will vary widely, depending upon if curb ramps and sidewalk modifications are required with the crossing. When considered at a single location, these low cost improvements are usually funded through local funding by local crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian and Bicycle	CRF:	25 %

NS21PB, Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the new crossing (influence area) with enhanced safety features. This CM is not intended to be used for high-cost aesthetic enhancements to intersection crosswalks (i.e. stamped concrete or stamped asphalt).		

General information
Where to use:
Non-signalized intersections where pedestrians are known to be crossing intersections that involve significant vehicular traffic. They are especially important at school crossings and intersections with turn pockets. Based on the Zegeer study (Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations) at many locations, a marked crosswalk alone may not be sufficient to adequately protect non-motorized users. In these cases, **flashing beacons, curb extensions, advanced "stop" or "yield" markings, and other safety features** should be added to complement the standard crossing elements.
Why it works:
Adding pedestrian crossings that include enhances safety features has the opportunity to enhance pedestrian safety at locations noted as being especially problematic. The enhanced safety elements help delineate a portion of the roadway that is designated for pedestrian crossing. Incorporating advanced "yield" markings provide an extra safety buffer and can be effective in reducing the 'multiple-threat' danger to pedestrians. Nearly one-third of all pedestrian-related crashes occur at or within 50 feet of an intersection. When agencies opt to install aesthetic enhancement to intersection crosswalks like stamped concrete/asphalt, the project design and construction costs can significantly increase. For HSIP applications, these costs must be accounted for in the B/C calculation, but these costs (over standard crosswalk markings) must be tracked separately and are not federally reimbursable and will increase the agency's local-funding share for the project costs.
General Qualities (Time, Cost and Effectiveness):
Costs associated with this strategy will vary widely, depending upon the types of enhanced features that will be combined with the standard crossing improvements. The need for new curb ramps and sidewalk modifications will also be a factor. This CM may be effectively and efficiently implemented using a systematic approach with more than one location and can have relatively high B/C ratios based on past non-motorized crash history.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian and Bicycle	CRF:	37%

NS22PB, Install Rectangular Rapid Flashing Beacon (RRFB)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the influence area (expected to be a maximum of within 250') of the crossing which includes the RRFB.		

General information
Where to use:
Rectangular Rapid Flashing Beacon (RRFB) includes pedestrian-activated flashing lights and additional signage that enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings. It uses an irregular flash pattern that is similar to emergency flashers on police vehicles. RRFBs are installed at unsignalized intersections and mid-block pedestrian crossings.
Why it works:
RRFBs can enhance safety by increasing driver awareness of potential pedestrian conflicts and reducing crashes between vehicles and pedestrians at unsignalized intersections and mid-block pedestrian crossings. The addition of RRFB may also increase the safety effectiveness of other treatments, such as crossing warning signs and markings.
General Qualities (Time, Cost and Effectiveness):
RRFBs are a lower cost alternative to traffic signals and hybrid signals. This CM can often be effectively and efficiently implemented using a systematic approach with numerous locations.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	7 – 47.4%

NS23PB, Install Pedestrian Signal (including Pedestrian Hybrid Beacon (HAWK))

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	55%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the intersection/crossing with the new signal.		

General information				
Where to use:				
Intersections noted as having a history of pedestrian vs. vehicle crashes and in areas where the likelihood of the pedestrian presence is high. Corridors should also be assessed to determine if there are adequate safe opportunities for non-motorists to cross and if a pedestrian signal, or a Pedestrian Hybrid Beacon (PHB) (also called High-Intensity Activated crossWalK beacon (HAWK)) are needed to provide an active warning to motorists when a pedestrian is in the crosswalk.				
Why it works:				
Adding a pedestrian signal has the opportunity to greatly enhance pedestrian safety at locations noted as being problematic. Nearly one-third of all pedestrian-related crashes occur at or within 50 feet of an intersection. In combination with this CM, better guidance signs and markings for non-motorized and motorized roadway users should be considered, including: sign and markings directing pedestrians and cyclists on appropriate/legal travel paths and signs and markings warning motorists of non-motorized uses of the roadway that should be expected.				
General Qualities (Time, Cost and Effectiveness):				
The cost of improvements are generally high, but can vary dependent on the type of signal and overall scope of the project. In most cases the project duration can be short. The expected effectiveness of this CM must be assessed for each individual location.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian and Bicycle	CRF:	15 - 69%

B.3 Roadway Countermeasures

R01, Add Segment Lighting

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Night	35%	20 years
Notes:	This CM only applies to "night" crashes (all types) occurring within limits of the proposed roadway lighting 'engineered' area.		

General information				
Where to use:				
Where to use: Noted substantial patterns of nighttime crashes. In particular, patterns of rear-end, right-angle, turning or roadway departure collisions on the roadways may indicate that night-time drivers can be unaware of the roadway characteristics.				
Why it works:				
Providing roadway lighting improves the safety during nighttime conditions by (1) making drivers more aware of the surroundings, which improves drivers' perception-reaction times, (2) enhancing drivers' available sight distances to perceive roadway characteristic in advance of the change, and (3) improving non-motorist's visibility and navigation.				
General Qualities (Time, Cost and Effectiveness):				
It expected that projects of this type may be constructed in a year or two and are relatively costly. There are several types of costs associated with providing lighting, including the cost of providing a permanent source of power to the location, the cost for the luminaire supports (i.e., poles), and the cost for routinely replacing the bulbs and maintenance of the luminaire supports. Some locations can result in high B/C ratios, but due to higher costs, these projects often result in medium to low B/C ratios.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Night, All	CRF:	18 - 69 %

R02, Remove or relocate fixed objects outside of Clear Recovery Zone

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	35%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new clear recovery zone (per Caltrans' HDM).		

General information				
Where to use:				
Known locations or roadway segments prone to collisions with fixed objects such as utility poles, drainage structures, trees, and other fixed objects, such as the outside of a curve, end of lane drops, and in traffic islands. A clear recovery zone should be developed on every roadway, as space is available. In situations where public right-of-way is limited, steps should be taken to request assistance from property owners, as appropriate.				
Why it works:				
While this strategy does not prevent the vehicle leaving the roadway, it does provide a mechanism to reduce the severity of a resulting crash. A clear zone is an unobstructed, traversable roadside area that allows a driver to stop safely or regain control of a vehicle that has left the roadway. Removing or moving fixed objects, flattening slopes, or providing recovery areas reduces the likelihood of a crash.				
General Qualities (Time, Cost and Effectiveness):				
Projects involving removing fixed objects from highway right-of-way can typically be accomplished quickly, assuming the objects are readily moveable. Clearing objects on private property requires more time for discussions with the property owner. Costs will generally be low, assuming that in most cases the objects to be removed are within the right-of-way. This CMs can be very effective and can be implemented by agencies' maintenance staff and/or implemented on a systematic approach. High-cost removals or removals implemented using a systematic approach would be good candidates for Caltrans Federal Safety Funding.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Fixed Object	CRF:	17 - 100 %

R03, Install Median Barrier

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	25%	20 years
Notes:	Note: For Caltrans' statewide Calls-for-Projects, this CM only applies to crashes occurring within the limits of the new barrier.		

General information
Where to use:
Areas where crash history indicates drivers are unintentionally crossing the median and the cross-overs are resulting in high severity crashes. The installation of median barriers can increase the number of PDO and non-severe injuries. The net result in safety from this countermeasure is connected more to reducing the severity of crashes not the number of crashes. It is recommended to review the warrants as outlined in Chapter 7 of the Caltrans Traffic Manual when considering whether to install median barriers.
Why it works:
This strategy is designed to prevent head-on collisions by providing a barrier between opposing lanes of traffic. The variety of median barriers available makes it easier to choose a site-specific solution. The main advantage is the reduction of the severity of the crashes. The key to success would be in selecting an appropriate barrier based on the site, previous crash history, maintenance needs, and median width.
General Qualities (Time, Cost and Effectiveness):
This strategy would in many cases be possible to implement within a short period after site selection. Costs will vary depending on the type of median barrier selected and whether the strategy is implemented as a stand-alone project or incorporated as part of a reconstruction or resurfacing effort. Maintenance costs and worker exposure will also vary depending on the type of barrier selected. The expected effectiveness of this CM must be assessed for each individual location.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Head-on	CRF:	0 - 94 %

R04, Install Guardrail

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	25%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new guardrail. This CM is not intended to be used for general maintenance activities (i.e. the replacement of existing damaged rail). For projects proposing to upgrade existing guardrail to current standards, this CM and corresponding CRF should only be applied to locations where past crash data or engineering judgment applied to the existing rail conditions suggests the upgraded guardrail may result in fewer or less severe crashes (justifying the use of the 25% CRF for this CM).		

General information
Where to use:
Guardrail is installed to reduce the severity of lane departure crashes. However, guardrail can reduce crash severity only for those conditions where striking the guardrail is less severe than going down an embankment or striking a fixed object. Guardrail should only be installed where it is clear that crash severity will be reduced, or there is a history of run-off-the-road crashes at a given location that have resulted in severe crashes. New and upgraded guardrail and end-treatments must meet current safety standards; see Method for Assessing Safety Hardware (MASH) for more information. Caltrans (or other national accepted guidance) slope/height criteria need to be considered and documented.
Why it works:
Guardrail redirects a vehicle away from embankment slopes or fixed objects and dissipates the energy of an errant vehicle.
General Qualities (Time, Cost and Effectiveness):
Strategies range from relatively inexpensive too costly. Costly projects may include those that upgrade existing guardrail applications to more semi-rigid and rigid barrier systems over extended distances. In general, this CMs can be effective and can be implemented by agencies' maintenance staff and/or implemented on a systematic approach.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Fixed Object, Run-off Road	CRF:	11 - 78 %

R05, Install impact attenuators

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	25%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the new attenuators. This CM is not intended to be used for general maintenance activities (i.e. the replacement of existing damaged attenuators). For projects proposing to upgrade existing attenuators to current standards, this CM and corresponding CRF should only be applied to locations where past crash data or engineering judgment applied to the existing attenuator conditions suggests the upgraded attenuators may result in fewer or less severe crashes (justifying the use of the 25% CRF for this CM).		

General information				
Where to use:				
Impact attenuators are typically used to shield rigid roadside objects such as concrete barrier ends, steel guardrail ends and bridge pillars from oncoming automobiles. Attenuators should only be installed where it is impractical for the objects to be removed. New and upgraded barrier end-treatments must meet current safety standards; see MASH for more information.				
Why it works:				
Attenuators bring an errant vehicle to a more-controlled stop or redirect the vehicle away from a rigid object. Attenuators are effective at absorbing impact energy and increasing occupant safety. They also tend to draw attention to the fixed object, which helps drivers steer clear of the fixed objects.				
General Qualities (Time, Cost and Effectiveness):				
Costs depending on the scope of the project, type(s) used, and associated ongoing maintenance costs. Time to install is fairly quick once site is identified.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Fixed Object, Run-off Road	CRF:	5 - 50 %

R06, Flatten side slopes

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	30%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new side slopes. Minor/incidental flattening of side slopes would not likely result in the CRF shown below and may not be appropriate for use in Caltrans B/C calculations.		

General information				
Where to use:				
Roadways experiencing frequent lane departure crashes that result in roll-over type crashes as a result of the roadway slope being so severe as to not accommodate a reasonable degree of driver correction. When there is a need to reduce the severity of lane departure crashes without installing a barrier system that could result in increased numbers of crashes.				
Why it works:				
Flattened slopes provide a greater area for a driver to regain control of a vehicle. Steep slopes, ditches or unprotected hazardous drops-offs adjacent to a travel lane offer little opportunities to correct an inappropriate action by a driver and can result in sever crashes.				
General Qualities (Time, Cost and Effectiveness):				
Roadside modifications range from relatively inexpensive to very costly. Strategies that include creating safer side slopes where none exists can be moderately expensive based on the scope of the project and the associated clearing, grading, etc. The potential for high environmental and right-of-way impacts is high which can take several years to clear. In other cases This CM can be effective and can be implemented by agencies' maintenance staff and/or implemented on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Fixed Object, Run-off Road	CRF:	5 - 62 %

R07, Flatten side slopes and remove guardrail

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	40%	20 years
Notes:	This CM only applies to crashes occurring within the limits of both the removed guardrail and the new side slopes.		

General information
Where to use:
Locations where high number of crashes originate as a lane departure and result in collision with guardrail or a fixed object located on the side slope shielded by guardrail. The guardrail may or may not meet current standards. Even though guardrails are generally installed to reduce the severity of departure crashes, they still can result in severe crashes in some locations.
Why it works:
Flattened side slopes and an unobstructed clear zone provide a greater area for a driver to regain control of a vehicle. The existing guardrail may help protect the steep slopes, fixed objects, or unprotected hazardous drops-offs adjacent to a travel lane, but removing all of these obstacles generally improves safety.
General Qualities (Time, Cost and Effectiveness):
Roadside modifications range from relatively inexpensive to very costly. Strategies that include creating safer side slopes where none exists can be moderately expensive based on the scope of the project and the associated clearing, grading, etc. The potential for high environmental and right-of-way impacts is high which can take several years to clear.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Roll Over, Fixed Object	CRF:	42%

R08, Install raised median

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	25%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new raised median. All new raised medians funded with federal HSIP funding must not include the removal of the existing roadway structural section and must be doweled into the existing roadway surface. This new requirement is being implemented to maximize the safety-effectiveness of the limited HSIP funding and to minimize project impacts.		

General information
Where to use:
Areas experiencing head-on collisions that may be affected by both the number of vehicles that cross the centerline and by the speed of oncoming vehicles. Installing a raised median is a more restrictive approach in that it represents a more rigid barrier between opposing traffic. Application of raised medians on roadways with higher speeds is not advised - instead a median barrier should be considered. Including landscaping in new raised medians can be counterproductive to the HSIP safety goals and should only be done in ways that do not increase drivers' exposure to fixed objects and that will maintain driver's sight distance needs throughout the life of the proposed landscaping. **Agencies need to consider and document impacts of additional turning movements at nearby intersections.**
Why it works:
Adding raised medians is a particularly effective strategy as it adds to or reallocates the existing cross section to incorporate a buffer between the opposing travel lanes and reinforces the limits of the travel lane. Raised median may also be used to limit unsafe turning movements along a roadway.
General Qualities (Time, Cost and Effectiveness):
In some cases this strategy may be a retrofit into the existing roadway by utilizing a portion of the existing paved shoulder. These raised medians can be installed directly over the existing pavement. Cost and time to implement could significantly increase if the paved area is not sufficient to include a median. The surface treatment of the raised median also significantly affects their cost-effectiveness: standard concrete or other hardscape surfaces are usually more cost effective than landscaped medians. When agencies opt to install landscaping in conjunction with new raised medians, the project design and construction costs can significantly increase due to excavation, backfill/top-soil, water-connection, irrigation, planting, maintenance needed for the landscaping. When agencies opt to install landscaping in conjunction with new raised medians, the portion of the cost for landscaping and other non-safety related items that exceeds 10% of the project total cost is not federally participated and must be funded by the applicant.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Head-on	CRF:	20 - 75 %

R09, Install median (flush)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	15%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new flush median. The new median must be a minimum of 4 feet wide (or "wider" if a narrow median exists before the proposed project).		

General information				
Where to use:				
Areas experiencing head-on collisions that may be affected by both the number of vehicles that cross the centerline and by the speed of oncoming vehicles. Roadways with oversized lanes offer an opportunity to restripe the roadway to reduce the lanes to standard widths and use the extra width for the median.				
Why it works:				
Adding medians is a particularly effective strategy as it adds to or reallocates the existing cross section to incorporate a narrow buffer median between opposing flows, thereby providing a greater opportunity to correct an errant maneuver and further reinforce the limits of the travel lane. Application widths can vary based on the available cross section and intended application. Additional safety can be provided by combining this CM with rumble strips.				
General Qualities (Time, Cost and Effectiveness):				
In some cases this strategy may be retrofitted into the existing roadway by utilizing a portion of the existing paved shoulder and can ultimately be as simple as restriping the roadway. Costs and time to implement could significantly increase if the paved area is not sufficient to include a median.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	15 - 78 %

R10PB, Install pedestrian median fencing

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring on the approaches/influence area of the new pedestrian median fencing.		

General information				
Where to use:				
Roadway segments with high pedestrian-generators and pedestrian-destinations nearby (e.g. transit stops) may experience a high volume of pedestrians J-walking across the travel lanes at mid-block locations instead of walking to the nearest intersection or designated mid-block crossing. When this safety issue cannot be mitigated with shoulder, sidewalk and/or crossing treatments, then installing a continuous pedestrian barrier in the median may be a viable solution.				
Why it works:				
Adding pedestrian median fencing has the opportunity to enhance pedestrian safety at locations noted as being problematic involving pedestrians running/darting across the roadway outside designated pedestrian crossings. Pedestrian median fencing can significantly reduce this safety issue by creating a positive barrier, forcing pedestrians to the designated pedestrian crossing.				
General Qualities (Time, Cost and Effectiveness):				
Costs associated with this strategy will vary widely depending on the type and placement of the median fencing. Impacts to transit and other land uses may need to be considered and controversy can delay the implementation. In general, this CM can be effective as a spot-location approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	25 - 40%

R11, Install acceleration/ deceleration lanes

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	25%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new accel/decel lanes on high speed roadways. Significant improvements to the merge length for lane-drop locations is also an acceptable use of this CM.		

General information				
Where to use:				
Areas proven to have crashes that are the result of drivers not being able to turn onto a high speed roadway to accelerate until the desired roadway speed is reached and areas that do not provide the opportunity to safety decelerate to negotiate a turning movement. This CM can also be used to improve the safety of merging vehicles at a lane-drop location.				
Why it works:				
A lane that does not provide enough deceleration length and storage space for turning traffic may cause the turn queue to back up into the adjacent through lane. This can contribute to rear-end and sideswipe crashes. An acceleration lane is an auxiliary or speed-change lane that allows vehicles to accelerate to highway speeds (high speed roadways) before entering the through-traffic lanes of a highway. Additionally, if acceleration by entering traffic takes place directly on the traveled way, it may disrupt the flow of through-traffic and cause rear-end and sideswipe collisions.				
General Qualities (Time, Cost and Effectiveness):				
Costs are highly variable. Where sufficient median or shoulder space exists it may be possible to provide acceleration/deceleration lanes at a moderate cost. Where the roadway must be widened and additional right-of-way must be acquired, higher costs and a lengthy time-to-construct are likely. The expected effectiveness of this CM must be assessed for each individual location.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Sideswipe, Rear-End	CRF:	10 - 75 %

R12, Widen lane (initially less than 10 ft)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	25%	20 years
Notes:	Note: For Caltrans' statewide Calls-for-Projects, this CM only applies to crashes occurring within the limits of the widened lanes. Widening must a minimum of 1 foot.		

General information				
Where to use:				
Horizontal curves or tangents and low speed or high speed roadways identified as having lane departure crashes, sideswipe or head-on crashes that can be attributed to an existing pavement width less than 10 feet.				
Why it works:				
Increasing pavement width can affect almost all crash types. A common practice is to widen the traveled way on horizontal curves to make operating conditions on curves comparable to those on tangents. Speed is a primary consideration when evaluating potential adverse impacts of lane width on safety. On high-speed, rural two-lane highways, an increased risk of cross-centerline head-on or cross-centerline sideswipe crashes is a concern because drivers may have more difficulty staying within the travel lane.				
General Qualities (Time, Cost and Effectiveness):				
Costs will depend on the amount of reconstruction necessary and on whether additional right-of-way is required. In general, this is one of the higher-cost strategies recommended, but it can also be very beneficial. Since this is a relatively expensive treatment, one of the keys to creating a cost effective project with at least a medium B/C ratio is targeting higher-hazard roadways.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	5 - 70 %

R13, Add two-way left-turn lane (without reducing travel lanes)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	30%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new lane, where an existing median did not already exist.		

General information
Where to use:
Roadways having a high frequency of drivers being rear-ended while attempting to make a left turn across oncoming traffic. Also can be effective for drivers crossing the centerline of an undivided multilane roadway inadvertently.
Why it works:
Two-way left-turn lanes provide a buffer between opposing directions of travel and separate left turning traffic from through traffic. They can also help to allow vehicles to begin to accelerate before entering the through-traffic lanes. They reduce the disruption of flow of through-traffic and reducing rear-end and sideswipe collisions. For some roadways the option of converting a four-lane undivided arterials to three-lane roadways with a center left-turn lane and bike lanes should be considered (see "Road Diet" CM.)
General Qualities (Time, Cost and Effectiveness):
In some cases this strategy may be retrofitted into the existing roadway by utilizing a portion of the existing paved shoulder and can ultimately be as simple as restriping the roadway. Costs and time to implement could significantly increase if the paved area is not sufficient to include a median, requiring new right-of-way, and having significant environmental impacts. The expected effectiveness of this CM must be assessed for each individual location as the B/C ratios will vary from low to high.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	8 - 50 %

R14, Road Diet (Reduce travel lanes from 4 to 3 and add a two way left-turn and bike lanes)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	30%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new lane striping. "Intersection" crashes can only be applied when they resulted from turning movements that had no designated turn lanes/phases in the existing condition and the Road Diet will provide turn lanes/phases for these movements. This CM does not apply to roadway sections that already included left turn lanes or two way left turn lanes before the lane reductions. New bike lanes are also expected to be part of these projects. Pre-approval from the HSIP program manager is needed for: 1) the use of this CM without removing a travel lane in each direction and/or without adding new bike lanes; and/or 2) if any pavement is planned to be removed for the purpose of adding landscaping, planter-boxes, or other non-roadway user features.		

General information
Where to use:
Areas noted as having a higher frequency of head-on, left-turn, and rear-end crashes with traffic volumes that can be handled by only 2 free flowing lanes. Using this strategy in locations with traffic volumes that are too high could result in diversion of traffic to routes less safe than the original four-lane design. It may also result in congestion levels that contribute to other crashes.
Why it works:
The application of this strategy usually reduces the roadway segment speeds and serious head-on crashes. In many cases the extra pavement width can be used for the installation of bike lanes. In addition to increasing bicycle safety, these bike lanes can improve the safety of on-street parking.
General Qualities (Time, Cost and Effectiveness):
Implementation would require more time than in other low-cost treatments to complete environmental analyses, traffic studies and public input. Projects that only require new lane markings and minor signalization modifications will have relatively low cost and can be very effective and can be considered on a systematic approach. These striping and signal modification costs should be considered part of this CM and not an additional CM. (If additional signal hardware improvements are being made, over what is needed for the road diet, then the Improve Signal Hardware CM may also be used.) Often road diet projects need a seal-coat placed on the roadway to fully remove the old striping. These seal coats are considered part of the proper installation of this CM. In contrast, structural-overlays should not be considered part of this CM and are not considered eligible for funding in the California Local HSIP.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	26 - 43 %

R15, Widen shoulder

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	30%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new paved shoulder. A minimum of 2 feet width must be added and the new/resulting shoulders must be a minimum of 4 feet wide. This CM is not eligible unless it is done as the last step of an "incremental approach", for which the agency documents that: 1) they have already pursued and installed lower cost and lower impact CMs (i.e. signing/striping upgrades to MUTCD standards/recommendations, rumble strips, etc.), 2) they have already monitored the crash occurrences after these improvements were installed, and 3) the 'after' crash rate is still unacceptably high. This 'incremental approach' (or a special exception from the HSIP program manager) must be documented in the Narrative Questions in the application and a summary of the 'before' and 'after' crash analysis must be attached to the application.		

General information				
Where to use:				
Roadways that have a frequent incidence of vehicles leaving the travel lane resulting in an unsuccessful attempt to reenter the roadway. The probability of a safe recovery is increased if an errant vehicle is provided with an increased paved area in which to initiate such a recovery.				
Why it works:				
Based on the best available research, adding shoulder or widening an existing shoulder provides a greater area to regain control of a vehicle, as well as lateral clearance to roadside objects such as guardrail, signs and poles. They may also provide space for disabled vehicles to stop or drive slowly, provide increased sight distance for through vehicles and for vehicles entering the roadway, and in some cases reduce passing conflicts between motor vehicles and bicyclists and pedestrians. The likely safety benefits for adding or widening an existing shoulder generally increase as the widening width increases - practitioners should refer to NCHRP Report 500 Series, the CMF Clearinghouse or other references for more details.				
General Qualities (Time, Cost and Effectiveness):				
Shoulder widening costs would depend on whether new right-of-way is required and whether extensive roadside modification is needed. Since shoulder widening can be a relatively expensive treatment, one of the keys to creating a cost effective project with at least a medium B/C ratio is targeting higher-hazard roadways.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Fixed Object, Run-off Road, Sideswipe	CRF:	15 - 75 %

R16, Curve Shoulder widening (Outside Only)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	45%	20 years
Notes:	This CM only applies to crashes occurring within the limits (or influence area) of the new shoulder widening at curves. A minimum of 2-4 feet width must be added to the outside of horizontal curves and the new traversable shoulder must be a minimum of 4 feet wide.		

General information	
Where to use:	
Roadway curves noted as having frequent lane departure crashes due to inadequate or no shoulders, resulting in an unsuccessful attempt to reenter the roadway.	
Why it works:	
Adding shoulders (outside only) creates a recovery area in which a driver can regain control of a vehicle, as well as lateral clearance to roadside objects.	
General Qualities (Time, Cost and Effectiveness):	
To minimize the R/W needs and the cost, only outside shoulder at curves is to be widened. This CM can be implemented in a relatively short timeframe.	
FHWA CMF Clearinghouse:	NA

R17, Improve horizontal alignment (flatten curves)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	50%	20 years
Notes:	This CM only applies to crashes occurring within the limits (or influence area) of the improved alignment. **This CM is not eligible unless** it is done as the last step of an "incremental approach", including: the agency documents that: 1) they have already pursued and installed lower cost and lower impact CMs (i.e. signing/striping upgrades to MUTCD standards/recommendations, rumble strips, etc.), 2) they have already monitored the crash occurrences after these improvements were installed, and 3) the 'after' crash rate is still unacceptably high. This 'incremental approach' (or a special exception from the HSIP program manager) must be documented in the Narrative Questions in the application and a summary of the agency's 'before' and 'after' crash analysis must be attached to the application.		

General information				
Where to use:				
Roadways with horizontal curves that have experienced lane departure crashes as a result of a roadway segment having compound curves or a severe radius. This strategy should generally be considered only when less expensive strategies involving clearing of specific sight obstructions or modifying traffic control devices have been tried and have failed to ameliorate the crash patterns.				
Why it works:				
Increasing the radius of a horizontal curve can be very effective in improving the safety performance of the curve. Curve modification reduces the likelihood of a vehicle leaving its lane, crossing the roadway centerline, or leaving the roadway at a horizontal curve; and minimizes the adverse consequences of leaving the roadway. Horizontal alignment improvement projects are expected to include standard/improved superelevation elements, which should be considered part of this CM and not an additional CM.				
General Qualities (Time, Cost and Effectiveness):				
This strategy is a long-term, higher-cost alternative for improving the safety of a horizontal curve because it usually involves total reconstruction of the roadway. It may also require acquisition of additional right-of-way and an environmental review. This strategy, albeit costly, has shown that increasing the radius of curvature can significantly reduce total curve-related crashes by up to 80 percent. The expected effectiveness of this CM must be assessed for each individual location.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	24 - 90%

R18, Flatten crest vertical curve

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	25%	20 years

Notes:	This CM only applies to crashes occurring within the limits (or influence area) of the improved alignment. This CM is not eligible unless it is done as the last step of an "incremental approach", including: the agency documents that: 1) they have already pursued and installed lower cost and lower impact CMs (i.e. signing/striping upgrades to MUTCD standards/recommendations, rumble strips, etc.), 2) they have already monitored the crash occurrences after these improvements were installed, and 3) the 'after' crash rate is still unacceptably high. This 'incremental approach' (or a special exception from the HSIP program manager) must be documented in the Narrative Questions in the application and a summary of the agency's 'before' and 'after' crash analysis must be attached to the application.

General information

Where to use:

The target for this strategy is usually unsignalized intersections with restricted sight distance due to vertical geometry and with patterns of crashes related to that lack of sight distance that cannot be ameliorated by less expensive methods. This strategy should generally be considered only when less expensive strategies involving clearing of specific sight obstructions or modifying traffic control devices have been tried and have failed to ameliorate the crash patterns.

Why it works:

Adequate sight distance for drivers at stopped approaches to intersections has long been recognized as among the most important factors contributing to overall intersection safety. Vertical alignment improvement projects are expected to include standard/improved superelevation elements, which should be considered part of this CM and not an additional CM.

General Qualities (Time, Cost and Effectiveness):

Projects involving changing the horizontal and/or vertical alignment to provide more sight distance are quite extensive and usually take several years to accomplish. If additional right-of-way is required or environmental impacts are expected, these projects will require a substantial period of time. Since this is usually an expensive treatment, one of the keys to creating a cost effective project with at least a medium B/C ratio is targeting higher-hazard locations.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	20 - 51 %

R19, Improve curve superelevation

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	45%	20 years

Notes:	This CM only applies to crashes occurring within the limits (or influence area) of the improved superelevation. This CM does not apply to sections of roadways where the horizontal or vertical alignments are changing via another CM.

General information

Where to use:

Roadways noted as having frequent lane departure crashes and inadequate or no superelevation. Safety can be enhanced when the superelevation is improved or restored along curves where the actual superelevation is less than the optimal.

Why it works:

Superelevation works with friction between the tires and pavement to counteract the forces on the vehicle associated with cornering. Many curves may have inadequate superelevation because of vehicles traveling at higher speeds than were originally designed for, because of loss of effective superelevation after resurfacing, or because of changes in design policy after the curve was originally constructed.

General Qualities (Time, Cost and Effectiveness):

This strategy can be a higher-cost alternative for improving the safety of a curve because it involves reconstruction to some degree. Other projects may be able to be constructed by simple overlays and minimal reconstruction of roadways features. When simple overlay fixes are pursued, a systematic installation approach may be appropriate. The expected effectiveness of this CM must be assessed for each individual location.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Run-off Road, All	CRF:	40 - 50 %

R20, Convert from two-way to one-way traffic

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	All	35%	20 years
Notes:	This CM only applies to crashes occurring within the limits of the new one-way sections.		

General information
Where to use:
One-way streets can offer improved signal timing and accommodate odd-spaced signals. One-way streets can simplify crossings for pedestrians, who must look for traffic in only one direction. While studies have shown that conversion of two-way streets to one-way generally reduces pedestrian crashes and the number of conflict points, one-way streets tend to have higher speeds which creates new problems. Care must be taken not to create conditions that cause driver confusion and erratic maneuvers.
Why it works:
Studies have shown a 10 to 50-percent reduction in total crashes after conversion of a two-way street to one-way operation. While studies have shown that con-version of two-way streets to one-way generally reduces pedestrian crashes, one-way streets tend to have higher speeds which creates new problems. At the same time, this strategy (1) increases capacity significantly and (2) can have safety-related drawbacks including pedestrian confusion and minor sideswipe crashes.
General Qualities (Time, Cost and Effectiveness):
The costs will vary depending on length of treatment and if the conversion requires modification to signals. Conversion costs can be high to build "crossovers" where the one-way streets convert back to two-way streets and to rebuild traffic signals. It's also likely that these types of modifications will require public involvement and could significantly add to the time it takes to complete the project. The expected effectiveness of this CM must be assessed for each individual location.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	26 - 43 %

R21, Improve pavement friction (High Friction Surface Treatments)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	55%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the improved friction overlay. This CM is not intended to apply to standard chip-seal or open-graded **maintenance** projects for long segments of corridors or structure repaving projects intended to fix failed pavement.		

General information
Where to use:
Nationally, this countermeasure is referred to as "High Friction Surface Treatments" or HFST. Areas as noted having crashes on wet pavements or under dry conditions when the pavement friction available is significantly less than actual roadway speeds; including but not limited to curves, loop ramps, intersections, and areas with short stopping or weaving distances. This treatment is intended to target locations where skidding is determined to be a problem, in wet or dry conditions and the target vehicle is one that runs (skids) off the road or is unable to stop due to insufficient skid resistance.
Why it works:
Improving the skid resistance at locations with high frequencies of wet-road crashes and/or failure to stop crashes can result in a reduction of 50 percent for wet-road crashes and 20 percent for total crashes. Applying HFST can double friction numbers, e.g. low 40s to high 80s. This CM represents a special focus area for both FHWA and Caltrans, which means there are extra resources available for agencies interested in more details on High Friction Surface Treatment projects.
General Qualities (Time, Cost and Effectiveness):
This strategy can be relatively inexpensive and implemented in a short timeframe. The installation would be done by either agency personnel or contractors and can be done by hand or machine. In general, This CM can be very effective and can be considered on a systematic approach.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Wet, Rear-End, All	CRF:	17 - 68 %

R22, Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	15%	10 years

Notes:	This CM only applies to crashes occurring within the influence area of the new/upgraded signs. This CM is not intended for maintenance upgrades of street-name, parking, guide, or any other signs without a primary focus on roadway safety. **This CM is not eligible unless** it is done as part of a larger sign audit project, including the study of: 1) the existing signs' locations, sizes and information per MUTCD standards, 2) missing signs per MUTCD standards, and 3) sign retroreflectivity. The overall sign audit scope (or a special exception from the HSIP program manager) must be documented in the Narrative Questions in the application. Based on the scope of the project/audit, it may be appropriate to combine other CMs in the B/C calculation.

General information

Where to use:

The target for this strategy should be on roadway segments with patterns of head on, nighttime, non-intersection, run-off road, and sideswipe crashes related to lack of driver awareness of the presence of a specific roadway feature or regulatory requirement. Ideally this type of safety CM would be combined with other sign evaluations and upgrades (install chevrons, warning signs, delineators, markers, beacons, and relocation of existing signs per MUTCD standards.)

Why it works:

This strategy primarily addresses crashes caused by lack of driver awareness (or compliance) roadway signing. It is intended to get the drivers attention and give them a visual warning by using fluorescent yellow sheeting (or other retroreflective material).

General Qualities (Time, Cost and Effectiveness):

Signing improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number of signs. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding. When considering any type of federally funded sign upgrade project, California local agencies are encouraged to consider "Roadway Safety Signing Audit (RSSA) and Upgrade Projects". Including RSSAs in the development phase of sign projects are expected to identify non-standard (per MUTCD) sign features and missing signs that may otherwise go unnoticed. More information on RSSA is available on the Local Assistance HSIP webpage.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Head on, Run-off road, Sideswipe, Night	CRF:	18 - 35%

R23, Install chevron signs on horizontal curves

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	40%	10 years
Notes:	This CM only applies to crashes occurring within the influence area of the new signs. (i.e. only through the curve).		

General information				
Where to use:				
Roadways that have an unacceptable level of crashes on relatively sharp curves during periods of light and darkness. Ideally this type of safety CM would be combined with other sign evaluations and upgrades (install warning signs, delineators, markers, beacons, and relocation of existing signs per MUTCD standards.)				
Why it works:				
Post-mounted chevrons are intended to warn drivers of an approaching curve and provide tracking information and guidance to the drivers. While they are intended to act as a warning, it should also be remembered that the posts, placed along the roadside, represent a possible object with which an errant vehicle can crash into. Design of posts to minimize damage and injury is an important part of the considerations to be made when selecting these treatments.				
General Qualities (Time, Cost and Effectiveness):				
Signing improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number of signs. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding. When considering any type of federally funded sign upgrade project, California local agencies are encouraged to consider "Roadway Safety Signing Audit (RSSA) and Upgrade Projects". Including RSSAs in the development phase of sign projects are expected to identify non-standard (per MUTCD) sign features and missing signs that may otherwise go unnoticed. More information on RSSA is available on the Local Assistance HSIP webpage.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Run-off Road, All	CRF:	6 - 64 %

R24, Install curve advance warning signs

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	25%	10 years
Notes:	This CM only applies to crashes occurring within the influence area of the new signs. (i.e. only through the curve)		

General information				
Where to use:				
Roadways that have an unacceptable level of crashes on relatively sharp curves during periods of light and darkness. This countermeasure may also include horizontal alignment and/or advisory speed warning signs. Ideally this type of safety CM would be combined with other sign evaluations and upgrades (install warning signs, chevrons, delineators, markers, beacons, and relocation of existing signs per MUTCD standards.)				
Why it works:				
This strategy primarily addresses problem curves, and serves as an advance warning of an unexpected or sharp curve. It provides advance information and gives drivers a visual warning that their added attention is needed.				
General Qualities (Time, Cost and Effectiveness):				
Signing improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number of signs. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding. When considering any type of federally funded sign upgrade project, California local agencies are encouraged to consider "Roadway Safety Signing Audit (RSSA) and Upgrade Projects". Including RSSAs in the development phase of sign projects are expected to identify non-standard (per MUTCD) sign features and missing signs that may otherwise go unnoticed. More information on RSSA is available on the Local Assistance HSIP webpage.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Run-off Road, All	CRF:	20 - 30 %

R25, Install curve advance warning signs (flashing beacon)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	30%	10 years
Notes:	This CM only applies to crashes occurring within the influence area of the new signs. (i.e. only through the curve)		

General information				
Where to use:				
Roadways that have an unacceptable level of crashes on relatively sharp curves. Flashing beacons in conjunction with warning signs should only be used on horizontal curves that have an established severe crash history to help maintain their effectiveness.				
Why it works:				
This strategy primarily addresses problem curves, and serves as an enhanced advance warning of an unexpected or sharp curve. It provides advance information and gives drivers a visual warning that their added attention is needed. Flashing beacons are an added indication that a curve may be particularly challenging.				
General Qualities (Time, Cost and Effectiveness):				
Use of flashing beacons requires minimal development process, allowing flashing beacons to be installed within a short time period. Before choosing this CM, the agency needs to confirm the ability to provide power to the site (solar may be an option). In general, This CM can be very effective and can be considered on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	30 %

R26, Install dynamic/variable speed warning signs

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	30%	10 years
Notes:	This CM only applies to crashes occurring within the influence area of the new signs. (i.e. through the curve) {**This CM does not apply to dynamic regulatory speed warning signs.** There are currently no nationally accepted CRFs for dynamic regulatory signs (also known as Radar Speed Feedback Signs). CRFs are being developed and Caltrans hopes to include these CMs and CRFs in future calls for projects.}		

General information				
Where to use:				
Curvilinear roadways that have an unacceptable level of crashes due to excessive speeds on relatively sharp curves.				
Why it works:				
This strategy primarily addresses crashes caused by motorists traveling too fast around sharp curves. It is intended to get the drivers attention and give them a visual warning that they may be traveling over the recommended speed for the approaching curve. Care should be taken to limit the placement of these signs to help maintain their effectiveness.				
General Qualities (Time, Cost and Effectiveness):				
Use of dynamic speed warning signs requires minimal development process, allowing them to be installed within a short time period. Before choosing this CM, the agency needs to confirm the ability to provide power to the site (solar may be an option). In general, This CM can be very effective and can be considered on a systematic approach.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	0 - 41 %

R27, Install delineators, reflectors and/or object markers

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	15%	10 years
Notes:	This CM only applies to crashes occurring within the limits / influence area of the new features. {**This is not a striping-related CM**}		

General information
Where to use:
Roadways that have an unacceptable level of crashes on curves (relatively flat to sharp) during periods of light and darkness. Any road with a history of fixed object crashes is a candidate for this treatment, as are roadways with similar fixed objects along the roadside that have yet to experience crashes. If a fixed object cannot be relocated or made break-away, placing an object marker can provide additional information to motorists. Ideally this type of safety CM would be combined with other sign evaluations and upgrades (install warning signs, chevrons, beacons, and relocation of existing signs per MUTCD standards.)
Why it works:
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 intended to provide tracking information and guidance to the drivers. 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.
General Qualities (Time, Cost and Effectiveness):
These improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number of locations. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in low to moderate cost projects that are more appropriate to seek state or federal funding. When considering any type of federally funded sign upgrade project, California local agencies are encouraged to consider "Roadway Safety Signing Audit (RSSA) and Upgrade Projects". Including RSSAs in the development phase of sign projects are expected to identify non-standard (per MUTCD) sign features and missing signs that may otherwise go unnoticed. More information on RSSA is available on the Local Assistance HSIP webpage.

FHWA CMF Clearinghouse:	Crash Types Addressed:	All	CRF:	0 - 30 %

R28, Install edge-lines and centerlines

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	25%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the new centerlines and/or edge-lines. This CM is not intended to be used for general maintenance activities (i.e. the replacement of existing striping and RPMs in-kind) and must include upgraded safety features over the existing striping. For two lane roadways allowing passing, a striping audit must be done to ensure the passing limits meeting the MUTCD standards. Both the centerline and edge-lines are expected to be upgraded, unless prior approval is granted by Caltrans staff in writing and attached to application.		

General information				
Where to use:				
Any road with a history of run-off-road right, head-on, opposite-direction-sideswipe, or run-off-road-left crashes is a candidate for this treatment - install where the existing lane delineation is not sufficient to assist the motorist in understanding the existing limits of the roadway. Depending on the width of the roadway, various combinations of edge line and/or center line pavement markings may be the most appropriate. Incorporating raised/reflective pavement markers (RPMs) into centerlines (and edge-lines) should be considered as it has been shown to improve safety.				
Why it works:				
Installing edge-lines and centerlines where none exists or making significant upgrades to existing lines (paint to thermoplastic, adding audible disks/bumps in the thermoplastic stripes, or adding RPMs) are intended/designed to help drivers who might leave the roadway because of their inability to see the edge of the roadway along the horizontal edge of the pavement or cross-over the centerline of the roadway into oncoming traffic. New pavement marking products tend to be more durable, are all-weather, more visible, and have a higher retroreflectivity than traditional pavement markings.				
General Qualities (Time, Cost and Effectiveness):				
These improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number and length of locations. This CM can be effectively and efficiently implemented using a systematic approach with numerous and long locations, resulting in low to moderate cost projects that are more appropriate to seek state or federal funding. When considering any type of federally funded striping upgrade project, California local agencies are encouraged to consider "Roadway Safety Striping Audit and Upgrade Projects". Including wide-scale striping audits in the development phase of striping projects are expected to identify non-standard (per MUTCD) striping/marking features, no-passing zone limits needing adjustment, and missing striping/markings that may otherwise go unnoticed. More information on this concepts is available on the Local Assistance HSIP webpage under an RSSA example document. Note: When federal safety funding is used for these installations in high-wear-locations, the local agency is expected to maintain the improvement for a minimum of 10 years.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Head-on, Run-off Road, All	CRF:	0 - 44 %

R29, Install no-passing line

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	45%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the new or extended no-passing zones.		

General information
Where to use:
Roadways that have a high percentage of head-on crashes suggesting that many head-on crashes may relate to failed passing maneuvers. No-passing lines should be installed where drivers "passing sight distance" is not available due to horizontal or vertical obstructions. General restriping projects can be good opportunities to reevaluate and incorporate new no-passing zones limits. The incorporation 'No Passing Zone' pennants should also be considered when reevaluating the limits of no-passing zones. Installing no-passing limits in areas that are not warranted may reduce the overall safety of the corridor as drivers may become frustrated and attempt passing maneuvers at other locations without the necessary sight distance.
Why it works:
When the centerline markings do not differentiate between passing and no-passing areas, drivers may have difficulty determining where passing maneuvers can be completed safely. Providing clear and engineered passing and no-passing areas can encourage drivers to wait patiently for safe passing areas and avoid aggressively looking for passing opportunities.
General Qualities (Time, Cost and Effectiveness):
These improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number and length of locations. When considered at a single location, these low cost improvements are usually funded through local funding by local maintenance crews. However, This CM can be effectively and efficiently implemented using a systematic approach with numerous and long locations, resulting in low to moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Head-on, Side-swipe	CRF:	40 - 53%

R30, Install centerline rumble strips/stripes

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	20%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the new rumble strips/stripes.		

General information
Where to use:
Center Line rumble strips/stripes can be used on virtually any roadway – especially those with a history of head-on crashes. It is recommended that rumble strips/stripes be applied systematically along an entire route instead of only at spot locations. For all rumble strips/stripes, pavement condition should be sufficient to accept milled rumble strips. Care should be taken when considering installing rumble strips in locations with residential land uses or in areas with high bicycle volumes.
Why it works:
Rumble strips provide an auditory indication and tactile rumble when driven on, alerting drivers that they are drifting out of their travel lane, giving them time to recover before they depart the roadway or cross the center line. Additionally, rumble stripes (pavement marking in the rumble itself) provide an enhanced marking, especially in wet dark conditions.
General Qualities (Time, Cost and Effectiveness):
These improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number and length of locations. This CM can be effectively and efficiently implemented using a systematic approach with numerous and long locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Head-on, Side-swipe, All	CRF:	15 - 68%

R31, Install edgeline rumble strips/stripes

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	All	15%	10 years
Notes:	This CM only applies to crashes occurring within the limits of the new rumble strips/stripes.		

General information
Where to use:
Shoulder and edge line milled rumble strips/stripes should be used on roads with a history of roadway departure crashes. It is recommended that rumble strips/stripes be applied systematically along an entire route instead of only at spot locations. For all rumble strips/stripes, pavement condition should be sufficient to accept milled rumble strips. Special requirements may apply and care should be taken when considering installing rumble strips in locations with residential land uses or in areas with high bicycle volumes.
Why it works:
Rumble strips provide an auditory indication and tactile rumble when driven on, alerting drivers that they are drifting out of their travel lane, giving them time to recover before they depart the roadway or cross the center line. Additionally, rumble stripes (pavement marking in the rumble itself) provide an enhanced marking, especially in wet dark conditions.
General Qualities (Time, Cost and Effectiveness):
These improvements do not require a long development process and can typically be implemented quickly. Costs for implementing this strategy are nominal and depend on the number and length of locations. This CM can be effectively and efficiently implemented using a systematic approach with numerous and long locations, resulting in moderate cost projects that are more appropriate to seek state or federal funding.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Run-off Road	CRF:	10 - 41%

R32PB, Install bike lanes

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring within the limits of the Class II (not Class III) bike lanes. When an off-street bike-path is proposed that is not adjacent to the roadway, the applicant must document the engineering judgment used to determine which "Ped & Bike" crashes to apply.		

General information
Where to use:
Roadway segments noted as having crashes between bicycles and vehicles or crashes that may be preventable with a buffer/shoulder. Most studies suggest that bicycle lanes may provide protection against bicycle/motor vehicle collisions. Striped bike lanes can be incorporated into a roadway when is desirable to delineate which available road space is for exclusive or preferential use by bicyclists.
Why it works:
Most studies present evidence that bicycle lanes provide protection against bicycle/motor vehicle collisions. Bicycle lanes provide marked areas for bicyclist to travel along the roadway and provide for more predictable movements for both bicyclist and motorist. Evidence also shows that riding with the flow of vehicular traffic reduces bicyclists' chances of collision with a motor vehicle. Locations with bicycle lanes have lower rates of wrong-way riding. In combination with this CM, better guidance signs and markings for non-motorized and motorized roadway users should be considered, including: sign and markings directing cyclists on appropriate/legal travel paths and signs and markings warning motorists of non-motorized uses of the roadway that should be expected.
General Qualities (Time, Cost and Effectiveness):
Adding striped bicycle lanes can range from the simply restriping the roadway and minor signing to projects that require roadway widening, right-of-way, and environmental impacts. It is most cost efficient to create bike lanes during street reconstruction, street resurfacing, or at the time of original construction. The expected effectiveness of this CM must be assessed for each individual location. For simple installation scenarios, This CM can be very effective and can be considered on a systematic approach.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	0 - 53 %

R33PB, Install Separated Bike Lanes

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	45%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring within the limits of the separated bike lanes. When an off-street bike-path is proposed that is not adjacent to the roadway, the applicant must document the engineering judgment used to determine which "Ped & Bike" crashes to apply.		

General information

Where to use:

Separated bikeways are most appropriate on streets with high volumes of bike traffic and/or high bike-vehicle collisions, presumably in an urban or suburban area. Separation types range from simple, painted buffers and flexible delineators, to more substantial separation measures including raised curbs, grade separation, bollards, planters, and parking lanes. These options range in feasibility due to roadway characteristics, available space, and cost. In some cases, it may be possible to provide additional space in areas where pedestrian and bicyclists may interact, such as the parking buffer, or loading zones, or extra bike lane width for cyclists to pass one another.

Why it works:

Separated bike lanes provide increased safety and comfort for bicyclists beyond conventional bicycle lanes. By separating bicyclists from motor traffic, "protected" or physically separated bike lanes can offer a higher level of comfort and are attractive to a wider spectrum of the public. Intersections and approaches must be carefully designed to promote safety and facilitate left-turns for bicyclists from the primary corridor to cross street.

In combination with this CM, better guidance signs and markings for non-motorized and motorized roadway users should be considered, including: sign and markings directing cyclists on appropriate/legal travel paths and signs and markings warning motorists of non-motorized uses of the roadway that should be expected.

General Qualities (Time, Cost and Effectiveness):

The cost of Installing separated bike lanes can be low to medium or high, depending on whether roadway widening, right-of-way and environmental impacts are involved. It is most cost efficient to create bike lanes during street reconstruction, street resurfacing, or at the time of original construction. The expected effectiveness of this CM must be assessed for each individual location.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	3.7 - 100 %

R34PB, Install sidewalk/pathway (to avoid walking along roadway)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	80%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring within the limits of the new walkway. This CM is not intended to be used where an existing sidewalk is being replaced with a wider one, unless prior Caltrans approval is included in the application. When an off-street multi-use path is proposed that is not adjacent to the roadway, the applicant must document the engineering judgment used to determine which "Ped & Bike" crashes to apply.		

General information

Where to use:

Areas noted as not having adequate or no sidewalks and a history of walking along roadway pedestrian crashes. In rural areas asphalt curbs and/or separated walkways may be appropriate.

Why it works:

Sidewalks and walkways provide people with space to travel within the public right-of-way that is separated from roadway vehicles. The presence of sidewalks on both sides of the street has been found to be related to significant reductions in the "walking along roadway" pedestrian crash risk compared to locations where no sidewalks or walkways exist. Reductions of 50 to 90 percent of these types of pedestrian crashes. In combination with this CM, better guidance signs and markings for non-motorized and motorized roadway users should be considered, including: sign and markings directing pedestrians and cyclists on appropriate/legal travel paths and signs and markings warning motorists of non-motorized uses of the roadway that should be expected.

General Qualities (Time, Cost and Effectiveness):

Costs for sidewalks will vary, depending upon factors such as width, materials, and existing of curb, gutter and drainage. Asphalt curbs and walkways are less expensive, but require more maintenance. The expected effectiveness of this CM must be assessed for each individual location. These projects can be very effective in areas of high-pedestrian volumes with a past history of crashes involving pedestrians.

FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	65 - 89 %

R35PB, Install/upgrade pedestrian crossing (with enhanced safety features)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the influence area (expected to be a maximum of within 250') of the new crossing which includes new enhanced safety features. Note: This CM is not intended to be combined with the "Install raised pedestrian crossing" when calculating the improvement's B/C ratio. This CM is not intended to be used for high-cost aesthetic enhancements (i.e. stamped concrete or stamped asphalt).		

General information				
Where to use:				
Roadway segments with no controlled crossing for a significant distance in high-use midblock crossing areas and/or multilane roads locations. Based on the Zegeer study (Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations) at many locations, a marked crosswalk alone may not be sufficient to adequately protect non-motorized users. In these cases, flashing beacons, curb extensions, medians and pedestrian crossing islands and/or other safety features should be added to complement the standard crossing elements. For multi-lane roadways, advance "yield" markings can be effective in reducing the 'multiple-threat' danger to pedestrians.				
Why it works:				
Adding pedestrian crossings has the opportunity to greatly enhance pedestrian safety at locations noted as being problematic. The enhanced safety elements, which may include curb extensions, medians and pedestrian crossing islands, beacons, and lighting, combined with pavement markings delineating a portion of the roadway that is designated for pedestrian crossing. Care must be taken to warn drivers of the potential for pedestrians crossing the roadway and enhanced improvements added to the crossing increase the likelihood of pedestrians crossing in a safe manner. In combination with this CM, better guidance signs and markings for non-motorized and motorized roadway users should be considered, including: sign and markings directing pedestrians and cyclists on appropriate/legal travel paths and signs. When agencies opt to install aesthetic enhancement to crossing like stamped concrete/asphalt, the project design and construction costs can significantly increase. For HSIP applications, these costs must be accounted for in the B/C calculation, but these costs (over standard crosswalk markings) must be tracked separately and are not federally reimbursable and will increase the agency's local-funding share for the project costs.				
General Qualities (Time, Cost and Effectiveness):				
Costs associated with this strategy will vary widely, depending on the extent of the curb extensions, raised medians, flashing beacons, and other pedestrian safety elements that are needed with the crossing. When considered at a single location, these improvements can sometimes be low cost and funded through local funding by local crews. This CM can often be effectively and efficiently implemented using a systematic approach with numerous locations, resulting in moderate to high cost projects that are appropriate to seek state or federal funding.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	8 - 56%

R36PB, Install raised pedestrian crossing

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the area with the new raised crossing. Note: This CM is not intended to be combined with the "Install pedestrian crossing (with enhanced safety features)" when calculating the improvement's B/C ratio.		

General information				
Where to use:				
On lower-speed roadways, where pedestrians are known to be crossing roadways that involve significant vehicular traffic. Based on the Zegeer study (Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations) at many locations, a marked crosswalk alone, may not be sufficient to adequately protect non-motorized users. In these cases, raised crossings can be added to complement the standard crossing elements. Special requirements may apply and extra care should be taken when considering installing raised crossings to ensure unintended safety issues are not created, such as: emergency vehicle access or truck route issues.				
Why it works:				
Adding a raised pedestrian crossing has the opportunity to enhance pedestrian safety at locations noted as being especially problematic. The raised crossing encourages motorists to reduce their speed and provides improved delineation for the portion of the roadway that is designated for pedestrian crossing. In combination with this CM, better guidance signs and markings for non-motorized and motorized roadway users should be considered, including: sign and markings directing pedestrians and cyclists on appropriate/legal travel paths.				
General Qualities (Time, Cost and Effectiveness):				
Costs associated with this strategy will vary widely, depending upon the elements of the raised crossing and the need for new curb ramps and sidewalk modifications. This CM may be effectively and efficiently implemented using a systematic approach with more than one location and can have medium to high B/C ratios based on past non-motorized crash history.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	30 - 46%

R37PB, Install Rectangular Rapid Flashing Beacon (RRFB)

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
100%	Pedestrian and Bicycle	35%	20 years
Notes:	This CM only applies to "Ped & Bike" crashes occurring in the influence area (expected to be a maximum of within 250') of the crossing which includes the RRFB.		

General information				
Where to use:				
Rectangular Rapid Flashing Beacon (RRFB) includes pedestrian-activated flashing lights and additional signage that enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings. It uses an irregular flash pattern that is similar to emergency flashers on police vehicles. RRFBs are installed at unsignalized intersections and mid-block pedestrian crossings.				
Why it works:				
RRFBs can enhance safety by increasing driver awareness of potential pedestrian conflicts and reducing crashes between vehicles and pedestrians at unsignalized intersections and mid-block pedestrian crossings. The addition of RRFB may also increase the safety effectiveness of other treatments, such as crossing warning signs and markings.				
General Qualities (Time, Cost and Effectiveness):				
RRFBs are a lower cost alternative to traffic signals and hybrid signals. This CM can often be effectively and efficiently implemented using a systematic approach with numerous locations.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Pedestrian, Bicycle	CRF:	7 – 47.4%

R38, Install Animal Fencing

For HSIP Calls-for-projects			
Funding Eligibility	Crash Types Addressed	CRF	Expected Life
90%	Animal	80%	20 years
Notes:	This CM only applies to "animal" crashes occurring within the limits of the new fencing.		

General information				
Where to use:				
At locations with high percent of vehicular/animal crashes (reactive) or where there is a known high percent of animals crossing due to migratory patterns (proactive).				
Why it works:				
Animal fencing helps to channelize the identified animals to a natural or man-made crossing, eliminating the conflict between vehicles and animals on the same place. Animal fencing is typically installed at a bridge location with its "run of need" dependent on the surrounding terrain.				
General Qualities (Time, Cost and Effectiveness):				
Time to install fencing can be moderate to lengthy depending on the environmental commitments and agreed upon solution to mitigating project impacts. Costs will be fairly low and depend on the "run of need" length. There will be minimal reoccurring maintenance costs on keeping the fence intact. The expected effectiveness of this CM must be assessed for each individual location.				
FHWA CMF Clearinghouse:	Crash Types Addressed:	Animal	CRF:	70 - 90 %

Appendix E

B/C Ratio Calculation Methodology

Appendix D: Benefit/Cost Ratio Calculations

This appendix includes the Benefit/Cost methodology used in the Caltrans calls-for-projects in the HSIP programs. The HSM, Part B - Chapter 7, includes more details on conducting Economic Appraisal for roadway safety projects. Local agencies will be required to utilize the HSIP Analyzer to calculate the B/C ratio as part of their application for HSIP funding. Starting in Cycle 7 call for projects, the fatality and severe injury costs have been combined for calculating the benefit. Because fatality figures are small and are a matter of randomness, this change is being made to reduce the possibility of selecting an improvement project on the basis of randomness.

1) $Benefit\ (Annual) = \sum_{s=0}^{3} \frac{CRF \times N \times CC_{ave}}{Y}$

- CRF : Crash reduction factor in each countermeasure.
- S : Severity (0: PDO, 1: Minor Injury, 2: Injury, 3: Severe Injury/Fatal). See the below table.
- N : Number of Crashes, in severity levels, related to selected countermeasure.
- Y : Crash data time period (Year).
- CC_{ave} : Crash costs in severity levels.

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

* The letters in parenthesis (K, A, B, C and O) refer to the KABCO scale; it is commonly used by law enforcement agencies in their crash reporting efforts and is further documented in the HSM.

** Figures were calculated based on an average Fatality (K) / Severe Injury (A) ratio for each area type, a crash cost for a Fatality (K) of $7,219,800, and a crash cost of a Severe/Disabling Injury (A) of $389,000. These costs are used in the HSIP Analyzer.

*** Based on Table 7-1, Highway Safety Manual (HSM), First Edition, 2010. Adjusted to 2020 Dollars.

2) *Benefit (Life) = Benefit (annual) x Years of service life*

3) Benefit/Cost Ratio (each countermeasure): $Benefit\ \ Cost\ Ratio_{(CM)} = \frac{Benefit\ (Life)_{(CM)}}{Total\ \mathrm{Pr}oject\ Cost_{(CM)}}$

4) Benefit/Cost Ratio (project): $Benefit/Cost\ Ratio\ (\mathrm{Pr}oject) = \frac{\sum_{CM=1}^{3} Benefit\ (Life)_{(CM)}}{Total\ \mathrm{Pr}oject\ Cost}$

Appendix F

Cost, Benefit and B/C Ratio Calculation Table

							10%	5%	10%
Rank	**Intersection**	**Controls**	**CM1**	**CM2**	**CM3**	**Total Cost**	**Continency**	**Environmental**	**PS&E**
1	Virginia Ave/Overland Ave	Signalized	S09	S12	S21PB				
			$ 2,160	$ 200,500	$ 7,500	$ 210,160.00	$ 21,016.00	$ 10,508.00	$ 21,016.00
2	Washington Blvd/Beethoven St	Signalized	S07	S09		$ -	$ -	$ -	$ -
			$ 128,100	$ 2,160		$ 130,260.00	$ 13,026.00	$ 6,513.00	$ 13,026.00
3	Sawtelle Blvd/Washington Pl	Signalized	S09	S12	S21PB	$ -	$ -	$ -	$ -
			$ 2,160	$ 200,500	$ 7,500	$ 210,160.00	$ 21,016.00	$ 10,508.00	$ 21,016.00
4	Inglewood Blvd/Washington Blvd	Signalized	S09	S12	S21PB	$ -	$ -	$ -	$ -
			$ 2,160	$ 200,500	$ 7,500	$ 210,160.00	$ 21,016.00	$ 10,508.00	$ 21,016.00
5	Higuera St/Krueger St	Unsignalized	NS01	NS06	NS07	$ -	$ -	$ -	$ -
			$62,000	$ 9,000	$ 3,300	$74,300	$ 7,430.00	$ 3,715.00	$ 7,430.00
6	Overland Ave/Northgate St	Unsignalized	NS06	NS07	NS20PB	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	$ 10,000	$ 22,300.00	$ 2,230.00	$ 1,115.00	$ 2,230.00
7	Jefferson Blvd/Hetzler Rd	Signalized	S02	S09	S21PB	$ -	$ -	$ -	$ -
			$ 32,000	$ 2,160	$ 7,500	$ 41,660.00	$ 4,166.00	$ 2,083.00	$ 4,166.00
8	Washington Blvd/Sawtelle Blvd	Signalized	S02	S09	S12	$ -	$ -	$ -	$ -
			$ 32,000	$ 2,160	$ 200,500	$ 234,660.00	$ 23,466.00	$ 11,733.00	$ 23,466.00
	Washington Blvd/Cattaraugus Ave (W)	Signalized	S02	S03	S09	$ -	$ -	$ -	$ -
			$ 32,000	$ 52,800	$ 2,160	$ 86,960.00	$ 8,696.00	$ 4,348.00	$ 8,696.00
	Washington Blvd/Cattaraugus Ave (E)	Unsignalized	NS01	NS06	NS07	$ -	$ -	$ -	$ -
			$62,000	$ 9,000	$ 3,300	$74,300	$ 7,430.00	$ 3,715.00	$ 7,430.00
9	Overland Ave/Braddock Dr	Signalized	S02	S07	S09	$ -	$ -	$ -	$ -
			$ 32,000	$ 128,100	$ 2,160	$ 162,260.00	$ 16,226.00	$ 8,113.00	$ 16,226.00
10	Sepulveda Blvd/Green Valley Cir;	Signalized	S02	S09	S12	$ -	$ -	$ -	$ -
			$ 32,000	$ 2,160	$ 200,500	$ 234,660.00	$ 23,466.00	$ 11,733.00	$ 23,466.00
	6000 Sepulveda Blvd/4th Level Parking Structure	Unsignalized	NS06	NS07	NS20PB	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	$ 10,000	$ 22,300.00	$ 2,230.00	$ 1,115.00	$ 2,230.00
11	Washington Blvd/Kensington Rd	Unsignalized	NS01	NS06	NS07	$ -	$ -	$ -	$ -
			$62,000	$ 9,000	$ 3,300	$74,300	$ 7,430.00	$ 3,715.00	$ 7,430.00
12	Culver Blvd/Sawtelle Blvd	Signalized	S01	S07	S09	$ -	$ -	$ -	$ -
			$ 130,400	$ 128,100	$ 2,160	$ 260,660.00	$ 26,066.00	$ 13,033.00	$ 26,066.00
13	Slauson Ave/Bristol Pky	Signalized	S02	S09	S21PB	$ -	$ -	$ -	$ -
			$ 32,000	$ 2,160	$ 7,500	$ 41,660.00	$ 4,166.00	$ 2,083.00	$ 4,166.00
14	Washington Blvd/Prospect Ave	Unsignalized	NS06	NS07	NS20PB	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	$ 10,000	$ 22,300.00	$ 2,230.00	$ 1,115.00	$ 2,230.00
15	Sepulveda Blvd/Washington Pl	Signalized	S09	S12		$ -	$ -	$ -	$ -
			$ 2,160	$ 200,500		$ 202,660.00	$ 20,266.00	$ 10,133.00	$ 20,266.00
16	Washington Blvd/Kenyon Ave	Unsignalized	NS01	NS06	NS07	$ -	$ -	$ -	$ -
			$62,000	$ 9,000	$ 3,300	$74,300	$ 7,430.00	$ 3,715.00	$ 7,430.00
17	Culver Blvd/Overland Ave	Signalized	S09	S21PB		$ -	$ -	$ -	$ -
			$ 2,160	$ 7,500.00		$ 9,660.00	$ 966.00	$ 483.00	$ 966.00
18	Overland Ave/Freshman Dr	Signalized		S09		$ -	$ -	$ -	$ -
				$ 2,160		$ 2,160.00	$ 216.00	$ 108.00	$ 216.00

		15%									
Rank	**Intersection**	**Construction**	**Total Cost per Location**	**Additional Improvements**	**CRF_CM1**	**CRF_CM2**	**CRF_CM3**	**Life_CM1**	**Life_CM2**	**Life_CM3**	**Total Collisions**
1	Virginia Ave/Overland Ave			S02, S03, S07							
		$ 31,524.00	$ 294,224.00		0.1	0.25	0.6	10	20	10	10
2	Washington Blvd/Beethoven St	$ -	$ -	S02, S03							
		$ 19,539.00	$ 182,364.00		0.3	0.1		20	10		7
3	Sawtelle Blvd/Washington Pl	$ -	$ -	S02, S03							
		$ 31,524.00	$ 294,224.00		0.1	0.25	0.6	10	20	10	12
4	Inglewood Blvd/Washington Blvd	$ -	$ -	S02, S03, S07							
		$ 31,524.00	$ 294,224.00		0.1	0.25	0.6	10	20	10	8
5	Higuera St/Krueger St	$ -	$ -	NS20PB							
		$ 11,145.00	$ 104,020.00		0.4	0.15	0.25	20	10	10	2
6	Overland Ave/Northgate St	$ -	$ -	Traffic Calming Measures							
		$ 3,345.00	$ 31,220.00		0.15	0.25	0.25	10	10	10	8
7	Jefferson Blvd/Hetzler Rd	$ -	$ -	S03, S06							
		$ 6,249.00	$ 58,324.00		0.15	0.1	0.6	10	10	10	13
8	Washington Blvd/Sawtelle Blvd	$ -	$ -	S03, S10							
		$ 35,199.00	$ 328,524.00		0.15	0.1	0.25	10	10	20	19
	Washington Blvd/Cattaraugus Ave (W)	$ -	$ -	S10, S12							
		$ 13,044.00	$ 121,744.00		0.15	0.15	0.1	10	10	10	4
	Washington Blvd/Cattaraugus Ave (E)	$ -	$ -	NS15							
		$ 11,145.00	$ 104,020.00		0.4	0.15	0.25	20	10	10	3
9	Overland Ave/Braddock Dr	$ -	$ -	S03, S21PB							
		$ 24,339.00	$ 227,164.00		0.15	0.3	0.1	10	20	10	10
10	Sepulveda Blvd/Green Valley Cir;	$ -	$ -								
		$ 35,199.00	$ 328,524.00		0.15	0.1	0.25	10	10	20	8
	6000 Sepulveda Blvd/4th Level Parking Structure	$ -	$ -								
		$ 3,345.00	$ 31,220.00		0.4	0.15	0.25	20	10	10	1
11	Washington Blvd/Kensington Rd	$ -	$ -	NS13							
		$ 11,145.00	$ 104,020.00		0.15	0.25	0.3	10	10	10	9
12	Culver Blvd/Sawtelle Blvd	$ -	$ -	S02, S03							
		$ 39,099.00	$ 364,924.00		0.4	0.3	0.1	20	20	10	34
13	Slauson Ave/Bristol Pky	$ -	$ -	S12							
		$ 6,249.00	$ 58,324.00		0.15	0.1	0.6	10	10	10	21
14	Washington Blvd/Prospect Ave	$ -	$ -	Traffic Calming Measures							
		$ 3,345.00	$ 31,220.00		0.15	0.25	0.25	10	10	10	4
15	Sepulveda Blvd/Washington Pl	$ -	$ -	S10							
		$ 30,399.00	$ 283,724.00		0.1	0.25		10	20		17
16	Washington Blvd/Kenyon Ave	$ -	$ -	NS20PB							
		$ 11,145.00	$ 104,020.00		0.4	0.15	0.25	20	10	10	5
17	Culver Blvd/Overland Ave	$ -	$ -	S02, S03							
		$ 1,449.00	$ 13,524.00		0.1	0.6		10	10		24
18	Overland Ave/Freshman Dr	$ -	$ -								
		$ 324.00	$ 3,024.00		0.4	0.1	0.25	20	10	20	4

											Years	5
Rank	**Intersection**	**Fatal**	**Severe Injury**	**Other Visible Injury**	**Compliant of Pain**	**PDO**	**Fatal**	**Severe Injury**	**Other Visible Injury**	**Compliant of Pain**	**PDO**	**Crash Costs**
1	Virginia Ave/Overland Ave											
		0	1	1	4	4	0	1590000	$142,300	$323,600	$53,200	$ 2,109,100
2	Washington Blvd/Beethoven St						0	0	$0	$0	$0	$ -
		0	1	2	0	4	0	1590000	$284,600	$0	$53,200	$ 1,927,800
3	Sawtelle Blvd/Washington Pl						0	0	$0	$0	$0	$ -
		0	2	3	5	2	0	3180000	$426,900	$404,500	$26,600	$ 4,038,000
4	Inglewood Blvd/Washington Blvd						0	0	$0	$0	$0	$ -
		0	2	3	3	0	0	3180000	$426,900	$242,700	$0	$ 3,849,600
5	Higuera St/Krueger St						0	0	$0	$0	$0	$ -
		0	1	0	0	1	0	2530000	$0	$0	$13,300	$ 2,543,300
6	Overland Ave/Northgate St						0	0	$0	$0	$0	$ -
		0	2	3	1	2	0	5060000	$426,900	$80,900	$26,600	$ 5,594,400
7	Jefferson Blvd/Hetzler Rd						0	0	$0	$0	$0	$ -
		0	2	2	7	2	0	3180000	$284,600	$566,300	$26,600	$ 4,057,500
	Washington Blvd/Sawtelle Blvd						0	0	$0	$0	$0	$ -
		0	2	5	10	2	0	3180000	$711,500	$809,000	$26,600	$ 4,727,100
8	Washington Blvd/Cattaraugus Ave (W)						0	0	$0	$0	$0	$ -
		0	1	3	0	0	0	1590000	$426,900	$0	$0	$ 2,016,900
	Washington Blvd/Cattaraugus Ave (E)						0	0	$0	$0	$0	$ -
		0	1	0	2	0	0	2530000	$0	$161,800	$0	$ 2,691,800
9	Overland Ave/Braddock Dr						0	0	$0	$0	$0	$ -
		0	2	5	2	1	0	3180000	$711,500	$161,800	$13,300	$ 4,066,600
	Sepulveda Blvd/Green Valley Cir;						0	0	$0	$0	$0	$ -
10		0	1	0	3	4	0	1590000	$0	$242,700	$53,200	$ 1,885,900
	6000 Sepulveda Blvd/4th Level Parking Structure						0	0	$0	$0	$0	$ -
		0	1	0	0	0	0	2530000	$0	$0	$0	$ 2,530,000
11	Washington Blvd/Kensington Rd						0	0	$0	$0	$0	$ -
		0	2	2	1	4	0	5060000	$284,600	$80,900	$53,200	$ 5,478,700
12	Culver Blvd/Sawtelle Blvd						0	0	$0	$0	$0	$ -
		0	1	7	20	6	0	1590000	$996,100	$1,618,000	$79,800	$ 4,283,900
13	Slauson Ave/Bristol Pky						0	0	$0	$0	$0	$ -
		1	2	1	8	9	1590000	3180000	$142,300	$647,200	$119,700	$ 5,679,200
14	Washington Blvd/Prospect Ave						0	0	$0	$0	$0	$ -
		0	1	1	2	0	0	2530000	$142,300	$161,800	$0	$ 2,834,100
15	Sepulveda Blvd/Washington Pl						0	0	$0	$0	$0	$ -
		0	2	1	10	4	0	3180000	$142,300	$809,000	$53,200	$ 4,184,500
16	Washington Blvd/Kenyon Ave						0	0	$0	$0	$0	$ -
		0	1	2	2	0	0	2530000	$284,600	$161,800	$0	$ 2,976,400
17	Culver Blvd/Overland Ave						0	0	$0	$0	$0	$ -
		1	1	4	13	5	1590000	1590000	$569,200	$1,051,700	$66,500	$ 4,867,400
18	Overland Ave/Freshman Dr						0	0	$0	$0	$0	$ -
		1	0	2	1	0	1590000	0	$284,600	$80,900	$0	$ 1,955,500

Rank	Intersection	CM1 Benefit	CM2 Benefit	CM3 Benefit	CM1 Benefit_Life	CM2 Benefit_Life	CM3 Benefit_Life	Total Benefit_Life	BCR
1	Virginia Ave/Overland Ave								
		$ 42,182	$ 105,455	$ 253,092	$ 421,820	$ 2,109,100	$ 2,530,920	$ 5,061,840	17.2
2	Washington Blvd/Beethoven St	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 115,668	$ 38,556	$ -	$ 2,313,360	$ 385,560	$ -	$ 2,698,920	14.8
3	Sawtelle Blvd/Washington Pl	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 80,760	$ 201,900	$ 484,560	$ 807,600	$ 4,038,000	$ 4,845,600	$ 9,691,200	32.9
4	Inglewood Blvd/Washington Blvd	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 76,992	$ 192,480	$ 461,952	$ 769,920	$ 3,849,600	$ 4,619,520	$ 9,239,040	31.4
5	Higuera St/Krueger St	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 203,464	$ 76,299	$ 127,165	$ 4,069,280	$ 762,990	$ 1,271,650	$ 6,103,920	58.7
6	Overland Ave/Northgate St	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 167,832	$ 279,720	$ 279,720	$ 1,678,320	$ 2,797,200	$ 2,797,200	$ 7,272,720	233.0
7	Jefferson Blvd/Hetzler Rd	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 121,725	$ 81,150	$ 486,900	$ 1,217,250	$ 811,500	$ 4,869,000	$ 6,897,750	118.3
8	Washington Blvd/Sawtelle Blvd	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 141,813	$ 94,542	$ 236,355	$ 1,418,130	$ 945,420	$ 4,727,100	$ 7,090,650	21.6
	Washington Blvd/Cattaraugus Ave (W)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 60,507	$ 60,507	$ 40,338	$ 605,070	$ 605,070	$ 403,380	$ 1,613,520	13.3
	Washington Blvd/Cattaraugus Ave (E)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 215,344	$ 80,754	$ 134,590	$ 4,306,880	$ 807,540	$ 1,345,900	$ 6,460,320	62.1
9	Overland Ave/Braddock Dr	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 121,998	$ 243,996	$ 81,332	$ 1,219,980	$ 4,879,920	$ 813,320	$ 6,913,220	30.4
10	Sepulveda Blvd/Green Valley Cir;	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 56,577	$ 37,718	$ 94,295	$ 565,770	$ 377,180	$ 1,885,900	$ 2,828,850	8.6
	6000 Sepulveda Blvd/4th Level Parking Structure	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 202,400	$ 75,900	$ 126,500	$ 4,048,000	$ 759,000	$ 1,265,000	$ 6,072,000	194.5
11	Washington Blvd/Kensington Rd	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 164,361	$ 273,935	$ 328,722	$ 1,643,610	$ 2,739,350	$ 3,287,220	$ 7,670,180	73.7
12	Culver Blvd/Sawtelle Blvd	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 342,712	$ 257,034	$ 85,678	$ 6,854,240	$ 5,140,680	$ 856,780	$ 12,851,700	35.2
13	Slauson Ave/Bristol Pky	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 170,376	$ 113,584	$ 681,504	$ 1,703,760	$ 1,135,840	$ 6,815,040	$ 9,654,640	165.5
14	Washington Blvd/Prospect Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 85,023	$ 141,705	$ 141,705	$ 850,230	$ 1,417,050	$ 1,417,050	$ 3,684,330	118.0
15	Sepulveda Blvd/Washington Pl	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 83,690	$ 209,225	$ -	$ 836,900	$ 4,184,500	$ -	$ 5,021,400	17.7
16	Washington Blvd/Kenyon Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 238,112	$ 89,292	$ 148,820	$ 4,762,240	$ 892,920	$ 1,488,200	$ 7,143,360	68.7
17	Culver Blvd/Overland Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 97,348	$ 584,088	$ -	$ 973,480	$ 5,840,880	$ -	$ 6,814,360	503.9
18	Overland Ave/Freshman Dr	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 156,440	$ 39,110	$ 97,775	$ 3,128,800	$ 391,100	$ 1,955,500	$ 5,475,400	1810.6

							10%	5%	10%
Rank	**Intersection**	**Controls**	**CM1**	**CM2**	**CM3**	**Total Cost**	**Continency**	**Environmental**	**PS&E**
19	Culver Blvd/Duquesne Ave	Signalized	S01	S07	S09	$ -	$ -	$ -	$ -
			$130,400	$ 128,100	$ 2,160	$ 260,660.00	$ 26,066.00	$ 13,033.00	$ 26,066.00
20	Washington Pl/Boise Ave	Unsignalized	NS06	NS07	NSPB20	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	$ 10,000	$ 22,300.00	$ 2,230.00	$ 1,115.00	$ 2,230.00
21	Washington Pl/Frances Ave	Unsignalized	NS06	NS07	NSPB20	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	$ 10,000	$ 22,300.00	$ 2,230.00	$ 1,115.00	$ 2,230.00
22	Mcmanus Ave/Washington Blvd (E)	Signalized	S09	S10	S21PB	$ -	$ -	$ -	$ -
			$ 2,160	$ 15,000	$ 7,500	$ 24,660.00	$ 2,466.00	$ 1,233.00	$ 2,466.00
23	Centinela Ave/Bristol Pky	Signalized	S02	S09	S10	$ -	$ -	$ -	$ -
			$ 32,000	$ 2,160.00	$ 15,000	$ 49,160.00	$ 4,916.00	$ 2,458.00	$ 4,916.00
	Slauson Ave/Buckingham Pky	Signalized	S01	S09	S10	$ -	$ -	$ -	$ -
24			$130,400	$ 2,160	$ 15,000	$ 147,560.00	$ 14,756.00	$ 7,378.00	$ 14,756.00
	Sepulveda Blvd/Vera Way	Unsignalized	NS06	NS07		$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300		$12,300	$ 1,230.00	$ 615.00	$ 1,230.00
25	Washington Blvd/Hutchison Ave	Unsignalized	NS06	NS07	NS08	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	15,000	$ 27,300.00	$ 2,730.00	$ 1,365.00	$ 2,730.00
26	Washington Pl/Tuller Ave	Unsignalized	NS06	NS07	NS20PB	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	$ 10,000	$ 22,300.00	$ 2,230.00	$ 1,115.00	$ 2,230.00
	Washington Blvd/Ince Blvd	Signalized	S09	S10	S12	$ -	$ -	$ -	$ -
27			$ 2,160	$ 8,000	$ 200,500	$ 210,660.00	$ 21,066.00	$ 10,533.00	$ 21,066.00
	La Cienega Blvd/Washington Blvd;	Signalized	S09	S10	S12	$ -	$ -	$ -	$ -
			$ 2,160	$ 15,000	$ 200,500	$ 217,660.00	$ 21,766.00	$ 10,883.00	$ 21,766.00
	Culver Blvd/Huron Ave;	Signalized	S09	S10	S12	$ -	$ -	$ -	$ -
			$ 2,160	$ 15,000	$ 200,500	$ 217,660.00	$ 21,766.00	$ 10,883.00	$ 21,766.00
28	Culver Blvd/Harter Ave	Unsignalized	NS06	NS07	NS09	$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300	$ 15,000	$ 27,300.00	$ 2,730.00	$ 1,365.00	$ 2,730.00
	Culver Blvd/Elenda St;	Signalized	S02	S09	S21PB	$ -	$ -	$ -	$ -
			$ 32,000	$ 2,160	$ 7,500	$ 41,660.00	$ 4,166.00	$ 2,083.00	$ 4,166.00
29	Robertson Blvd/Washington Blvd	Signalized	S02	S09	S12	$ -	$ -	$ -	$ -
			$ 32,000	$ 2,160	$ 200,500	$ 234,660.00	$ 23,466.00	$ 11,733.00	$ 23,466.00
	Washington Blvd/Glencoe Ave (W)	Signalized	S07	S09	S12	$ -	$ -	$ -	$ -
			$ 128,100	$ 2,160	$ 200,500	$ 330,760.00	$ 33,076.00	$ 16,538.00	$ 33,076.00
	Washington Blvd/Tivoli Ave;	Unsignalized	NS01	NS06	NS07	$ -	$ -	$ -	$ -
			$62,000	$ 9,000	$ 3,300	$74,300	$ 7,430.00	$ 3,715.00	$ 7,430.00
30	Washington Blvd/Michael Ave;	Unsignalized	NS01	NS06	NS07	$ -	$ -	$ -	$ -
			$62,000	$ 9,000	$ 3,300	$74,300	$ 7,430.00	$ 3,715.00	$ 7,430.00
	Washington Blvd/Alla Rd (W)	Unsignalized	NS01	NS06	NS07	$ -	$ -	$ -	$ -
			$62,000	$ 9,000	$ 3,300	$74,300	$ 7,430.00	$ 3,715.00	$ 7,430.00
	Washington Blvd/Del Rey Ave	Unsignalized	NS06	NS07		$ -	$ -	$ -	$ -
			$ 9,000	$ 3,300		$ 12,300.00	$ 1,230.00	$ 615.00	$ 1,230.00

		15%									
Rank	**Intersection**	**Construction**	**Total Cost per Location**	**Additional Improvements**	**CRF_CM1**	**CRF_CM2**	**CRF_CM3**	**Life_CM1**	**Life_CM2**	**Life_CM3**	**Total Collisions**
19	Culver Blvd/Duquesne Ave	$ -	$ -								
		$ 39,099.00	$ 364,924.00		0.4	0.3	0.1	20	20	10	11
20	Washington Pl/Boise Ave	$ -	$ -								
		$ 3,345.00	$ 31,220.00		0.15	0.25	0.25	10	10	10	2
21	Washington Pl/Frances Ave	$ -	$ -								
		$ 3,345.00	$ 31,220.00		0.15	0.25	0.25	10	10	10	3
22	Mcmanus Ave/Washington Blvd (E)	$ -	$ -								
		$ 3,699.00	$ 34,524.00		0.1	0.3	0.6	10	10	10	4
23	Centinela Ave/Bristol Pky	$ -	$ -								
		$ 7,374.00	$ 68,824.00		0.15	0.1	0.3	10	10	10	10
	Slauson Ave/Buckingham Pky	$ -	$ -								
24		$ 22,134.00	$ 206,584.00		0.4	0.1	0.3	20	10	10	18
	Sepulveda Blvd/Vera Way	$ -	$ -								
		$ 1,845.00	$ 17,220.00		0.15	0.25		10	10		5
25	Washington Blvd/Hutchison Ave	$ -	$ -								
		$ 4,095.00	$ 38,220.00		0.15	0.25	0.15	10	10	10	4
26	Washington Pl/Tuller Ave	$ -	$ -								
		$ 3,345.00	$ 31,220.00		0.15	0.25	0.25	10	10	10	6
	Washington Blvd/Ince Blvd	$ -	$ -	S02, S03							
27		$ 31,599.00	$ 294,924.00		0.1	0.3	0.25	10	10	20	11
	La Cienega Blvd/Washington Blvd;	$ -	$ -	S02, S03							
		$ 32,649.00	$ 304,724.00		0.1	0.3	0.25	10	10	20	21
	Culver Blvd/Huron Ave;	$ -	$ -	S02, S03							
		$ 32,649.00	$ 304,724.00		0.1	0.3	0.25	10	10	20	13
28	Culver Blvd/Harter Ave	$ -	$ -								
		$ 4,095.00	$ 38,220.00		0.15	0.25	0.3	10	10	10	7
	Culver Blvd/Elenda St;	$ -	$ -								
		$ 6,249.00	$ 58,324.00		0.15	0.1	0.6	10	10	10	12
29	Robertson Blvd/Washington Blvd	$ -	$ -								
		$ 35,199.00	$ 328,524.00		0.15	0.1	0.25	10	10	20	6
	Washington Blvd/Glencoe Ave (W)	$ -	$ -	S02, S21PB							
		$ 49,614.00	$ 463,064.00		0.3	0.1	0.25	20	10	20	22
	Washington Blvd/Tivoli Ave;	$ -	$ -	NA14, NS15							
		$ 11,145.00	$ 104,020.00		0.4	0.15	0.25	20	10	10	8
30	Washington Blvd/Michael Ave;	$ -	$ -	NS14							
		$ 11,145.00	$ 104,020.00		0.4	0.15	0.25	20	10	10	3
	Washington Blvd/Alla Rd (W)	$ -	$ -	NS14							
		$ 11,145.00	$ 104,020.00		0.4	0.15	0.25	20	10	10	4
	Washington Blvd/Del Rey Ave	$ -	$ -								
		$ 1,845.00	$ 17,220.00		0.15	0.25		10	10		4

											Years	5
Rank	**Intersection**	**Fatal**	**Severe Injury**	**Other Visible Injury**	**Compliant of Pain**	**PDO**	**Fatal**	**Severe Injury**	**Other Visible Injury**	**Compliant of Pain**	**PDO**	**Crash Costs**
19	Culver Blvd/Duquesne Ave						0	0	$0	$0	$0	$ -
		0	1	4	4	2	0	1590000	$569,200	$323,600	$26,600	$ 2,509,400
20	Washington Pl/Boise Ave						0	0	$0	$0	$0	$ -
		0	1	0	1	0	0	2530000	$0	$80,900	$0	$ 2,610,900
21	Washington Pl/Frances Ave						0	0	$0	$0	$0	$ -
		0	1	0	1	1	0	2530000	$0	$80,900	$13,300	$ 2,624,200
22	Mcmanus Ave/Washington Blvd (E)						0	0	$0	$0	$0	$ -
		0	1	1	1	1	0	1590000	$142,300	$80,900	$13,300	$ 1,826,500
23	Centinela Ave/Bristol Pky						0	0	$0	$0	$0	$ -
		1	0	3	4	2	1590000	0	$426,900	$323,600	$26,600	$ 2,367,100
	Slauson Ave/Buckingham Pky						0	0	$0	$0	$0	$ -
24		1	1	2	8	6	1590000	1590000	$284,600	$647,200	$79,800	$ 4,191,600
	Sepulveda Blvd/Vera Way						0	0	$0	$0	$0	$ -
		0	1	1	3	0	0	2530000	$142,300	$242,700	$0	$ 2,915,000
25	Washington Blvd/Hutchison Ave						0	0	$0	$0	$0	$ -
		1	0	0	2	1	2530000	0	$0	$161,800	$13,300	$ 2,705,100
26	Washington Pl/Tuller Ave						0	0	$0	$0	$0	$ -
		0	1	2	2	1	0	2530000	$284,600	$161,800	$13,300	$ 2,989,700
	Washington Blvd/Ince Blvd						0	0	$0	$0	$0	$ -
27		0	1	2	3	5	0	1590000	$284,600	$242,700	$66,500	$ 2,183,800
	La Cienega Blvd/Washington Blvd;						0	0	$0	$0	$0	$ -
		0	1	4	12	4	0	1590000	$569,200	$970,800	$53,200	$ 3,183,200
	Culver Blvd/Huron Ave;						0	0	$0	$0	$0	$ -
		0	1	3	6	3	0	1590000	$426,900	$485,400	$39,900	$ 2,542,200
28	Culver Blvd/Harter Ave						0	0	$0	$0	$0	$ -
		0	1	5	1	0	0	2530000	$711,500	$80,900	$0	$ 3,322,400
	Culver Blvd/Elenda St;						0	0	$0	$0	$0	$ -
		1	0	2	3	6	1590000	0	$284,600	$242,700	$79,800	$ 2,197,100
29	Robertson Blvd/Washington Blvd						0	0	$0	$0	$0	$ -
		0	1	3	1	1	0	1590000	$426,900	$80,900	$13,300	$ 2,111,100
	Washington Blvd/Glencoe Ave (W)						0	0	$0	$0	$0	$ -
		0	1	8	8	5	0	1590000	##########	$647,200	$66,500	$ 3,442,100
	Washington Blvd/Tivoli Ave;						0	0	$0	$0	$0	$ -
		0	1	3	2	2	0	2530000	$426,900	$161,800	$26,600	$ 3,145,300
30	Washington Blvd/Michael Ave;						0	0	$0	$0	$0	$ -
		0	1	1	0	1	0	2530000	$142,300	$0	$13,300	$ 2,685,600
	Washington Blvd/Alla Rd (W)						0	0	$0	$0	$0	$ -
		0	1	1	2	0	0	2530000	$142,300	$161,800	$0	$ 2,834,100
	Washington Blvd/Del Rey Ave						0	0	$0	$0	$0	$ -
		0	1	2	1	0	0	2530000	$284,600	$80,900	$0	$ 2,895,500

Rank	Intersection	CM1 Benefit	CM2 Benefit	CM3 Benefit	CM1 Benefit_Life	CM2 Benefit_Life	CM3 Benefit_Life	Total Benefit_Life	BCR
19	Culver Blvd/Duquesne Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 200,752	$ 150,564	$ 50,188	$ 4,015,040	$ 3,011,280	$ 501,880	$ 7,528,200	20.6
20	Washington Pl/Boise Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 78,327	$ 130,545	$ 130,545	$ 783,270	$ 1,305,450	$ 1,305,450	$ 3,394,170	108.7
21	Washington Pl/Frances Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 78,726	$ 131,210	$ 131,210	$ 787,260	$ 1,312,100	$ 1,312,100	$ 3,411,460	109.3
22	Mcmanus Ave/Washington Blvd (E)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	#DIV/0!
		$ 36,530	$ 109,590	$ 219,180	$ 365,300	$ 1,095,900	$ 2,191,800	$ 3,653,000	105.8
23	Centinela Ave/Bristol Pky	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 71,013	$ 47,342	$ 142,026	$ 710,130	$ 473,420	$ 1,420,260	$ 2,603,810	37.8
24	Slauson Ave/Buckingham Pky	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 335,328	$ 83,832	$ 251,496	$ 6,706,560	$ 838,320	$ 2,514,960	$ 10,059,840	48.7
	Sepulveda Blvd/Vera Way	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 87,450	$ 145,750	$ -	$ 874,500	$ 1,457,500	$ -	$ 2,332,000	135.4
25	Washington Blvd/Hutchison Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 81,153	$ 135,255	$ 81,153	$ 811,530	$ 1,352,550	$ 811,530	$ 2,975,610	77.9
26	Washington Pl/Tuller Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 89,691	$ 149,485	$ 149,485	$ 896,910	$ 1,494,850	$ 1,494,850	$ 3,886,610	124.5
27	Washington Blvd/Ince Blvd	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 43,676	$ 131,028	$ 109,190	$ 436,760	$ 1,310,280	$ 2,183,800	$ 3,930,840	13.3
	La Cienega Blvd/Washington Blvd;	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 63,664	$ 190,992	$ 159,160	$ 636,640	$ 1,909,920	$ 3,183,200	$ 5,729,760	18.8
28	Culver Blvd/Huron Ave;	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 50,844	$ 152,532	$ 127,110	$ 508,440	$ 1,525,320	$ 2,542,200	$ 4,575,960	15.0
	Culver Blvd/Harter Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 99,672	$ 166,120	$ 199,344	$ 996,720	$ 1,661,200	$ 1,993,440	$ 4,651,360	121.7
	Culver Blvd/Elenda St;	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 65,913	$ 43,942	$ 263,652	$ 659,130	$ 439,420	$ 2,636,520	$ 3,735,070	64.0
29	Robertson Blvd/Washington Blvd	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 63,333	$ 42,222	$ 105,555	$ 633,330	$ 422,220	$ 2,111,100	$ 3,166,650	9.6
30	Washington Blvd/Glencoe Ave (W)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 206,526	$ 68,842	$ 172,105	$ 4,130,520	$ 688,420	$ 3,442,100	$ 8,261,040	17.8
	Washington Blvd/Tivoli Ave;	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 251,624	$ 94,359	$ 157,265	$ 5,032,480	$ 943,590	$ 1,572,650	$ 7,548,720	72.6
	Washington Blvd/Michael Ave;	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 214,848	$ 80,568	$ 134,280	$ 4,296,960	$ 805,680	$ 1,342,800	$ 6,445,440	62.0
	Washington Blvd/Alla Rd (W)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 226,728	$ 85,023	$ 141,705	$ 4,534,560	$ 850,230	$ 1,417,050	$ 6,801,840	65.4
	Washington Blvd/Del Rey Ave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
		$ 86,865	$ 144,775	$ -	$ 868,650	$ 1,447,750	$ -	$ 2,316,400	134.5

						10%	5%	10%
Rank	**Roadway Segment Collision Locations**	**CM1**	**CM2**	**CM3**	**Total Cost**	**Continency**	**Environmental**	**PS&E**
1	Jefferson Boulevard, 152 feet E and 375 feet W of Raintree Cir		R21					
			$ 312,900		$ 312,900	$ 31,290	$ 15,645	$ 31,290
2	Sawtelle Blvd, between Herbert St and 470 feet N of Culver Blvd	R8	R21			$ -	$ -	$ -
		310,100	$ 312,900		$ 623,000	$ 62,300	$ 31,150	$ 62,300
3	Washington Blvd, between Ince Blvd and Higuera St	R8	R21	R35PB		$ -	$ -	$ -
		310,100	$ 312,900	$ 20,000.00	$ 643,000	$ 64,300	$ 32,150	$ 64,300
4	Culver Blvd, between Harter Ave and 138 feet W of Huron Ave		R21			$ -	$ -	$ -
			$ 312,900		$ 312,900	$ 31,290	$ 15,645	$ 31,290

		15%						
Rank	**Roadway Segment Collision Locations**	**Construction**	**Total Cost per Location**	**Additional Improvements**	**CRF_CM1**	**CRF_CM2**	**CRF_CM3**	**Life_CM1**
1	Jefferson Boulevard, 152 feet E and 375 feet W of Raintree Cir			R26				
		$ 46,935	$ 438,060			0.4		
2	Sawtelle Blvd, between Herbert St and 470 feet N of Culver Blvd	$ -	$ -	R26				
		$ 93,450	$ 872,200		0.25	0.4		20
3	Washington Blvd, between Ince Blvd and Higuera St	$ -	$ -	R26				
		$ 96,450	$ 900,200		0.25	0.4	0.3	20
4	Culver Blvd, between Harter Ave and 138 feet W of Huron Ave	$ -	$ -	R26				
		$ 46,935	$ 438,060			0.4		

												No. of Year	5
Rank	**Roadway Segment Collision Locations**	**Life_CM2**	**Life_CM3**	**Total Collisions**	**Fatal**	**Severe Injury**	**Other Visible Injury**	**Complian t of Pain**	**PDO**	**Fatal**	**Severe Injury**	**Other Visible Injury**	**Complian t of Pain**
1	Jefferson Boulevard, 152 feet E and 375 feet W of Raintree Cir												
		10		5	0	1	0	4	0	0	2190000	$0	$323,600
2	Sawtelle Blvd, between Herbert St and 470 feet N of Culver Blvd			0						0	0	$0	$0
		10		21	0	3	6	9	3	0	6570000	$853,800	$728,100
3	Washington Blvd, between Ince Blvd and Higuera St			0						0	0	$0	$0
		10	10	12	0	1	2	5	4	0	2190000	$284,600	$404,500
4	Culver Blvd, between Harter Ave and 138 feet W of Huron Ave			0						0	0	$0	$0
		10		6	0	2	3	1	0	0	4380000	$426,900	$80,900

Rank	Roadway Segment Collision Locations	PDO	Crash Costs	CM1 Benefit	CM2 Benefit	CM3 Benefit	CM1 Benefit_Life	CM2 Benefit_Life	CM3 Benefit_Life
1	Jefferson Boulevard, 152 feet E and 375 feet W of Raintree Cir								
		$0	$ 2,513,600	$ -	$ 201,088	$ -	$ -	$ 2,010,880	$ -
2	Sawtelle Blvd, between Herbert St and 470 feet N of Culver Blvd	$0	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		$39,900	$ 8,191,800	$ 409,590	$ 655,344	$ -	$ 8,191,800	$ 6,553,440	$ -
3	Washington Blvd, between Ince Blvd and Higuera St	$0	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		$53,200	$ 2,932,300	$ 146,615	$ 234,584	#######	$ 2,932,300	$ 2,345,840	$ 1,759,380
4	Culver Blvd, between Harter Ave and 138 feet W of Huron Ave	$0	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		$0	$ 4,887,800	$ -	$ 391,024	$ -	$ -	$ 3,910,240	$ -

Rank	Roadway Segment Collision Locations	Total Benefit_Life	BCR
1	Jefferson Boulevard, 152 feet E and 375 feet W of Raintree Cir		
		$ 2,010,880	4.6
2	Sawtelle Blvd, between Herbert St and 470 feet N of Culver Blvd	$ -	
		$ 14,745,240	16.9
3	Washington Blvd, between Ince Blvd and Higuera St	$ -	
		$ 7,037,520	7.8
4	Culver Blvd, between Harter Ave and 138 feet W of Huron Ave	$ -	
		$ 3,910,240	8.9