CITY OF CUPERTINO

LOCAL ROADWAY SAFETY PLAN

JANUARY 2023

FINAL REPORT

CUPERTINO


Homestead Rd
CUPERTINO

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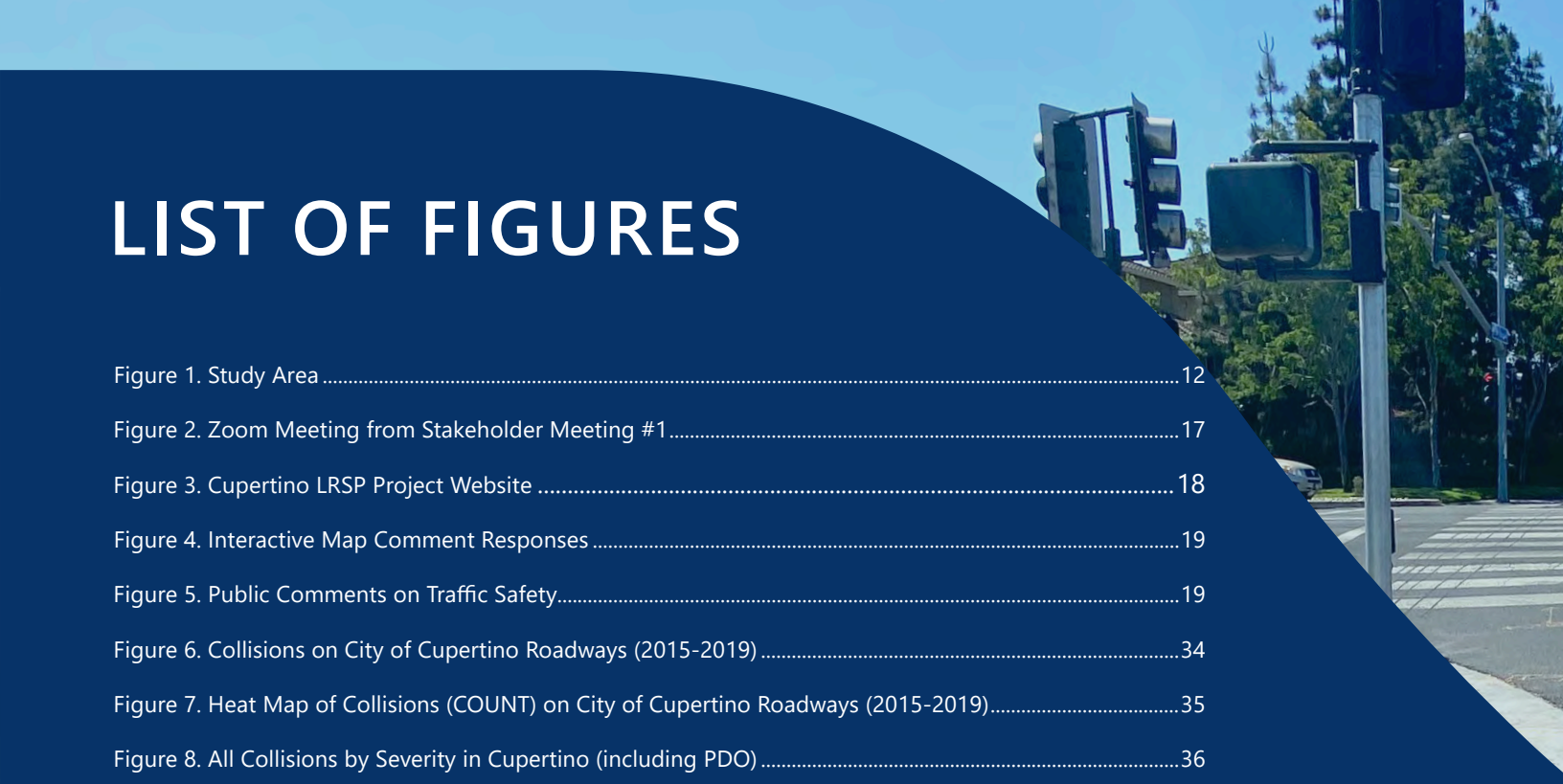

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GLOSSARY

4E – The 4E of traffic safety: education, enforcement, engineering, emergency medical services.

ACS – American Community Survey.

ADT – Average Daily Traffic.

ATP – Active Transportation Plan.

B/C Ratio – Benefit-Cost Ratio. It summarizes overall value for money of a project.

BTP – Bicycle Transportation Plan.

CRF – Crash Reduction Factor. It is the percentage crash reduction that might be expected after implementing a given countermeasure at a specific site.

Collision Rate – It is the number of crashes that occur at a given location during a specified time period (usually three to five years) divided by a measure of exposure for the same period.

Collision Severity – Defined as seriousness of collision, which include fatal (F), severe injury (SI), other visible injury and complaint of pain (Other), and property damage only (PDO).

EMS – Emergency Medical Services.

FHWA – Federal Highway Administration.

HSIP – Highway Safety Improvement Program.

LRSM – Local Roadway Safety Manual.

MITP – Metropolitan Transportation Improvement Program.

OTS – California Office of Traffic Safety.

RSTP – Federal Regional Surface Transportation Program.

Primary Violation Factor – Defined as factors that are strong in contribution to the collision.

SB1 – Sustainable Community Grants

SACOG – Sacramento Area Council of Governments.

SR2S –Safe Routes to School.

STIP – State Transportation Improvement Program.

SWITRS – Statewide Integrated Traffic Records System. It is a database that contains all collisions reported to California Highway Patrol from local and governmental agencies.

TIMS – Transportation Injury Mapping System. It is a platform to access California's crash data.

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EXECUTIVE SUMMARY

The City of Cupertino's Local Roadway Safety Plan (LRSP) is a comprehensive plan that creates a framework to systematically identify and analyze traffic safety related issues and recommend projects and countermeasures. It aims to reduce fatal and severe injury (F+SI) collisions through a prioritized list of improvements that can enhance safety on local roadways.

The LRSP takes a proactive approach to addressing safety needs. It is viewed as a guidance document that can be a source of information and ideas. It is also a living document, one that is routinely reviewed and updated by City staff and their safety partners to reflect evolving collision trends and community needs and priorities. With the LRSP as a guide, the City will be able to readily apply for grant funds, such as the federal Highway Safety Improvement Program (HSIP) or One Bay Area Grant (OBAG). This document summarizes an analysis of collisions that occurred in Cupertino, identifies high-injury locations, and recommends countermeasures at each of these high-risk locations.

GOALS OF THE LRSP

- Goal 1: Identify and analyze road safety issues from a systemic perspective and recommend improvements
- Goal 2: Improve pedestrian and bicyclist safety through the application of proven effective countermeasures
- Goal 3: Coordinate the actions of key stakeholders to implement road safety improvements and Emergency response in the City of Cupertino
- Goal 4: Continually seek funding for safety improvements
- Goal 5: Ensure that all safety improvements are made in a fair and equitable manner for all residents of the City of Cupertino

PROCESS

The systemic approach in preparing the LRSP involves the following steps:

- Develop plan goals and objectives
- Analyze collision data
- Meet with stakeholders/safety partners
- Determine focus areas and identify crash reduction strategies
- Prioritize countermeasures/projects
- Prepare the LRSP

COLLISION DATA

Collision data was obtained for a five-year period from 2015 to 2019 from the Santa Clara County's Crossroads Software's Traffic Collision Database, California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) and the University of California at Berkeley SafeTREC's Transportation Injury Mapping Service (TIMS). For the purpose of this report the data was analyzed for a five-year period from 2015 to 2019 from the Santa Clara County's Crossroads Software's Traffic Collision Database.

COLLISION TREND

Key findings on patterns and trends:

- A total of 2,140 collisions occurred between 2015 and 2019.
- Three collisions resulted in fatality, 46 collisions resulted in severe injuries, 203 resulted in a visible injury, 362 resulted in a complaint of pain injury, and 1,526 resulted in PDO collisions.
- The year 2015 had highest number of collisions with 133 collisions, and 2018 had the lowest number of collisions with 109 collisions.
- The highest number of injury collisions occurred within 250 feet of an intersection (80%).
- Rear-end and broadside collisions, each accounted for 26% of total injury collisions. 29% of broadside collisions resulted into F+SI collisions.
- Unsafe speed accounted for 28% of all injury collisions, followed by automobile right-of-way violation (20%) and improper turning (16%).
- Most of the F+SI collisions occurred between 4:00 p.m. and 6:00 p.m., followed by between 6:30 p.m. and 7:30 p.m., 7:30 a.m. and 10:00 a.m.
- 53% of injury collisions were motor vehicle involved with other motor vehicles followed by motor vehicle involved with a cyclist (24%), motor vehicle involved with a pedestrian (12%), and fixed objects (7%).
- There were a total of 219 bicycle and pedestrian injury collisions during the study period, of which 147 were bicycle and 72 pedestrian collisions. The total number of pedestrian and cyclist collisions has remained relatively steady over the five-year period.

HIGH RISK LOCATIONS

The collision rate analysis was performed on all City streets. The corridors were ranked to show the top 11 high-collision roadway segments and top 10 high-collision intersections.

Key findings of identifying high-risk roadway segment are as follows:

- There were a total of 390 injury collisions that occurred on the roadway segments
- 38 collisions led to F+SI collisions
- The Stevens Creek Boulevard between Janice Avenue and Judy Avenue had the highest number of F+SI collisions with 11, followed by De Anza Boulevard between Pacifica Drive and Homestead Road with eight F+SI collisions

Key findings of identifying high-risk intersections are as follows:

- There were a total of 147 injury collisions that occurred at the intersection
- 24 collisions led to F+SI
- The intersection of De Anza Boulevard and Homestead Road had the highest number of injury collisions overall (41)

EMPHASIS AREAS

Emphasis areas are focus areas for the LRSP that are identified through the comprehensive collision analysis of the identified high injury locations within the City of Cupertino. The nine emphasis area identified for the City of Cupertino are:

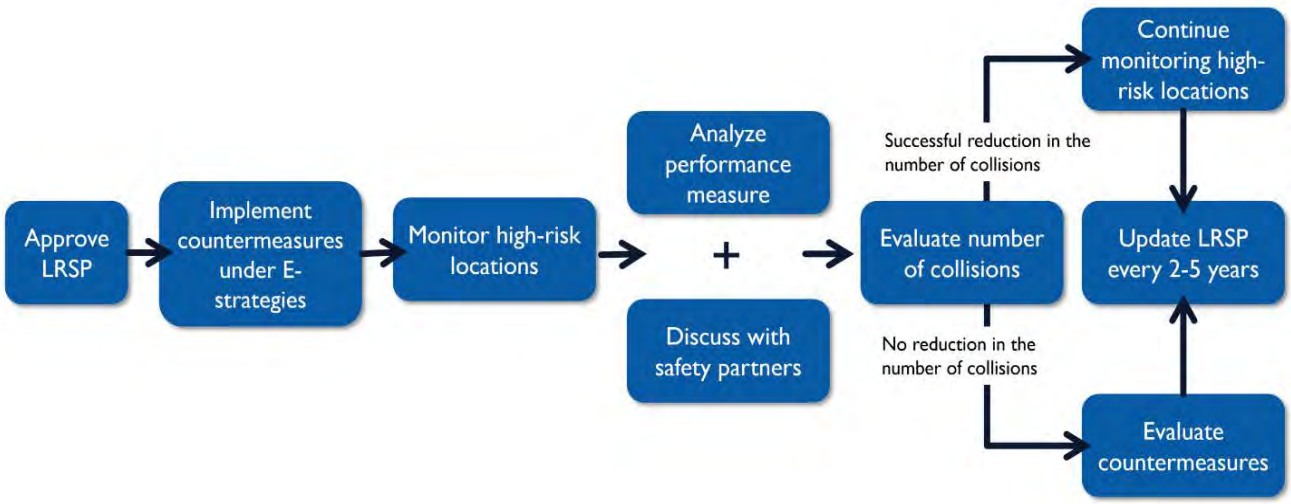
- Improve Intersection Safety (Collisions within 250 feet of an intersection)
- Reduce Unsafe Speed
- Reduce Automobile Right-of-Way Violations
- Improve Pedestrian and Bicyclist Safety
- Reduce Nighttime Collisions
- Reduce Rear End Collisions
- Reduce Broadside Collisions
- Reduce Improper Driving Collisions
- Reduce Collisions near Schools

VIABLE SAFETY PROJECTS

A set of six safety projects were created for the high-risk intersections and roadway segments.

- Project 1: Safety at Signalized Intersections - Unsafe Speed and Rear End
- Project 2: Safety at Signalized Intersections - Improper Turning, Auto Right-of-Way Violations, and Broadside
- Project 3: Safety at Signalized Intersections - Pedestrian and Bicyclist Safety
- Project 4: Safety on Roadway Segments - Unsafe Speed Violations and Rear End
- Project 5: Safety on Roadway Segments - Improve Pedestrian and Bicyclist Safety
- Project 6: Safety on Roadway Segments - Reduce Nighttime Collisions

The LRSP is a guidance document that is recommended to be updated every two to five years in coordination with the safety partners. The LRSP document provides engineering, education, enforcement, and emergency medical service-related countermeasures that can be implemented throughout the City to reduce F+SI collisions. It is recommended that the City of Cupertino implement the selected projects in high-collision locations in coordination with other projects proposed for the City's infrastructure development in their future Capital Improvement Plans. After implementing countermeasures, the performance measures for each emphasis area should be evaluated annually. The most important measure of success of the LRSP should be reducing F+SI collisions throughout the City. If the number of F+SI collisions does not decrease over time, then the emphasis areas and countermeasures should be re-evaluated.



REPORT ORGANIZATION

CHAPTER 1 – INTRODUCTION

The Introduction describes what an LRSP is and details the study area. It also summarizes the systemic approach involved in preparing the LRSP and goal and objectives of the plan.

CHAPTER 2 – SAFETY PARTNERS AND PUBLIC OUTREACH

Involvement of safety partners is critical in the success of the LRSP. For the City of Cupertino, this included the City Department Staff from Public Works and Planning, City's Public Outreach Representatives, Santa Clara County Sheriff's Department, Santa Clara County Fire Department, Cupertino Union School District, Fremont Union High School District, Walk Bike Cupertino, and Cupertino Bicycle Pedestrian Commission. This chapter summarizes the public outreach involvement of the stakeholders in the LRSP process.

CHAPTER 3 – EXISTING PLANNING EFFORTS

This chapter summarizes City and regional planning documents and projects that are relevant to the LRSP. It ensures that the recommendations of the LRSP are in line with existing goals, objectives, policies, or projects.

CHAPTER 4 – COLLISION DATA AND ANALYSIS

This chapter summarizes the data analysis approach and presents preliminary as well as detailed collision analysis and findings in the study area.

CHAPTER 5 – EMPHASIS AREAS

This chapter identifies the top nine emphasis areas for the City and the safety strategies for each.

CHAPTER 6 – COUNTERMEASURE IDENTIFICATION

This chapter identifies the engineering countermeasures were selected for each of the high-risk locations and for the emphasis areas. These were based off of approved countermeasures from the Caltrans Local Roadway Safety Manual (LRSM) used in HSIP grant calls for projects. The intention is to give the City potential countermeasures for each location that can be implemented either in future HSIP calls for projects, or using other funding sources, such as the City's Capital Improvement Program. Non-engineering countermeasures were also selected using the 4 E's strategies, and are included with the emphasis areas.

CHAPTER 7 – SAFETY PROJECTS

This chapter summarizes the list of viable safety projects applicable to the high-risk intersections and roadway segments, along with the cost for implementation and their benefit cost ratio.

CHAPTER 8 – IMPLEMENTATION AND EVALUATION

This chapter summarizes the process of implementation, monitoring, evaluation, and future updates.

1. INTRODUCTION

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1 INTRODUCTION

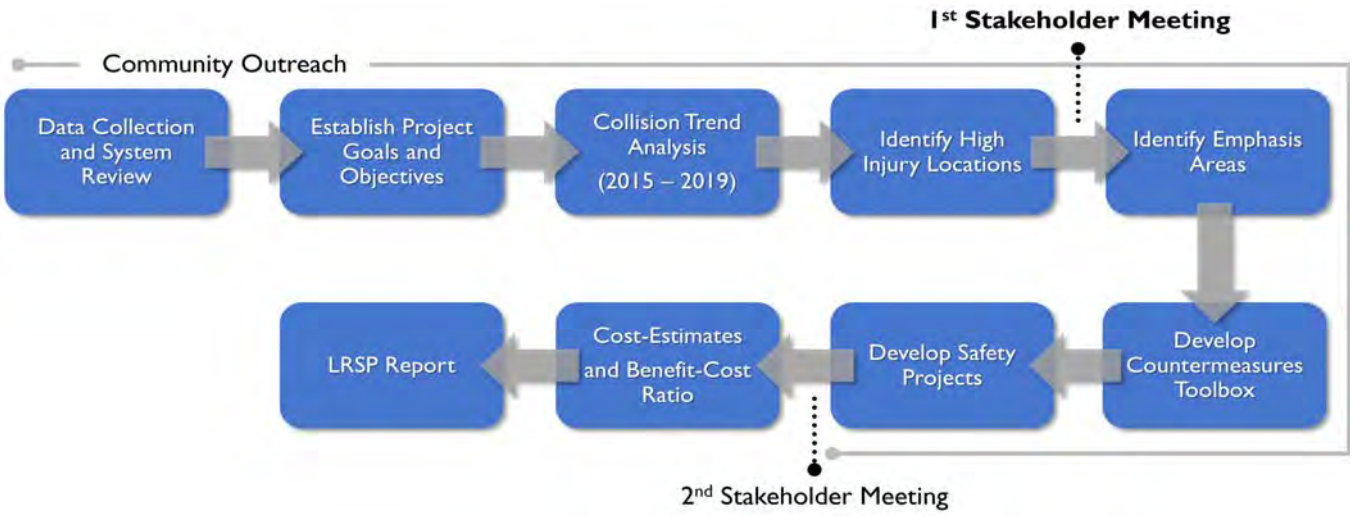
WHAT IS AN LRSP?

The LRSP is a localized data-driven traffic safety plan that provides opportunities to address unique roadway safety needs and reduce the number of F+SI collisions. The LRSP creates a framework to systematically identify and analyze traffic safety-related issues, and recommend safety projects and countermeasures. It facilitates the development of local agency partnerships and collaboration, resulting in the development of a prioritized list of improvements that can qualify for HSIP funding. The LRSP is a proactive approach to addressing safety needs and is viewed as a living document that can be constantly reviewed and revised to reflect evolving trends, and community needs and priorities.

PROCESS

The systemic approach in preparing the LRSP involves the following steps:

- Develop plan goals and objectives
- Analyze collision data
- Meet with stakeholders/safety partners
- Determine focus areas and identify crash reduction strategies
- Prioritize countermeasures/projects
- Prepare the LRSP



GOALS AND OBJECTIVES

GOAL 1: IDENTIFY AND ANALYZE ROAD SAFETY ISSUES FROM A SYSTEMIC PERSPECTIVE AND RECOMMEND IMPROVEMENTS

Objective 1: *Determine where, when, and how F+SI collisions occur in the City of Cupertino using the data-driven Systemic Safety Analysis process and implement appropriate and proven countermeasures.*

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

Objective 3: *Implement traffic calming strategies on residential streets to discourage speeding and other unsafe driving behaviors.*

Objective 4: *Ensure that all recommended improvements are consistent with City, County, State, and Federal plans (such as, California Strategic Highway Safety Plan).*

GOAL 2: IMPROVE PEDESTRIAN AND BICYCLIST SAFETY THROUGH THE APPLICATION OF PROVEN EFFECTIVE COUNTERMEASURES

Objective 1: *Identify safety concerns and hot spots in the City of Cupertino where bicycle and pedestrian collisions occur and address them with appropriate and effective engineering countermeasures.*

Objective 2: *Conduct educational programs to educate bicyclists, pedestrians, and motorists about the importance of sharing the public right-of-way safely. This can be accomplished through after-school programs, police department initiatives, or other public/privately sponsored initiatives.*

Objective 3: *Improve the safety and efficiency of sidewalks, walkways, and crossings by eliminating hazards and minimizing conflicts with vehicular traffic.*

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

GOAL 3: COORDINATE THE ACTIONS OF KEY STAKEHOLDERS TO IMPLEMENT ROAD SAFETY IMPROVEMENTS AND EMERGENCY RESPONSE IN THE CITY OF CUPERTINO

Objective 1: *Coordinate efforts between Public Works, the Sheriff Department, the Fire Department, and the EMS agencies to ensure a coherent approach to traffic safety issues, including:*

- *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*
- *Minimizing impacts to emergency response times*

Objective 2: *Collaborate with local, regional, and state partners to identify and address traffic safety issues, and ensure a coordinated response.*

GOAL 4: CONTINUALLY SEEK FUNDING FOR SAFETY IMPROVEMENTS

Objective 1: *Ensure that the LRSP complies with HSIP guidelines to apply for funding for identified countermeasures.*

Objective 2: *Provide a prioritized list of improvements that will serve as a guide for City investments and grant applications.*

Objective 3: *Continually seek funding sources to implement engineering, education, enforcement, and emergency response solutions to road safety issues in the City of Cupertino.*

GOAL 5: ENSURE THAT ALL SAFETY IMPROVEMENTS ARE MADE IN A FAIR AND EQUITABLE MANNER FOR ALL RESIDENTS OF THE CITY OF CUPERTINO

Objective 1: *Where feasible, conduct community outreach to inform residents about upcoming safety enhancements and solicit their input.*

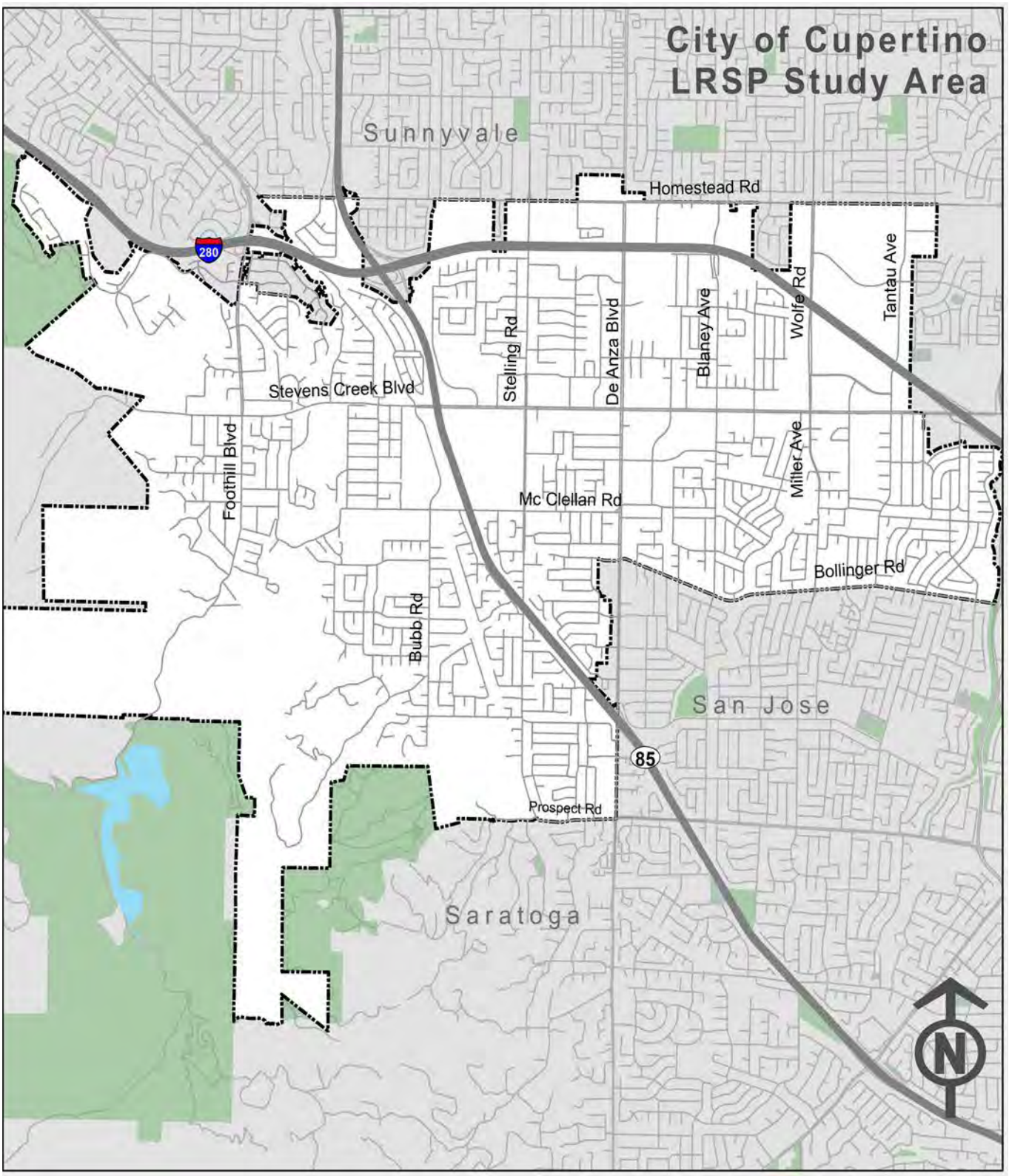
Objective 2: *Provide a forum for residents to lodge complaints about traffic safety, as well as for City officials to respond to such complaints.*

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

STUDY AREA

The City of Cupertino, located in Santa Clara County, California, covers a total area of 11.3 square miles and is located in the South Bay just west of San Jose. The City's estimated population is 60,381 (US Census 2020). Interstate (I)-280 and State Route (SR) 85 are main thoroughfares that connect the City with nearby cities. The nearest cities include San Jose and Santa Clara to the east, Saratoga to the south, and Sunnyvale and Los Altos to the north. The study area is mapped in **Figure 1** on the following page.

Figure 1. Study Area



According to five-year estimates from the American Community Survey (ACS) 2019 from the U.S. Census, 79.1% of Cupertino commuters get to work by driving alone, higher than both the Santa Clara County and State rate of driving commuters. The second most common method of commuting to work is carpool at 7.9%. The different modes of transportation used by Cupertino residents to commute to work are shown in **Table 1** below.

Table 1. Cupertino Commute to Work Census Data

Commute to Work	Cupertino	Santa Clara County	California
Drive Alone	79.1%	74.7%	73.7%
Carpool	7.9%	10.6%	10.1%
Public Transportation	3.5%	4.4%	5.1%
Walked	2.2%	2.1%	2.6%
Bicycle	0.7%	1.8%	1.0%
Work from Home	5.3%	5.0%	5.9%
Other	1.3%	1.3%	1.6%

2. SAFETY PARTNERS AND PUBLIC OUTREACH

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2 SAFETY PARTNERS AND PUBLIC OUTREACH

Safety partners are vital to the development and implementation of an LRSP. For the City of Cupertino, these include City Department Staff from Public Works and Planning, City's Public Outreach Representatives, Santa Clara County Sheriff's Department, Santa Clara County Fire Department, Cupertino Union School District, Fremont Union High School District, Walk Bike Cupertino, and Cupertino Bicycle Pedestrian Commission. These stakeholders attended two virtual stakeholder meetings, which were held on February 03, 2022, and July 06, 2022, to review project goals and findings, and to solicit feedback from the group.

Figure 2. Zoom Meeting from Stakeholder Meeting #1

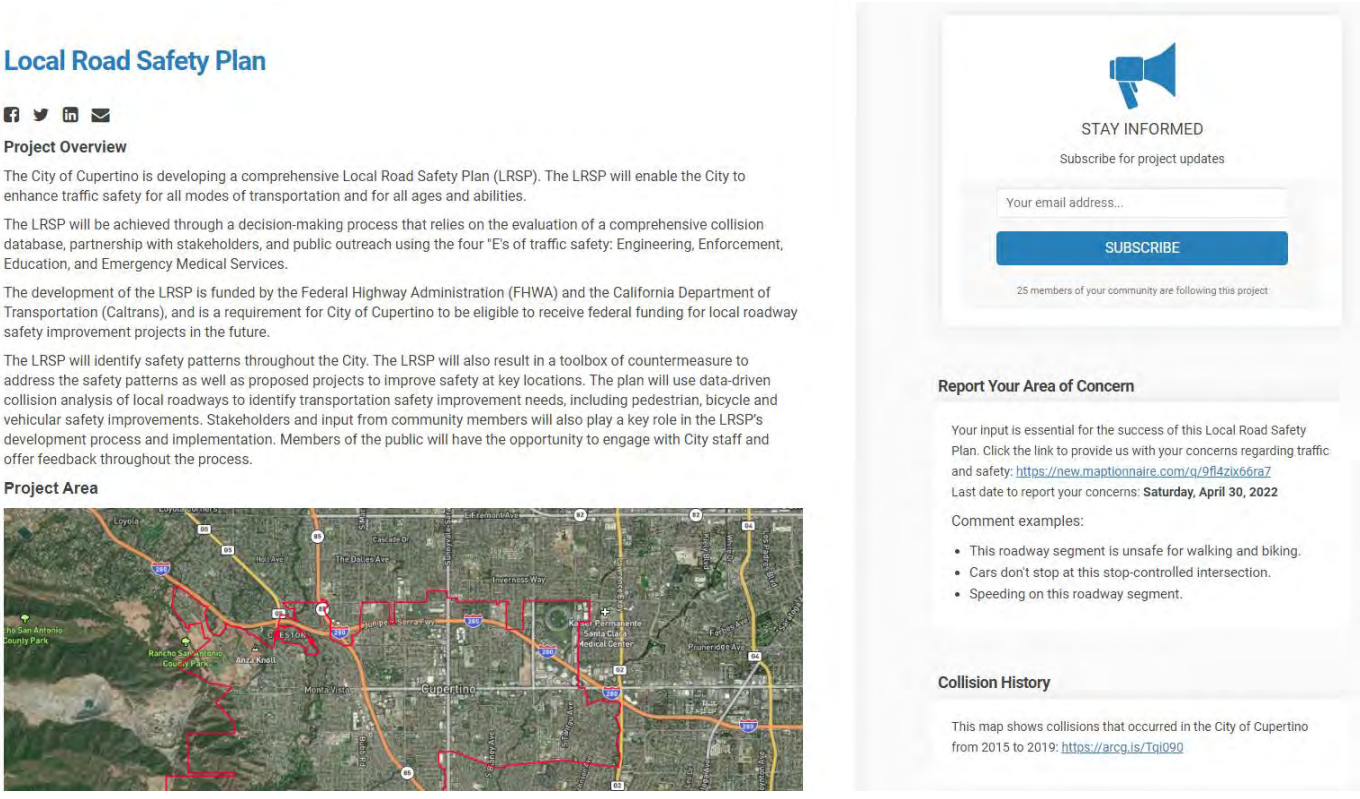
This stakeholder outreach was supplemented by two community workshops, held on March 30, 2022 and July 11, 2022. The first community workshop was attended by 18 residents and introduced the project to the community, as well as collected feedback on traffic safety concerns. The second community workshop was attended by 11 participants and focused on the recommendations from the plan, and solicited feedback on the plan's findings.

The outreach also included a project website with an interactive map tool platform that was posted to the City's Engage Cupertino website. The interactive map was used to solicit input from Cupertino residents and stakeholders outside the confines of traditional meetings.

Community Information and Perceptions

Community members and stakeholders shared their observations and concerns regarding locations and situations where collisions are occurring but are not necessarily being reported. They shared their knowledge and experiences of locations where "near-miss" collisions were occurring. They also indicated those locations that did not "feel safe" and that despite a lack of documented crash data, a heightened risk of collisions could occur. In other words, there was a risk of a collision but that risk had yet to materialize as an actual event. This is more than a general fear of a collision occurring, but an intuitive and rational sense that a particular location was not safe.

Figure 3. Cupertino LRSP Project Website



In total, 387 comments were received through the project website for Cupertino. The most comments were received about Stevens Creek Boulevard and McClellan Road, and the most common concerns were pedestrian safety and bicycle safety. The results of the interactive map are shown below in **Figure 4**, and summarized in **Figure 5**. In **Figure 4**, each dot and line represents a comment provided by a community member. Comments received from the community are attached in **Appendix A.**

Figure 4. Interactive Map Comment Responses

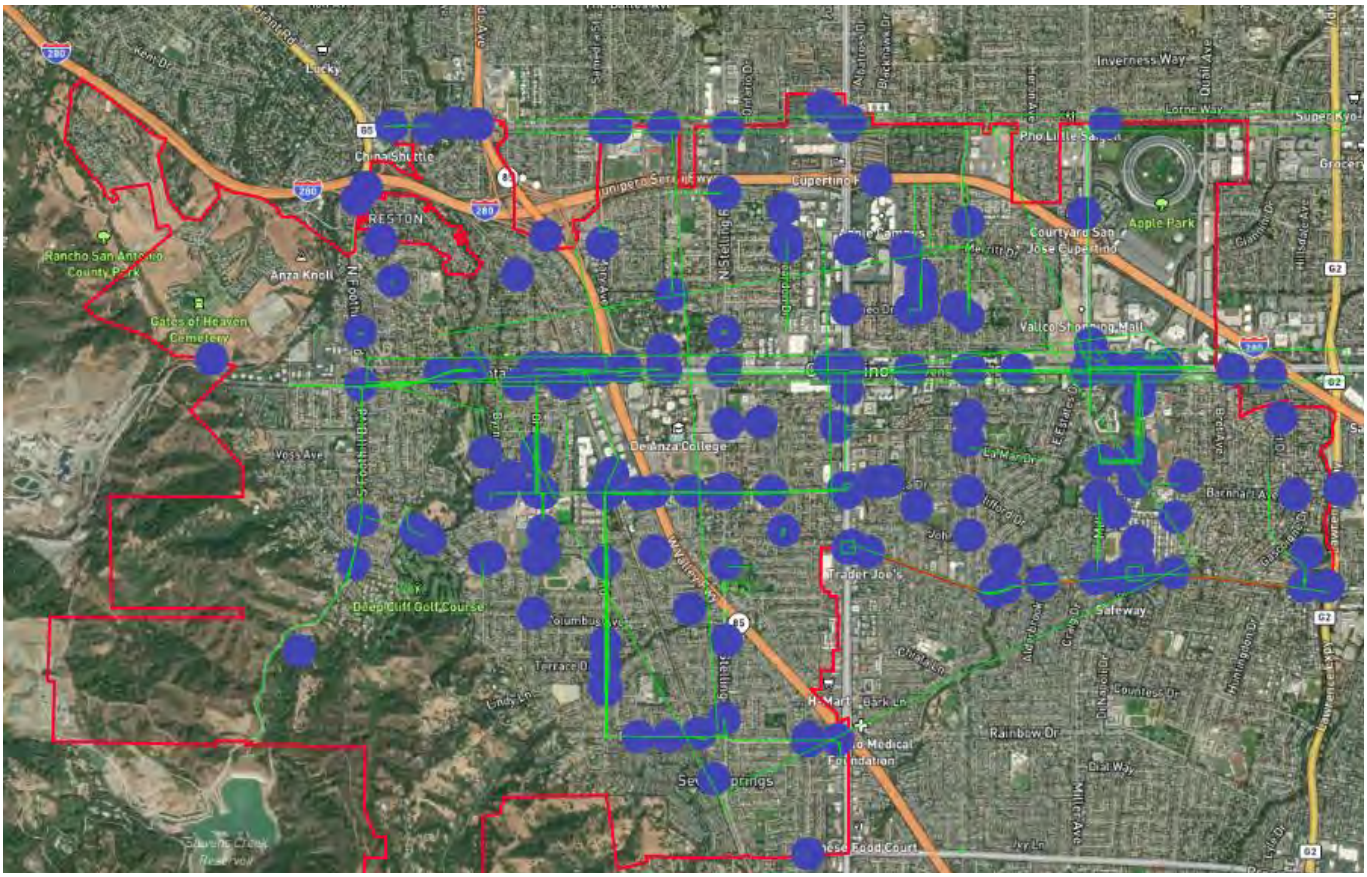
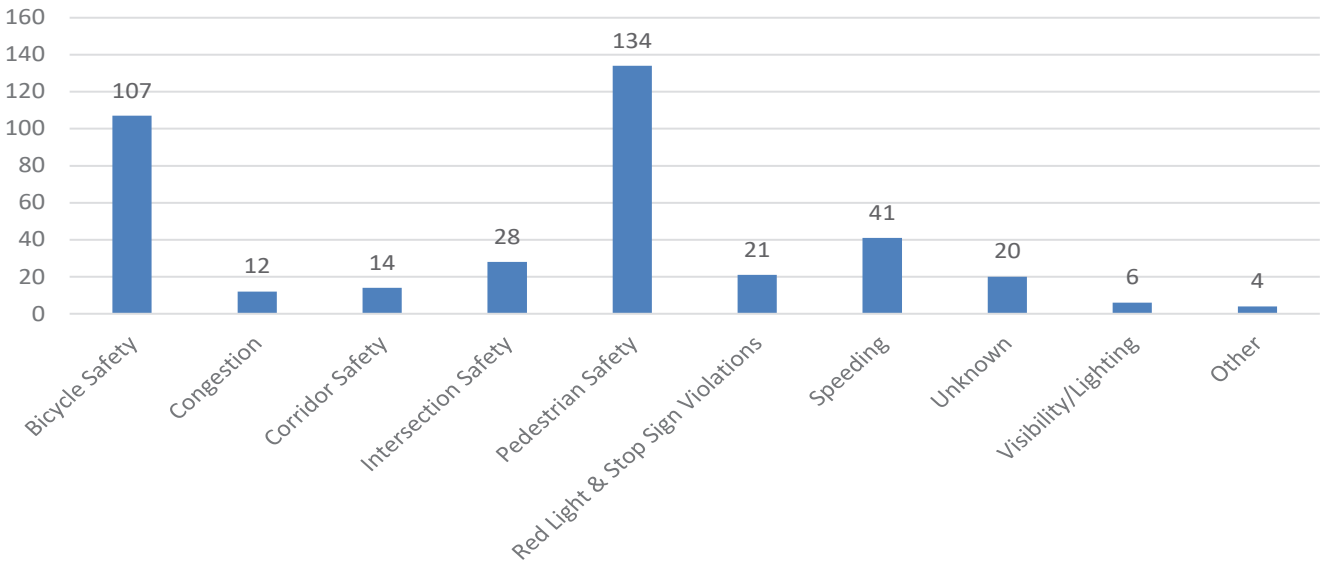


Figure 5. Public Comments on Traffic Safety



3. EXISTING PLANNING EFFORTS

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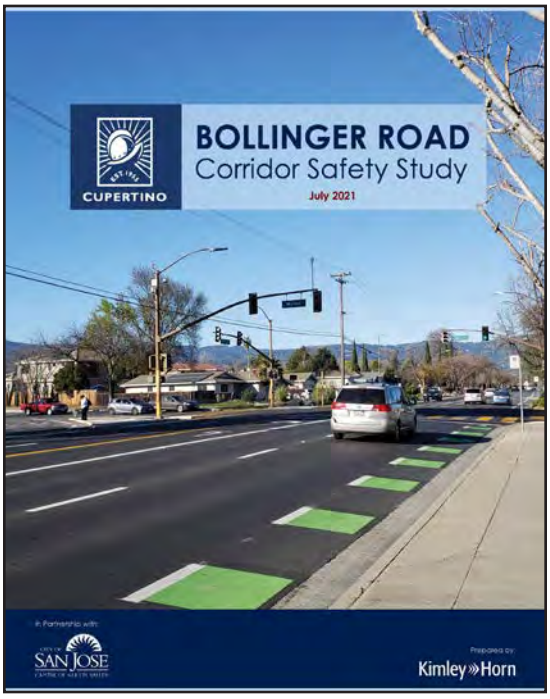
3 EXISTING PLANNING EFFORTS

This chapter summarizes the planning documents, projects underway, and studies reviewed for the City of Cupertino LRSP. The purpose of this section is to ensure the LRSP vision, goals, and 4 E's strategies (Education, Enforcement, Engineering, and EMS) are aligned with prior planning efforts, planned transportation projects, and non-infrastructure programs for the City. The documents reviewed are listed below:

- City of Cupertino Bollinger Road Corridor Safety Study (2021)
- City of Cupertino Transportation Study Guidelines (2021)
- City of Cupertino Neighborhood Traffic Calming Program (2020)
- City of Cupertino 2020 Parks and Recreation System Master Plan (2020)
- City of Cupertino Capital Improvement Program FY 2023
- City of Cupertino Pedestrian Transportation Plan (2018)
- City of Cupertino 2016 Bicycle Transportation Plan (2016)
- City of Cupertino General Plan 2040 Chapter 5: Mobility Element (2015)
- VTP2040 The Long-Range Transportation Plan for Santa Clara County
- Cupertino Safe Routes to School Program
- City of Cupertino School Walk Audit Report (2016/17)

The following sections include brief descriptions of these documents and how they inform the development of the LRSP. A more detailed list of relevant policies and projects is listed in **Appendix B**.

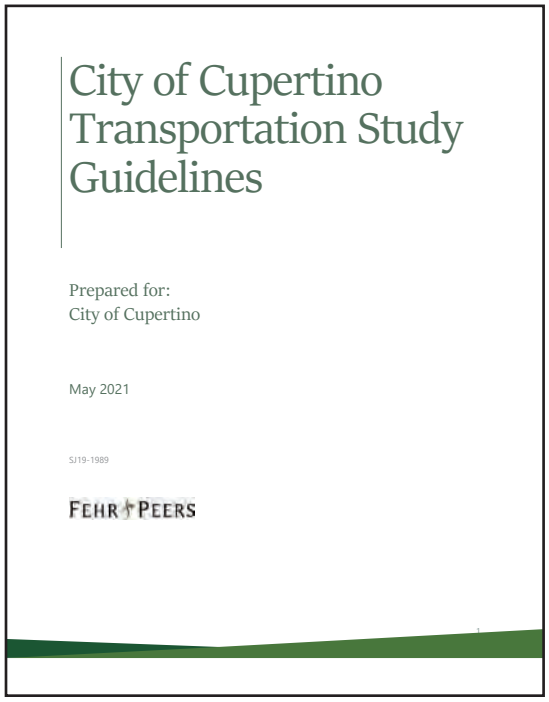
CITY OF CUPERTINO BOLLINGER ROAD CORRIDOR SAFETY STUDY (2021)



Bollinger Road is a two-mile long east-west major collector street that connects Lawrence Expressway and De Anza Boulevard, two major north-south arterials. The road lies along the border of Cupertino and San Jose, with Cupertino to the north and San Jose to the south. The road traverses through a residential neighborhood, which is home to four nearby elementary schools, Hyde Middle School, and Cupertino High School.

The City of Cupertino commissioned the Bollinger Road Corridor Safety Study ("Study") to identify improvements to create a safer and more accessible corridor for pedestrians, bicyclists, transit riders, and motorists. As part of the Study, an analysis of existing conditions and a summary of past collisions along the corridor was conducted. This was followed by an online public survey that gathered public input on location-specific improvement needs along the corridor. The feedback from the community was evaluated and used to create two conceptual corridor alternatives. These proposed alternatives were then presented to the community in a neighborhood meeting. Feedback was collected during the meeting as well as through a summarized online survey. The efforts performed for the study are summarized in this report.

CITY OF CUPERTINO TRANSPORTATION STUDY GUIDELINES (2021)



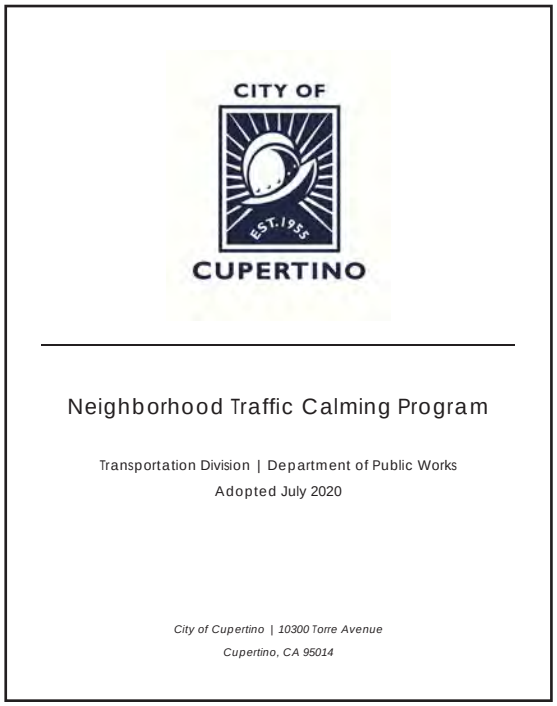
The Transportation Study Guidelines provide a clear and consistent technical approach for evaluating the transportation effects (adverse or beneficial) of projects on the City's transportation system and services. A transportation study provides essential information for decision-makers and the public when evaluating individual development projects, small- and large-scale area plans, and transportation infrastructure projects.

The Mobility Element of the Cupertino General Plan seeks to "implement strategies that make alternative modes of transportation attractive choices, help reduce the strain on the automobile network, and improve health and quality of life for Cupertino residents and businesses." The Transportation Study Guidelines support this goal by evaluating new projects against the policies of the General Plan and other relevant documents. In addition, these Guidelines fulfill Goal M-7 of the Cupertino General Plan, which requires that the City "review and update Transportation Impact Analysis (TIA) policies and guidelines that allow for adequate consideration for all modes of transportation including automobiles, walking, bicycles, and transit."

CITY OF CUPERTINO NEIGHBORHOOD TRAFFIC CALMING PROGRAM (2020)

Due to rising public interest and concerns about speeding and cut-through traffic in Cupertino's residential neighborhoods, the City of Cupertino Transportation Division has developed a Neighborhood Traffic Calming Program.

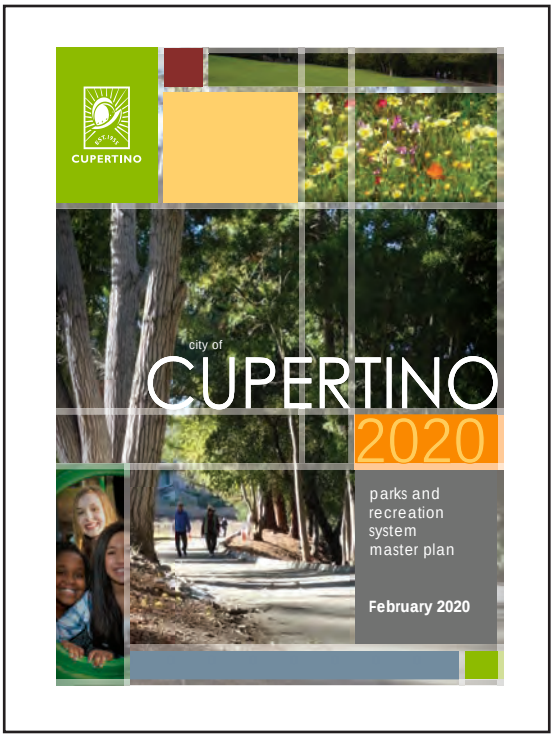
The Neighborhood Traffic Calming Program aims to establish a consistent set of guidelines to provide residents and property owners with a means to obtain relief from traffic-related concerns, namely speeding vehicles and cut-through traffic on their residential street. This is accomplished through a multi-step process involving an initial petition, a traffic survey, neighborhood meetings, a postcard survey, and the possible installation of traffic calming measures.



CITY OF CUPERTINO 2020 PARKS AND RECREATION SYSTEM MASTER PLAN (2020)

The Parks and Recreation System Master Plan (Master Plan) integrates the City's long-term vision and aspirations into a cohesive strategy to guide the future development, renovation, management, and programming of city parks and recreation facilities. The Master Plan will provide direction for the City and Parks and Recreation Department as it improves and enhances parks and recreation through the year 2040.

The community identified 12 primary themes to address through new policies and projects. These include improving park and facility access and trail connectivity, as well as integrating nature, the arts, and extraordinary play opportunities. Residents want a greater variety of recreation options, plus welcoming customer-friendly parks, and services that reflect the community's diverse culture and unique characteristics. Empowering youth and teens, supporting social gatherings, and collaborating with partners and stakeholders round out the priorities noted through community feedback. From this community input, the Master Plan's vision, mission, and goals were defined to guide the City in enhancing recreation opportunities for all Cupertino residents.

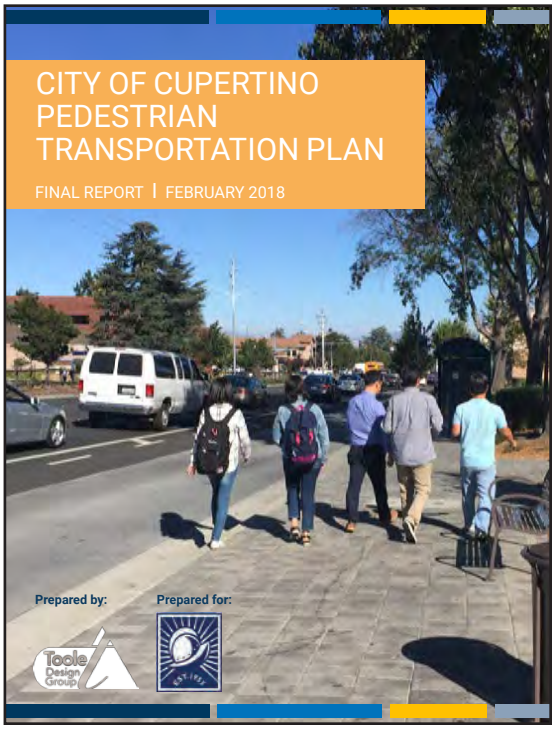


CITY OF CUPERTINO CAPITAL IMPROVEMENT PROGRAM FY 2023

This document guides the City in the funding and scheduling of infrastructure improvement projects for fiscal year 2022/23 and provides insights into project and funding needs over the next five years. Community-Driven Master Plans and Asset Management Plans continue to guide how we build our city's infrastructure. With the completion of the Storm Drain Master Plan and the Citywide Building Condition Assessment in FY 2018/19 combined with the recently completed plans (Bicycle Transportation Plan, ADA Transition Plan, Pedestrian Master Plan, School Walk Audit, the Santa Clara County Expressway Plan, the Stevens Creek Corridor Park Master Plan and Restoration Plan, the McClellan Ranch Preserve Master Plan, and the Regnart Road Slope Stability Study), we now have a more complete picture of our infrastructure maintenance needs. Many of our current and new projects are identified as priorities in these adopted master plans.

CITY OF CUPERTINO PEDESTRIAN TRANSPORTATION PLAN (2018)

The City of Cupertino is undertaking a number of ambitious initiatives to improve pedestrian and bicycling conditions throughout the city. This Pedestrian Transportation Plan is the blueprint for Cupertino to achieve its vision of an inviting, safe, and connected pedestrian network that enhances the quality of life for all community members and visitors. The purpose of this Pedestrian Transportation Plan is to establish a guiding framework for the development and maintenance of pedestrian facilities throughout Cupertino and recommend policies, programs, and messaging to support and promote walking.

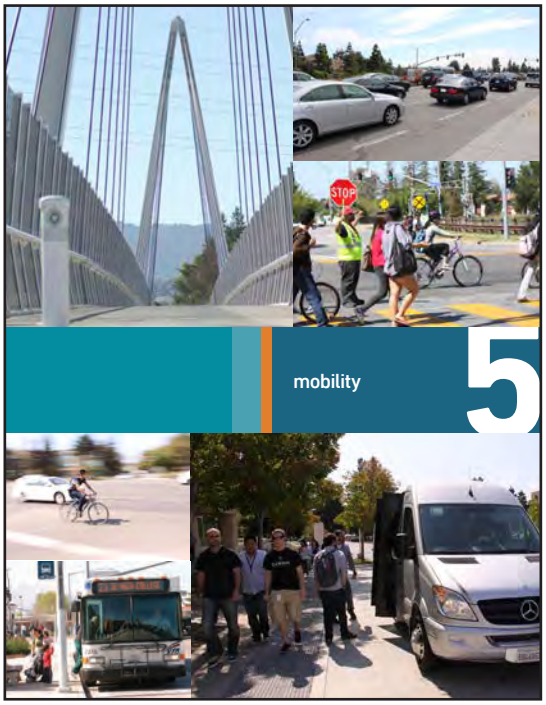


The Pedestrian Transportation Plan builds upon the City's comprehensive strategies to create a connected, multimodal transportation network, and enhance quality of life throughout Cupertino. For example, the Cupertino Bicycle Transportation Plan (adopted 2016) envisions a citywide multimodal bicycle network, and this document complements the proposed bicycle network to create comprehensive active transportation options of safe routes for pedestrians and bicyclists.

CITY OF CUPERTINO 2016 BICYCLE TRANSPORTATION PLAN (2016)

Riding a bicycle is a great way to stay fit, reduce air pollution, and traffic congestion. The City of Cupertino, through implementation of projects recommended in the Cupertino Bicycle Transportation Plan, is working toward establishing a comprehensive network of bicycle facilities throughout the City to encourage cycling by providing safe and convenient routes for doing so. The Plan is a long-range planning document designed to encourage bicycling as a safe, practical, and healthy alternative to the motor vehicle. It addresses present and future needs of the bicycling community, lays the groundwork for grant funding eligibility for bicycle projects, and is in close alignment with the goals set by the Cupertino Bicycle Pedestrian Commission to significantly increase the attractiveness and safety of bicycling throughout the City, with a particular focus on safe connectivity to schools.

CITY OF CUPERTINO GENERAL PLAN 2040 CHAPTER 5: MOBILITY ELEMENT (2015)

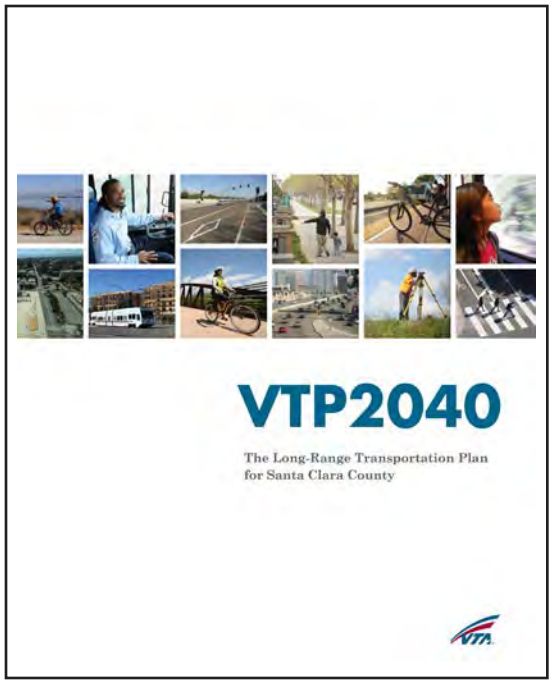


Cupertino's transportation system is multi-faceted. It integrates walkways, sidewalks, bicycle routes, bus transit facilities, local streets, major roadways, and freeways into a single, integrated system that supports the city's high quality of life. At the local level, this includes facilities that connect neighborhoods with pedestrian, bicycle, and automobile routes. Longer distance connections include links to major boulevards, expressways, commuter rail, and the regional freeway system.

This Element includes goals, policies and strategies that the City will use in making decisions regarding transportation network improvements needed to accommodate Cupertino's anticipated growth. The purpose of this Element is to implement strategies that make alternative modes of transportation attractive choices. This will help reduce strain on the automobile network and improve health and quality of life for Cupertino residents and businesses.

VTP2040: THE LONG-RANGE TRANSPORTATION PLAN FOR SANTA CLARA COUNTY

The Valley Transportation Plan 2040 (VTP 2040) provides a long-range vision for the transportation system in Santa Clara County. VTP 2040 identifies programs, projects, and policies that Santa Clara Valley Transportation Authority's (VTA) Board of Directors is going to pursue over the lifetime of the plan. It connects projects and programs with anticipated funds and provides a framework for the development and maintenance of the transportation over the next 25 years. It considers all travel modes and addresses the links between transportation, land use, air quality, energy use, and community livability.



VTA, as the Congestion Management Agency for Santa Clara County, is responsible for preparing and updating the VTP on a four-year cycle coinciding with the update of the Bay Area's Regional Transportation Plan. The 2040 update to the Regional Transportation Plan, called the Plan Bay Area, produced by the Metropolitan Transportation Commission (MTC), guides transportation funding and helps to inform planning throughout the nine-county Bay Area through the year 2040.

CUPERTINO SAFE ROUTES TO SCHOOL PROGRAM

Cupertino Safe Routes to School (SRTS) is a partnership between local schools, school districts, parent organizations, community groups, and the Santa Clara County Sheriff's Office in the mission of creating a safer environment for students and families in Cupertino to travel to and from school safely, and reducing single occupancy vehicle travel to and from school in order to reduce carbon emission. In pursuit of these goals, the City is actively working toward expanding beyond the traditional infrastructure and enforcement approach to traffic safety, by incorporating education, encouragement, engagement, evaluation, and equity into the program. This unique approach has led to the creation of an effective and powerful Cupertino SRTS program.

CITY OF CUPERTINO SCHOOL WALK AUDIT REPORT (2016/17)

In 2016/17, Cupertino SRTS worked with each public school in Cupertino to develop a list of infrastructure improvements that would make walking and biking safer, and the student drop-off and pick-up operations smoother. This effort, which focused on the public roadway network within a few blocks of the schools, culminated in 14 Walk Audit Reports, one specific for each public school in the City. In 2019/20, Cupertino SRTS worked with each school to update the reports, which together contribute towards the SRTS program goals of enhancing safety, reducing congestion and encouraging active transportation to and from Cupertino's public schools.

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4. COLLISION DATA AND ANALYSIS

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4 COLLISION DATA AND ANALYSIS

This chapter the results of the analysis of collisions that have occurred in the City of Cupertino between January 1, 2015 and December 31, 2019, as part of the LRSP. This chapter includes the following sections:

1. Data Collection
2. Collision Data Analysis Results
3. High Injury Network
4. Summary

The LRSP focuses on systemically identifying and analyzing traffic safety issues and recommends appropriate safety improvements. The chapter starts with a comprehensive analysis of collisions of all severity types in the City of Cupertino and compares this with F+SI collisions. Factors such as collision severity, type of collision, primary collision factor, lighting, weather, and time of day were analyzed. Following this, a more detailed analysis was conducted for F+SI collisions that have occurred on the City's roadways, including analyzing collision factors together (such as comparing collision type with violation category). **Figure 6** illustrates all collisions (including PDO collisions) that have occurred in the City of Cupertino from January 1, 2015 to December 31, 2019. **Figure 7** illustrates a heat map depicting collision counts on Cupertino roadways.

Figure 6. Collisions on City of Cupertino Roadways (2015-2019)

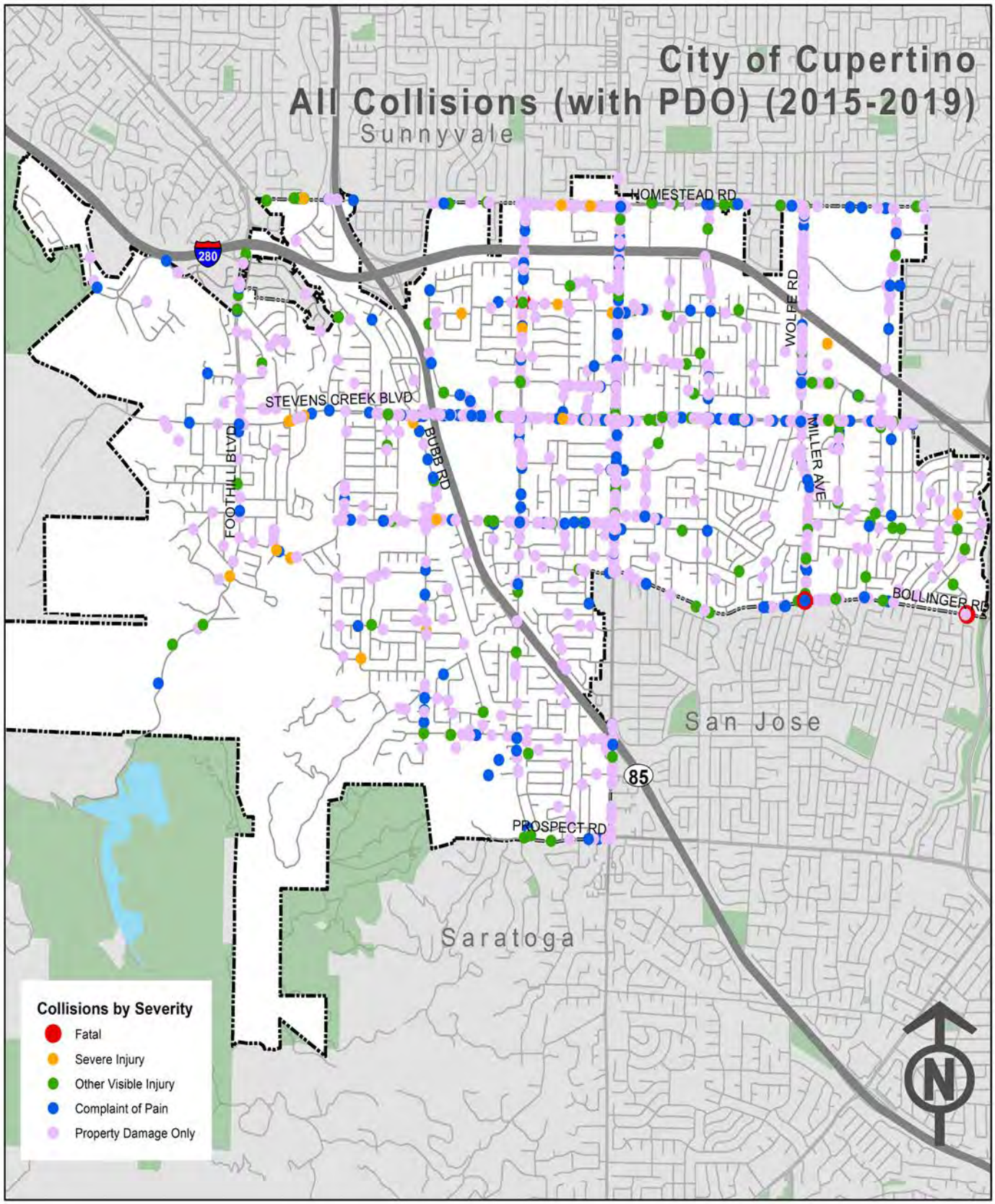
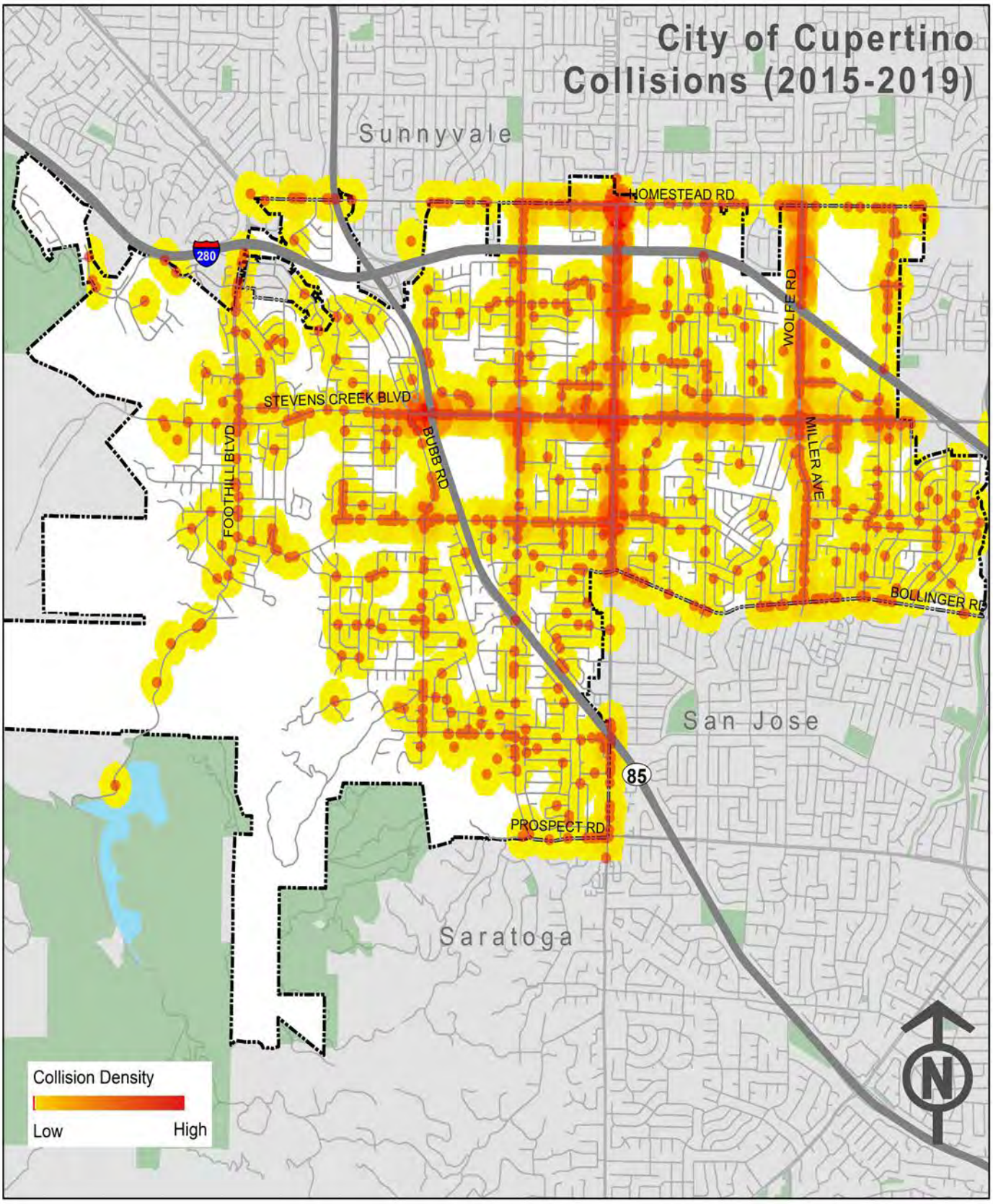


Figure 7. Heat Map of Collisions (COUNT) on City of Cupertino Roadways (2015-2019)



DATA COLLECTION

COLLISION DATA

Collecting and analyzing collision data is helpful to understand different factors that might be influencing collision patterns in a given area. For the purpose of this analysis, five years of collision data was retrieved from Santa Clara County's Crossroads Software's Traffic Collision Database from 2015 to 2019. Additional data was sourced from the SafeTREC TIMS in order to assess hourly collision data trends. The collision data was analyzed and plotted in ArcMap to identify high collision intersections and roadways segments.

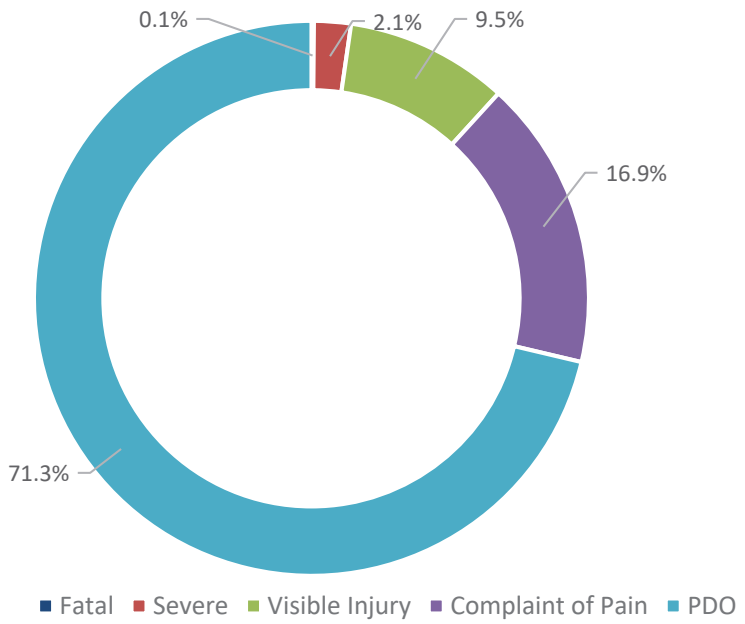
GIS SHAPEFILES

GIS shapefiles of the city's boundary and roadway centerlines were collected from the City of Cupertino's open data portal. Additional shapefiles of parks and open space, water bodies, and surrounding city boundaries were collected from Santa Clara County's open data portal.

COLLISION DATA ANALYSIS RESULTS[1]

Between 2015 and 2019, the city reported a total of 2,140 collisions. Out of these 2,140 collisions, 1,526 (71.3%) resulted in PDO collisions, 362 (16.9%) resulted in a complaint of pain injury, and 203 (9.5%) resulted in a visible injury. In addition, 46 collisions (2.1%) resulted in a serious injury and three collisions (0.1%) resulted in a fatality. **Figure 8** depicts the severity classification of all collisions.

Figure 8. All Collisions by Severity in Cupertino (including PDO)



1 Percentages may not total 100 due to rounding.

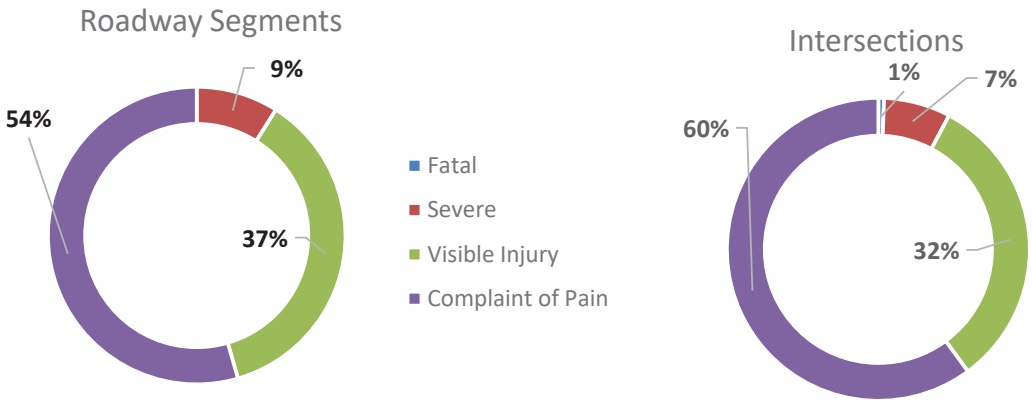
The preliminary analysis below includes a comparative evaluation between injury collisions (fatal, severe injury, visible injury, and complaint of pain collisions) and F+SI collisions, while omitting PDO collisions. The evaluation is focused on various factors including (but not limited to): primary collision factor, collision type, facility type (roadway or intersection), motor vehicle involved with weather, lighting, and time of day. The next section includes a comprehensive analysis for F+SI collisions only. The LRSP process focuses on the locations of these collisions to proactively identify and counter the respective safety issues.

Injury collision data was separated by facility type, identifying collisions occurring at intersections versus on roadway segments. For the purposes of the analysis, a collision was said to have taken place at an intersection if it occurred within 250 feet of the intersection in accordance with Caltrans HSIP guidance. The reported injury collisions are categorized by facility type and collision severity in **Table 2**. Fatal, severe injury, visible injury, and complaint of pain collisions by roadway segments and intersections are displayed in **Figure 9**. About 9% collisions on roadway segments led to severe injury, 37% led to visible injury, and 54% led to complaint of pain. At intersections, about 1% led to fatality, 7% led to severe injury, 32% led to visible injury, and 60% led to complaint of pain.

Table 2. Injury Collisions by Severity and Facility Type in Cupertino

Collision Severity	Roadway Segment	Intersection	Total	Percent
Fatal	0	3	3	0.5%
Severe	11	35	46	7.5%
Visible Injury	45	158	203	33%
Complaint of Pain	67	295	362	59%
Total	**123**	**491**	**614**	

Figure 9. Injury Collisions by Severity on Roadway Segments and Intersections



PRELIMINARY ANALYSIS[1]

YEAR TREND – INJURY COLLISIONS

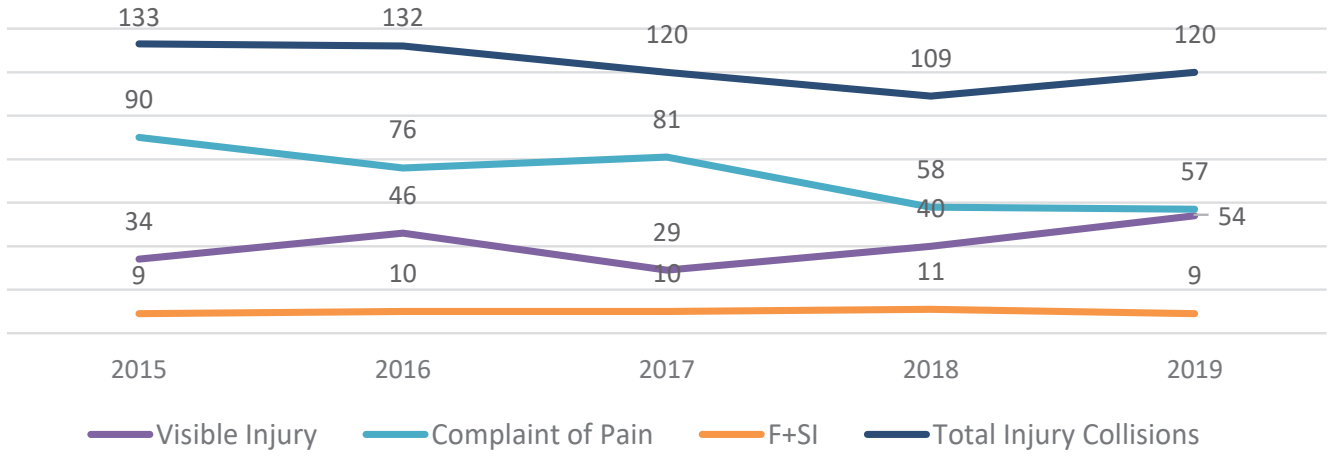
The total number of injury collisions decreased from 2015 to 2018, then increased back to 2017 levels in 2019. The highest number of injury collisions (133 collisions) were recorded in 2015, and the lowest number of injury collisions (109) were recorded in 2018.

A total of 49 F+SI collisions occurred in the City during the study period. They were observed to be the lowest in 2015 and 2019 (nine collisions each), and highest in 2018 (11 collisions). Overall, the number of F+SI collisions remained relatively stable throughout the study period. **Table 3** and **Figure 10** illustrates the five-year injury collision trend for all injury collisions, F+SI collisions, visible injury collisions, and collisions resulting in complaints of pain by drivers, passengers, or other parties involved in the collision.

Table 3. Five-Year Injury Collision Trend

Collision Severity	2015	2016	2017	2018	2019
F+SI	9	10	10	11	9
Visible Injury	34	46	29	40	54
Complaint of Pain	90	76	81	58	57
Total	**133**	**132**	**120**	**109**	**120**

Figure 10. Five-Year Injury Collision Trend Chart



1 Other/Not Stated categories, unless otherwise noted, refer to instances where the category was not coded into the police report, and/or where the category was small and had few collisions associated with it. These categories were aggregated together in such instances

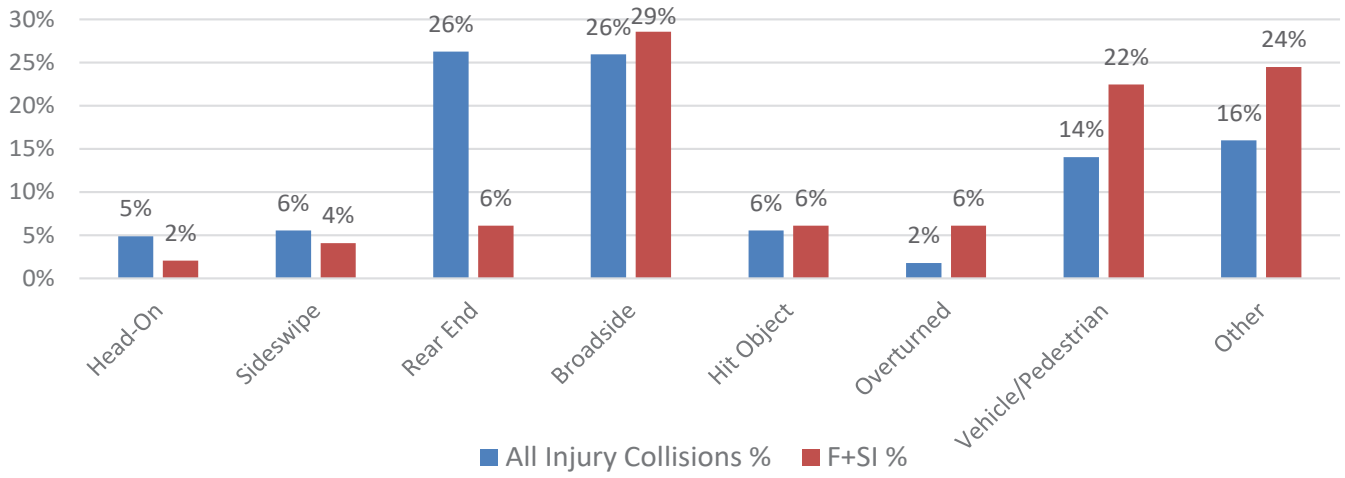
INTERSECTION VS. ROADWAY COLLISIONS

An analysis of injury collisions allocated by facility reveals that 20% (123 collisions) occurred on roadway segments whereas 80% (491 collisions) occurred within 250 feet of an intersection. When only F+SI collisions are considered, 22% (11 collisions) occurred on roadway segments, while 78% (38 collisions) occurred near intersections.

COLLISION TYPE

The most commonly occurring collision types among all injury collisions were rear-end collisions (26%), broadside collisions (26%), and "other" collisions (16%), where a specific collision type was not coded in the police report. When only F+SI collisions are considered, the most commonly occurring collision types were broadside (29%), and vehicle/pedestrian collisions (22%). **Figure 11** illustrates the collision type for all injury collisions and F+SI collisions.

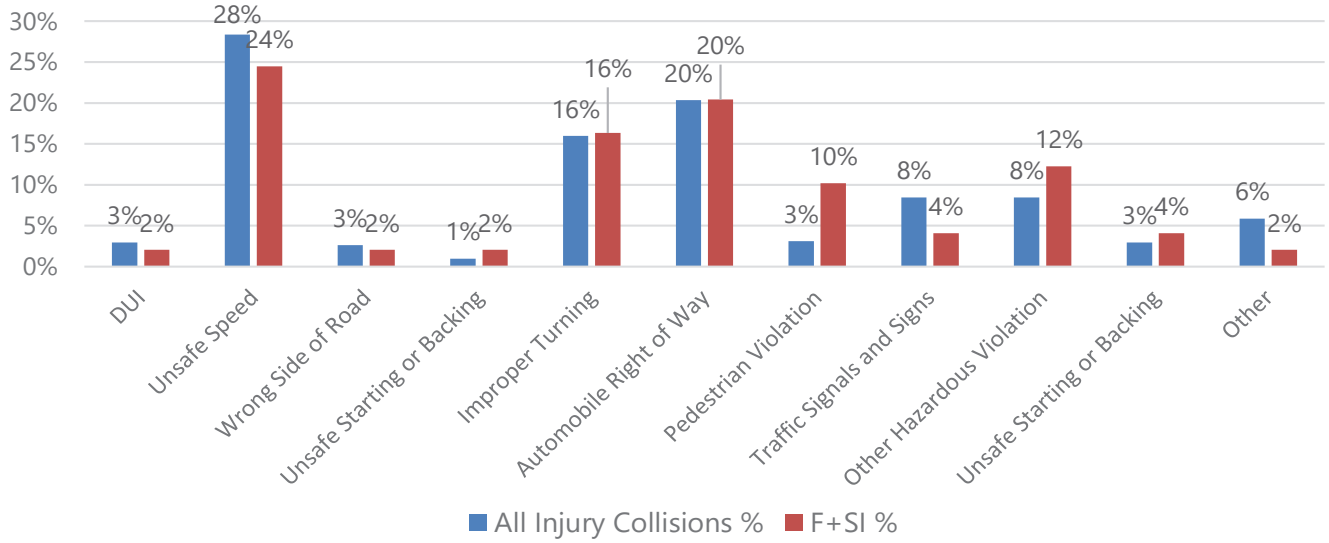
Figure 11. Collision Type: All Injury Collisions vs. F+SI Collisions



PRIMARY COLLISION FACTOR

The most common primary collision factor for injury collisions was unsafe speed (28%), followed by automobile right of way (20%), and improper turning (16%). The most common primary collision factor for F+SI collisions was also unsafe speed (24%), followed by automobile right of way (20%), and improper turning (16%). **Figure 12** illustrates the primary collision factor for all injury collisions and F+SI collisions.

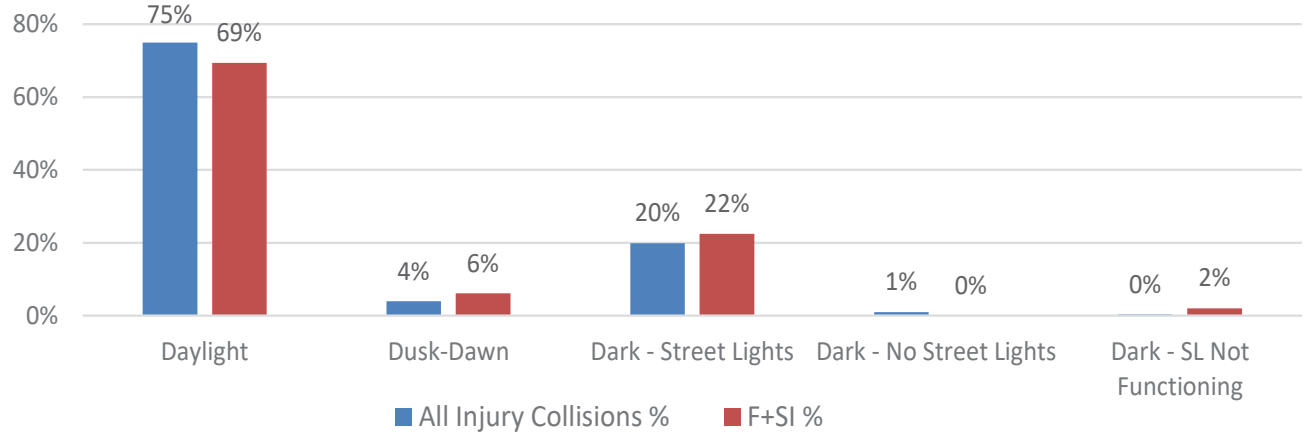
Figure 12. Primary Collision Factor: All Injury Collisions vs. F+SI Collisions



LIGHTING

Of all injury collisions, 75% occurred in daylight and 20% occurred in the dark on streets with street lights. Similar trends were observed for F+SI collisions, where 69% of collisions occurred in daylight and 22% occurred in the dark on streets with street lights. **Figure 13** illustrates the lighting condition for all injury collisions and F+SI collisions.

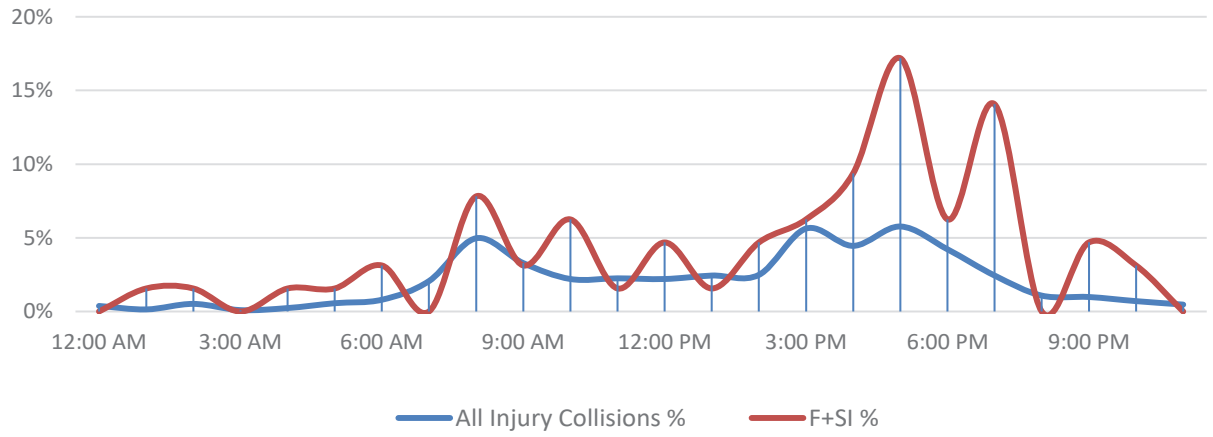
Figure 13. Lighting Conditions: All Injury Collisions vs. F+SI Collisions



TIME OF THE DAY

Of all injury collisions, the highest number of collisions occurred at around 3:00 p.m. (6%) and 5:00 p.m. (6%), and the lowest number of collisions occurred between 11:00 p.m. and 4:00 a.m. For F+SI collisions, the highest number of collisions occurred at around 5:00 p.m. (17%). The lowest number of F+SI collisions occurred between 11:00 p.m. and 12:00 a.m. **Figure 14** illustrates the percentage of collisions occurring during the day for all injury collisions as well as F+SI collisions.

Figure 14. Time of the Day: All Injury Collisions vs. F+SI Collisions

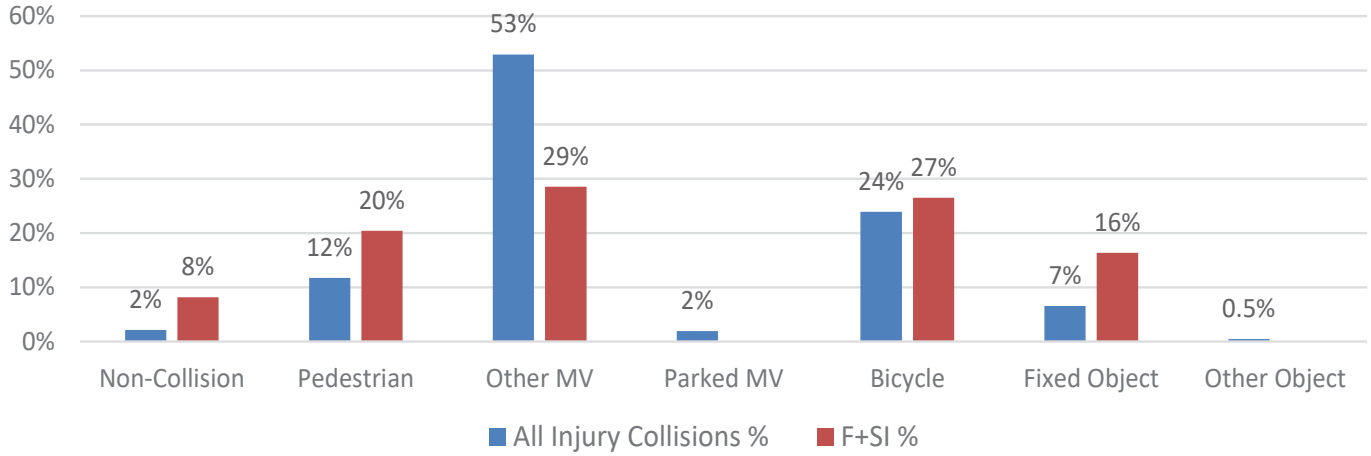


DATA SOURCE: Data for collision times was sourced from the SafeTREC Transportation Injury Mapping System (TIMS) in lieu of City-collected crash data due to the method of time recording; TIMS crash time data was recorded using military time format, which allows for 24-hour crash time analysis.

MOTOR VEHICLE INVOLVED WITH

53% of injury collisions were motor vehicle involved with other motor vehicles. Other prominent categories among all injury collisions include motor vehicle involved with a cyclist (24%), motor vehicle involved with a pedestrian (12%), and fixed objects (7%). Similar trends were observed for F+SI collisions. About 29% of the collisions occurred where motor vehicles were involved with other motor vehicles, 27% of the collisions involved a cyclist, 20% involved a pedestrian, and 16% involved a fixed object. **Figure 15** illustrates the percentage for all injury collisions as well as F+SI collisions.

Figure 15. Motor Vehicle Involved With: All Injury Collisions vs. F+SI Collisions



PEDESTRIAN AND BICYCLE INJURY COLLISIONS

Pedestrian and bicycle collision data is of particular importance to the assessment of active transportation safety. Examining which collision types and violations lead to pedestrian and cyclist injury collisions highlights causal variables specific to these categories and supports countermeasure development. **Figure 16** below shows the bicycle and pedestrian injury collision counts by year throughout the study period. The total number of pedestrian and cyclist collisions has remained relatively steady over the five-year period. There were a total of 219 bicycle and pedestrian injury collisions during the study period, of which 147 were bicycle and 72 pedestrian collisions. **Figure 17** illustrates pedestrian collisions and **Figure 18** illustrates bicycle collisions on City of Cupertino roadways.

Figure 16. Bicycle and Pedestrian Injury Collision Counts by Year

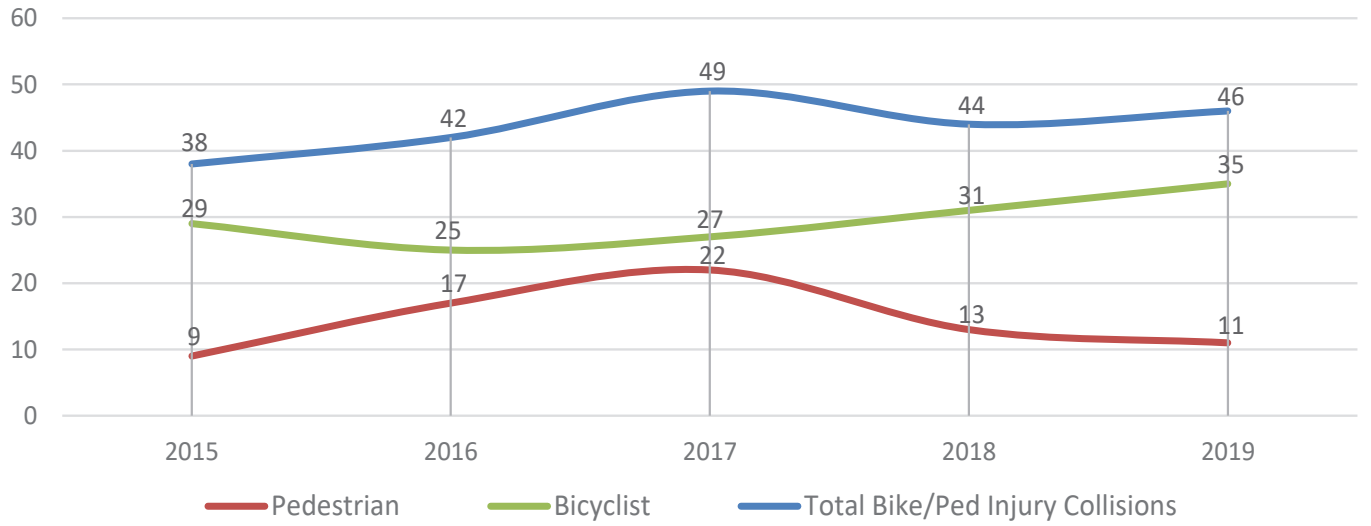


Figure 17. Pedestrian Collisions on City of Cupertino Roadways

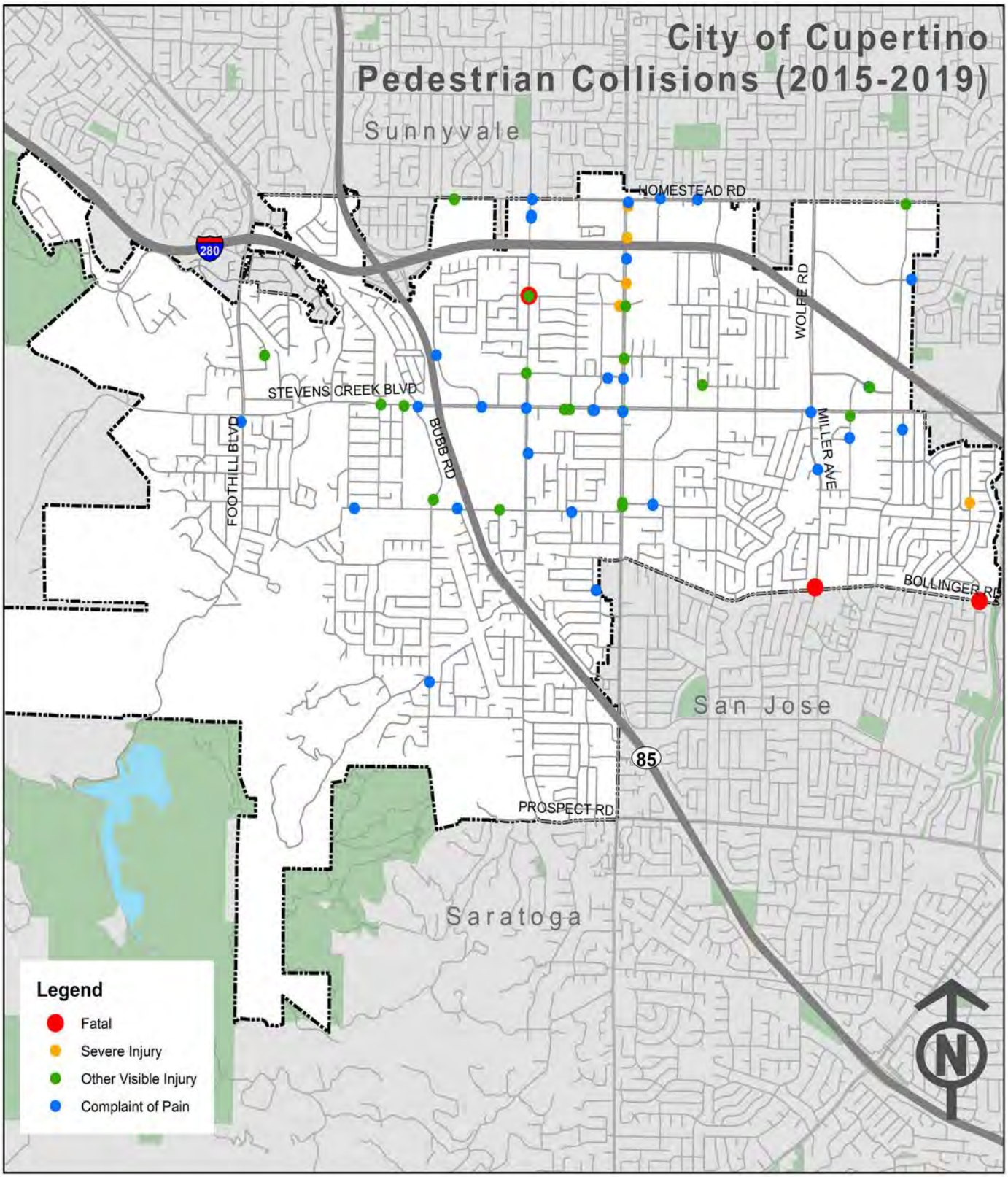


Figure 18. Bicycle Collisions on City of Cupertino Roadways

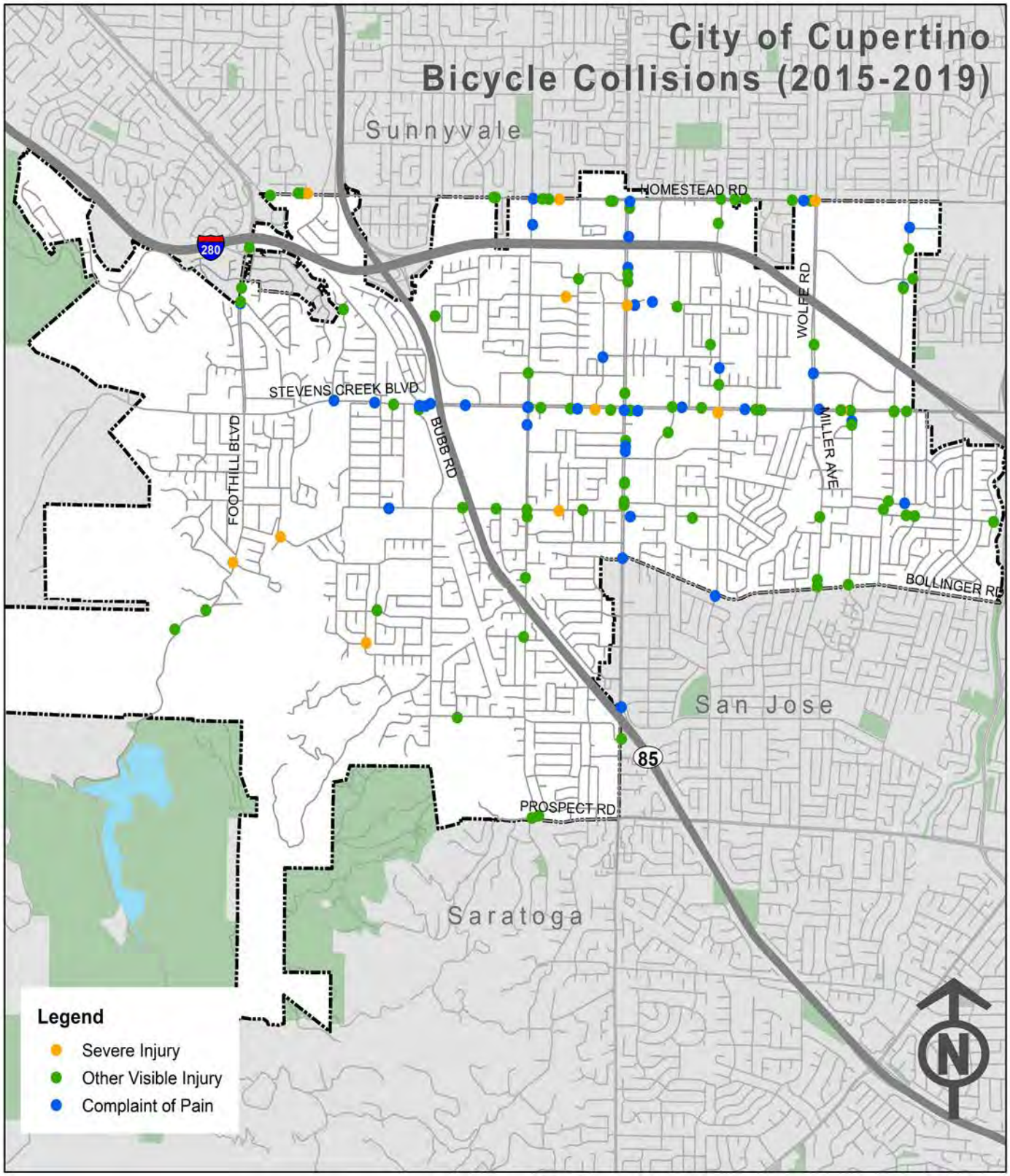


FIgure 19 and **Figure 20** identify the most common violations associated with pedestrian and bicyclist injury collisions. Improper turning and automobile right of way are the top violation types for bicycle collisions, while "other hazardous violations" and pedestrian violations are the primary causes of pedestrian injury collisions. When considering pedestrian and cyclist collision data, we observe that the same trends hold true; improper turning and automobile right-of-way are the common violations.

Figure 19a. Primary Violations (by Percentage) Contributing to Bicycle Injury Collisions Combined

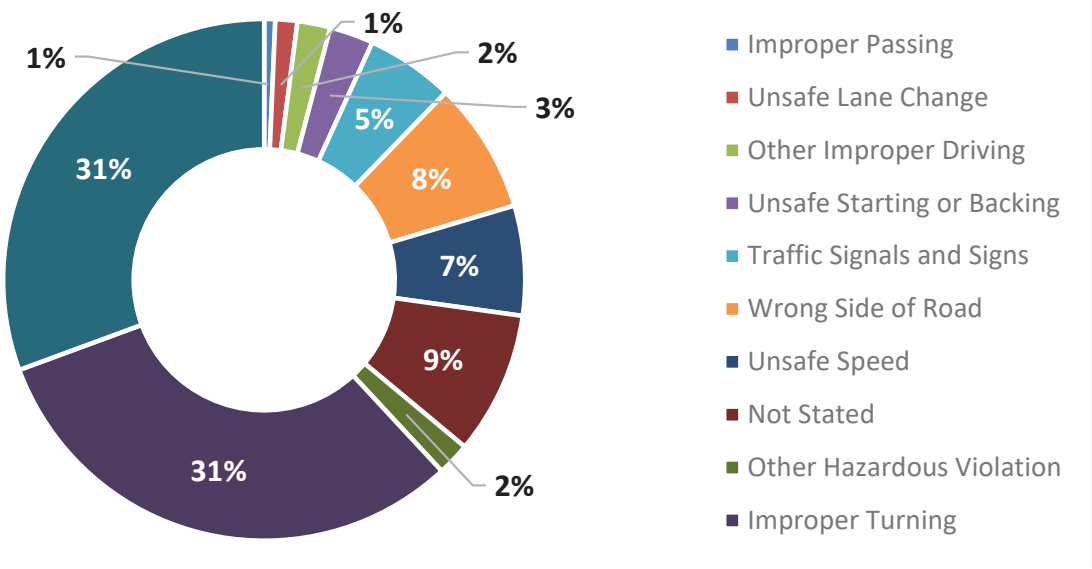


Figure 19b. Primary Violations (by Percentage) Contributing to Pedestrian Injury Collisions Combined

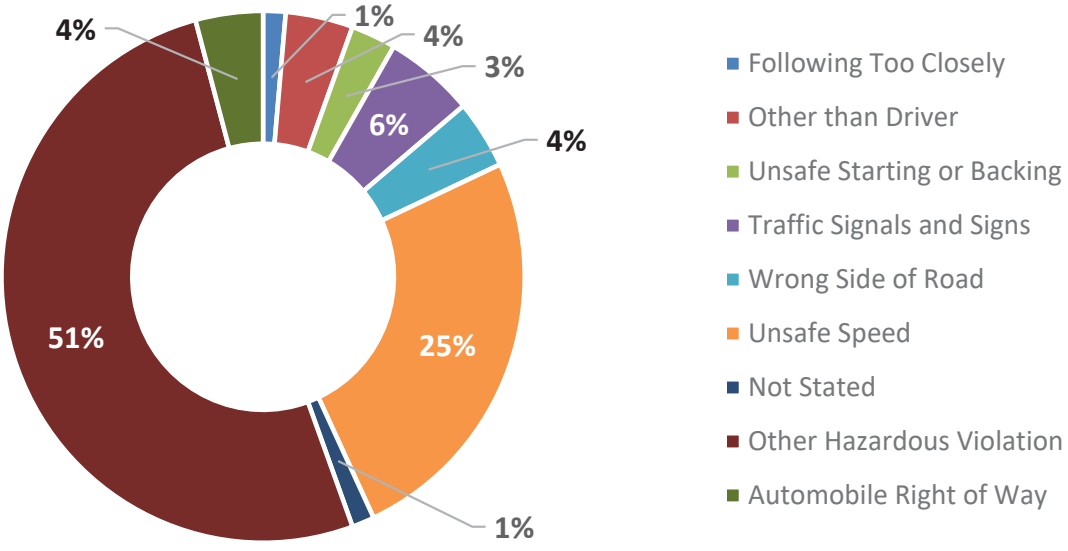
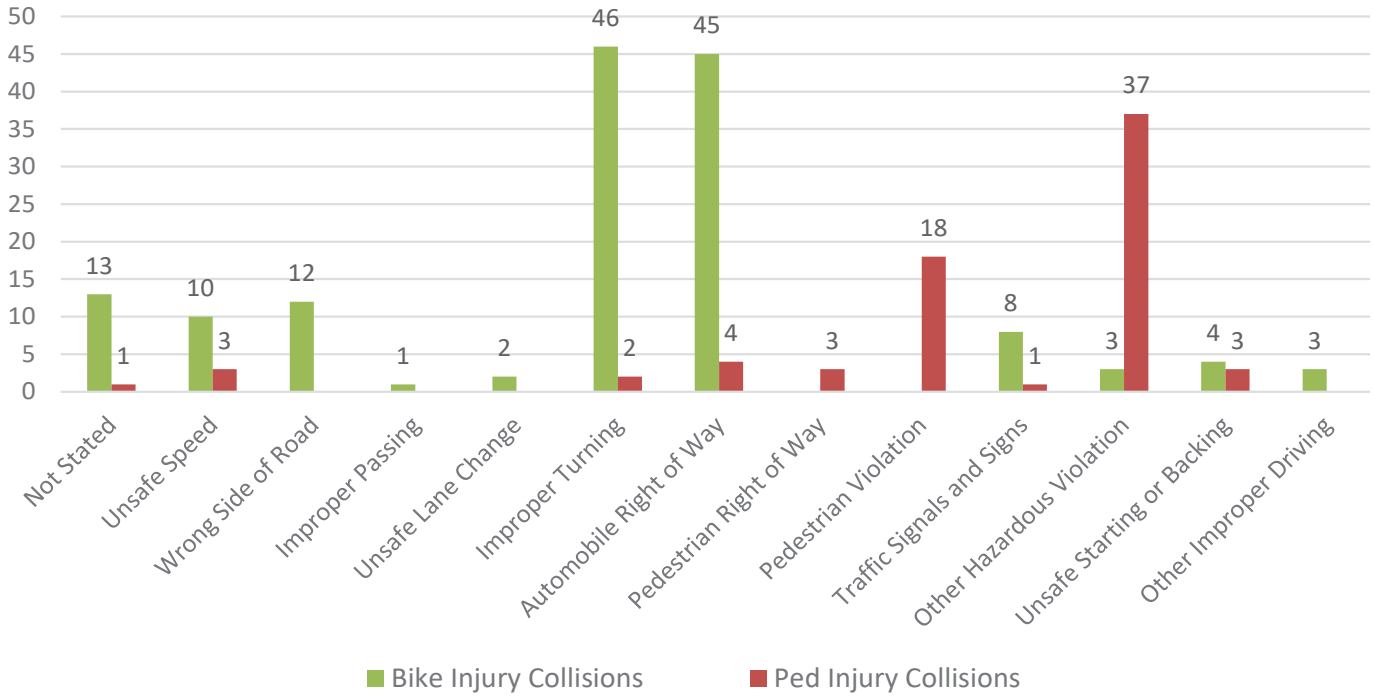


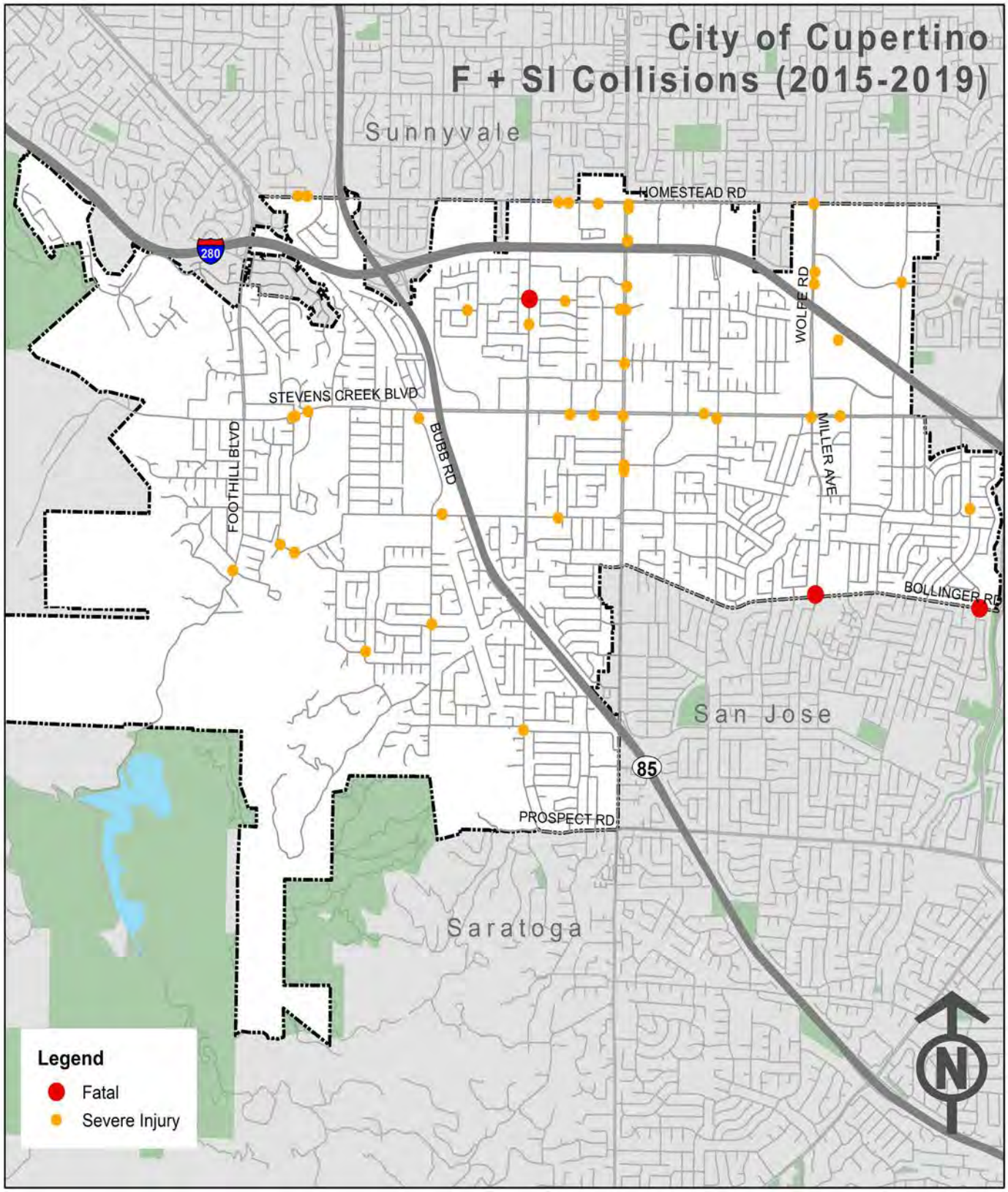
Figure 20. Primary Violations (by Count) Contributing to Pedestrian and Bicycle Injury Collisions



FATAL AND SEVERE INJURY COLLISIONS BY FACILITY TYPE

This section describes a detailed collision analysis performed for F+SI collisions on roadway segments and at intersections in the City of Cupertino. There were a total of 49 collisions in the City that resulted in a fatality or severe injury, out of which 11 collisions (22%) occurred along roadway segments, and 38 (78%) occurred at or near intersections. **Figure 21** illustrates F+SI collisions in the City of Cupertino.

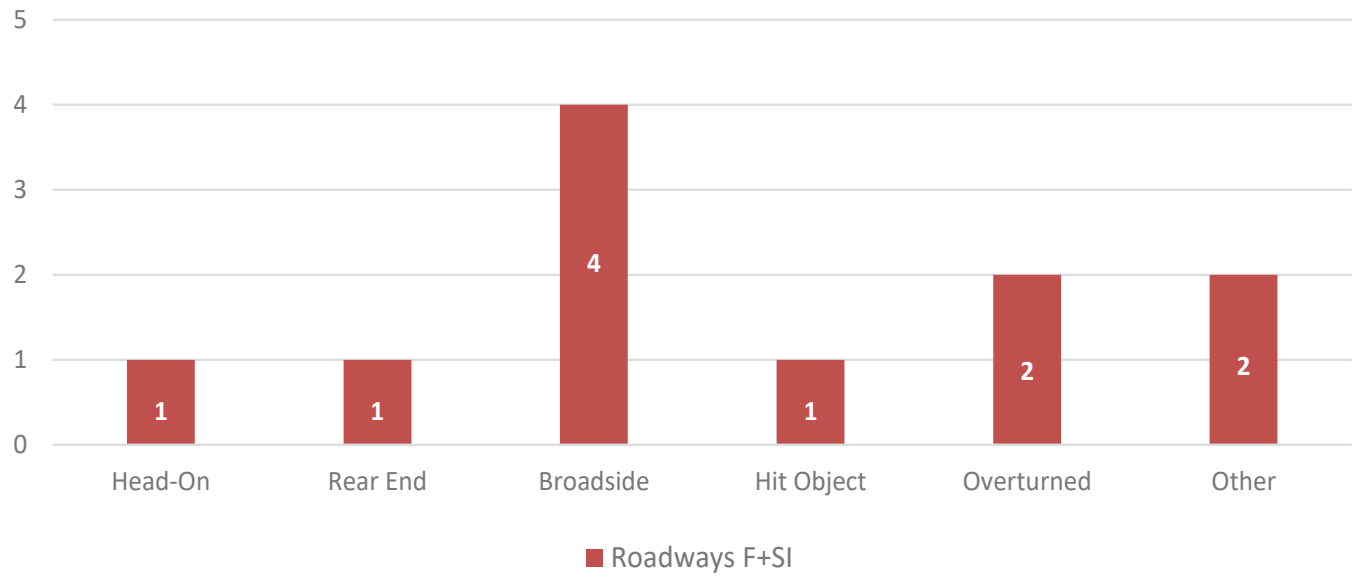
Figure 21. F+SI Collisions in the City of Cupertino



ROADWAY SEGMENT F+SI COLLISION ANALYSIS

Out of the total 49 F+SI collisions in the City of Cupertino between 2015 and 2019, 11 collisions occurred on roadway segments (collisions occurring more than 250 feet from an intersection). For F+SI collisions on roadway segments, the most common collision type was broadside, followed by overturned collisions. **Figure 22** illustrates F+SI collision totals on roadway segments by collision type.

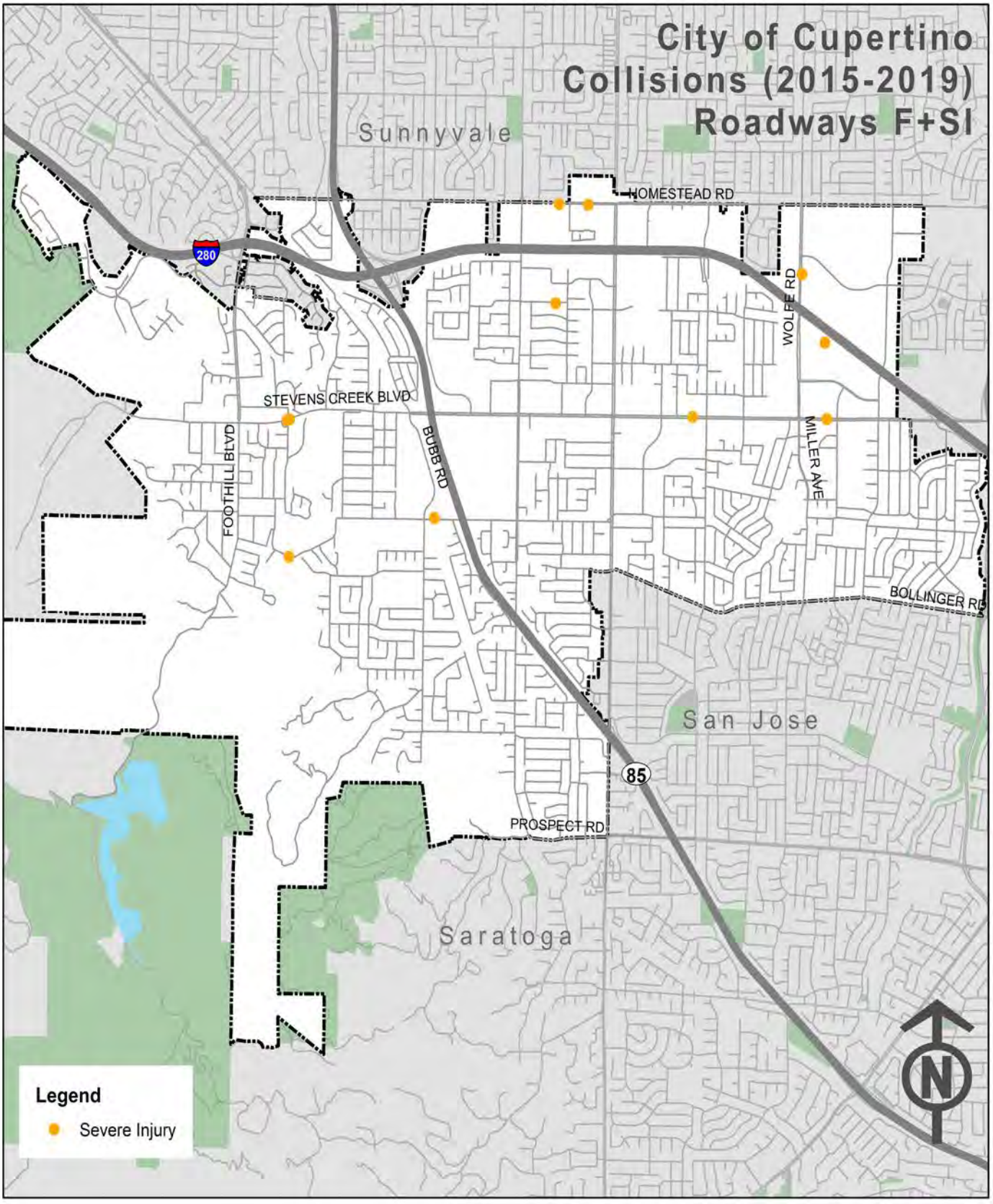
Figure 22. Roadway Segment F+SI Collision Counts by Collision Type



ROADWAY SEGMENT F+SI COLLISION: COLLISION TYPE AND SEVERITY

All 11 F+SI collisions on roadway segments resulted in severe injuries; no fatalities were reported outside of intersection areas during the study period. **Figure 23** below illustrates the F+SI collisions that have occurred on roadway segments.

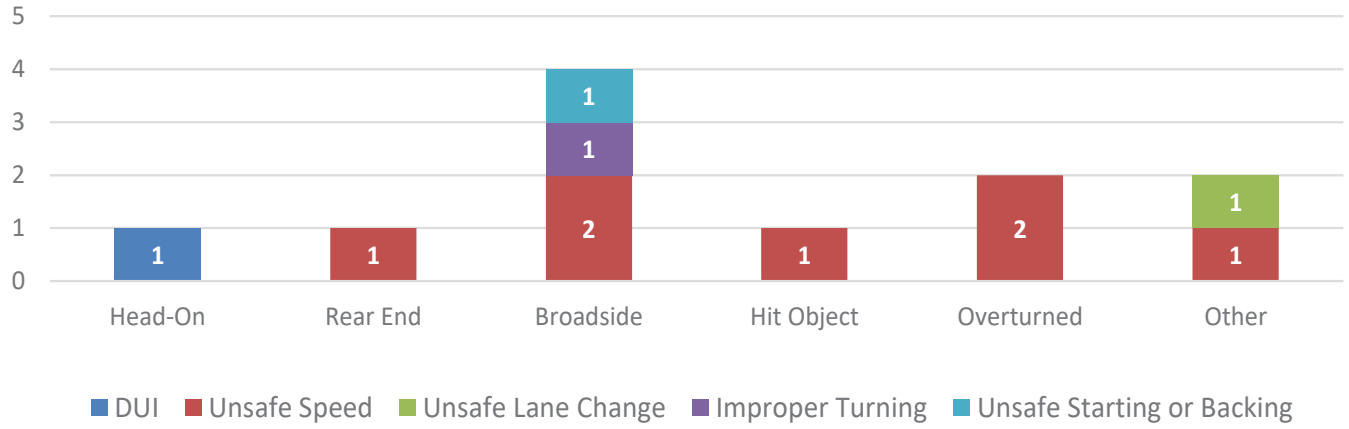
Figure 23. F+SI Collisions on City of Cupertino Roadways (2015-2019)



ROADWAY SEGMENT F+SI COLLISIONS: COLLISION TYPE AND VIOLATION FACTOR

Of the 11 F+SI collisions on roadway segments, seven resulted due to unsafe speed. DUI, unsafe lane change, improper turning, and unsafe starting or backing caused one F+SI collision each. The two most common collision type/violation factor combinations were broadside collisions caused by unsafe speed, and overturned collisions caused by unsafe speed. **Figure 24** illustrates F+SI collisions on roadway segments by collision type and violation factor.

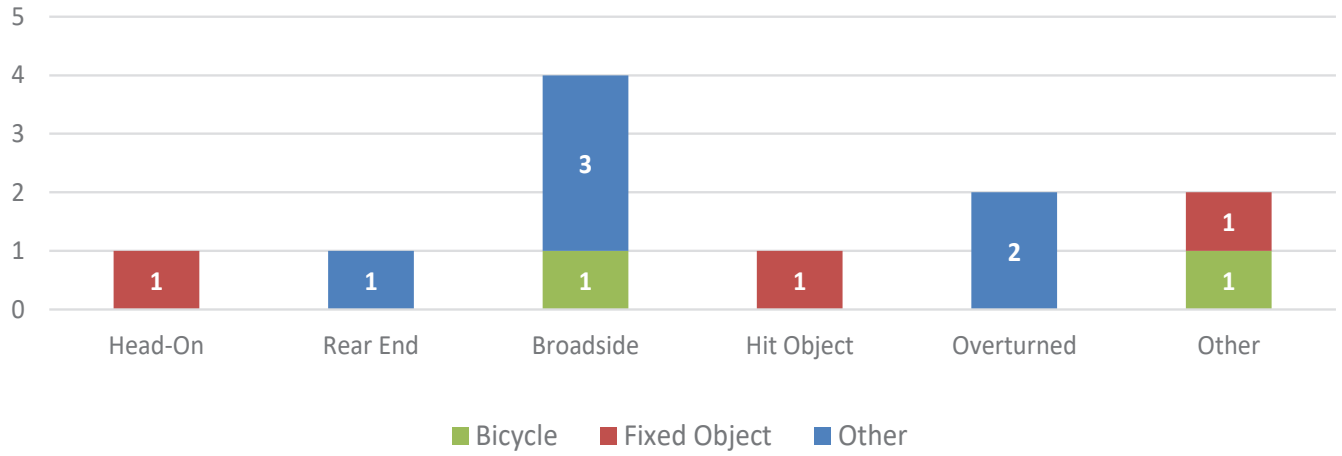
Figure 24. Roadway Segment F+SI Collisions: Collision Type and Violation Factor



ROADWAY SEGMENT F+SI COLLISIONS: COLLISION TYPE AND MOTOR VEHICLE INVOLVED WITH

Bicycles were involved in two of 11 F+SI collisions occurring on roadway segments. Three of 11 F+SI collisions involved a fixed object (such as a tree or telephone pole). **Figure 25** illustrates collision type by mode for all F+SI collisions that have occurred along roadway segments during the study period.

Figure 25. Roadway Segment F+SI Collisions: Collision Type and Mode



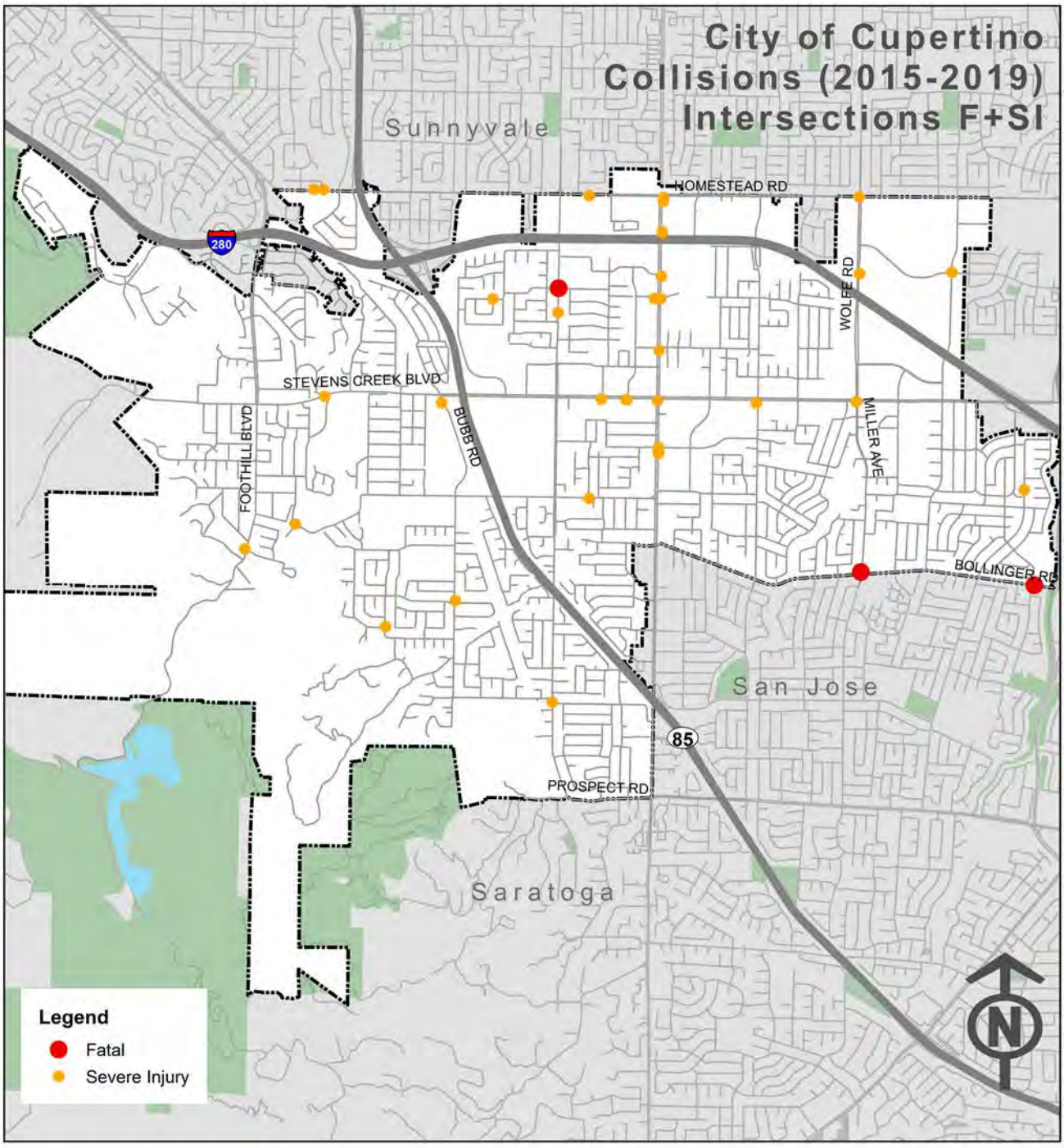
ROADWAY SEGMENT F+SI COLLISIONS: COLLISION TYPE AND LIGHTING CONDITION

All F+SI collisions on roadway segments occurred during daylight (natural light conditions).

INTERSECTION F+SI COLLISION ANALYSIS

Of the 49 F+SI collisions in the City of Cupertino occurring between 2015 and 2019, 38 occurred at or near intersections (within 250 feet from the center of an intersection). **Figure 26** illustrates all F+SI collisions that have occurred at intersections in the City during the study period.

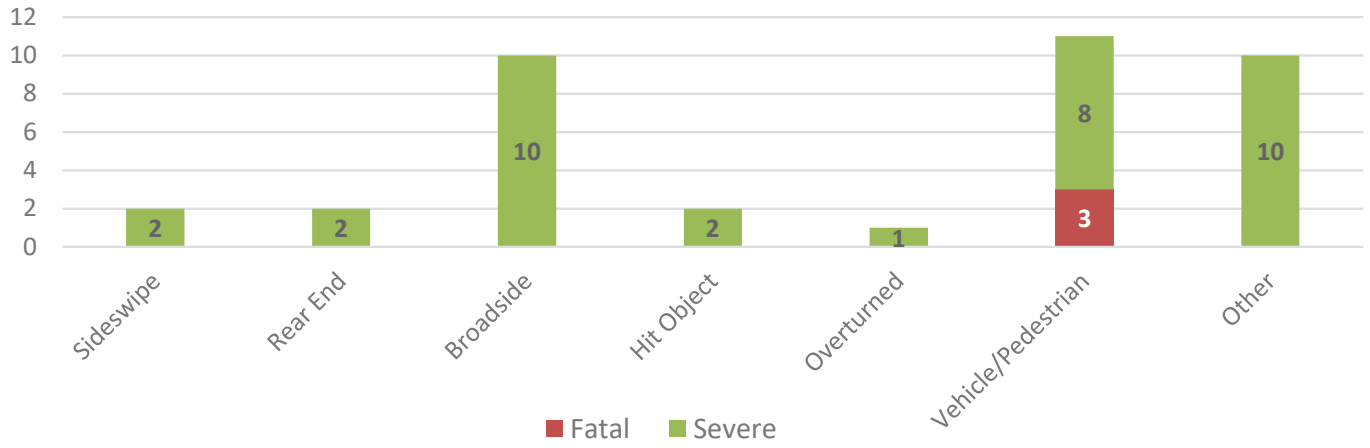
Figure 26. F+SI Collisions at City of Cupertino's Intersections



INTERSECTION F+SI COLLISIONS: COLLISION TYPE AND SEVERITY

Examining which collision types led to F+SI collisions at intersections can help to identify the appropriate countermeasures. Of the 38 F+SI collisions at intersections, sideswipe, rear-end, broadside, hit object, overturned, vehicle/pedestrian, and other accounted for 35 severe injuries, while vehicle/pedestrian collisions accounted for all three fatal collisions, as shown in **Figure 27**.

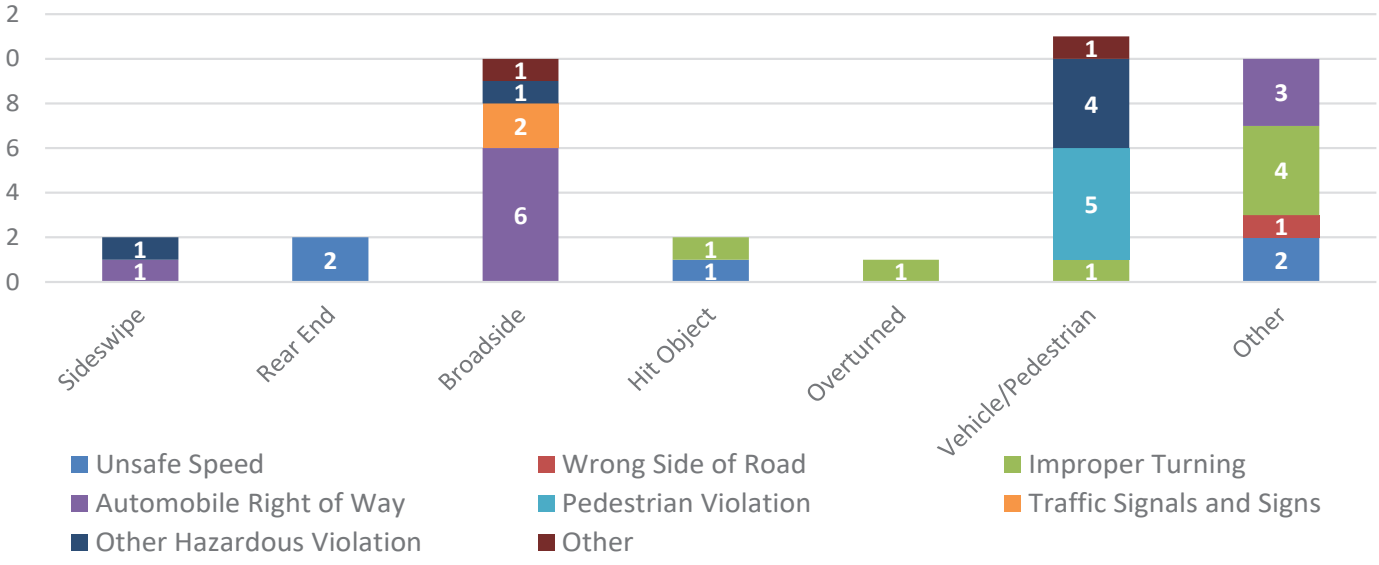
Figure 27. Intersection F+SI Collisions: Collision Type and Severity



INTERSECTION F+SI COLLISIONS: COLLISION TYPE AND VIOLATION FACTOR

Of the 38 F+SI collisions at intersections, vehicle/pedestrian collisions were the most prevalent. These collisions were most commonly associated with pedestrian violations (five) and other hazardous violations (four) out of the 11 total vehicle/pedestrian F+SI collisions. Broadside collisions (10) were the second most common F+SI type to occur within 250 feet of an intersection; six of the 10 broadside collisions were caused by automobile right-of-way violations. **Figure 28** illustrates F+SI collisions at intersections by collision type and violation factor.

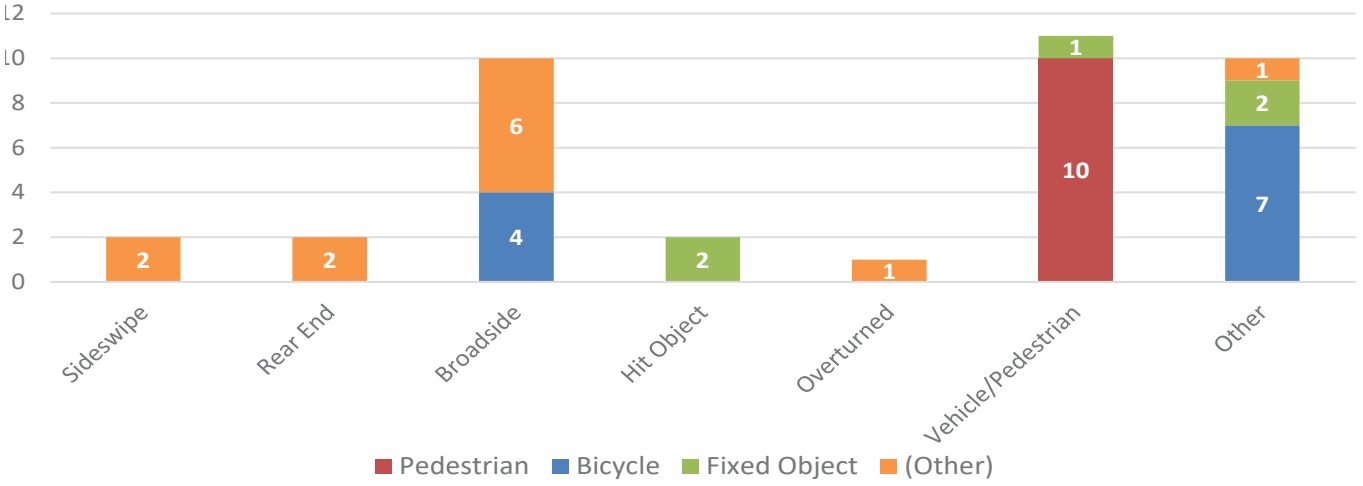
Figure 28. Intersection F+SI Collisions: Collision Type and Violation Factor



INTERSECTION F+SI COLLISIONS: COLLISION TYPE AND MODE

Of the 38 F+SI collisions recorded at intersections, 11 involved bicyclists, and 10 involved pedestrians. A fixed object (such as a tree or telephone pole) was involved in five of 38 F+SI collisions at intersections. **Figure 29** illustrates F+SI collisions at intersections by collision type and mode.

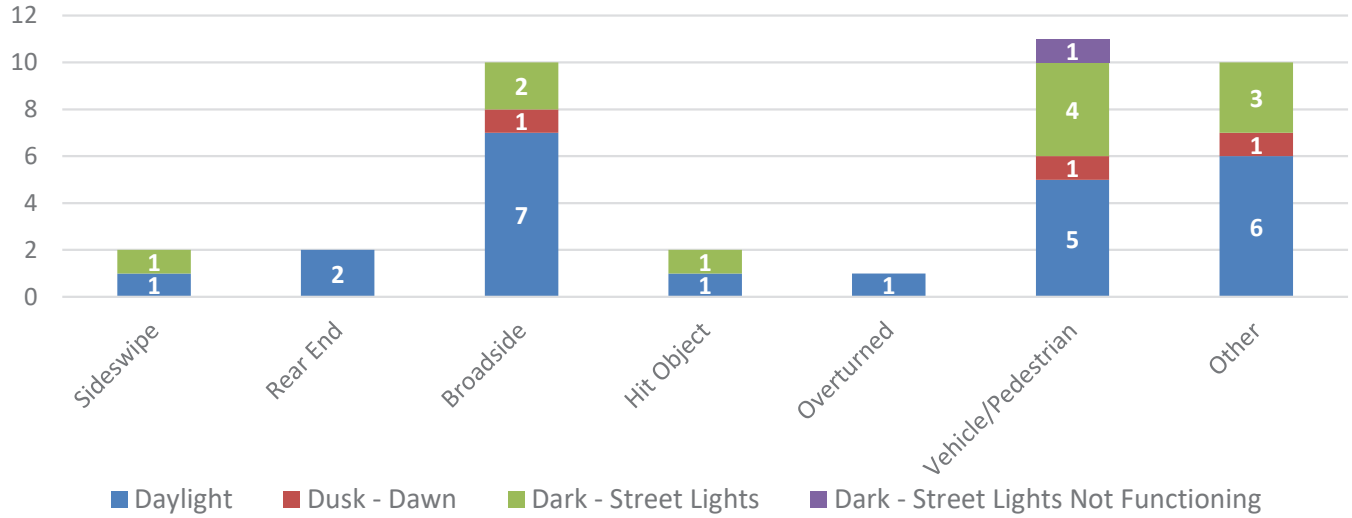
Figure 29. Intersection F+SI Collisions: Collision Type and Mode



INTERSECTION F+SI COLLISIONS: COLLISION TYPE AND LIGHTING CONDITION

Of the 38 F+SI collisions recorded at intersections, 23 occurred during the day (natural light conditions) and the rest occurred during low-light or dark conditions. Vehicle/pedestrian collisions show a greater share of collisions occurring in both daylight and nighttime conditions. **Figure 30** illustrates F+SI collisions at intersections by collision type and lighting condition.

Figure 30. Intersection F+SI Collisions: Collision Type and Lighting Condition



PROMINENT COLLISION TRENDS

The collision analysis above was used to identify key trends among collisions in Cupertino. These collision trends will help to inform the emphasis areas selected for the LRSP, which represent the most critical traffic safety issues in Cupertino. It is important to identify these top collision trends because the emphasis areas will not only be based on these trends, each emphasis area will be accompanied by 4 E's strategies. The 4 E's strategies are intended to help address each of the top collision trends holistically through educational programs, enforcement tactics, engineering countermeasures, and emergency response strategies. The top collision trends (and subsequently the High Collision Network locations), will be better addressed through the 4 E's strategies than through engineering solutions alone. Eight factors emerged as a result of this analysis:

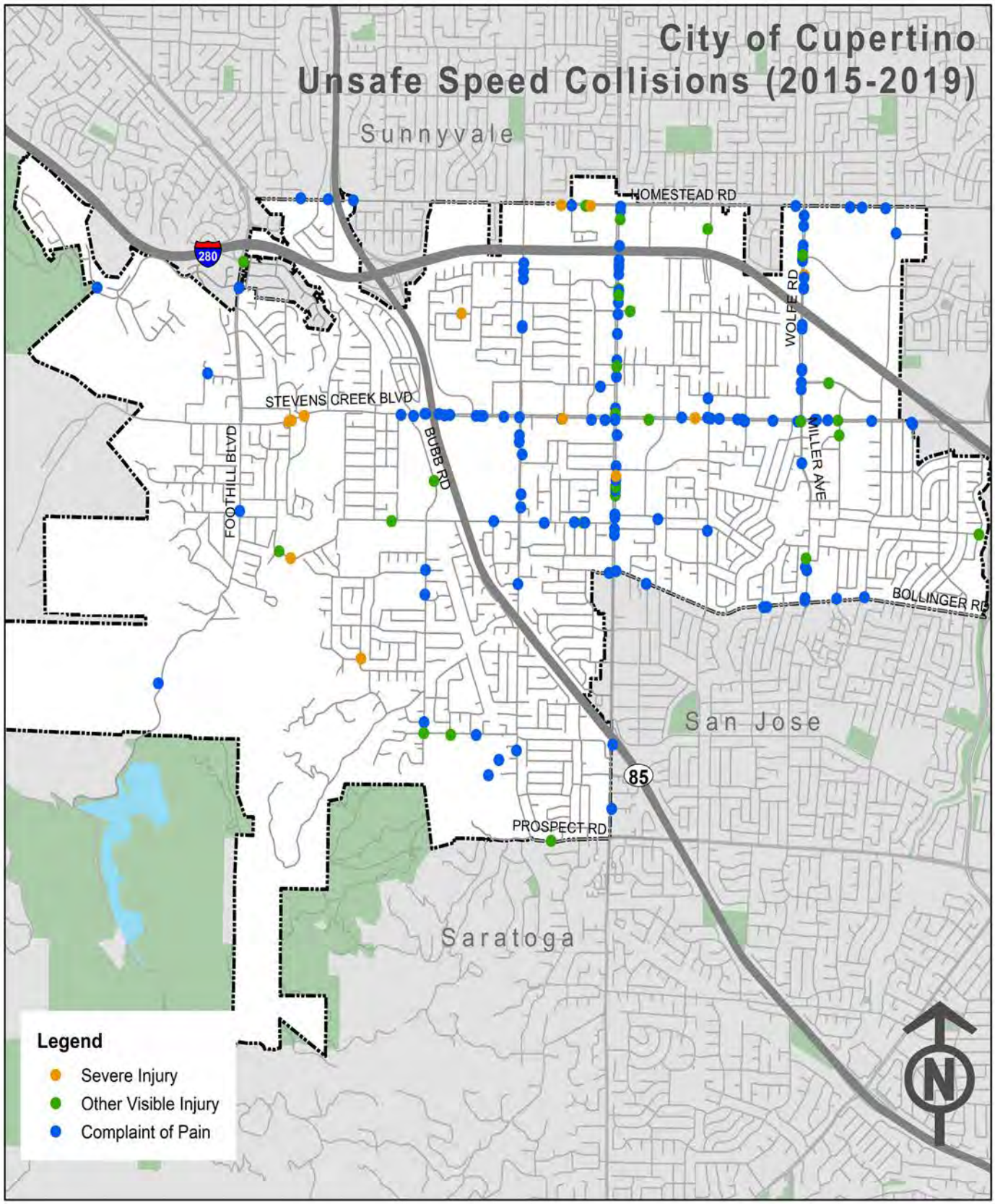
- **Unsafe speed** violations leading to injury collisions (particularly F+SI collisions)
- **Automobile right-of-way** violations leading to injury collisions (particularly F+SI collisions)
- Collisions caused by **improper turning** violations leading to injury collisions (particularly F+SI collisions)
- **Broadside** collisions leading to injury collisions (particularly F+SI collisions)
- **Rear-end** collisions leading to injury collisions
- **Vehicle/pedestrian** collisions leading to a high number of fatality and/or severe injury
- **Vehicle/bicycle** collisions leading to a high number of severe injury
- **Nighttime** collisions resulting in a high number of fatality and/or severe injury

Each of the factors listed above are mapped and summarized in the following pages.

UNSAFE SPEED VIOLATIONS

Among all injury collisions, 28% occurred as a result of unsafe speed. Speeding also caused 24% of F+SI collisions. Higher levels of unsafe speed violations resulting in injury collisions occurred on De Anza Boulevard, Homestead Road, McClellan Road, Stelling Road, Wolfe Road, and Stevens Creek Boulevard. About 79% of injury collisions caused by unsafe speed violations were rear-end collisions. **Figure 31** shows the distribution of unsafe speed-related injury collisions in Cupertino.

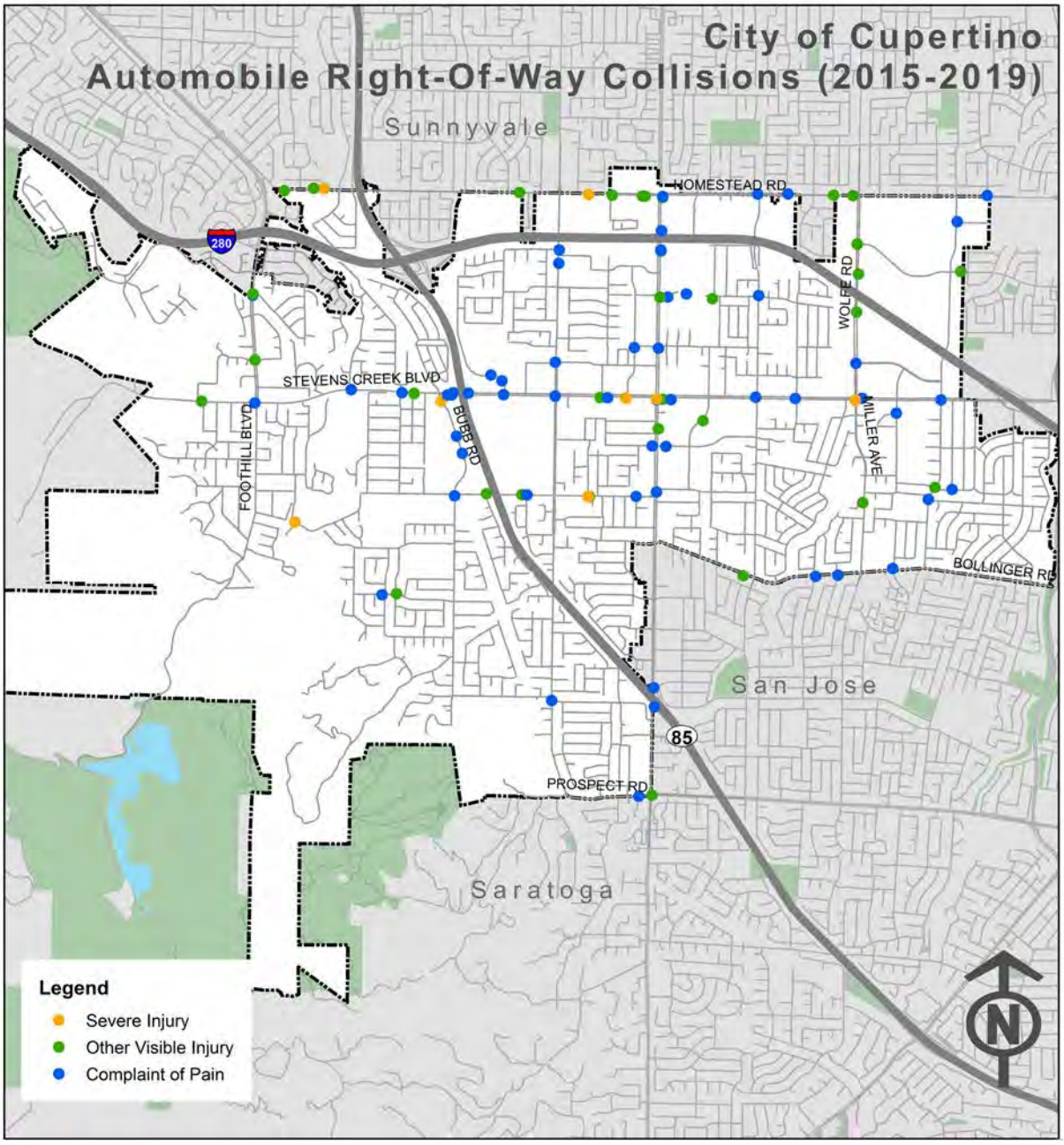
Figure 31. Unsafe Speed Injury Collisions by Severity



AUTOMOBILE RIGHT-OF-WAY VIOLATIONS

Automobile right-of-way violations were the second most common violation among all injury collisions (20%) and F+SI collisions (20%). Automobile right-of-way violations occur when the party at fault violates the right-of-way of another approaching vehicle (eg. turning in front of another vehicle at an intersection). Approximately 55% of automobile right-of-way violations leading to injury collisions resulted in broadside collisions. Higher numbers of automobile right-of-way violations were observed on Stevens Creek Boulevard, De Anza Boulevard, McClellan Road, Homestead Road, and Stelling Road compared to other Cupertino roads. **Figure 32** shows the distribution of automobile right-of-way violation-related injury collisions in Cupertino.

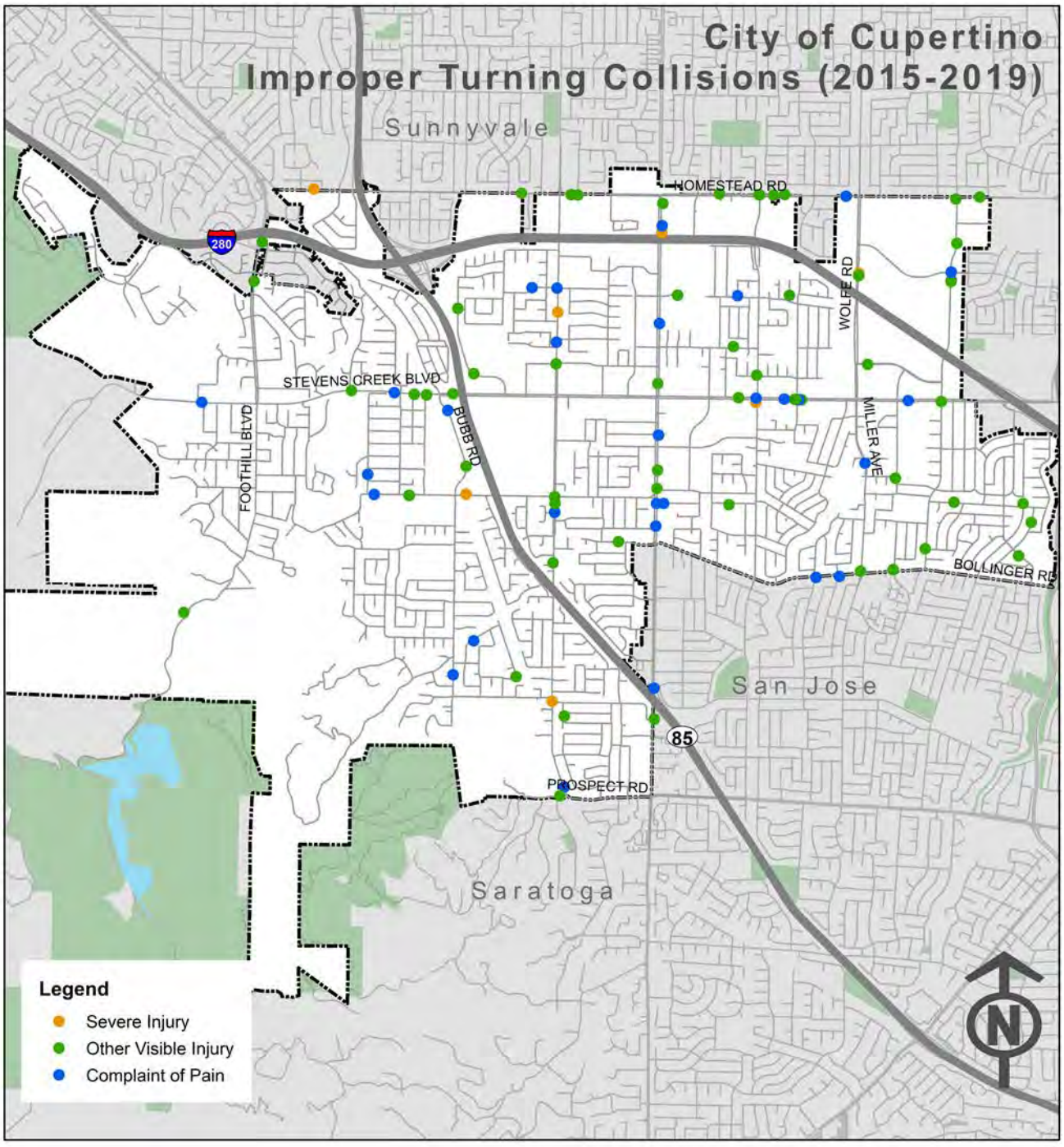
Figure 32. Automobile Right-of-Way Violation-Related Injury Collisions



IMPROPER TURNING VIOLATIONS

Improper turning violations caused 16% of all injury collisions, and 16% of F+SI collisions during the study period. The majority of injury collisions resulting from improper turning violations were hit object collisions (18%), broadside collisions (17%), and vehicle/pedestrian collisions (10%). **Figure 33** maps injury collisions resulting from improper turning violations.

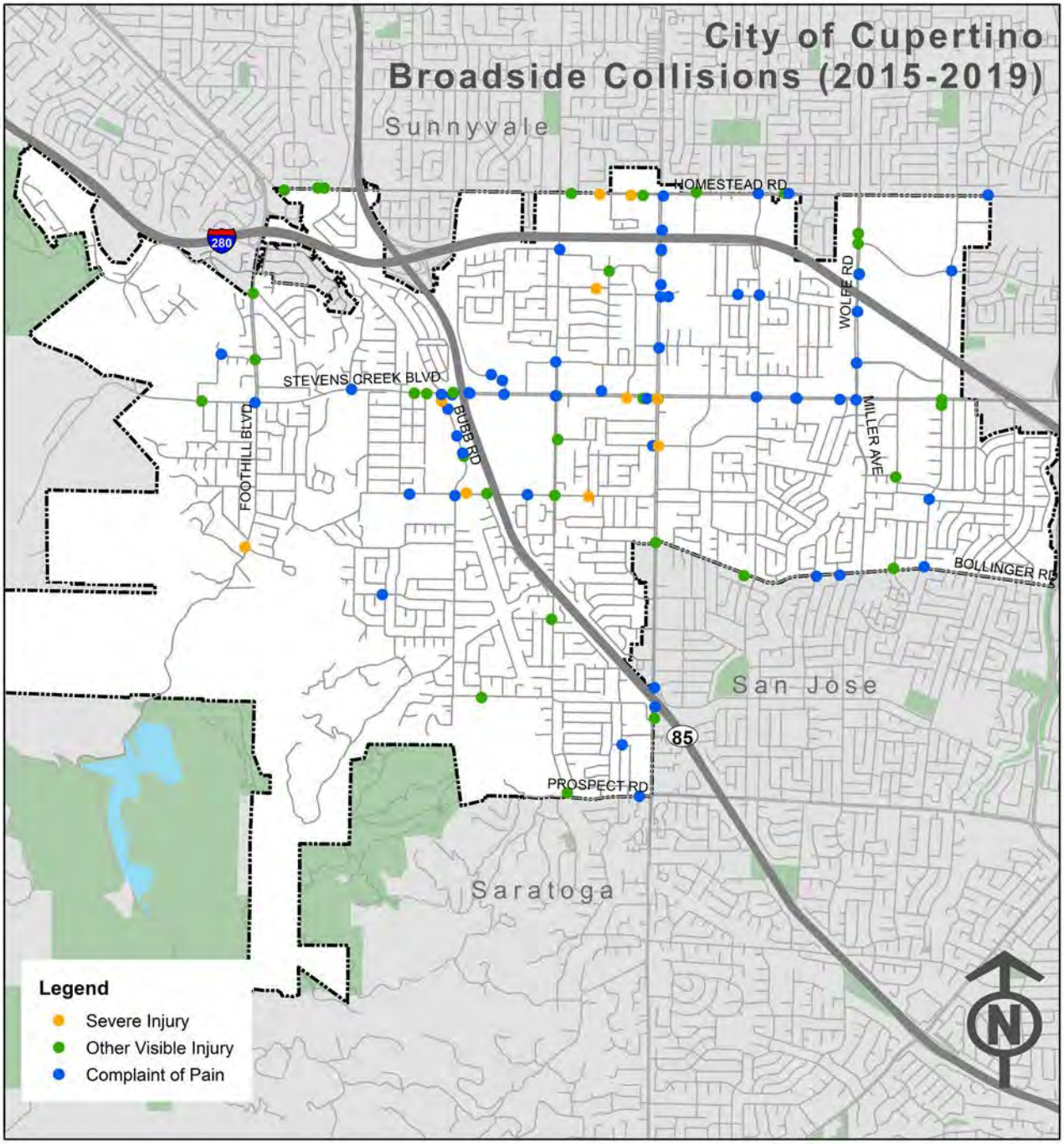
Figure 33. Improper Turning-Related Injury Collisions



BROADSIDE COLLISIONS

Broadside collisions were the second most prominent collision type among all injury collisions (26%), but account for the largest number of F+SI collisions (29%). They most commonly occur at intersections where there are increased vehicle conflict points. Higher numbers of broadside collisions occurred on De Anza Boulevard, Homestead Road, and Stevens Creek Boulevard. **Figure 34** shows the distribution of broadside injury collisions in Cupertino.

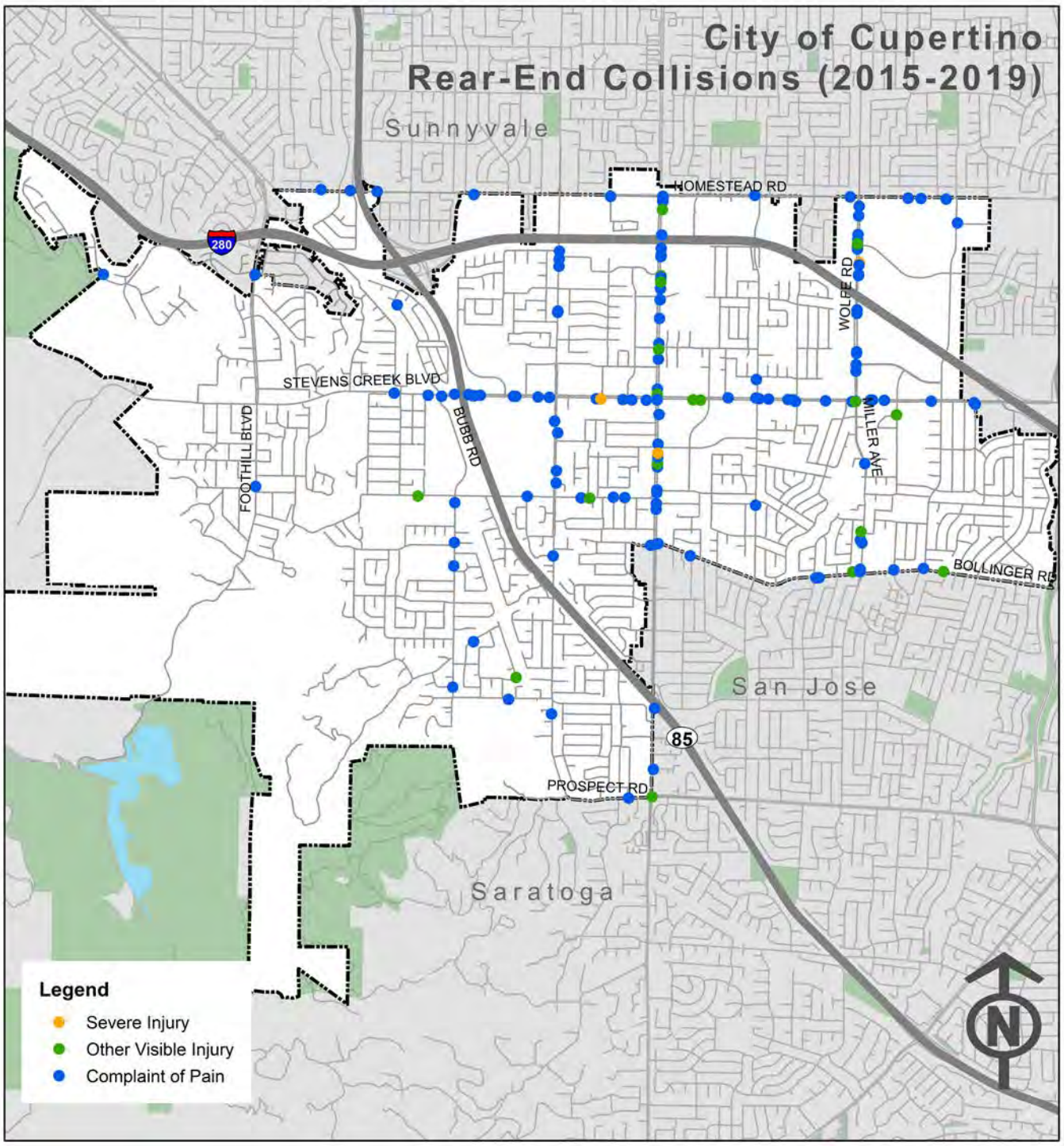
Figure 34. Broadside Injury Collisions



REAR-END COLLISIONS

Rear-end collisions comprise 26% of all injury collisions in Cupertino, with the majority caused by unsafe speed violations. The high numbers of both unsafe speed violations and rear-end collisions indicate a need for traffic slowing measures on certain roadways. **Figure 35** maps rear-end injury collisions in Cupertino.

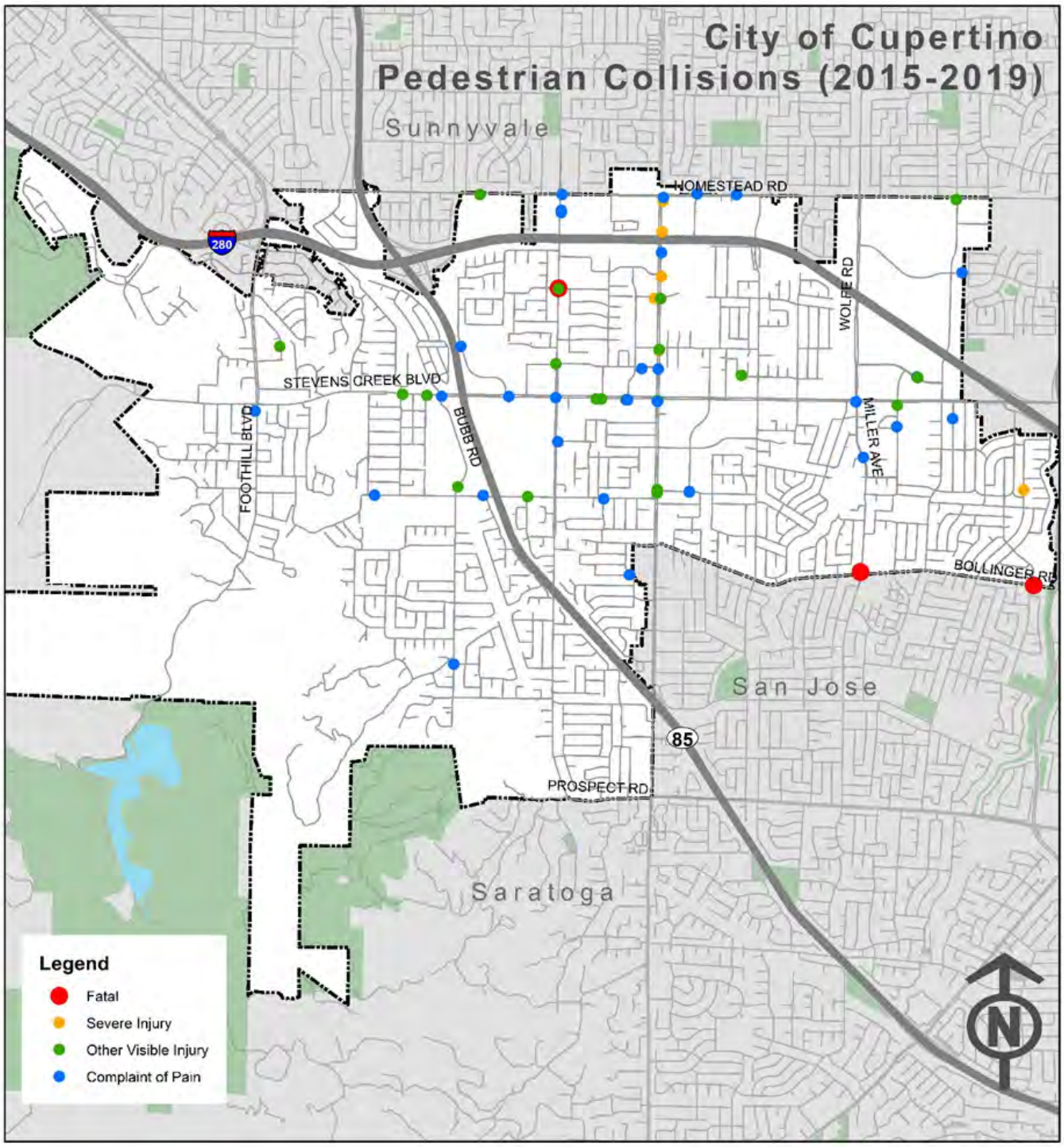
Figure 35. Rear-End Injury Collisions



VEHICLE/PEDESTRIAN COLLISIONS

All of the three fatal collisions that occurred in Cupertino during the five-year study period involved pedestrians. Pedestrian collisions account for 12% of all injury collisions, and 20% of F+SI collisions. **Figure 36** maps pedestrian injury collisions; higher concentrations of F+SI pedestrian collisions occurred on De Anza Boulevard.

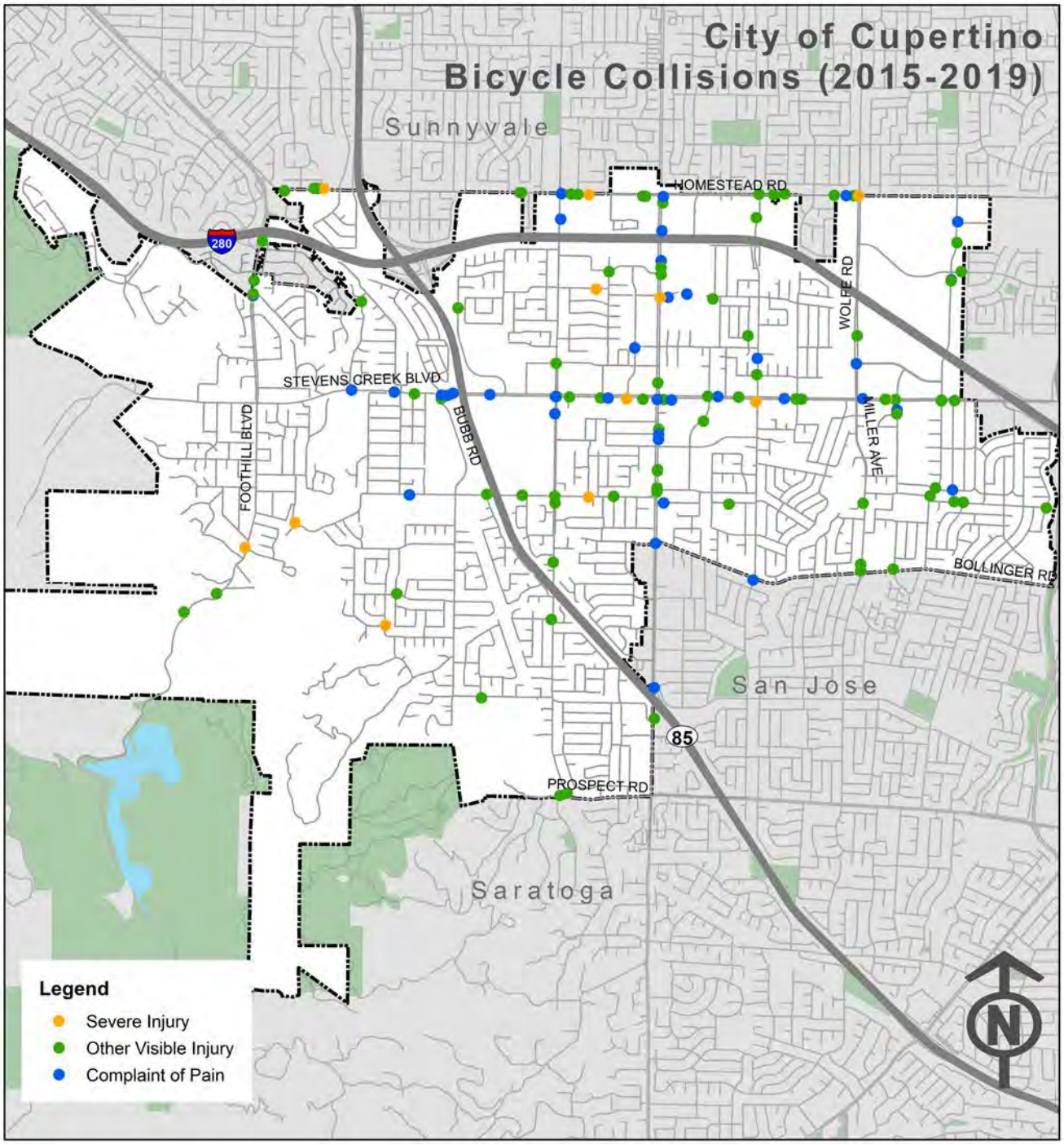
Figure 36. Pedestrian Injury Collisions



VEHICLE/BICYCLE COLLISIONS

Cyclists were involved in 24% of all injury collisions, and 27% of F+SI collisions. Automobile right of way violations caused 31% of bicycle injury collisions and 38% of bicycle F+SI collisions. In addition, improper turning violations caused 31% of bicycle injury collisions and 15% of bicycle F+SI collisions. Bicycle collisions in Cupertino are concentrated along De Anza Boulevard and Stevens Creek Boulevard. **Figure 37** maps bicycle injury collisions.

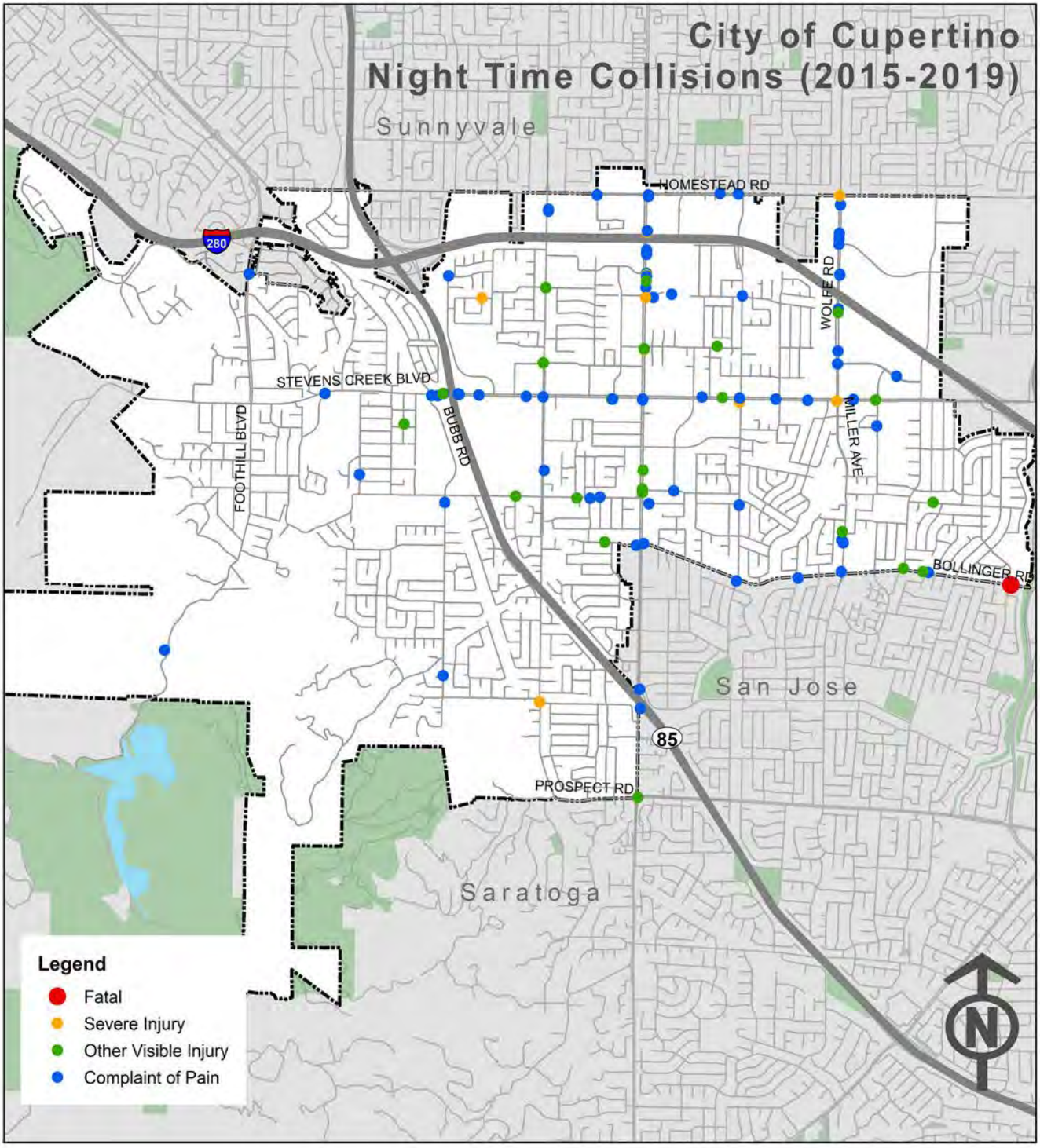
Figure 37. Bicycle Injury Collisions by Severity (No PDO)



NIGHTTIME COLLISIONS

For F+SI collisions, 31% occurred during nighttime or dawn/dusk conditions, compared to just 25% of injury collisions. Street corridors with higher concentrations of collisions occurring under non-daylight conditions include De Anza Boulevard, Stevens Creek Boulevard, and Wolfe Road, indicating lighting as a potential countermeasure at these locations. **Figure 38** shows the distribution of nighttime injury collisions in Cupertino.

Figure 38. Nighttime Injury Collisions



IDENTIFICATION OF HIGH COLLISION NETWORK

EQUIVALENT PROPERTY DAMAGE ONLY (EPDO) SCORE

The EPDO method was used to identify the high severity collision network. The EPDO method accounts for both the severity and frequency of collisions by converting each collision to an equivalent number of PDO collisions. The EPDO method assigns a crash cost and score to each collision according to the severity of the crash weighted by the comprehensive crash cost. These EPDO scores are calculated using a simplified version of the comprehensive crash costs per HSIP Cycle 10 application. The weights used in the analysis are shown below in **Table 4**.

Table 4. EPDO Score used in HSIP Cycle 10

Collision Severity	EPDO Score
Fatal and Severe Injury Combined	165*
Visible Injury	11
Complaint of Pain	6
PDO	1

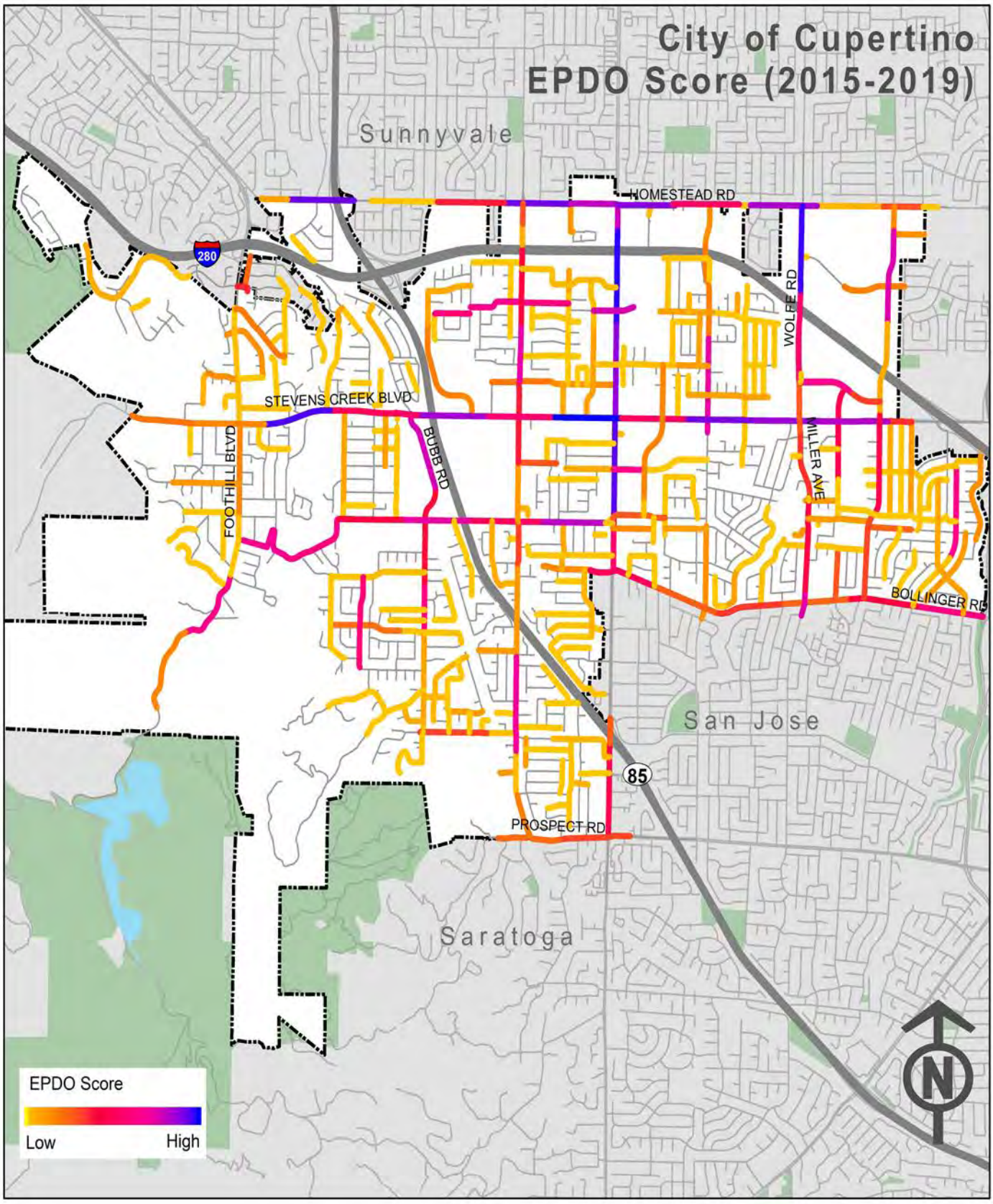
**This is the score used in HSIP Cycle 10 for collisions on roadways segments, to simplify the analysis this study uses the same score for all F+SI collisions regardless of location*

EPDO is used because it provides a methodology for the project team to understand the locations in Cupertino that are experiencing the most severe crashes. Because of the high score given to F+SI crashes, locations that have these types of crashes are more likely to receive a higher EPDO score than other locations that may have more collisions, but fewer F+SI collisions. Locations that have the highest EPDO scores are selected for inclusion in the High Collision Network**.** Identified intersections are scored based on collisions occurring at or within 250 feet of the intersection, while roadway segment locations are identified based on collisions that occur along the segment, except directly at an intersection (zero feet from intersection per Crossroads data). Identifying the locations with the most severe crashes allows the team to focus recommended solutions and countermeasures at these locations.

The EPDO scores for all collisions can then be aggregated in a variety of ways to identify collision patterns, such as location hot-spots. The weighted collisions for the City of Cupertino were geolocated onto Cupertino's road network. For the purposes of this analysis (and future analyses), PDO collisions were included. GIS is then used to calculate the EPDO score for each roadway segment and intersection citywide, which is then ranked according to its score.

Figure 39 shows the location and geographic concentration of collisions by their EPDO score.

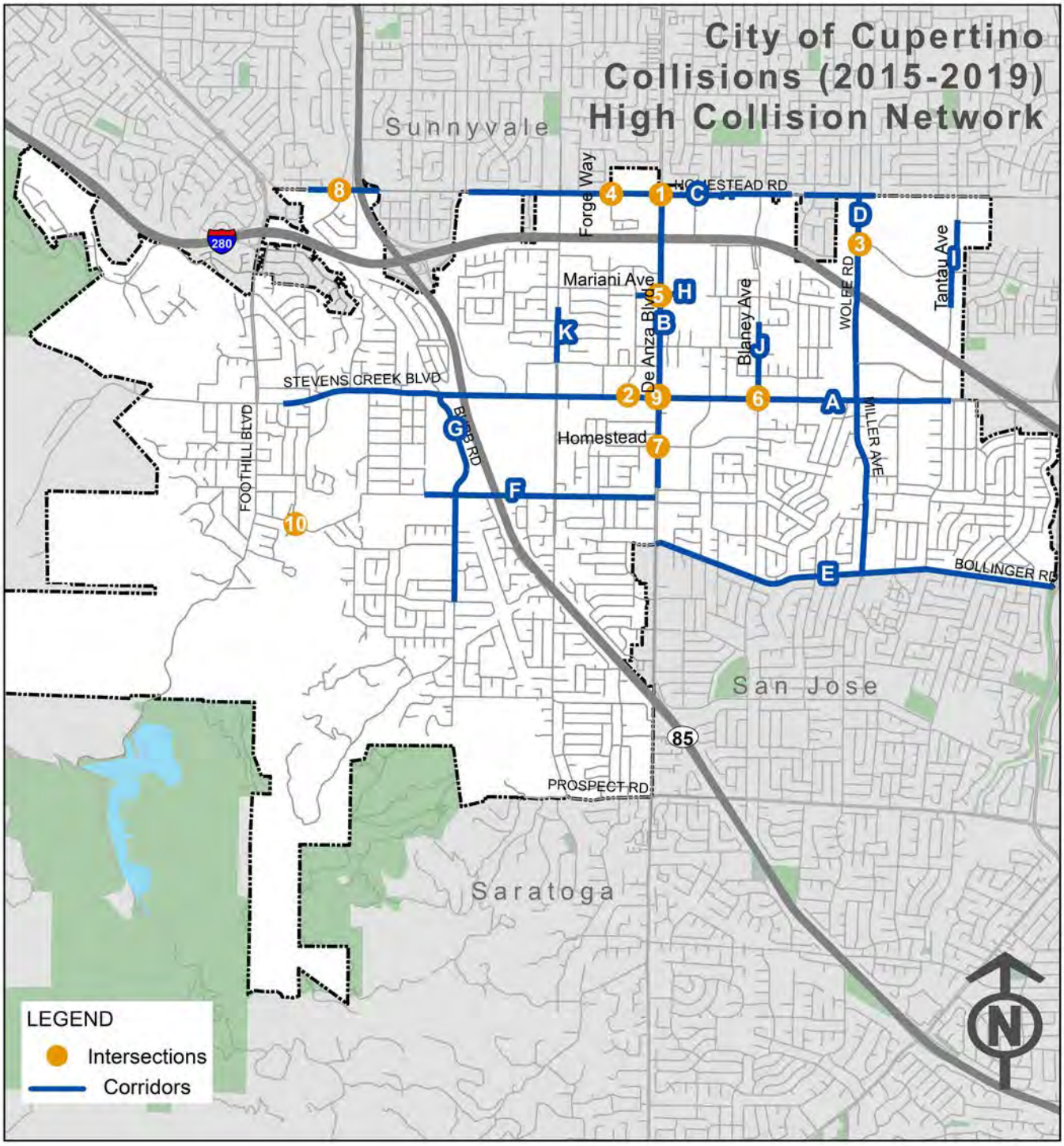
Figure 39. Equivalent Property Damage Only (EPDO) Score



HIGH COLLISION NETWORK

Following the detailed collision analysis in **Section 4**, the next step in the LRSP analysis identifies high-risk roadway segments and intersections. Intersections and segments were selected using the weighted score methodology from the EPDO analysis. **Figure 40** shows the top 11 high-collision roadway segments, and top 10 high-collision intersections in Cupertino.

Figure 40. High Collision Network



CORRIDOR RANKINGS

Eleven corridors were identified as high collision corridors. There were a total of 390 injury collisions, 38 F+SI collisions, and 987 PDO collisions on these corridors, which represents 64% of all injury collisions, 78% of all F+SI collisions, and 65% of all PDO collisions citywide. The Stevens Creek Boulevard corridor had the highest number of F+SI collisions with 11.

Table 5 lists the collision rate of the top 11 identified high-collision corridors along with the number of total injury collisions, F+SI collisions, PDO collision, total (injury+PDO) nighttime, total (injury+PDO) pedestrian, total (injury+PDO) bicycle collisions, length of the corridors, and EPDO score.

Table 5. High Collision Corridors

ID	Corridor	Collisions						Length (miles)	EPDO Score
		Total Injury	F+SI	PDO	Total Nighttime	Total Pedestrian	Total Bicycle		
A	Stevens Creek Blvd: Janice Ave to Judy Ave	147	11	323	81	17	45	3.4	3,139
B	De Anza Blvd: Pacifica Dr to Homestead Rd	87	8	187	72	11	18	1.5	2,096
C*	Homestead Rd: Fallen Leaf Ln to Wolfe Rd	45	7	188	32	6	22	2.8	1,666
D	Wolfe Rd/Miller Ave: Homestead Rd to Bollinger Rd	36	2	150	39	0	3	1.9	729
E*	Bollinger Rd: Lawrence Expy to De Anza Blvd	27	2	42	19	2	3	1.5	562
F	McClellan Rd: Imperial Ave to De Anza Blvd	17	2	40	9	2	6	1.2	490
G	Bubb Rd: Stevens Creek Blvd to Columbus Ave	13	2	20	4	1	3	1.1	436
H	Mariani Ave: Bandley Dr to Infinite Loop	5	1	10	2	1	3	0.3	209
I	Tantau Ave: Forge Dr to Pruneridge Ave	5	1	9	0	0	4	0.3	208
J	Blaney Ave: Pear Tree Ln to Stevens Creek Blvd	4	1	9	1	0	4	0.3	192
K	N Stelling Rd: Alves Dr to Greenleaf Dr	4	1	9	1	0	1	0.3	192

**Corridors are shared with other jurisdictions (Homestead Road is shared with the City of Sunnyvale and Bollinger Road is shared with the City of San Jose).*

INTERSECTION RANKINGS

There were 10 intersections identified as high collision intersections. There were a total of 147 injury collisions, 24 F+SI collisions and 354 PDO collisions that occurred at these intersections, which represents 24% of all injury collisions, 49% of all F+SI collisions, and 23% of all PDO collisions citywide. The intersection of De Anza Boulevard and Homestead Road had the highest number of injury collisions overall (41).

Table 6 lists the collision rate of the top 10 identified high-risk intersections along with the number of total injury collisions, F+SI collisions, PDO collision, total (injury+PDO) nighttime, total (injury+PDO) pedestrian, total (injury+PDO) bicycle collisions, and EPDO score.

Table 6. High Collision Intersections

ID	Intersection	Collisions						EPDO Score
		Total Injury	F+SI	PDO	Total Nighttime	Total Pedestrian	Total Bicycle	
1	De Anza Blvd and Homestead Rd	41	4	86	35	7	9	1,028
2	Bandley Dr and Stevens Creek Blvd	18	4	31	8	7	2	800
3	Prunridge Ave and Wolfe Rd	20	2	78	20	0	0	546
4	Franco Ct/Forge Wy and Homestead Rd	6	3	22	6	0	1	545
5	De Anza Blvd and Mariani Ave	15	2	37	11	2	5	465
6	Blaney Ave and Stevens Creek Blvd	9	2	23	7	0	4	400
7	S De Anza Blvd and Rodrigues Ave	8	2	17	8	0	0	388
8	Barranca Dr and Homestead Rd	6	2	4	1	1	5	373
9	De Anza Blvd and Stevens Creek Blvd	20	1	54	14	2	8	373
10	McClellan Rd and Clubhouse Ln	4	2	2	2	0	2	349

SUMMARY

Between 2015 and 2019, a total of 2,140 collisions occurred within the City of Cupertino, of which 1,526 resulted in PDO collisions, 362 resulted in a complaint of pain injury, 203 resulted in a visible injury, 46 resulted in a serious injury, and three resulted in a fatality. Of the total 614 injury collisions (fatal, severe injury, visible injury, and complaint of pain), 123 occurred on roadway segments whereas 491 occurred within 250 feet of an intersection.

Among all injury collisions, the most prominent collision types were rear-end and broadside collisions, while unsafe speed, automobile right-of-way, and improper turning were the most common violation types. EPDO methodology was used to understand the locations in Cupertino that are experiencing the most severe crashes. A total of 11 corridors and 10 intersections contributed to a high collision network. The corridor with the highest EPDO score was Stevens Creek Boulevard from Janice Avenue to Judy Avenue, while the intersection with the highest EPDO score was the crossing of De Anza Boulevard and Homestead Road.

The next steps in the LRSP will be to identify emphasis areas based on the collision analysis. The most prominent collision types, violations, and human behaviors will be selected for inclusion as an emphasis area, as these represent the most prominent traffic safety issues in Cupertino. Each emphasis area will be accompanied with strategies corresponding to the 4 E's of safety to comprehensively help make the City of Cupertino safer for all modes of transportation.

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5. EMPHASIS AREAS

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5 EMPHASIS AREAS

Emphasis areas are focus areas for the LRSP that are identified through the comprehensive collision analysis of the identified high injury locations within the City of Cupertino. Emphasis areas help in identifying appropriate safety strategies and countermeasures with the greatest potential to reduce collisions occurring at these high injury locations. They can include (but not be limited to): specific collision types, human behaviors, facility types, and specific locations or corridors.

This chapter summarizes the top nine emphasis areas identified for the City of Cupertino. These emphasis areas were derived from the consolidated high injury collision database (**Appendix C**) where top injury factors were identified by combining the data manually. Along with findings from the data analysis, stakeholder input was also considered while identifying emphasis areas specific to the City of Cupertino.

The identified emphasis areas are as follows:

- Improve Intersection Safety (Collisions within 250 feet of an intersection)
- Reduce Unsafe Speed
- Reduce Automobile Right-of-Way Violations
- Improve Pedestrian and Bicyclist Safety
- Reduce Nighttime Collisions
- Reduce Rear End Collisions
- Reduce Broadside Collisions
- Reduce Improper Driving Collisions
- Reduce Collisions near Schools

THE 4 E'S OF TRAFFIC SAFETY

The LRSP utilizes a comprehensive approach to safety incorporating the "4 E's of traffic safety": **E**ngineering, **E**nforcement, **E**ducation, and **E**MS. This approach recognizes that not all locations can be addressed solely by infrastructure improvements. Incorporating the 4 E's of traffic safety is often required to ensure successful implementation of significant safety improvements and reduce the severity and frequency of collisions throughout a jurisdiction.

Some of the common violation types that may require a comprehensive approach are speeding, failure-to-yield to pedestrians, red light running, aggressive driving, failure to wear safety belts, distracted driving, and driving while impaired. When locations are identified as having these types of violations, coordination with the appropriate law enforcement agencies is needed to arrange visible targeted enforcement to reduce the potential for future driving violations and related crashes and injuries.

To improve safety, education efforts can be used to supplement enforcement and improve the efficiency of each strategy. Education can also be employed in the short-term to address high crash locations until the recommended infrastructure project can be implemented. Similarly, EMS entails strategies around supporting organizations that provide rapid response and care when responding to collisions causing injury, by stabilizing victims and transporting them to medical facilities.

EXISTING TRAFFIC SAFETY EFFORTS IN THE CITY OF CUPERTINO

The City of Cupertino and partner agencies have already planned and implemented safety strategies corresponding to the 4 E's of traffic safety. The strategies detailed in this section can supplement these existing programs and concentrate them on high injury collision locations and crash types. These initiatives are summarized in **Table 7**.

Table 7. Existing Efforts Summary

Document/Program	Description	E's Addressed
Santa Clara County Sheriff's Department and Fire Department	Santa Clara County Sheriff's Department and Fire Department provide traffic enforcement and emergency response to collisions occurring in the unincorporated areas, as well as within the City of Cupertino limits.	Enforcement, EMS
City of Cupertino Traffic Calming Program (2020)	The Neighborhood Traffic Calming Program aims to establish a consistent set of guidelines to provide residents and property owners with a means to obtain relief from traffic-related concerns, namely speeding vehicles and cut-through traffic on their residential street. This is accomplished through a multi-step process involving an initial petition, a traffic survey, neighborhood meetings, a postcard survey, and the possible installation of traffic calming measures.	Engineering, Education
Cupertino Safe Routes to School Program	SRTS is a citywide program encouraging students to walk and bike to school and to enhance safety for students walking and biking to school. Looking at student and parent barriers to walking and biking, environmental/ infrastructure issues that make walking and biking easy or difficult, education, and supports and incentives to encourage walking, the program strives to increase the number of students that walk and bike to school.	Education
SRTS School Walk Audit Project	In 2016/17, Cupertino SRTS worked with each public school in Cupertino to develop a list of infrastructure improvements that would make walking and biking safer, and drop-off and pick-up smoother.	Engineering, Education
Capital Improvement Program FY 2023	The City's Capital Improvement Program lists proposed improvements including signal modifications, additional Class I and Class IV bike lanes and signage.	Engineering

FACTORS CONSIDERED IN THE DETERMINATION OF EMPHASIS AREAS

This section presents collision data analysis of collision type, collision factors, facility type, and roadway geometries, analyzed for the various emphasis areas. Emphasis areas were determined by identifying factors that led to the highest number of injury collisions (fatal, severe injury, visible injury, and complaint of pain) with a specific emphasis on F+SI injury collisions. The City of Cupertino data indicates a total of 2,140 collisions between 2015 and 2019, of which 1,526 resulted in PDO collisions, 362 resulted in a complaint of pain injury, 203 resulted in a visible injury, and 49 resulted in a F+SI. Following that, a high collision network was identified that included top 11 high-collision roadway segments and top 10 high-collision intersections. This high collision network experienced 439 injury collisions, including 42 F+SI collisions, and 1,052 PDO collisions, for a total of 1,491 collisions. The data presented below in each emphasis area is based on the fatal, severe injury, visible injury, complaint of pain, and PDO collisions on the high collision network.

Each emphasis area is accompanied by comprehensive programs, policies and countermeasures to reduce collisions on the City roads in that specific emphasis area. It will provide the basis by which the countermeasure toolbox is developed for each identified high-risk location.

Engineering countermeasures and improvements were selected from the 2022 LRSM from Caltrans, where:

- S refers to improvements at signalized locations,
- NS refers to improvements at non-signalized locations, and
- R refers to improvements at roadway segments.

EMPHASIS AREA 1 – INTERSECTIONS

There were a total of 147 injury collisions (including 24 F+SI collisions) and 354 PDO collisions that occurred at the 10 high-risk intersections in the City of Cupertino. The following collision data is based on only intersection collisions that occurred in the high collision network in the City of Cupertino. **Table 8** describes recommended programs and countermeasures to comprehensively address intersection safety.

11%

Involved pedestrians and bicyclists

32%

Unsafe speed collisions

22%

Occurred at night

Table 8. Emphasis Area 1 Strategies

Objective: To reduce the number of fatal and severe injury collisions at intersections.					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	Conduct public information and education campaign for intersection safety laws regarding traffic signals, stop signs, and turning left or right.	Number of education campaigns	City/School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	Targeted enforcement at high-risk intersections to monitor traffic law violations, right-of-way violations, speed limit laws and other violations that occur at intersections.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S01, Install intersection lighting • S02, Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number • S03, Improve signal timing (coordination, phases, red, yellow, or operation) • S06, Install left-turn lane and add turn phase (signal has no left-turn lane or phase before) • S07, Provide protected left turn phase (left turn lane already exists) • S08, Convert signal to mast arm (from pedestal-mounted) • S09, Install raised pavement markers and striping (Through Intersection) • S16/NS04/NS05, Convert intersection to roundabout • S19PB, Pedestrian Scramble • S20PB, Install advance stop bar before crosswalk (Bicycle Box) • NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs • NS14, Install raised median on approaches • R01, Add Segment Lighting • R22, Install/Upgrade signs with new fluorescent sheeting (regulatory or warning) • R27, Install delineators, reflectors and/or object markers • Curb extension	Number of intersections improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	• S05, Install emergency vehicle pre-emption systems • Maintenance and upgradation of existing preemptive system	EMS vehicle response timew	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 2 – UNSAFE SPEED

Of the 1,491 collisions in the high collision network, 368 were caused by unsafe speeding. The following collision analysis is based on unsafe speed collisions in the high collision network in the City of Cupertino. **Table 9** describes recommended programs and countermeasures to comprehensively reduce unsafe speed collisions.

40%
Involved pedestrians and bicyclists

18%
Involved fixed objects

60%
Nighttime collisions

Table 9. Emphasis Area 2 Strategies

Objective: To reduce the number of collisions caused due to unsafe speeding.					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	• Conduct public education and outreach activities that elevate the awareness of the dangers of speeding. • Public service announcements regarding increased and strict traffic law enforcement.	Number of public outreach events and public service announcements	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	Increase enforcement, penalties and prosecution for traffic law violations.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S03, Improve signal timing (coordination, phases, red, yellow, or operation) • S04, Provide Advanced Dilemma-Zone Detection for high speed approaches • S11/NS12, Improve pavement friction (High Friction Surface Treatments) • S12, Install raised median on approaches (S.I.) • S16, Convert intersection to roundabout • NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs • NS07, Upgrade intersection pavement markings (NS.I.) • NS11, Improve sight distance to intersection (Clear Sight Triangles) • R14, Road Diet • R25, Install curve advance warning signs (flashing beacon) • R26, Install dynamic/variable speed warning signs • R27, Install delineators, reflectors and/or object markers • Decrease width of travel lanes	Number of locations improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	• S05, Install emergency vehicle pre-emption systems • Maintenance and upgradation of existing preemptive system	EMS vehicle response time	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 3 – AUTOMOBILE RIGHT-OF-WAY VIOLATIONS

Of the total 1,491 collisions in the high collision network of the City of Cupertino, 323 resulted due to automobile right-of-way violations. The following collision analysis is based on automobile right-of-way violations-related collisions in the high collision network in the City of Cupertino. **Table 10** describes recommended programs and countermeasures to comprehensively reduce automobile right-of-way violations.

14%

Involved pedestrians

58%

Broadside collisions

30%

Nighttime collisions

Table 10. Emphasis Area 3 Strategies

Objective: To reduce the number of collisions caused due to automobile right-of-way violations.					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	• Conduct public information and education campaign for intersection safety laws regarding traffic lights, stop signs, and turning left or right.	Number of education campaigns	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	• Increase enforcement, penalties and prosecution for traffic law violations. • Targeted enforcement at locations with most automobile right-of-way violations, and implement strict penalties for such violations.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S02, Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number • S03, Improve signal timing (coordination, phases, red, yellow, or operation) • S08, Convert signal to mast arm (from pedestal-mounted) • S09, Install raised pavement markers and striping (Through Intersection) • S16/NS04/NS05, Convert intersection to roundabout • NS02, Convert to all-way STOP control (from 2-way or Yield control) • NS03, Install signals • NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs • NS07, Upgrade intersection pavement markings (NS.I.) • NS08, Install flashing beacons at stop controlled intersections • NS11, Improve sight distance to intersection (Clear Sight Triangles)	Number of locations improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	• S05, Install emergency vehicle pre-emption systems • Maintenance and upgradation of existing preemptive system	EMS vehicle response time	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 4 – PEDESTRIAN AND BICYCLIST COLLISIONS

Of the 1,491 collisions in the City of Cupertino's high collision network, 147 collisions involved a pedestrian or a bicyclist. The following collision data is based on pedestrian and bicyclist collisions in the high collision network in the City of Cupertino. **Table 11** describes recommended programs and countermeasures to comprehensively improve pedestrian and bicyclist safety.

33%

Automobile right-of-way violations

32%

Nighttime collisions

21%

Broadside collisions

Table 11. Emphasis Area 4 Strategies

Objective: To improve environment for pedestrians and bicyclists.					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	• Pedestrian safety campaigns and outreach to raise awareness of pedestrian safety needs through media outlets and public events. • Post signage along roadways in areas of anticipated or known high pedestrian activity advising motorists of zero tolerance motor vehicle law enforcement. • Provide public outreach to advise of City efforts toward zero-tolerance motor vehicle law enforcement in high pedestrian activity. • Public education and outreach to raise awareness of bicyclist safety needs and helmets.	Number of outreach events for pedestrian and bicyclist safety campaigns	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	Targeted and zero-tolerance enforcement of motor vehicle speed limit violations, signal/right-of-way violations, pedestrian violations, aggressive driving, distracted driving, and DUI in areas with known or anticipated high pedestrian and bicyclist activity.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S17PB, Install pedestrian countdown signal heads • S18PB, Install pedestrian crossing (S.I.). • S19PB, Pedestrian Scramble • S20PB, Install advance stop bar before crosswalk (Bicycle Box) • S21PB, Modify signal phasing to implement a Leading Pedestrian Interval (LPI) • NS07, Upgrade intersection pavement markings (NS.I.) • NS19PB, Install raised medians (refuge islands) • NS20PB, Install pedestrian crossing at uncontrolled locations (signs and markings only) • NS21PB/R35PB, Install/upgrade pedestrian crossing (with enhanced safety features) • R32PB, Install bike lanes. • R33PB, Install Separated Bike Lanes • R34PB, Install sidewalk/pathway (to avoid walking along roadway) • R35PB, Install/upgrade pedestrian crossing (with enhanced safety features) • R36PB, Install raised pedestrian crossing • R37PB, Install Rectangular Rapid Flashing Beacons (RRFB) • High-visibility ladder crosswalks • Mid-block curb extension • Pedestrian crossing flags • Yield sign for pedestrian crossing at crosswalk • Highlighted crossing for bicyclist • Curb extensions at wide approaches	Number of locations improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	Improve resource deployment for emergency responses at collision sites.	EMS vehicle response time	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 5 – NIGHTTIME COLLISIONS

Out of the total 1,491 collisions on the high collision network in the City of Cupertino, 222 occurred at night (no natural lighting condition). The following collision analysis is based on nighttime collisions on the high collision network in the City of Cupertino. **Table 12** describes recommended programs and countermeasures to comprehensively reduce nighttime collisions.

17%

Involved bicyclists and pedestrians

28%

Rear-end collisions

32%

While making turns

Table 12. Emphasis Area 5 Strategies

Objective: To reduce the number of fatal and severe injury collisions occurring at night (no natural light).					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	Develop awareness program to inform residents of high-risk collision locations, the most common violations and collision types occurring at night.	Number of education campaigns	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	Increase patrolling during nighttime.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S02, Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number • S09, Install raised pavement markers and striping (Through Intersection) • S10, Install flashing beacons as advance warning (S.I.) • NS01, Intersection Lighting • NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs • NS07, Upgrade intersection pavement markings (NS.I.) • R01, Add segment lighting • R22, Install/Upgrade signs with new fluorescent sheeting (regulatory or warning) • R27, Install delineators, reflectors and/or object markers • R37PB/NS22PB, Install Rectangular Rapid Flashing Beacon (RRFB) • Reflective paint on roadside objects, guard walls and poles	Number of locations improved to mitigate night-time collisions	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	Improve resource of deployment at night for emergency responses to collision sites.	EMS vehicle response time at night	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 6 – REAR-END COLLISIONS

The City of Cupertino experienced a total 1,491 reported collisions on the high collision network, of which 388 were rear-end collisions. The following collision analysis is based on rear-end collisions on the high collision network in the City of Cupertino. **Table 13** describes recommended programs and countermeasures to comprehensively reduce rear-end collisions.

77%

Unsafe speed collisions

18%

Nighttime collisions

Table 13. Emphasis Area 6 Strategies

Objective: To reduce the number of rear-end collisions.					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	Conduct public education and outreach activities that elevate the awareness of the dangers of rear-end collisions.	Number of public outreach events	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	Increase penalties for repeat offenders.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department)	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S02, Improve signal hardware: lenses, back-plates with retro-reflective borders, mounting, size, and number • S03, Improve signal timing (coordination, phases, red, yellow, or operation) • S09, Install raised pavement markers and striping (Through Intersection) • S11, Improve pavement friction (High Friction Surface Treatments) • S12, Install raised median on approaches (S.I.) • NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs • NS07, Upgrade intersection pavement markings (NS.I.) • NS10, Install transverse rumble strips on approaches • NS11, Improve sight distance to intersection (Clear Sight Triangles) • NS12, Improve pavement friction (High Friction Surface Treatments) • R05, Install impact attenuators • R22, Install/Upgrade signs with new fluorescent sheeting (regulatory or warning) • R27, Install delineators, reflectors and/or object markers • Add paved shoulders • Simplify turn configurations	Number of locations improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	• S05, Install emergency vehicle pre-emption systems • Maintenance and upgradation of existing preemptive system	EMS vehicle response time	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 7 – BROADSIDE COLLISIONS

The City of Cupertino had a total of 1,491 collisions reported on the high collision network, with 397 resulting in broadside collisions. The following collision analysis is based on broadside collisions on the high collision network in the City of Cupertino. **Table 14** describes recommended programs and countermeasures to comprehensively reduce broadside collisions.

89%

Involved another motor vehicle

17%

Nighttime collisions

43%

Automobile right-of-way violations

Table 14. Emphasis Area 7 Strategies

Objective: To reduce the number of broadside collisions.					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	Conduct public information and education campaign for intersection safety laws regarding traffic lights, stop signs, and turning left or right.	Number of education campaigns	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	Targeted enforcement at locations with most red light running and stop sign violations, and implement strict penalties for such violations.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S02, Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number • S03, Improve signal timing (coordination, phases, red, yellow, or operation) • S08, Convert signal to mast arm (from pedestal-mounted) • S09, Install raised pavement markers and striping (Through Intersection) • S16/NS04/NS05, Convert intersection to roundabout • NS02, Convert to all-way STOP control (from 2-way or Yield control) • NS03, Install signals • NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs • NS07, Upgrade intersection pavement markings (NS.I.) • NS08, Install flashing beacons at stop controlled intersections • NS11, Improve sight distance to intersection (Clear Sight Triangles)	Number of locations improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	• S05, Install emergency vehicle pre-emption systems • Maintenance and upgradation of existing preemptive system	EMS vehicle response time	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 8 – IMPROPER DRIVING

Of the 1,491 total collisions in the high collision network, 328 collisions were caused by improper driving actions (improper passing, improper turning, and wrong side of road). The following collision analysis is based on improper driving actions on the high collision network in the City of Cupertino. **Table 15** describes recommended programs and countermeasures to comprehensively reduce improper driving.

21%

Involved fixed objects and parked motor vehicles

33%

Nighttime collisions

13%

Broadside collisions

Table 15. Emphasis Area 8 Strategies

Objective: To reduce the number of collisions caused due to improper driving.					
	Strategies	**Performance Measure**	**Agencies/ Organizations**	**Monitoring and Evaluation**	**Funding Sources**
Education	• Conduct public education and outreach activities that elevate the awareness of the dangers of improper driving. • Public service announcements regarding increased and strict traffic law enforcement.	Number of public outreach events and public service announcements	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS
Enforcement	Increase enforcement, penalties and prosecution for traffic law violations.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S09, Install raised pavement markers and striping (Through Intersection) • S11, Improve pavement friction (High Friction Surface Treatments) • S12, Install raised median on approaches (S.I.) • NS06, Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs • NS07, Upgrade intersection pavement markings (NS.I.) • NS10, Install transverse rumble strips on approaches • NS12, Improve pavement friction (High Friction Surface Treatments) • R03, Install Median Barrier • R22, Install/Upgrade signs with new fluorescent sheeting (regulatory or warning) • R27, Install delineators, reflectors and/or object markers • R30, Install centerline rumble strips/stripes • R31, Install edgeline rumble strips/stripes	Number of locations improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	Improve resource deployment for emergency responses at collision sites.	EMS vehicle response time	City/ Fire Department	EMS response time compared to the previous year	OTS

EMPHASIS AREA 9 – REDUCE COLLISIONS NEAR SCHOOLS

Cupertino residents, stakeholders, and city officials have all agreed that safety around schools is of paramount importance, with a particular emphasis on reducing collisions near schools. The programs and countermeasures recommended to comprehensively reduce collisions near schools are outlined in **Table 16**.

Table 16. Emphasis Area 9 Strategies

Objective: To reduce the number of collisions within 0.25 miles of school properties.					
	Strategies	Performance Measure	Agencies/ Organizations	Monitoring and Evaluation	Funding Sources
Education	Continue to support SRTS program and educate school-goers about safe walking practices and activities on road safety.	Number of schools participating	City/ School District/ Sheriff's Department	Online or print survey of public response	ATP BTP OTS SRTS
Enforcement	Targeted enforcement at intersections and roadway segments around schools during pickup and drop-off hours.	Decrease in number of citations and/or warnings issued over time due to increased driver compliance	Sheriff's Department	Number of intersection collisions related to traffic law, violations, compared to the previous year	ATP OTS
Engineering	• S09, Install raised pavement markers and striping (Through Intersection) • S12, Install raised median on approaches (S.I.) • S21PB, Modify signal phasing to implement a Leading Pedestrian Interval (LPI) • NS08, Install Flashing Beacons at Stop-Controlled Intersections • NS21PB, Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features) • NS22PB, Install Rectangular Rapid Flashing Beacon (RRFB) • R14, Road Diet (Reduce travel lanes from 4 to 3 and add a two way left-turn and bike lanes) • R22, Install/Upgrade signs with new fluorescent sheeting (regulatory or warning) • R35PB, Install/upgrade pedestrian crossing (with enhanced safety features) • R37PB, Install Rectangular Rapid Flashing Beacon (RRFB)	Number of locations improved	City	Number of intersection crashes related to traffic movement compared to the previous year	HSIP ATP BTP SB1 RSTP MTIP STIP
EMS	Improve resource deployment for emergency responses at collision sites within 0.25 miles of schools.	EMS vehicle response time	City/ Fire Department	EMS response time compared to the previous year	OTS

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6. COUNTERMEASURE SELECTION

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6 COUNTERMEASURE SELECTION

IDENTIFICATION OF COUNTERMEASURES

Upon the identification of high-risk locations and Emphasis Areas, the next step is to identify appropriate safety countermeasures. The Caltrans LRSM provides 82 countermeasures, of which 21 are eligible in the current HSIP call for signalized intersections, 23 for un-signalized intersections, and 38 for roadway segments. The LRSM provides guidance on where to apply the countermeasures including the crash types each countermeasure would address, and a crash reduction factor (CRF) for each countermeasure. The FHWA CMF Clearinghouse and published research papers were reviewed by the project team to gain additional insight on CRFs and effectiveness of specific countermeasures.

The project team conducted a thorough review of the high-injury locations (intersections and roadway segments) using aerial photography, Google Maps Street View software, and in-person site visits. Crash characteristics of all collisions occurring on the High Injury Network were considered. After combining the physical and collision characteristics, the project team developed a table of preliminary countermeasures that address each of the nine identified Emphasis Areas. The table was refined by selecting up to seven countermeasures for each high-risk location that were most commonly recommended among all Emphasis Areas. By doing this, the project team was able to identify countermeasures with the greatest opportunity for systemic implementation.

COUNTERMEASURE TOOLBOX

Engineering countermeasures were selected for each of the high-risk locations and for the emphasis areas. These were based off of approved countermeasures from the Caltrans LRSM used in HSIP grant calls for projects. The intention is to give the City potential countermeasures for each location that can be implemented either in HSIP applications already submitted or future HSIP calls for projects, or using other funding sources, such as the City's Capital Improvement Program. Non-engineering countermeasures were also selected using the 4 E's strategies, and are included with the emphasis areas. The countermeasure toolbox in **Appendix C** details the countermeasures for each high-risk location and emphasis area, separated by intersections and roadway segments. While not all of these countermeasures will be included in the resulting safety projects, they are included to give the City a toolbox for implementing future safety improvements through other means, such as the City's Capital Improvement Program.

Table 17 provides a description of each countermeasure along with the CRF, federal funding eligibility, and opportunity for systemic implementation. An excerpt of the LRSM, detailing each available HSIP countermeasure referenced in the recommendations tables, is included as **Appendix D**.

Table 17. Countermeasures Selected for the City of Cupertino

Code	Countermeasure Name	Countermeasure Description	CRF	Federal Funding	Systemic Approach Opportunity
S02	Improve signal hardware: lenses, back-plates with retroreflective borders, 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.	15%	90%	Very High
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.	15%	50%	Very High
S04	Provide Advanced Dilemma Zone Detection for high speed approaches	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.	40%	100%	High
S07	Provide protected left turn phase (left turn lane already exists)	Left turns are widely recognized as the highest-risk movements at signalized intersections. Providing Protected left-turn phases 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.	30%	90%	High
S08	Convert signal to mast arm (from pedestal-mounted)	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.	30%	90%	Medium
S09	Install raised pavement markers and striping (Through Intersection)	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.	10%	90%	Very High
S11	Improve pavement friction (High Friction Surface Treatments)	Improving the skid resistance at locations with high frequencies of wet road crashes and/or failure to stop crashes.	55%	90%	Medium
S12	Install raised median on approaches (S.I.)	Raised medians next to left turn lanes at intersections offer a cost effective means for reducing crashes and improving operations at higher volume intersections.	25%	90%	Medium

Code	Countermeasure Name	Countermeasure Description	CRF	Federal Funding	Systemic Approach Opportunity
S13PB	Install pedestrian median fencing on approaches	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.	30%	90%	Low
S20PB	Install advance stop bar before crosswalk (Bicycle Box)	Signalized Intersections with a marked crossing, where significant bicycle and/or pedestrians volumes are known to occur.	15%	90%	Very High
S21PB	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	Addition of LPI gives pedestrians the opportunity to enter an intersection three-seven seconds before vehicles are given a green indication; only minor signal timing alteration is required.	60%	90%	Very High
NS06	Install/upgrade larger or additional stop signs or other intersection warning/regulatory	Additional regulatory and warning signs at or prior to intersections will help enhance the ability of approaching drivers to perceive them.	15%	90%	Very High
NS07	Upgrade intersection pavement markings (NS.I.)	Typical improvements include "Stop Ahead" markings and the addition of centerlines and stop bars.	25%	90%	Very High
NS08	Install Flashing Beacons at Stop-Controlled Intersections	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.	15%	90%	High
NS09	Install flashing beacons as advance warning (NS.I.)	Installation of advance flashing beacons to call drivers attention to intersection control signs.	30%	90%	Low
NS10	Install transverse rumble strips on approaches	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.	20%	90%	High
NS11	Improve sight distance to intersection (Clear Sight Triangles)	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.	20%	90%	High

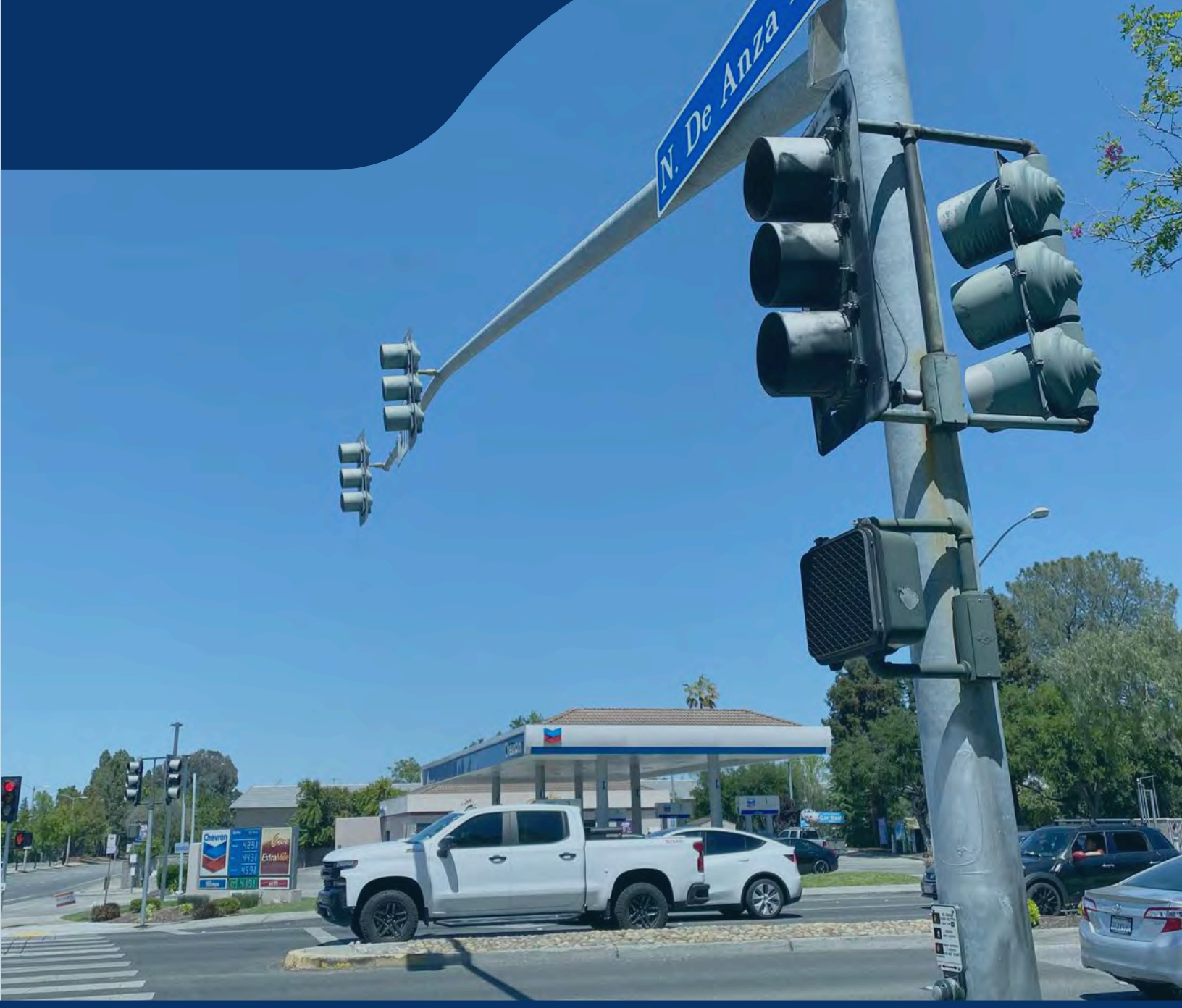
Code	Countermeasure Name	Countermeasure Description	CRF	Federal Funding	Systemic Approach Opportunity
NS12	Improve pavement friction (High Friction Surface Treatments)	Non-signalized Intersections noted as having crashes on wet pavements or under dry conditions when the pavement friction available is 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.	55%	90%	Medium
NS14	Install raised median on approaches (NS.I.)	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.	25%	90%	Medium
NS21PB	Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)	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, flashing beacons, curb extensions, advanced "stop" or "yield" markings, and other safety features should be added to complement the standard crossing elements.	35%	90%	Medium
R01	Add segment lighting	Adds the provision of lighting along segments where none exists or is inadequate to address nighttime collisions.	35%	90%	Medium
R08	Install raised median	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.	25%	90%	Medium
R10PB	Install pedestrian median fencing	Adds fencing along a median on a roadway segment to prevent pedestrians from jay-walking outside of a marked crosswalk.	35%	90%	Low
R14	Road Diet (Reduce travel lanes from four to three and add a two-way left turn lane and bike lanes)	Reduces the number of travel lanes and allows for the installation of bike lanes to help increase bicycle safety and reduce vehicle speeds.	35%	90%	Medium

Code	Countermeasure Name	Countermeasure Description	CRF	Federal Funding	Systemic Approach Opportunity
R21	Improve pavement friction (High Friction Surface Treatment)	Roadway segments 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.	55%	90%	High
R22	Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	Additional or new signage can address crashes caused by lack of driver awareness or compliance of roadway signing.	15%	90%	Very High
R26	Install dynamic/ variable speed warning signs	Provides a visual feedback of a motorist's speed.	30%	90%	High
R27	Install delineators, reflectors and/or object markers	Installation of delineators, reflectors and/or object markers are intended to warn drivers of an approaching curve or fixed object that cannot easily be removed.	15%	90%	Very High
R30	Install centerline rumble strips/ stripes	Center Line rumble strips/stripes can be used on virtually any roadway – especially those with a history of head-on crashes.	20%	90%	High
R33PB	Install separated bike lanes	Installs a bike lane with a vertical separation from adjacent travel lanes to increase comfort and safety of bicyclists.	45%	90%	Medium
R35PB	Install/upgrade pedestrian crossing (with enhanced safety features)	Roadway segments with no controlled crossing for a significant distance in high-use midblock crossing areas and/or multilane roads locations. flashing beacons, curb extensions, medians and pedestrian crossing islands and/or other safety features should be added to complement the standard crossing elements.	35%	90%	Medium
R37PB	Install Rectangular Rapid Flashing Beacon (RRFB)	RRFB should be installed in the median rather than the far-side of the roadway if there is a pedestrian refuge or other type of median. Use in combination with a crosswalk, wheelchair ramps, advance yield or stop pavement markings and signs may be used to supplement RRFBs.	35%	90%	Medium

** Code: S - Signalized intersection improvements*

NS - Non-signalized intersection improvements

R - Roadway segment improvements



7. VIABLE SAFETY PROJECTS

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7 VIABLE SAFETY PROJECTS

This chapter summarizes the process of selecting safety projects as part of the analysis for the Cupertino LRSP. 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 roadway segments and intersections.

Specific countermeasures and improvements were selected from the 2020 LRSM from Caltrans, where:

- S refers to improvements at signalized locations,
- NS refers to improvements at non-signalized locations, and
- R refers to improvements at roadway segments.

The corresponding number refers to the countermeasure number in the LRSM (2022). The countermeasures were grouped into safety projects for high-risk intersections and roadway segments. A total of six safety projects were developed. All countermeasures were identified based on the technical teams' assessment of viability that consisted of extensive analysis, observations, City staff input, and stakeholder/community input. The most applicable and appropriate countermeasures as identified have been grouped together to form projects that can help make high-injury locations safer. These safety projects were chosen based on the previously completed collisions analysis, which was used to identify main collision attributes that were found to be leading factors of fatal and severe collisions in Cupertino.

Table 18 lists the safety projects for high-risk intersections and roadway segments, along with total base planning level cost (2022 dollar amounts) estimates and the resultant preliminary Benefit-Cost (B/C) Ratio. The "Total Benefit" estimates were calculated for the proposed improvements being evaluated in the proactive safety analysis. This "Total Benefit" 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 LRSM (2020).

Appendix E lists the detailed methodology to calculate B/C Ratio, as well as the complete cost, benefit and B/C Ratio calculation spreadsheet.

Typically, the next step in the process will be to prepare grant ready materials for HSIP applications. It should be noted that while the LRSP projects were based on high-injury locations, HSIP applications can be expanded to include many locations across the City. Based off this list of Safety Projects and countermeasures, three HSIP applications, for Safety Projects 1, 5, and 6, were submitted for HSIP Cycle 11 review. Note that HSIP is a competitive grant funding source based on a benefit/cost analysis. The benefit value is calculated automatically based on crash data document by law enforcement and standard cost data. The cost of some measures may adversely impact the benefit to cost ratio making the grant application less competitive for funding.

Below is the list of identified projects for the City of Cupertino, with a preliminary cost estimate for each location and the resulting B/C ratio of the project (the title of each countermeasure is located in a separate table below). The cost per location includes construction costs, Plans, Specifications, and Estimates (PS&E), environmental reporting costs, construction engineering costs, and a 10% contingency. Construction costs are based on industry standards in the Bay Area and TJKM's knowledge and experience of the area. Our team is consistently updating our unit prices to match current construction costs. Please note, the BCR ratios below and in Attachment E may not match exactly based off those projects submitted for HSIP Cycle 11 review.

Table 18. List of Viable Safety Projects

Location	CM1	CM2	CM3	Cost per Location	Total Cost	B/C Ratio
Project 1: Safety at Signalized Intersections - Unsafe Speed and Rear End						
De Anza Blvd and Homestead Rd	S02			$465,523	$2,077,306	21.40
Bandley Dr and Stevens Creek Blvd	S02	S09		$27,318		
Pruneridge Ave and Wolfe Rd	S02		S11	$258,550		
Franco Ct/Forge Wy and Homestead Rd	S02	S09	S11	$140,875		
De Anza Blvd and Mariani Ave	S02			$26,245		
Blaney Ave and Stevens Creek Blvd	S02	S09	S11	$286,665		
S De Anza Blvd and Rodrigues Ave	S02	S09	S11	$238,018		
Barranca Dr and Homestead Rd	S02		S11	$142,129		
De Anza Blvd and Stevens Creek Blvd	S02		S11	$465,479		
Calle De Barcelona and Miller Ave	S02	S09		$26,506		

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

S09 – Install raised pavement markers (through intersection)

S11 – Improve pavement friction (High Friction Surface Treatment)

Location	CM1	CM2	CM3	Cost per Location	Total Cost	B/C Ratio
Project 2: Safety at Signalized Intersections - Improper Turning, Auto ROW Violations, and Broadside						
De Anza Blvd and Homestead Rd	S03			$9,425	$783,725	38.24
Bandley Dr and Stevens Creek Blvd	S03	S08		$197,200		
Prunridge Ave and Wolfe Rd	S03			$9,425		
De Anza Blvd and Mariani Ave	S03	S08		$242,150		
Barranca Dr and Homestead Rd	S03			$9,425		
De Anza Blvd and Stevens Creek Blvd	S03			$9,425		
Calle De Barcelona and Miller Ave			S07	$7,250		
De Anza Blvd and Rodrigues		S08		$116,725		
Blaney Ave and Stevens Creek Rd		S08		$182,700		

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

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

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

Project 3: Safety at Signalized Intersections - Pedestrian and Bicyclist Safety						
De Anza Blvd and Homestead Rd	S20PB	S21PB		$114,985	$1,076,277	61.16
Bandley Dr and Stevens Creek Blvd	S20PB	S21PB		$118,117		
Prunridge Ave and Wolfe Rd		S21PB		$7,250		
Franco Ct/Forge Wy and Homestead Rd	S20PB	S21PB		$108,460		
De Anza Blvd and Mariani Ave	S20PB			$129,195		
Blaney Ave and Stevens Creek Blvd	S20PB			$170,433		
Barranca Dr and Homestead Rd	S20PB	S21PB		$8,131		
De Anza Blvd and Stevens Creek Blvd	S20PB	S21PB		$275,384		
Calle De Barcelona and Miller Ave	S20PB	S21PB		$64,322		

S20PB – Install advance stop bar (Bicycle box)

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

Location	CM1	CM2	CM3	Cost per Location	Total Cost	B/C Ratio
Project 4: Safety on Roadway Segments - Improve Pedestrian and Bicyclist Safety						
Stevens Creek Blvd: Janice Ave to Judy Ave	R22	R27		$127,999	$621,617	102.13
De Anza Blvd: Pacifica Dr to Homestead Rd	R22	R27		$40,528		
Homestead Rd: Fallen Leaf Ln to Wolfe Rd	R22	R27		$96,860		
Wolfe Rd/Miller Ave: Homestead Rd to SCB	R22	R27		$49,191		
Bollinger Rd: Lawrence Expy to De Anza Blvd	R22	R27		$64,598		
McClellan Rd: Imperial Ave to De Anza Blvd	R22	R27		$80,910		
Bubb Rd: Stevens Creek Blvd to Columbus Ave	R22	R27		$43,500		
Mariani Ave: Bandley Dr to Infinite Loop	R22	R27		$7,359		
Tantau Ave: Forge Dr to Pruneridge Ave	R22	R27		$15,660		
Blaney Ave: Homestead to Stevens Creek Blvd	R22	R27		$32,589		
N Stelling Rd: Alves Dr to Greenleaf Dr	R22	R27		$22,838		
Rainbow Dr: Bubb Rd to Stelling Rd		R27		$6,090		
Rainbow Dr: De Anza to Stelling Rd		R27		$1,305		
McCellan Rd: Byrne Ave to Stevens Canyon Rd		R27		$7,830		
Miller Ave: Bollinger Rd to Stevens Creek Blvd		R27		$6,960		
Calvert Dr: Stevens Creek Blvd to Tilson Ave		R27		$2,610		
Finch Ave: Stevens Creek Blvd to Tilson Ave		R27		$3,480		
Stelling Rd: Rainbow Dr to Prospect Rd		R27		$4,350		
Prospect Rd: Stelling Rd to De Anza Blvd		R27		$5,220		
Valley Green Dr: Stelling Rd to Beardon Dr		R27		$1,740		

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

R27 - Install delineators, reflectors and/or object markers

Location	CM1	CM2	CM3	Cost per Location	Total Cost	B/C Ratio
Project 5: Safety on Roadway Segments - Unsafe Speed Violations and Rear End						
Stevens Creek Blvd: Janice Ave to Judy Ave	R21	R26		$748,345	$4,134,835	235.06
De Anza Blvd: Pacifica Dr to Homestead Rd	R21			$546,505		
Homestead Rd: Fallen Leaf Ln to Wolfe Rd	R21			$322,915		
Wolfe Rd/Miller Ave: Homestead Rd to Bollinger Rd	R21			$396,720		
Bollinger Rd: Lawrence Expy to De Anza Blvd	R21	R26		$796,993		
McClellan Rd: Imperial Ave to Stelling Rd	R21	R26		$258,267		
Bubb Rd: Stevens Creek Blvd to Columbus Ave		R26		$41,615		
Mariani Ave: Bandley Dr to Infinite Loop	R21			$304,210		
Tantau Ave: Forge Dr to Pruneridge Ave	R21	R26		$448,768		
Blaney Ave: Homestead to Stevens Creek Blvd		R26		$41,615		
Rainbow Dr: Bubb Rd to Stelling Rd		R26		$20,808		
Rainbow Dr: De Anza Blvd to Stelling Rd		R26		$20,808		
McCellan Rd: Byrne Ave to Stevens Canyon Rd		R26		$41,615		
Miller Ave: Bollinger Rd to Stevens Creek Blvd		R26		$41,615		
Stelling Rd: McClellan Rd to Prospect Rd		R26		$41,615		
Valley Green Dr between Stelling Rd and Beardon Dr		R26		$20,808		
Calvert Dr between Stevens Creek Blvd to Tilson Ave		R26		$20,808		
Mary Ave between Parkwood Dr to Meteor Dr		R26		$20,808		

R21 - Improve pavement friction (High Friction Surface Treatment)
R26 – Install dynamic/variable speed warning signs

Location	CM1	CM2	CM3	Cost per Location	Total Cost	B/C Ratio
6: Safety on Roadway Segments - Improve Pedestrian and Bicyclist Safety						
Stevens Creek Blvd: Janice Ave to Judy Ave	R33PB	R35PB		$306,240		
De Anza Blvd: Pacifica Dr to Homestead Rd	R33PB	R35PB		$633,940		
Homestead Rd: Fallen Leaf Ln to Wolfe Rd	R33PB	R35PB		$559,694		
Wolfe Rd/Miller Ave: Homestead Rd to SCB		R35PB		$58,754		
Bollinger Rd: Lawrence Expy to De Anza Blvd	R33PB	R35PB		$604,636		
McClellan Rd: Imperial Ave to De Anza Blvd		R35PB		$101,500		
Bubb Rd: Stevens Creek Blvd to Columbus Ave		R35PB		$287,680		
Blaney Ave: Homestead to Stevens Creek Blvd		R35PB		$174,377		
N Stelling Rd: Alves Dr to Greenleaf Dr	R33PB	R35PB		$127,600	$4,622,174	24.18
Rainbow Dr: Bubb Rd to Stelling Rd		R35PB	R37PB	$268,598		
Rainbow Dr: De Anza Blvd to Stelling Rd		R35PB	R37PB	$226,635		
McCellan Rd: Byrne Ave to Stevens Canyon Rd		R35PB	R37PB	$201,550		
Miller Ave: Bollinger Rd to Stevens Creek Blvd		R35PB		$64,815		
Finch Ave: Stevens Creek Blvd to Tilson Ave		R35PB	R37PB	$294,205		
Stelling Rd: Rainbow Dr to Prospect Rd		R35PB		$72,500		
Prospect Rd: Stelling Rd to De Anza Blvd		R35PB	R37PB	$403,622		
Valley Green Dr: Stelling Rd to Beardon Dr		R35PB	R37PB	$235,828		

WR33PB – Install separated bike lanes

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

R37PB – Install Rectangular Rapid Flashing Beacon (RRFB)

Notes: CM – countermeasure. B/C ratio is the dollar amount of benefits divided by the cost of the countermeasure.

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8. IMPLEMENTATION AND EVALUATION

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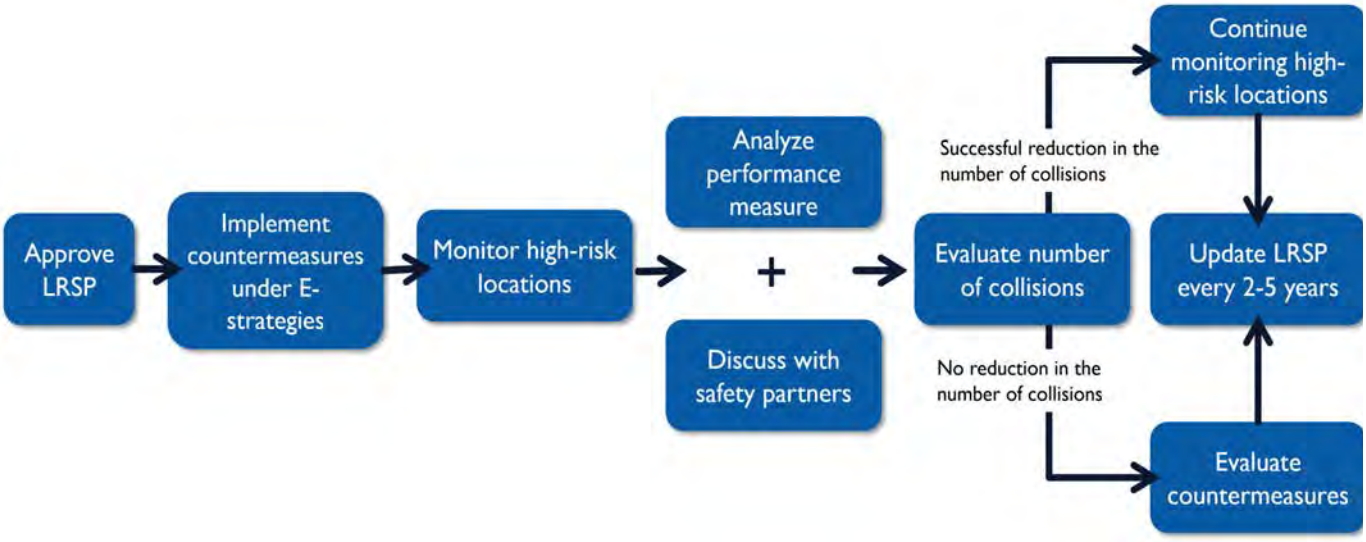
8 IMPLEMENTATION AND EVALUATION

This chapter describes the steps the City may take to evaluate the success of this plan and steps needed to update the plan in the future. The LRSP is a guidance 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. This document was developed based on community needs, stakeholder input, and collision analysis conducted to identify priority emphasis areas throughout the City. The implementation of strategies under each emphasis area would aim to reduce F+SI collisions in the coming years.

IMPLEMENTATION

The LRSP is a guidance document that is recommended to be updated every two to five years in coordination with the safety partners. The LRSP document provides engineering, education, enforcement, and emergency medical service-related countermeasures that can be implemented throughout the City to reduce F+SI collisions. It is recommended that the City of Cupertino implement the selected projects in high-collision locations in coordination with other projects proposed for the City's infrastructure development in their future Capital Improvement Plans. After implementing countermeasures, the performance measures for each emphasis area should be evaluated annually. The most important measure of success of the LRSP should be reducing F+SI collisions throughout the City. If the number of F+SI collisions does not decrease over time, then the emphasis areas and countermeasures should be re-evaluated.



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 as listed in **Table 19**.

Table 19. 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, MTC	~$650 million per cycle (every two years)	2023	Engineering, Education	Can use used for most active transportation related safety projects as well as education programs. Funding available through Caltrans or MTC.
Highway Safety Improvement Program	Caltrans		May 2024	Engineering	Most common grant source for safety projects.
One Bay Area Grant (OBAG) Cycle 3	MTC (Combines various federal funds)	$750 million for 2023-2026	County & Local Program: 2022	Engineering	Distributes federal funding to cities and counties in MTC region.
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		TBD; most recent call in 2022	Engineering, Education	Must be connected to affordable housing projects; typically focuses on bike/pedestrian infrastructure/ programs.
Urban Greening	California Natural Resources Agency	$28.5 million	TBD; most recent call in 2020	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	TBD	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.

Funding Source	Funding Agency	Amount Available	Next Estimated Call for Projects	Applicable E's	Notes
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.
Safe Streets and Roads for All	USDOT	~$1 billion	Current call opened 2022	Engineering	Funds action plans, supplemental action plan activities, and implementation projects that address roadway safety.

MONITORING AND EVALUATION

For the success of the LRSP, it is crucial to monitor and evaluate the 4 E-strategies continuously. Monitoring and evaluation help provide accountability, ensures the effectiveness of the countermeasures for each emphasis area, and help make 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 F+SI 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 F+SI 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 guidance document and is recommended to be updated every two to 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: PUBLIC COMMENTS

APPENDIX B: SUMMARY OF PLANNING DOCUMENTS

APPENDIX C: COUNTERMEASURE TOOLBOX

APPENDIX D: LRSM EXCERPT

APPENDIX E:
B/C RATIO CALCULATIONS