

Local Roadway Safety Plan

Final Document

City of Petaluma

August 5, 2022



REPORT SIGNATURE SHEET

This Local Road Safety Plan for the City of Petaluma has been prepared under the direction of the following Professional Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.



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August 5, 2022

Date

Acknowledgements

A special thanks to all the Safety Partners that contributed to this plan.

City of Petaluma

Mayor

Vice Mayor

Council Members

Public Works Department

City of Petaluma Police and Fire

Caltrans District 4

Sonoma County Department of Transportation and Maintenance

Petaluma Transit

Sonoma County Transit

Sonoma County Bicycle Coalition

Bicycle and Pedestrian Advisory Committee

Sonoma County Transportation Authority

Sonoma County Department of Health Services

Sonoma County Transportation Authority

Santa Rosa Junior College

Old Adobe Union School District

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Petaluma City Schools

Petaluma Joint Union High School District

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Executive Summary

This Local Roadway/Road Safety Plan (LRSP) is a comprehensive traffic safety plan that identifies priority locations for improvements and a variety of safety countermeasures the City of Petaluma can choose from and implement through different funding sources (Capital Improvement Projects and grants) including everyday maintenance activities. LRSPs have proven to reduce overall collision severity and frequency and are encouraged to be updated as needed (living document) with a formal update every five years.

Since an LRSP is now a requirement for Highway Safety Improvement Program (HSIP) grant funding, the City of Petaluma was awarded a state grant from Caltrans for the development of this plan. The LRSP includes a citywide analysis of the roadway system in Petaluma comprising the current collision patterns and high-risk roadway characteristics (systemic analysis). In addition, this plan engages stakeholders and citizens, in understanding areas of concern that may not currently be showing a collision pattern or issue.

The development of the LRSP was a collaborative process that involved a local leadership (stakeholder) group that had representatives for the 5 E's (not just engineering) and included public outreach. **The 5 E's of traffic safety include Engineering, Enforcement, Education, Emergency Response, and Emerging Technologies.**



This holistic approach allows certain areas of concern not showing a crash pattern to be analyzed. Also, it fosters local, state, and agency partnerships to advance local road safety.

In following the overall LRSP process, a Stakeholder Working Group (Working Group) was formed. This group gathered for meetings to discuss the overall collision analysis, goals, priorities, safety recommendations, and overall development of the safety plan.

Based on the past five years (2016-2020) collision analysis and the Stakeholder Working Group meeting, this LRSP will address multiple Strategic Highway Safety Plan (SHSP) Challenge Areas including but not limited to:

1. Bicyclists
2. Distracted Driving
3. Aggressive Driving / Speed Management
4. Intersections
5. Pedestrians

In addition, a vision, mission statement, and goals were established during the development of the LRSP.

The following strategies are recommended for the focused study locations and Citywide systemic applications for the 5 E's of Traffic Safety.

1. Engineering: Apply safety countermeasures at current locations experiencing collisions and systemically at locations with similar risks (comprehensive approach).
2. Enforcement: Enforce actions that reduce high-risk behaviors to include speeding, distracted roadway usage, and Driving Under the Influence (DUI).
3. Education: Educate all road users on safe behaviors.
4. Emergency Response: Improve emergency response times and action.

5. Emerging Technologies: Utilize emerging technologies in conveying and collecting information from the roadway users in an effort to improve safety and operations.

Through collision data analysis, public input, and City feedback, priority locations were identified in the city with additional locations identified based on stakeholder and public input. These locations, along with their proposed engineering countermeasures, are shown in the tables below.

Priority Intersections and Recommended Countermeasures, City Jurisdiction

Intersection	Recommended Countermeasures
<i>City Jurisdiction</i>	
S McDowell Blvd / Caulfield Ln	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number Improve signal timing (coordination, phases, red, yellow, or operation) Modify signal phasing to implement a Leading Pedestrian Interval (LPI) Install right turn lane
McDowell Blvd / E Washington St	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number Improve signal timing (coordination, phases, red, yellow, or operation) Install advance stop bar before crosswalk (Bicycle Box) Increase enforcement
N McDowell Blvd / Professional Dr	Improve signal timing (phases, red, yellow, or operation) Install advance stop bar before crosswalk (Bicycle Box) Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
Petaluma Blvd N / Sycamore Ln/Shasta Ave	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number Modify signal phasing to implement a Leading Pedestrian Interval (LPI) Upgrade intersection lane markings Restripe crosswalks
Ely Blvd S / Caulfield Ln	Upgrade intersection pavement markings (Stop Ahead)
Washington St / Keller St	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs Create directional median openings to allow (and restrict) left-turns and u- turns OR Evaluate conversion to all-way STOP control (from 2-way or Yield control)* OR Evaluate installing signals*
E Washington St / Lakeville St	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number Install raised pavement markers and striping (Through Intersection) OR Evaluate converting intersection to roundabout (from signal)
E D St / Lakeville St	Improve signal timing (coordination, phases, red, yellow, or operation) Install bike lane striping and lane assignment storage OR Evaluate converting intersection to roundabout (from signal)
E Washington St / Ellis St/Johnson St	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number Improve signal timing (coordination, phases, red, yellow, or operation) Install advance intersection lane control sign (R3-8A, per MUTCD)
* Intersection must meet CA MUTCD warrants to implement countermeasure	

Priority Intersections and Recommended Countermeasures, Caltrans Jurisdiction

Intersection	Recommended Countermeasures
<i>Caltrans Jurisdiction</i>	
SR 116 / S McDowell Blvd (W)	Improve signal timing (coordination, phases, red, yellow, or operation) Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
SR 116 / US 101 SB Ramps	Improve signal timing (coordination, phases, red, yellow, or operation) Install green conflict markings on bicycle lanes
SR 116 / Pine View Way	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs Install yield signs for right turn movements OR Evaluate installing signals*
SR 116 / S McDowell Blvd Ext	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs
E Washington St / US 101 NB Ramps	Modify signal phasing to implement a Leading Pedestrian Interval (LPI) Traffic control enforcement Upgrade ramps per NACTO signage and striping guidance Install green conflict markings on bicycle lanes
SR 116 / Casa Grande Rd	Improve signal timing (coordination, phases, red, yellow, or operation) Install flashing beacons as advance warning Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
SR 116 / Baywood Dr	Improve signal timing (coordination, phases, red, yellow, or operation)
SR 116 / Marina Ave	Improve signal timing (coordination, phases, red, yellow, or operation)
* Intersection must meet CA MUTCD warrants to implement countermeasure	

Additional Intersections and Recommended Countermeasures

Intersection	Recommended Countermeasures
<i>City Jurisdiction</i>	
D St / 5th St	Evaluate conversion to all-way STOP control (from 2-way or Yield control)* Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs Upgrade intersection pavement markings
D St / 6th St	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number Install flashing beacons as advance warning Upgrade intersection pavement markings Monitor vegetation and proactively perform trimming
E Washington St / Maria Dr	Install right turn lane Refresh intersection markings Install green conflict markings for bicycles
D St / Petaluma Blvd S	Improve signal timing (coordination, phases, red, yellow, or operation)
N McDowell Blvd / E Madison St	Convert signal to mast arm (from pedestal-mounted) Modify signal phasing to implement a Leading Pedestrian Interval (LPI) Upgrade intersection pavement markings Install high visibility crosswalk
S McDowell Blvd / McKenzie Avenue/Maria Drive	Convert signal to mast arm (from pedestal-mounted) Upgrade school zone signing and striping to most current MUTCD and NACTO guidance Conduct targeted enforcement during school hours and events Education campaign on rules of the road for McDowell Elementary School Consider flagging or crossing guard(s) during events
D St / 4th St	Evaluate conversion to all-way STOP control (from 2-way or Yield control)*
Caulfield Ln / St Francis Dr	Refresh intersection markings Install green conflict markings for bicycles
Caulfield Ln / Payran St	Refresh intersection markings Install green conflict markings for bicycles
S McDowell Blvd / Casa Grande Rd	Extend existing bicycle lanes to intersection OR Evaluate converting intersection to roundabout (from signal)
* Intersection must meet CA MUTCD warrants to implement countermeasure	

Priority Segments and Recommended Countermeasures

Segment	Recommended Countermeasures
City Jurisdiction	
N McDowell Blvd (Old Redwood Hwy/Petaluma Blvd N to Lynch Creek Way)	Install dynamic/variable speed warning signs
Lakeville St (Wilson St to Caulfield Ln)	Add segment lighting Install raised median
Corona Rd (N McDowell Blvd to Industrial Ave)	Install dynamic/variable speed warning signs Install sidewalk/pathway (to avoid walking along roadway)
E Washington St (McDowell Blvd to Lakeville St)	Install wayfinding signs to alternate bicycle routes Resurface the roadway Restripe roadway with thermoplastic striping
N McDowell Blvd (Lynch Creek Way to E Washington St)	Install bike lanes Evaluate installing raised median
E Washington St (Howard St to Lakeville St)	Install bike lanes Evaluate reducing number of uncontrolled crosswalks Speed enforcement
Caltrans Jurisdiction	
SR 116 (US 101 NB Ramps to Frates Rd)	Install raised median Speed enforcement
SR 116 (Pine View Way to S of Silace Rd near S City Limit)	Install centerline rumble strips/stripes Install edgeline rumble strips/stripes

Systemic countermeasures were also recommended for city roadways. These countermeasures included citywide recommendations that can also be used for more specific project locations. The table below shows some of the non-engineering strategies that are incorporated in the plan.

Recommended Systemic Countermeasures

Location	Type of Countermeasure	Countermeasure
Signalized Intersections	Engineering	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size and number, provide pedestrian countdown timers and updated push buttons, AND Modify signal phasing to implement a Leading Pedestrian Interval (LPI)
Washington Street; McDowell Boulevard	Engineering	Resurface and restripe roadway
Near schools	Engineering	Pedestrian and bicycle improvements
Citywide	Engineering	Pedestrian and bicycle improvements
Citywide	Enforcement	Speed enforcement
Citywide	Education	Distracted driving campaign
Citywide	Education	Education campaign for bicyclists and pedestrians about rules of the road

It is important to understand the upcoming funding opportunities in the successful implementation of these safety projects. Most of the proposed engineering countermeasures are HSIP fundable (Cycle 11) call for projects (ends September 12, 2022). However, safety countermeasures can also be implemented through other funding sources to include:

- Active Transportation Program (ATP)
- One Bay Area Grant 3 (OBAG 3)
- USDOT Rebuilding American Infrastructure with Sustainability and Equity (RAISE)
- Congestion Mitigation and Air Quality (CMAQ) program
- Sustainable Transportation Planning Grant (Sustainable Communities)
- Local Partnership Program (LPP) – anticipated to be due fall 2022
- Stimulus funding sources
- Capital Improvement Program or with on-going maintenance work
- Office of Traffic Safety (OTS) grants
- Statewide Transportation Improvement Program (STIP) funding sources
 - State Highway Operation and Protection Program (SHOPP) funding for Caltrans roadways

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Appendices

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List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
APS	Accessible Pedestrian Signal
ATP	Active Transportation Program or Plan
AWSC	All Way Stop Control
BCR	Benefit-to-Cost Ratio
BUI	Biking Under the Influence
CA MUTCD	California Manual on Uniform Traffic Control Devices
CMAQ	Congestion Mitigation and Air Quality
DUI	Driving Under the Influence
EPDO	Equivalent Property Damage Only
FHWA	Federal Highway Administration
FSI	Fatal and Severe Injury Collisions
HSIP	Highway Safety Improvement Program
HSM	Highway Safety Manual
LRSM	Local Roadway Safety Manual
LRSP	Local Roadway/Road Safety Plan
SCTA	Sonoma County Transportation Authority
SHSP	Strategic Highway Safety Plan
SMART	Sonoma Marin Area Rail Transit
SSAR	Systemic Safety Analysis Report
SWITRS	Statewide Integrated Traffic Records System
TIMS	Transportation Injury Mapping System
TWSC	Two Way Stop Control
TWLTL	Two-Way Left-Turn Lane

1. Introduction

The Local Roadway/Road Safety Plan (LRSP) is a data driven traffic safety planning document for local agencies to address unique roadway safety needs in their jurisdictions. This comprehensive document will both help to guide the City's implementation of safety countermeasures and allow eligibility for funding in future Highway Safety Improvement Program (HSIP) grant applications.

Preparing an LRSP facilitates local agency partnerships and collaboration, resulting in a prioritized list of improvements and actions that contribute to California's Strategic Highway Safety Plan (SHSP) overall vision and goals. This SHSP focuses on reducing fatal and severe injury collisions (FSI collisions) with focused challenge areas with a focus on the Five "E's" of Traffic Safety (see **Figure 1**).



Figure 1 California SHSP (2020-2024)

The City and its consulting engineering firm, GHD, Inc., will follow the Federal Highways Administration's (FHWA) Local Road Safety process in the following six steps as shown in **Figure 2**:



Figure 2 FHWA's LRSP Development Process

In working with the first step of establishing leadership, Jeff Stutsman (City Engineer), served as Safety Champion/Lead for this project with a stakeholder working group that consisted of the other E's (enforcement, education, emergency response, and emerging technologies) and other important safety partners. This stakeholder working group was paramount in creating a comprehensive safety plan tailored to address the local needs and issues.

2. Background

2.1 Purpose and Need

The City of Petaluma is located in Sonoma County, south of Santa Rosa, California with an approximate population of 60,000 residents. Petaluma is just northwest of San Pablo Bay sharing its southeastern border with Haystack, California. US 101 crosses through the city in the northwest-southeast direction with three interchanges in the city: at Old Redwood Highway, at Washington Street, and at Lakeville Highway. State Route 116 runs at-grade through the southern part of Petaluma, east of US 101, and intersects multiple major city roadways: Frates Road, South McDowell Boulevard, Casa Grande Road, and Baywood Drive. Additionally, Petaluma includes one active station and one planned station served by the Sonoma-Marín Area Rail Transit (SMART) line; one (active) in the downtown region, which connects SMART to Golden Gate, Petaluma, and Sonoma County transit services, and the other (planned) in the northern area of the city.

Focusing in on the roadway safety needs, the past five years of collisions (2016-2020) were evaluated for City roadways and Caltrans interchange locations. As presented in **Figure 3**, there were 12 fatal and 50 severe injury collisions on city roadways. Caltrans locations, including interchanges and SR 116 (but not US 101 mainline due to no interaction with local roadways), had six fatal and four severe injuries. In improving roadway safety for the City of Petaluma, it is important to focus on mitigating these high injury collisions. More information on these collisions can be found in **Section 4.2: Collision Data**.

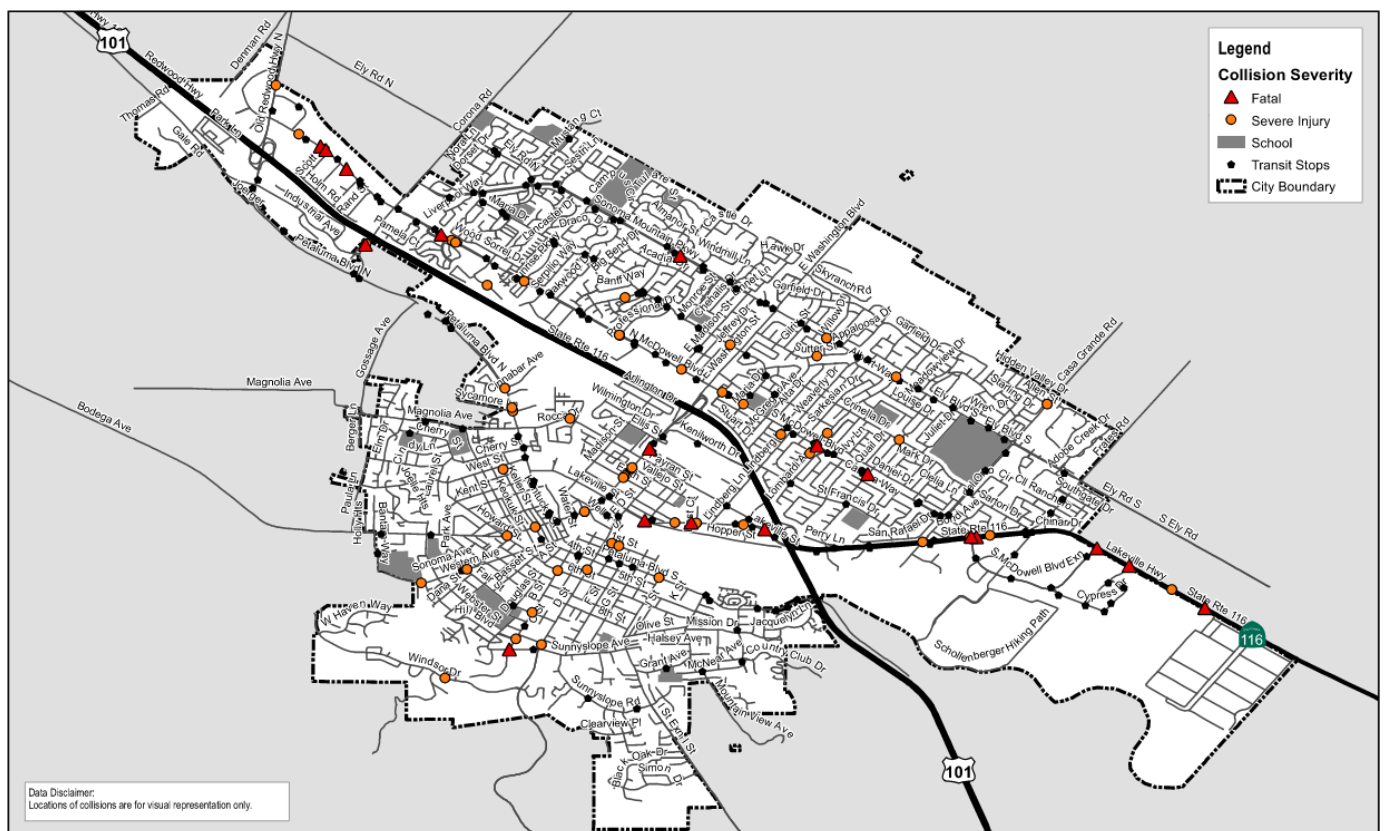
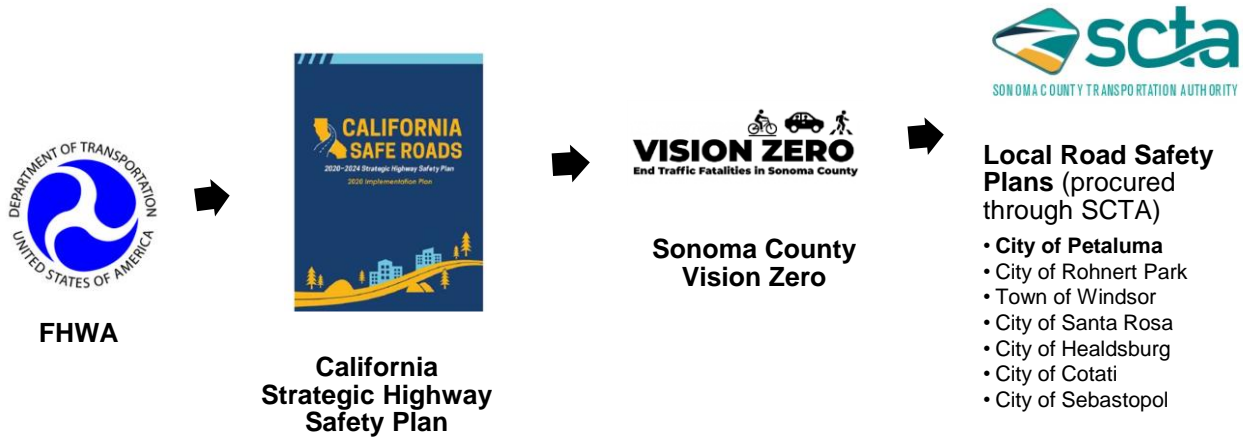


Figure 3 High Severity Collisions in the City of Petaluma

2.2 Guiding Documents

FHWA requires that each state has a SHSP to receive federal funding. The California SHSP is a statewide safety plan that helps provide a framework to reduce fatal and high severity collisions. Sonoma County recently completed a countywide Vision Zero Action plan with similar goals (for more information, see **Section 2.2.2**) and the City of Petaluma adopted this plan in May 2022. In 2020, Sonoma County Transportation Authority procured seven LRSPs throughout Sonoma County. These LRSPs have similar goals to the California SHSP and Sonoma County Vision Zero but are more tailored to the local roadway needs of each agency.



2.2.1 California Strategic Highway Safety Plan

The LRSP will complement California’s SHSP 2020-2024. Per this plan, the recommended challenge areas are shown in **Figure 4**. This plan will focus on challenge/emphasis areas that are determined through data analysis and stakeholder input.



Figure 4 SHSP Challenge Areas

2.2.2 Sonoma County Vision Zero

The Sonoma County Transportation Authority (SCTA) and the Department of Health Services launched a Vision Zero plan for all of Sonoma County. This LRSP aims to complement this plan with elements catered specifically for the City of Petaluma. SCTA’s goal is to produce “a project that will focus on action-oriented strategies to reduce serious injuries and fatalities caused by traffic collisions, and improving health, quality of life and economic vitality, particularly for low-income and disadvantaged communities.” The vision and goals of this document will follow similar standards.

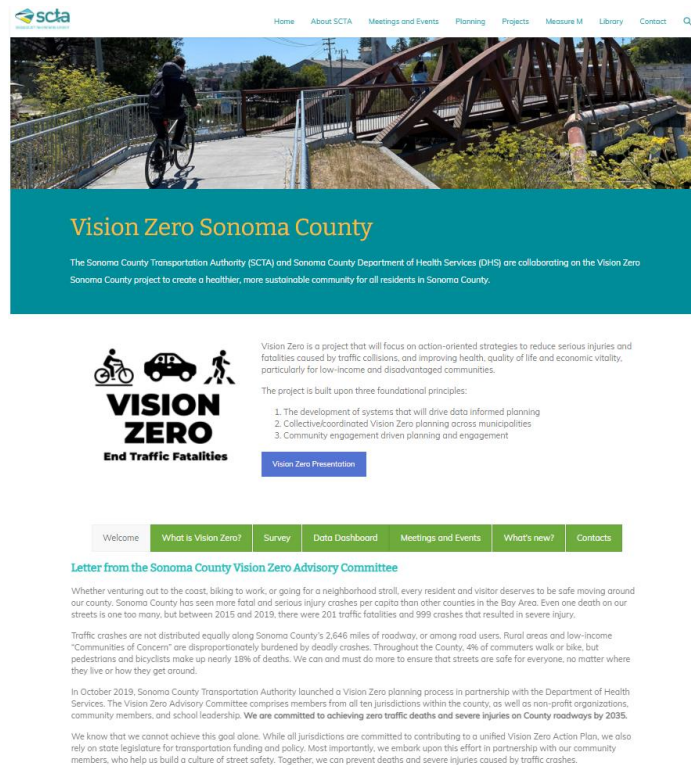


Figure 5 Sonoma County Transit Authority Vision Zero Website

2.2.2.1 Vision Zero

Vision Zero is a significant departure from the status quo in two major ways:

- Vision Zero recognizes that people will sometimes make mistakes, so the road system and related policies should be designed to minimize those inevitable mistakes and reduce their likeliness to result in severe injuries or fatalities. This means that system designers and policymakers are expected to improve the roadway environment, policies (such as speed management), and other related systems to lessen the severity of crashes. Roadway users are however still responsible for their mistakes and should follow all applicable laws and use reasonable judgement when conducting themselves within the public right of way.
- Vision Zero is a multidisciplinary approach, bringing together diverse and necessary stakeholders to address this complex problem. In the past, meaningful, cross-disciplinary collaboration among local traffic planners and engineers, policymakers, and public health professionals has not been the norm. Vision Zero acknowledges that many factors contribute to safe mobility—including roadway design, speeds, behaviors, technology, and policies—and sets clear goals to achieve the shared goal of zero fatalities and severe injuries.

2.2.3 Safe System Approach

The Federal Highway Administration (FHWA) is using the Safe System approach to work towards their goal of zero fatalities in vehicles. In providing a comprehensive approach to safety, the Safe System approach is to design our

vehicles and infrastructure in a manner that anticipates human error and accommodates human tolerances with a goal of reducing fatal and serious injuries. The following framework is intended to assist the vehicle and infrastructure communities in making decisions in alignment with Safe System principles. Implementing and selecting safe system practices and design will incrementally improve safety over time.

FHWA defines the Safe System Approach Principles and Elements as follows:

- **Safe Road Users**—The safety of all road users is equitably addressed, including those who walk, bike, drive, ride transit, or travel by other modes.
- **Safe Vehicles**—Vehicles are designed and regulated to minimize the frequency and severity of collisions using safety measures that incorporate the latest technology.
- **Safe Speeds**—Humans are less likely to survive high-speed crashes. Reducing speeds can accommodate human-injury tolerances in three ways: reducing impact forces, providing additional time for drivers to stop, and improving visibility.
- **Safe Roads**—Designing transportation infrastructure to accommodate human mistakes and injury tolerances can greatly reduce the severity of crashes that do occur. Examples include physically separating people traveling at different speeds, providing dedicated times for different users to move through a space, and alerting users to hazards and other road users.
- **Post-Crash Care**—People who are injured in collisions rely on emergency first responders to quickly locate and stabilize their injuries and transport them to medical facilities. Post-crash care also includes forensic analysis at the crash site, traffic incident management, and other activities.

Adopting a Safe System approach does not absolve users of their responsibility. Other safety practices such as speed management strategies, driver education, enforcement, and effective emergency response will remain essential to improving road safety. With the passing of Assembly Bill (AB) 43, there will be flexibility in setting speed limits. This bill allows the agency to keep the existing speed limit if no roadway capacity is added or major developments, even if the engineering and traffic survey favors a higher speed. In addition, this allows Petaluma to declare a lower speed limit through an ordinance around school grounds and a business district without an engineering and traffic survey.

Figure 6 shows a diagram of the Safe System approach.



Source: FHWA.

Figure 6 Safe Systems Approach

2.2.4 Standards and Guidelines

In developing the City of Petaluma LRSP, the following standards and guidelines were followed:

1. "Local Roadway Safety, A Manual for California's Local Road Owners", Caltrans, Version 1.6, April 2022.
2. 2020-2024 California's Strategic Highway Safety Plan (SHSP), "California Safe Roads: 2020-2024 Strategic Highway Safety Plan", Caltrans.
3. "Developing Safety Plans, A Manual for Local Rural Road Owners", Federal Highway Administration, March 2012.
4. "Local and Rural Road Safety Briefing Sheets: Local Road Safety Plans," Federal Highway Administration, November 2014.
5. "Highway Safety Manual", American Association of State Highway Officials (AASHTO), 1st Edition, 2014 supplement.
6. "California Manual of Uniform Traffic Control Devices (CA MUTCD)", Revision 5, 2014.

2.3 Methodology

The LRSP methodology followed the FHWA's LRSP development process as shown in **Figure 7** and the Caltrans *Local Roadway Safety Manual* document.

Below is a roadmap created by the FHWA to show the process of creating the LRSP. Here are the primary steps used to create this plan:

1. **Identify Stakeholders**
 - i) *Working Group was formed of the 5 E's and other interested representatives.*
2. **Use Safety Data**
 - i) *Past five years of collisions were analyzed with discussion of other high-risk locations.*
3. **Chose Proven Solutions**
 - i) *FHWA Proven Countermeasures and Caltrans safety countermeasures were used in mitigation collision trends and risk characteristics.*
4. **Implement Solutions**
 - i) *Projects were identified for specific locations and systemically.*



Figure 7 FHWA's LRSP Development Map (Source: Federal Highway Administration)

3. Safety Partners/Stakeholders

3.1 Stakeholder Working Group Members

Based on community connections, the City of Petaluma led the formation of the LRSP Stakeholder Working Member Group. This leadership group was crucial in the development of the LRSP and helped in capturing the safety needs, goals, and priorities including safety countermeasures for the City of Petaluma.

The following agencies were requested to participate in the LRSP Stakeholder Working Group:

- City of Petaluma
- City of Petaluma Police and Fire
- Caltrans District 4
- Sonoma County Department of Transportation and Maintenance
- Sonoma County Transit
- Sonoma County Bicycle Coalition
- Bicycle and Pedestrian Advisory Committee
- Sonoma County Transportation Authority
- Sonoma County Department of Health Services
- Sonoma County Transportation Authority
- Santa Rosa Junior College
- Old Adobe Union School District
- Waugh School District
- Wilmar School District
- Petaluma City Schools
- Petaluma Joint Union High School District
- Petaluma School Board
- Liberty School District
- Cinnabar School District



3.2 Stakeholder Working Group Meetings

One meeting was held with the stakeholder working group. The virtual meeting was as follows:

1. May 19, 2022 – 1 p.m. to 2:30 p.m.
 - a. Discussed the LRSP overall process, working group member’s safety priorities, past five years of collisions (City and Caltrans roadways), guiding principles (vision, mission, goals), public comments.

The meeting summary for the stakeholder working group meeting are in **Appendix A: Community Engagement**. The stakeholder working group also provided their feedback and comments on the draft Local Roadway Safety Plan document before the plan was finalized. Since many of the safety countermeasures incorporate engineering, enforcement, and emergency response strategies, stakeholder approval is important for understanding how the plan will be implemented.

3.3 Feedback from Local Schools

Local schools were contacted to ensure that any road safety issues that impacted students and school staff were addressed in this report. Due to the high concentration of vehicle trips and high volumes of pedestrians and bicyclists that schools generate, these locations were heavily considered while determining intersections and segments of concern throughout the city. This plan will work in conjunction with Safe Routes to School Program to provide students and their families with safer local streets and intersections as they navigate to and from school each day.

3.3.1 General - Petaluma City Schools

The following areas of concern were provided by the City Schools' Superintendent:

- General Improvements to Bike Lanes and Safe Neighborhood Crossings
- Sonoma Mountain Parkway and Ely Boulevard S (recent vehicle and pedestrian collision)
- Ellis Street and E Washington Street (pedestrian collision in recent years)
- Local Skate Park and City Pool (areas of significant congregation of students)
- Streets adjacent to Kenilworth Junior High School
- Streets adjacent to Casa Grande High School

3.3.2 Corona Creek School

The following areas of concern were provided by Corona Creek School from Waugh School Superintendent:

- Provide Continuous Sidewalk Along Riesling Road to Corona Creek School (currently ends at Fieldstone Lane)
- Crossing Enhancements (emphasis at Hartman Lane and Quarry Street)
- Crossing Enhancements on Ely Road by York Way
 - Recent improvements were made at Ely Road and Hartman Lane.

3.4 SHSP Challenge/Emphasis Areas

Based on the collision data analysis and LRSP Stakeholder Working Group meetings, this LRSP will address multiple SHSP Challenge Areas including:

1. Bicyclists
2. Distracted Driving
3. Aggressive Driving / Speed Management
4. Intersections
5. Pedestrians

3.5 Guiding Principles

The members of the stakeholder working group coordinated to establish the vision, mission statement, and goals that guided the development of the document. Ideally, this document will help the City move toward Vision Zero. The aim of Vision Zero is to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, and equitable mobility for all. Traditionally, traffic deaths and severe injuries have been considered as inevitable side effects of modern life. The reality is that these tragedies can be addressed overtime by taking a proactive, preventative approach that prioritizes traffic safety as a public health issue.

Additionally, this document should also work in tandem with the City's recently adopted Climate Emergency Action Framework, which was created to guide the City's policy decisions to respond to the existing climate crisis. One of the

major goals of the framework is to invest in community-based solutions that create community stability, greater public health, and economic well-being. This goal echoes the focused efforts in this report that address intersections and street segments that were noted by the city’s residents. By increasing the safety of these pedestrian and bicycle facilities, users will hopefully feel more confident leaving their motor vehicles at home, therefore reducing the climate impact of on-road transportation (Petaluma’s highest emission sector).

3.5.1 Vision

A vision statement describes what the Local Roadway Safety Plan is trying to achieve.

Provide a safe, sustainable, and equitable multimodal transportation system for all users of the public roadways in the City of Petaluma.

3.5.2 Mission Statement

The mission statement defines the purpose of the plan, what it does, and what it is about. The mission statement was developed in collaboration with the working group.

Ensure all people have the transportation choice to walk, bike, drive, and take public transit while working to achieve zero fatalities and no life-altering injuries on City of Petaluma roadways, because every person in our community matters.

3.5.3 Goals

Safety goals were developed for the Local Roadway Safety Plan. It is important to capture realistic goals that can be measurable or evolve over time.

Goal 1

Maintain existing Crossroads database and standardized reporting practices.

Goal 2

Reduce pedestrian and bicycle to vehicle collisions with improved accommodations.

Goal 3

Improve safety and accessibility for vulnerable road users.

Goal 4

Improve safety around schools with a connected multimodal system, enhanced crossings, enforcement of school zones, education campaigns about school drop off/pick up, bicycle and pedestrian safety, and driver awareness.

Goal 5

Reduce improper turning related collisions through engineering, enforcement, and education strategies.

Goal 6

Develop an implementation priority for identified countermeasures. Implement countermeasures utilizing strategies across all traffic safety disciplines, engineering, enforcement, education, & emergency services.

Goal 7

Implement speed management strategies and increase enforcement presence.

Goal 8

Regularly engage with partner agencies, stakeholders, advocacy groups, & the public to enhance identification of collision patterns and countermeasures.

4. Analyze Safety Data

4.1 Existing Safety Efforts

The City of Petaluma is actively implementing various safety policies/guidelines from the General Plan and Countywide Bicycle and Pedestrian Master Plan, and currently developing an Active Transportation Plan. There are several safety projects and programs that are currently in progress, nearly complete, recently completed or will begin in the near future. Some of these projects include:

- Petaluma Blvd South Road Diet Extension
 - E St to Crystal Lane, reduce roadway from four lanes to two with TWLTL and Class II and IV bike lanes, install curb bulb outs, ADA ramps, and RRFBs
- River Trail – 101 Crossing
- Traffic Signal Installation
 - Caulfield Ln at Hopper St, D St at Copeland St – in conjunction with development projects at these locations
- Traffic Signal Timing Upgrade Improvements
 - Upgrading traffic signal infrastructure, installing Leading Pedestrian Intervals (LPIs) at Ely N at Columbine Pkwy and E Washington at Ellis St
- Traffic Calming and Bike Boulevards
 - Installation of bike boulevard on 5th St
- D Street Improvements
 - Roadway rehabilitation, new ADA curb ramps, signal improvements, active transportation improvements
- Bike and Pedestrian Master Plan and Wayfinding
 - Updates to the Bicycle and Pedestrian Master Plan and GPU based on existing conditions
- E Washington Sidewalk Frontage Improvements

For additional information regarding the existing safety efforts within the City of Petaluma, see **Appendix: B: Existing Safety Efforts**.

4.1.1 HSIP, Cycle 10

Three HSIP applications were submitted by the City of Petaluma for Cycle 10, all three of which received funding. The applications were for Rectangular Rapid Flashing Beacons (RRFBs), Traffic Signal Modifications, and a Guardrail project.

4.1.1.1 Rectangular Rapid Flashing Beacons (RRFBs) Project

At 12 distinct locations throughout the City of Petaluma, uncontrolled and midblock crossings were retrofitted with RRFBs to improve pedestrian crossing safety. These beacons were installed on both existing and new poles (see **Figure 8** for locations).

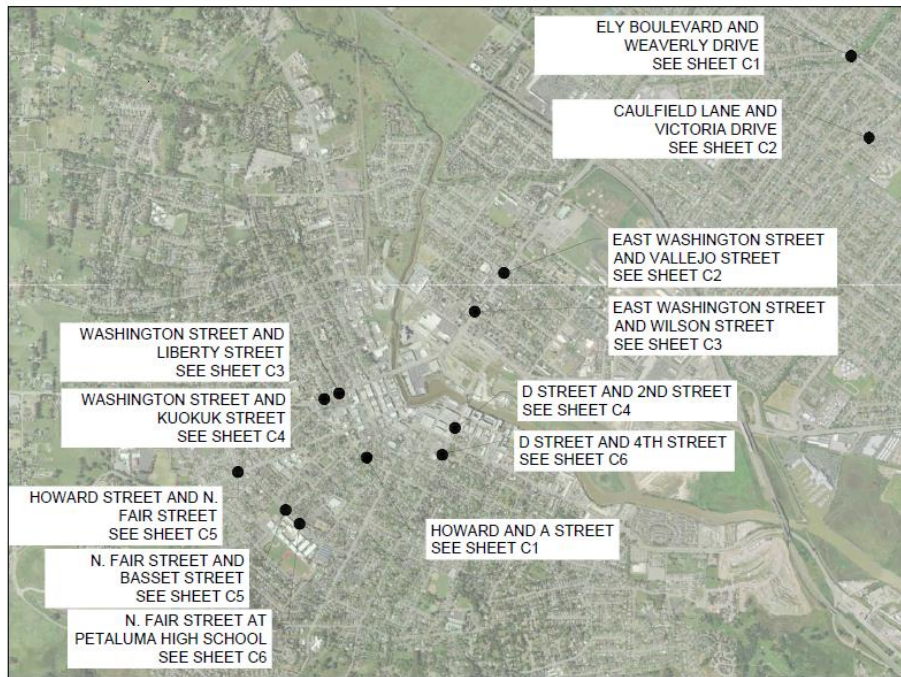


Figure 8 Rectangular Rapid Flashing Beacon Locations

4.1.1.2 Traffic Signal Modifications Project

Existing traffic signal hardware was upgraded at 12 intersections in the city by replacing the 8-inch signal indications to 12 inches, retroreflective yellow tape on the back plates, countdown pedestrian signal heads, and accessible pedestrian signals. The project also included upgrading each intersection’s detection and emergency pre-emption equipment, controllers, and adding battery backup systems

4.1.1.3 Guardrail Project

Along Petaluma Boulevard North near Gossage Avenue, more than 170 feet of guard rail along the horizontal curve of the roadway. These guardrails were designed based on the 2018 Caltrans Standard Plans. The roadway was also restriped to include a six-foot bike lane and two vehicle travel lanes.

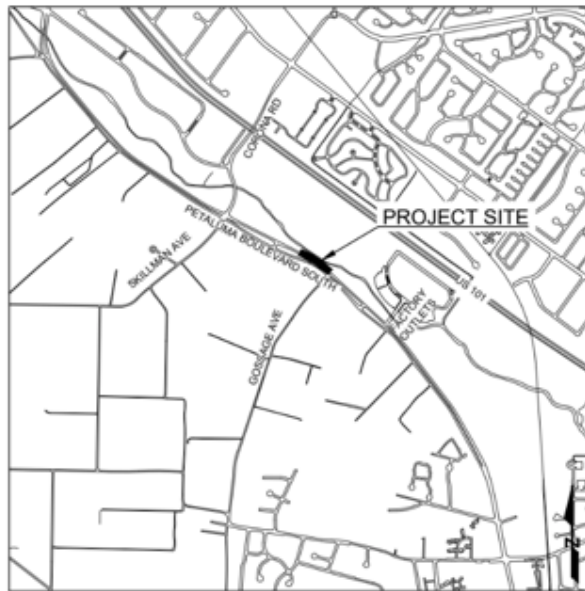


Figure 9 Location of Guardrail Project

4.1.2 2019 Walking Audit

In October 2019, a Walking Action Plan was completed by a member of the community with the goal of determining the intersection “hot spots” in the city with high numbers of collisions involving cyclists and pedestrians. The plan utilized University of California at Berkeley’s Transportation Injury Mapping System to conduct the collision analysis and organized Walking Audit with community members to recommend changes and strategies to make these intersections more comfortable for users. The following intersections were audited and recommended changes:

- East Washington St. & Maria Drive
- North McDowell Blvd. & East Madison St.
- East Washington St. & McDowell Blvd.
- East Washington St. & Edith St.
- East Washington St. & Lakeville St.
- Petaluma Blvd (from Washington St. to D St.) through downtown

Following the walking audit, recommendations for the intersections included but were not limited to: repairing and maintaining sidewalk facilities, signal adjustments (including LPIs, no right turn on red), pavement striping updates and maintenance, implementing wayfinding signs, and installing protected bike lanes. These findings were presented to the PBAC in November 2019 and updates to the Bicycle and Pedestrian Plan were to be implemented in 2020.

4.1.3 2025 General Plan

The City of Petaluma’s 2025 General Plan has made pedestrian and bicycle improvements some of its primary mobility priorities. These priorities are to “*create a pedestrian environment that is safe, attractive, encourages walking, and is accessible to all*” and to “*implement a bicycle network free of gaps that permits easy bicycle travel to all schools and major City destinations*”.

Similarly, the Bicycle and Pedestrian Plan seeks to “*Create and maintain a safe, comprehensive, and integrated bicycle and pedestrian system throughout Petaluma that encourages bicycling and walking and is accessible to all*”. This LRSP works to function in conjunction with both the General and Bicycle and Pedestrian plans to create safer facilities for these road users.

4.1.4 Active Transportation Plan

The City of Petaluma hired a consultant to provide a citywide Active Transportation Plan. This plan will identify existing facilities for bicycles, pedestrians, and connections to transit and evaluate safety for alternative modes. Proposed facilities will also be identified for bicycles and pedestrians where there is a lack of accommodations or need for improvements, gaps in bikeway or sidewalk connectivity, need for an improved crossing, and last mile connections to transit. This plan is expected to be completed in 2023.

4.2 Citywide Collision Data

The City of Petaluma collision data was gathered using collisions from Crossroads. The data set contains five complete years' worth of collisions spanning from January 1, 2016, to December 31, 2020.

During this period, a total of 2501 collisions were reported in the City of Petaluma. These collisions were classified based on location: City intersection, City segment, State Route 116 intersections, State Route 116 segments, or US 101 Ramp intersections.

The chart in **Figure 10** depicts the number of collisions by collision location. The highest number of collisions were at city intersections.

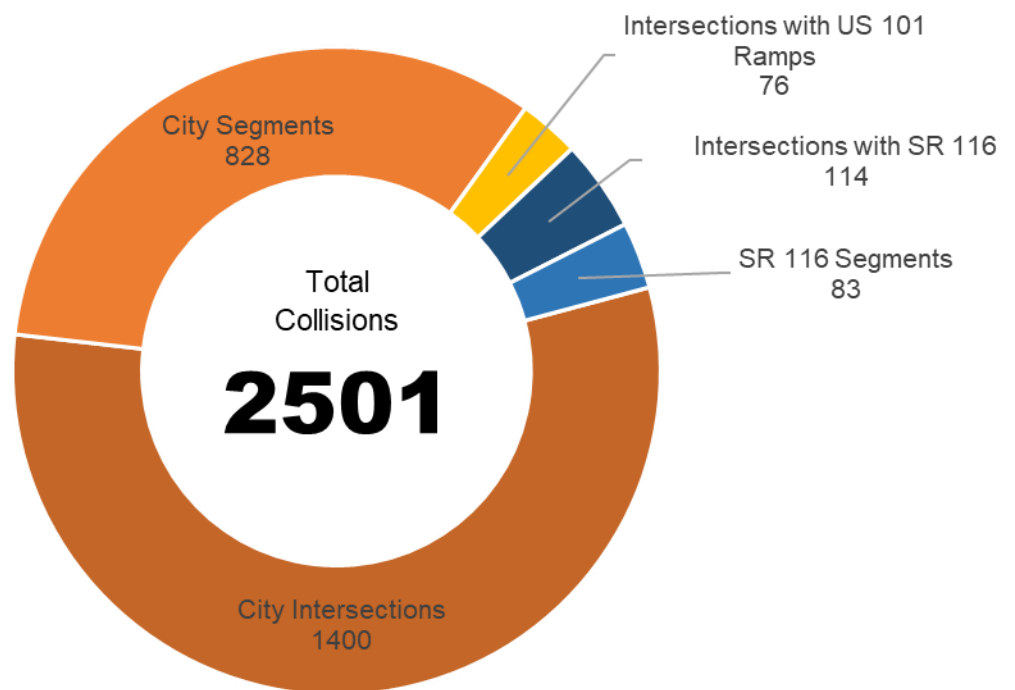


Figure 10 Total Collisions within the City of Petaluma (2016-2020)

Figure 11 displays the collision density throughout the Petaluma, including interchange locations. The hot spots include the intersections at Petaluma Boulevard and Washington Street, E Washington Street and N McDowell Boulevard, Lakeville Street and E Washington Street, Old Redwood Highway and N McDowell Boulevard, Petaluma Boulevard S and D Street, and Lakeville Street and E D Street.

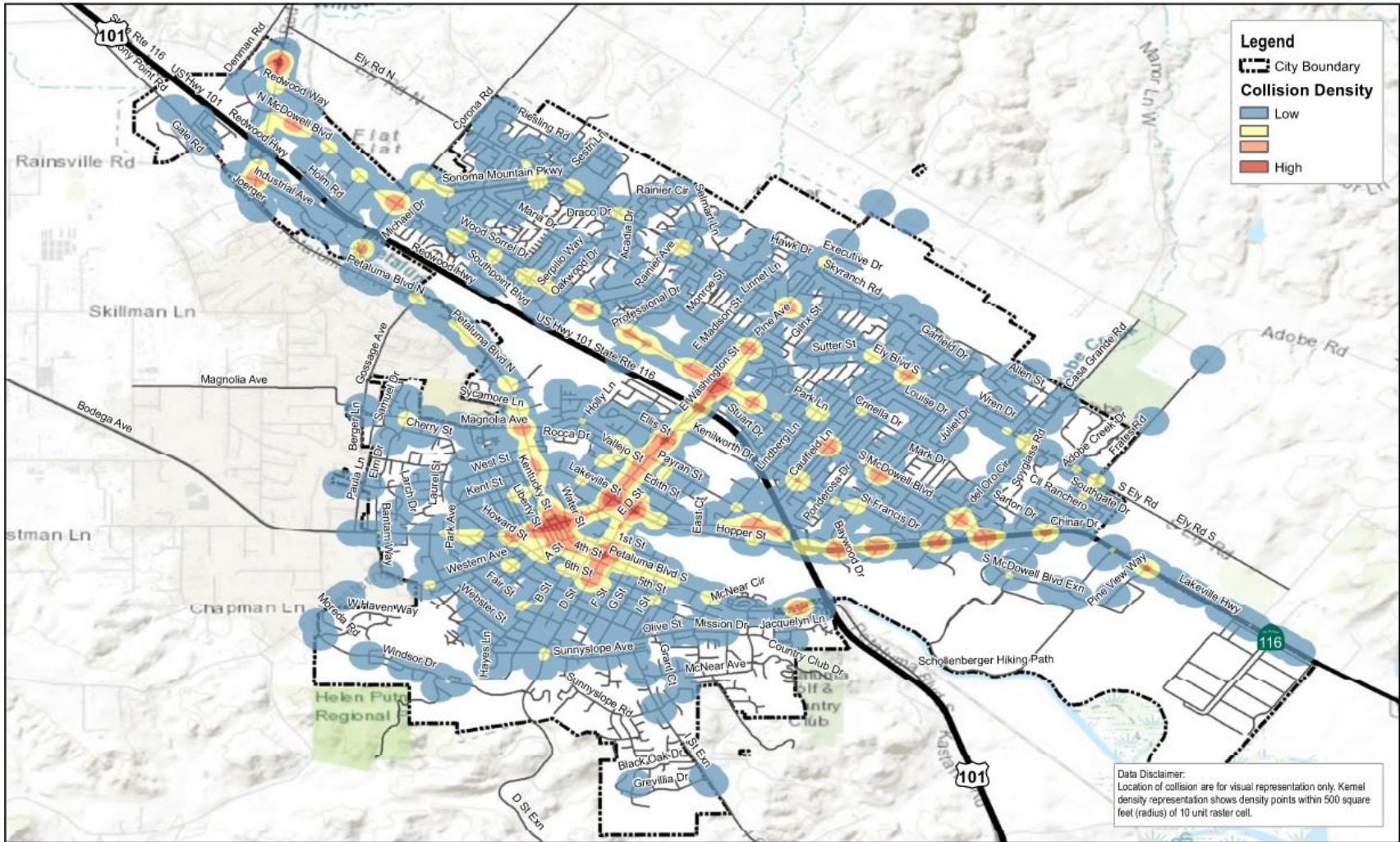


Figure 11 Collision Density in the City of Petaluma (2016-2020)

4.2.1 Collisions on City Maintained Roadways

There were 2228 collisions recorded on the city roadways between 2016 and 2020. **Figure 12** shows the breakdown of collisions by year and severity. The highest number of collisions were reported in 2016. The number of collisions trended downward since the peak in 2016. However, there was an increase in the number of severe injury collisions from 2017 to 2019. Fatalities occurred in each of the five years with an increase in fatalities from 2019 to 2020.

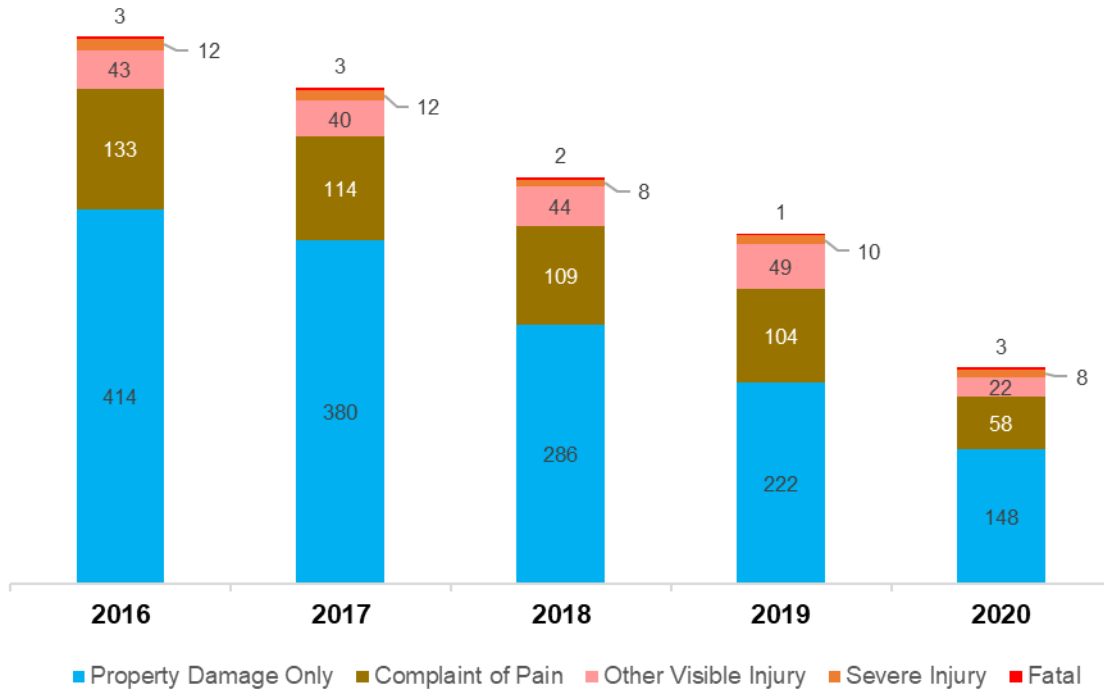


Figure 12 Collisions by Year on City of Petaluma Roadways (2016-2020)

Rear end collisions were the most common collision type, closely followed by broadside collisions. Other common collision types include sideswipe and hit object. **Figure 13** summarizes the city collisions based on severity and type.

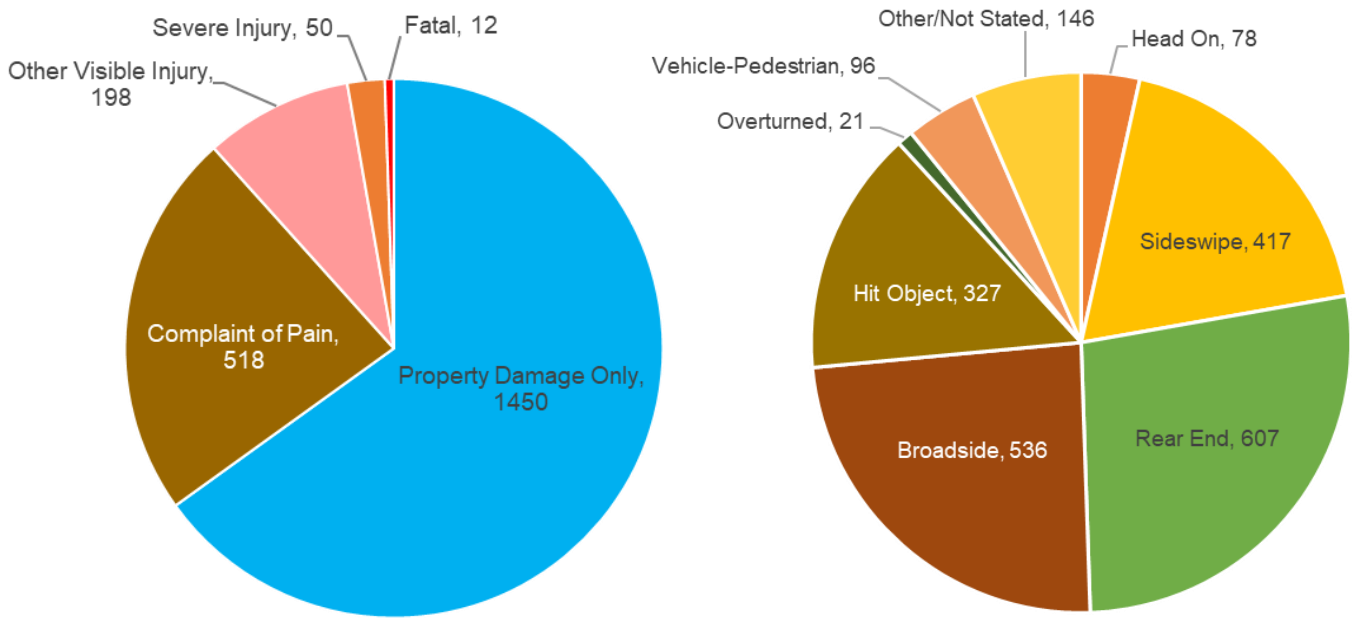


Figure 13 Collision Severity and Type for City Roadways (2016-2020)

The majority of collisions were recorded as property damage only with 35% of the collisions in the past five years recorded as injury or fatal collisions. **Figure 14** displays the top five violation categories (not including unknown/not stated) and the number of collision types per category. Improper turning was the top violation category with the majority of collisions being sideswipes.

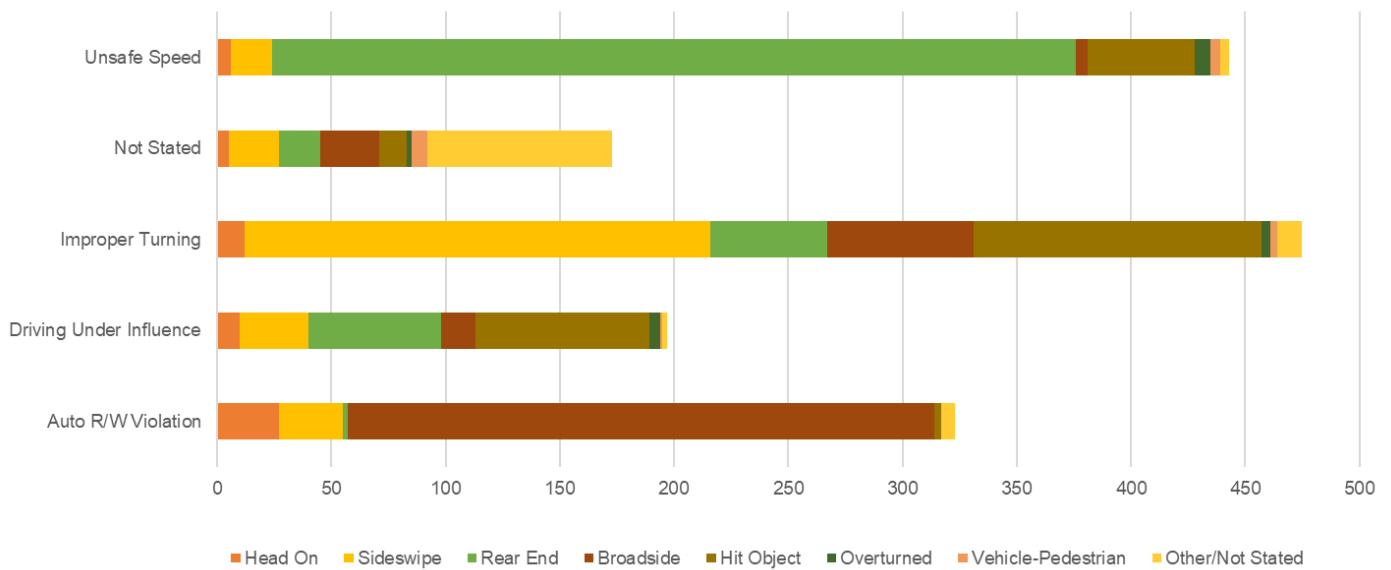


Figure 14 Top Violation Categories for Collisions on City Roadways (2016-2020)

The total number of collisions and Equivalent Property Damage Only (EPDO) rating were assessed at the city intersection locations to aid in the determination of the top study intersections (refer to **Appendix C: Collision Data** for the breakdown of collision severity and violation type by intersection). Per the Caltrans Local Roadway Safety Manual, it is recommended to rank locations with higher severity as higher focus.

The Local Roadway Safety Manual (LRSM) calculates the Equivalent Property Damage Only (EPDO) rating by combining the cost of the high-severity collisions. LRSM methodology assigns a weight to collisions by capturing the relative severity in equivalent property damage only where a property damage only collision is given a weight of 1. This weighting helps the locations with highest collision severity to rank the highest. This is also the method used to calculate the Benefit-to-Cost Ratio (BCR) in HSIP applications.

To view the crash costs and associated EDPO for the LRSM method, see **Table 1** below. Collision costs include both direct and indirect costs. Direct crash costs include ambulance service, police and fire services, property damage, insurance, and other costs directly related to the crashes. Indirect collision costs account for the value society would place on pain and suffering or loss of life associated with the crash.

Table 1 Comprehensive Collision Costs and EPDO Weights

SWITRS Code	Crash Severity	Location Type	Crash Cost*	Severity Ranking**
Local Roadway Safety Manual (LRSM)***				
1 & 2	Fatal & Severe Injury	Signalized Intersection	\$ 1,787,000	120
		Non-Signalized Intersection	\$ 2,843,000	191
		Roadway	\$ 2,461,000	165
3	Other Visible Injury	-	\$ 159,900	11
4	Complaint of Pain	-	\$ 90,900	6
0	Property Damage Only	-	\$ 14,900	1

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

** Based on Equivalent Property Damage Only (EPDO)

*** Local Roadway Safety: A Manual for California's Local Road Owners (LRSM), Version 1.6, 2022.

The past five years of data (2016-2020) were analyzed for the LRSP's countermeasure development as HSIP only considers the most recent five years of collisions in its grant allocation. It should be noted that the decrease in collisions in 2020 was likely due to the traffic pattern changes due to the COVID 19 pandemic.

For the purposes of identifying priority locations for the LRSP, the intersections and segments with collisions on City roadways were analyzed based off the LRSM EPDO ranking and total collisions. The top five intersections and segments in each of these three categories were identified as a priority. After removing duplicates between the lists, nine unique City intersections, eight unique City intersections with Caltrans roadways, and eight unique City roadway segments were identified.

The intersection of S McDowell Avenue and Caulfield Lane had the highest EPDO using the LRSM methodology (440) due to a fatality in 2017 at this location. The intersection of McDowell Boulevard and E Washington Street had the highest number of collisions (51). **Table 2** shows the top intersections, per collision analysis. Further detailed collision analysis is in **Appendix C: Collision Data**.

Table 2 Top Intersections, per Collision Analysis

Primary Road	Secondary Road	Severity Ranking (EPDO)	Total Collisions
		LRSM	
S McDowell Ave	Caulfield Ln	440	25
McDowell Blvd	E Washington St	166	51
N McDowell Blvd	Professional Dr	432	12
Petaluma Blvd N	Sycamore Ln/Shasta Ave	418	13
Ely Blvd S	Caulfield Ln	292	17
Washington St	Keller St	288	23
E Washington St	Lakeville St	138	48
E D St	Lakeville St	76	31
E Washington St	Ellis St/Johnson St	70	25

The segment collisions were also analyzed by EPDO and total number of collisions. **Table 3** shows the top segments, per collision analysis for the City of Petaluma and Caltrans segments. McDowell Blvd from Old Redwood Highway/Petaluma Boulevard North to Lynch Creek Way had the highest EPDO rating using the LRSM methodology (1018) due to a fatal collision in 2017. This segment also had the highest number of collisions (58).

Table 3 Top Segments, per Collision Analysis

Street Name	From	To	Severity Ranking (EPDO)	Total Collisions
			LRSM	
N McDowell Blvd	Old Redwood Hwy/Petaluma Blvd N	Lynch Creek Way	1018	58
SR 116	US 101 NB Ramps	Frates Rd	470	47
SR 116	Pine View Way	S of Silace Rd near S City Limit	389	21
Lakeville St	Wilson St	Caulfield Ln	381	13
Corona Rd	N McDowell Blvd	Industrial Ave	335	7
E Washington St	McDowell Blvd	Lakeville St	319	50
N McDowell Blvd	Lynch Creek Way	E Madison St	158	38
E Washington St	Howard St	Lakeville St	283	29

4.2.2 Collisions on Caltrans Maintained Roadways

For the purpose of this plan, the Caltrans maintained roadways are classified as the interchanges (intersections where US 101 ramps meet with City roadways) and State Route 116. Due to the interface with city roadways, SR 116 segments were included in section 4.2.1 along with the city segments in **Table 3**. There were 76 collisions at interchanges, 114 collisions at SR 116 intersections, and 83 collisions on SR 116 segments between 2016 and 2020.

Figure 15 displays the top five violation categories (not including unknown/not stated) and the number of collision types per category. Unsafe speed was the top violation category with the majority of collisions being rear end collisions.

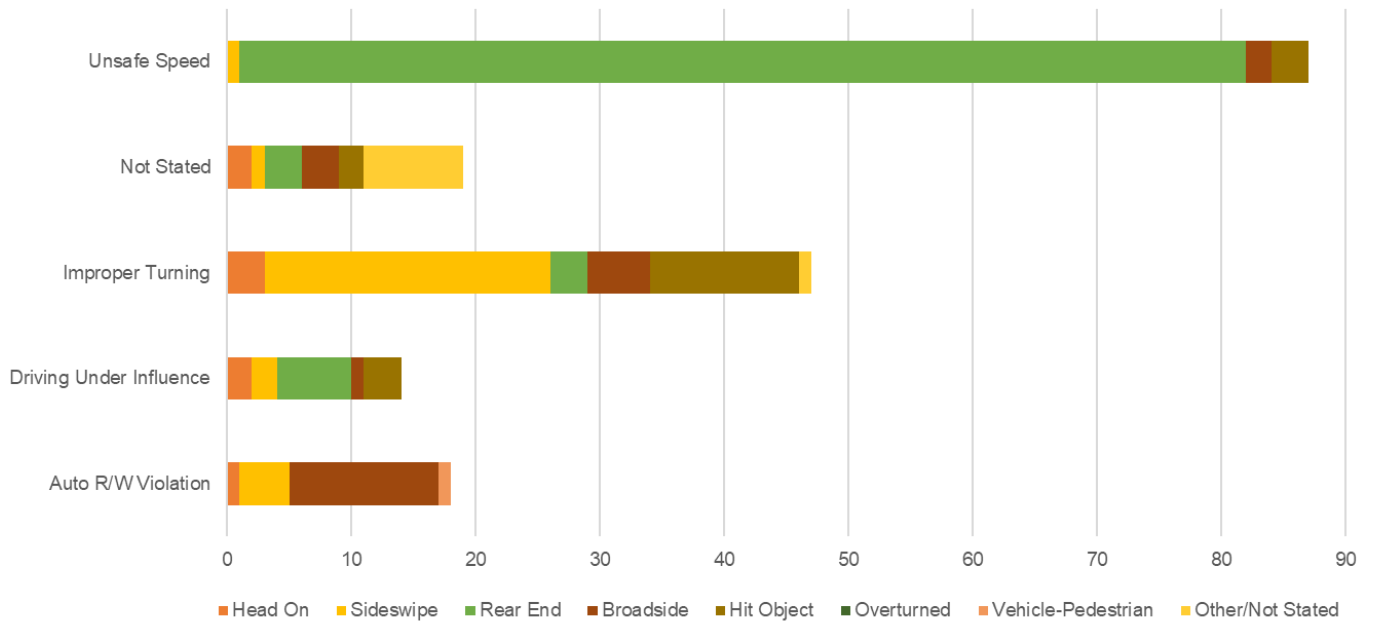


Figure 15 Top Violation Categories for Collisions on Caltrans Roadways (2016-2020)

Figure 16 summarizes the Caltrans collisions based on severity and type. The main collision type was rear end followed by broadside. A little over half of the collisions were recorded as property damage only with 44% of the collisions in the past five years recorded as injury collisions.

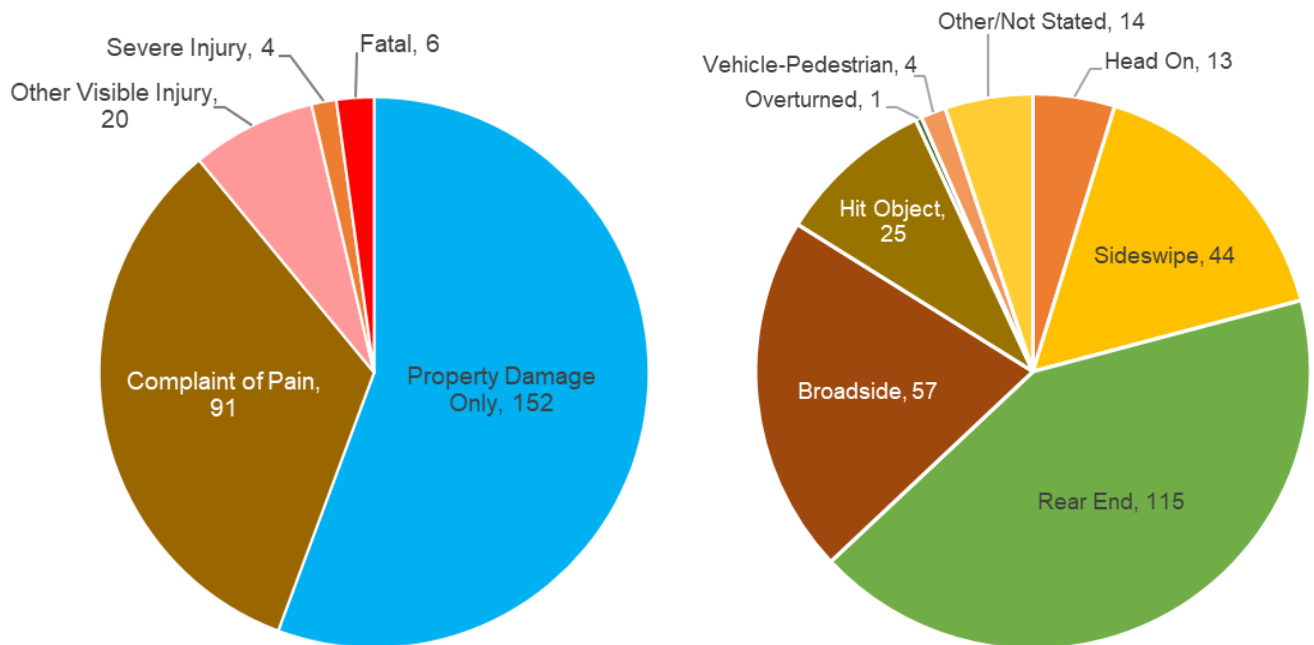


Figure 16 Summary of Caltrans Collisions (2016-2020)

The intersection of State Route 116 and S McDowell Avenue had highest EPDO using the LRSM methodology (449). The intersection of E Washington Street and US 101 Northbound ramps had the highest number of collisions (29).

This interchange has recently been modified by Caltrans as a part of the Marin-Sonoma Narrows Segment C2, Petaluma Widening, Project (MSN C2 Project). Further investigation into the collision reduction impact of this modification is necessary upon completion of the MSN C2 Project. **Table 4** shows the top interchange locations, per collision analysis. Further detailed collision analysis is in **Appendix C: Collision Data**.

Table 4 Top Interchanges, per Collision Analysis

Primary Road	Secondary Road	Severity Ranking (EPDO)	Total Collisions
		LRSM	
SR 116	S McDowell Ave	449	19
SR 116	US 101 SB Ramps	237	12
SR 116	Pine View Way	225	10
SR 116	S McDowell Blvd Ext	214	4
E Washington St	US 101 NB Ramps	109	29
SR 116	Casa Grande Rd	237	17
SR 116	Baywood Dr	85	25
SR 116	Marina Ave	84	24

4.2.3 Collisions Related to Challenge Areas

4.2.3.1 Bicyclists

There were 110 bicycle collisions on city roadways and seven bicycle collisions on Caltrans roadways between 2016 and 2020. Bicyclist-to-vehicle collisions were approximately 5% of the total city collisions. Of these collisions, 19 resulted in severe injuries and two in fatalities. **Figure 17** shows the bicycle collision severity by year for city collisions.

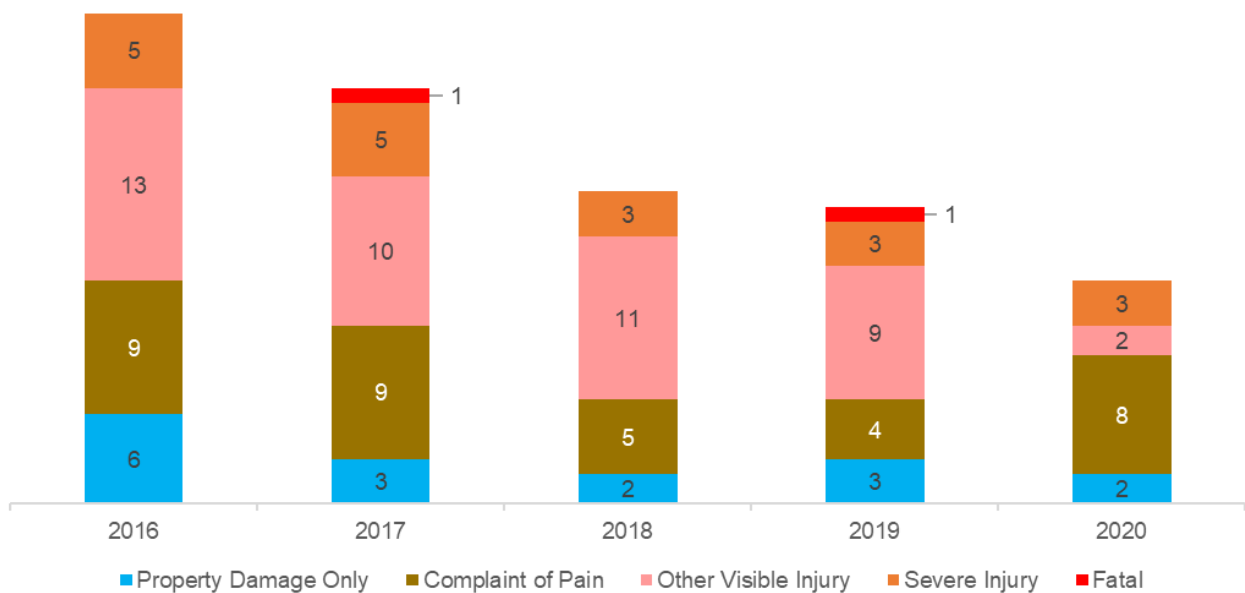


Figure 17 Severity by Year for Bicycle-Related Collisions on City Roadways (2016-2020)

The top five violation categories for bicycle-related collisions on City-maintained roadways (not including unknown/not stated) are shown in **Figure 18** below. The top violation category for bicycle collisions was improper turning. One collision with an improper turning violation resulted in a fatality and six resulted in severe injuries.

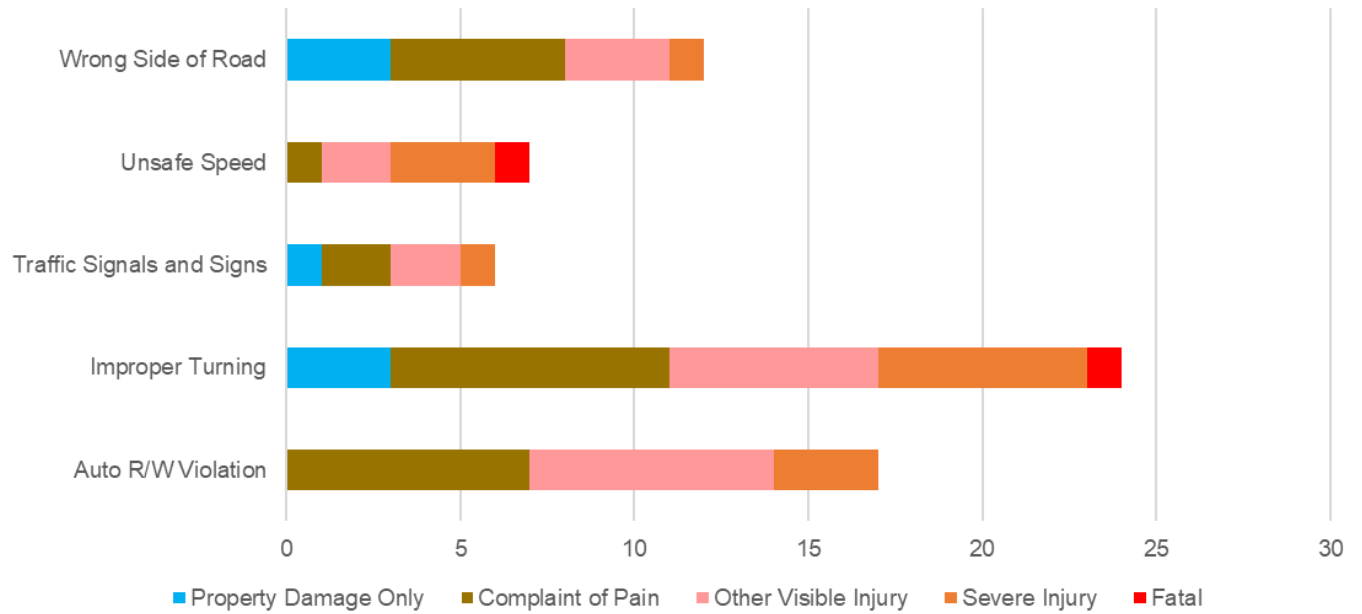


Figure 18 Top Violation Categories for Bicycle-Related Collisions (2016-2020)

The location of each collision is outlined in **Figure 19**.

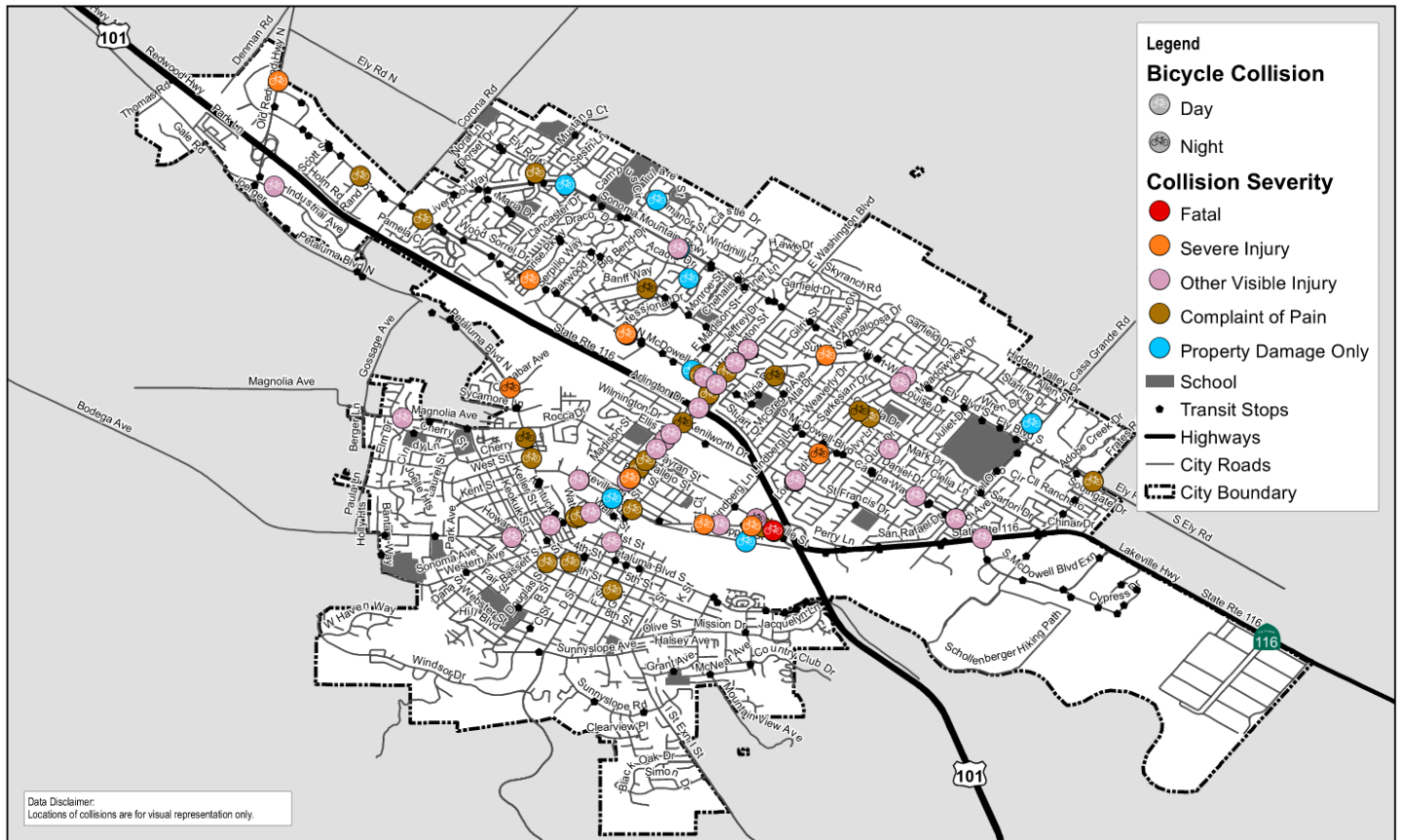


Figure 19 Map of Bicycle Collisions (2016-2020)

4.2.3.2 Distracted Driving

Distracted driving is categorized in collision data as inattention. Categories for inattention include cell phones (handheld or hands-free), electronic equipment, smoking, eating, children, animals, personal hygiene, and reading. From 2016 to 2020, there were 112 collisions with at least one party cited due to inattention. This is approximately 4% of all collisions (including interchange collisions). There was one severe injury collision and one fatal injury collision as a result of inattention (see **Figure 20** for a breakdown of collision severity with inattention as a factor).

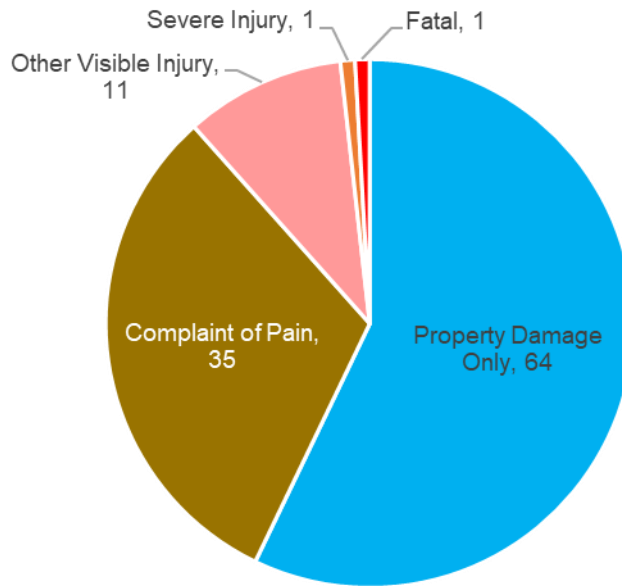


Figure 20 Severity of Collisions with Inattention as a Factor (2016-2020)

4.2.3.3 Aggressive Driving / Speed Management

Aggressive driving can be quantified through collision data through unsafe speed violations. There were 443 collisions on City roadways and 87 collisions on Caltrans roadways due to unsafe speed between 2016 and 2020. This is approximately 19% of all collisions on City roadways and 32% of all collisions of Caltrans roadways. The majority of these collisions resulted in rear end collisions. There were three fatal and eight severe injury collisions as a result of unsafe speed – all occurring on City roadways.

4.2.3.4 Intersections

As mentioned in **Section 4.2**, there were 1400 collisions at City intersections during the study period. These account for approximately 55% of all collisions on City roadways. The top collision type was rear end, followed by broadside. The top violation category was unsafe speed, with many of these violations resulting in rear end collisions. It is important to note that unsafe speed violations are not always due to high vehicle speeds but rather due to the difference in speeds to an approach to an intersection, traffic congestion or sudden stopping, or vehicles following too closely that results in a rear end collision. **Figure 21** outlines the top five violation categories and their associated collision types for the intersection-related collisions.

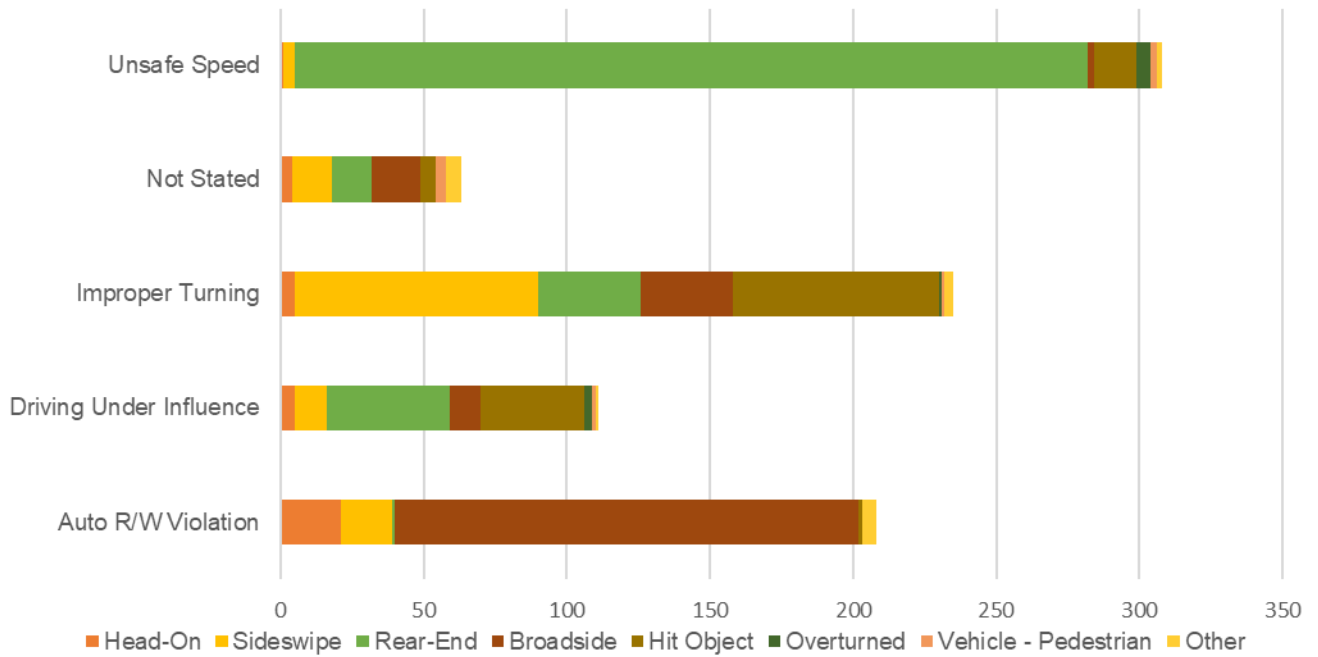


Figure 21 Top Violation Categories for Intersection Collisions

4.2.3.5 Pedestrians

Vehicle-to-pedestrian collisions accounted for approximately 4% of the total collisions and there were 95 pedestrian collisions on the city roadways and four on Caltrans roadways. 2017 had the highest number of pedestrian collisions with 24. Years 2016 and 2017 had the highest collision severities with two severe injury and two fatal collisions each. The number of pedestrian collisions had an overall downward trend since 2017 but rose slightly in 2019 before descending again to the lowest number of pedestrian collisions in 2020. Figure 22 presents the pedestrian collision severity by year.

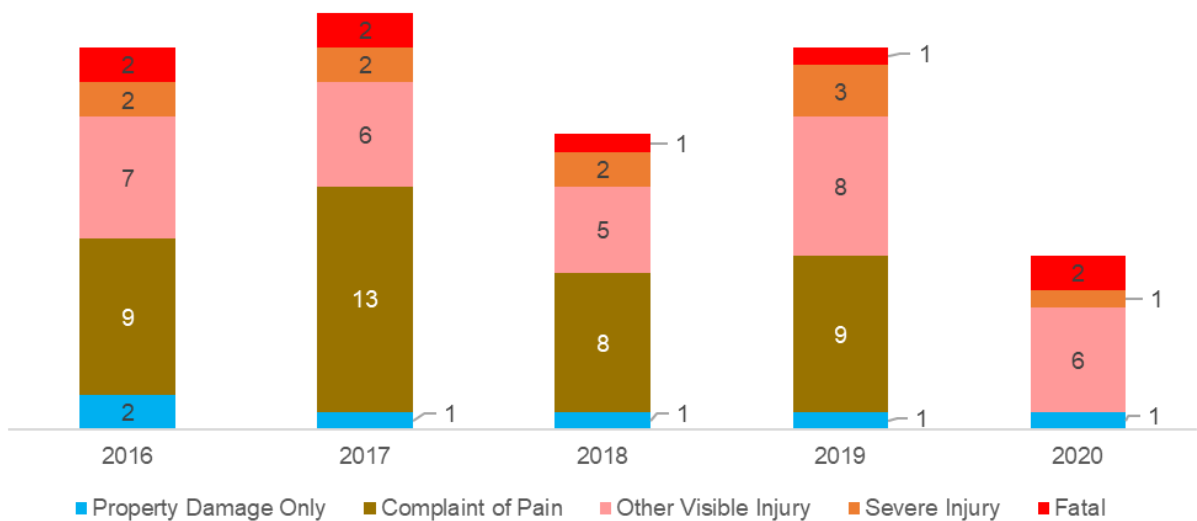


Figure 22 Severity by Year for Pedestrian-Related Collisions

The pedestrian location at the time of collision, along with corresponding severity, is shown in **Figure 23**. Most pedestrians were crossing in the crosswalk at an intersection. The mapped location of each collision is shown in **Figure 24**.

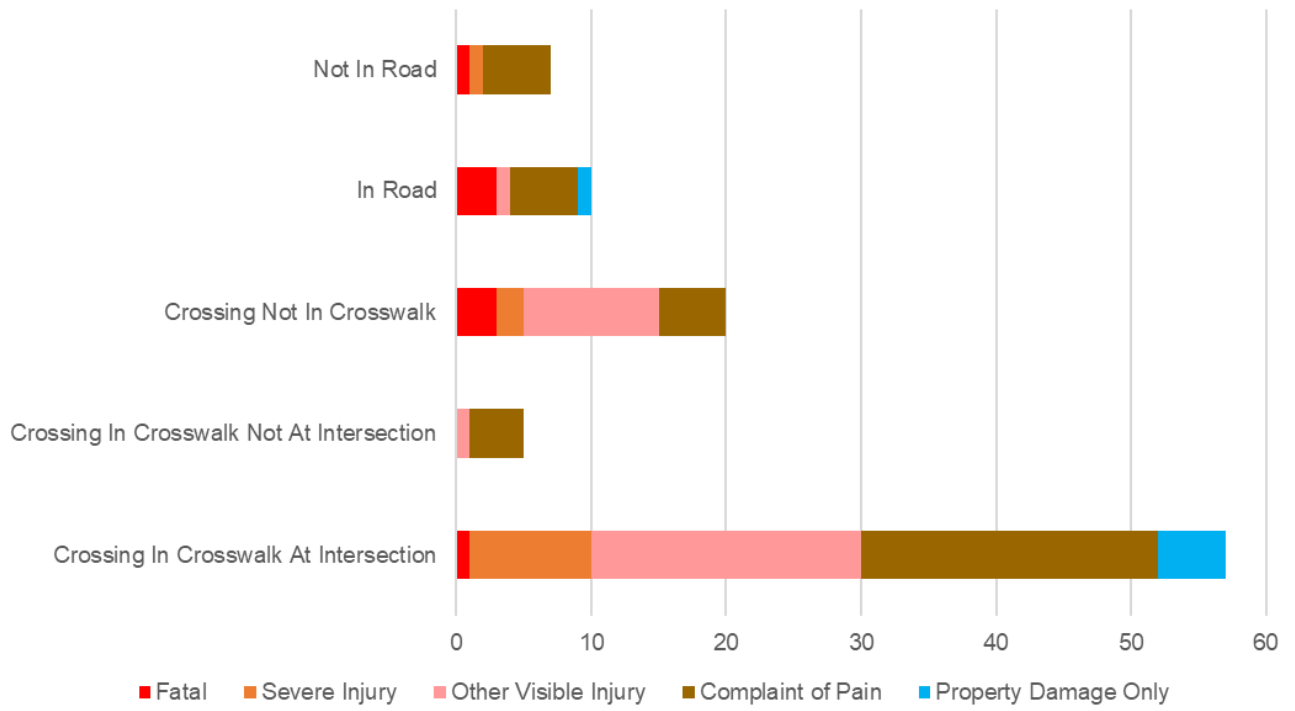


Figure 23 Pedestrian Location at Time of Collision (2016-2020)

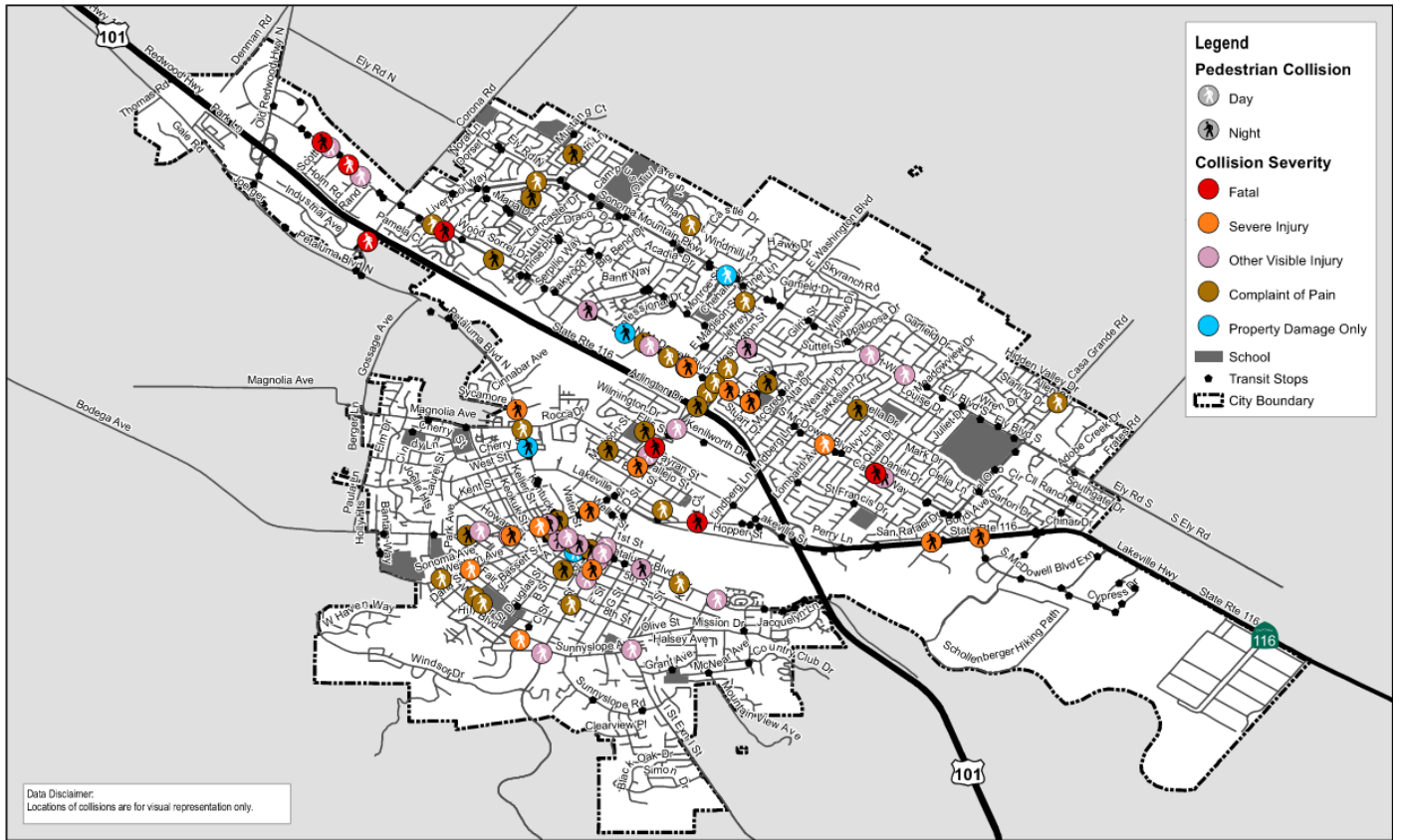


Figure 24 Map of Pedestrian Collisions

5. Public Engagement

5.1 Social Pinpoint Website

A project website was created on the Social Pinpoint platform to inform the public about the LRSP and provide a platform for input. **Figure 25** displays the homepage for the website found at <https://lrsp.mysocialpinpoint.com/city-of-petaluma-lrsp>. The project website had Google Translate enabled that could translate the webpage in over 100 languages and detect the user’s browsers settings to automatically display the webpage in their language preference. In addition, the user could toggle the preferred language on the upper right corner of the webpage. Visitors to the page were invited to provide comments on an interactive project map and share their thoughts through a project survey. Comments from the interactive map and detailed results from the survey are included in **Appendix A: Community Engagement**.

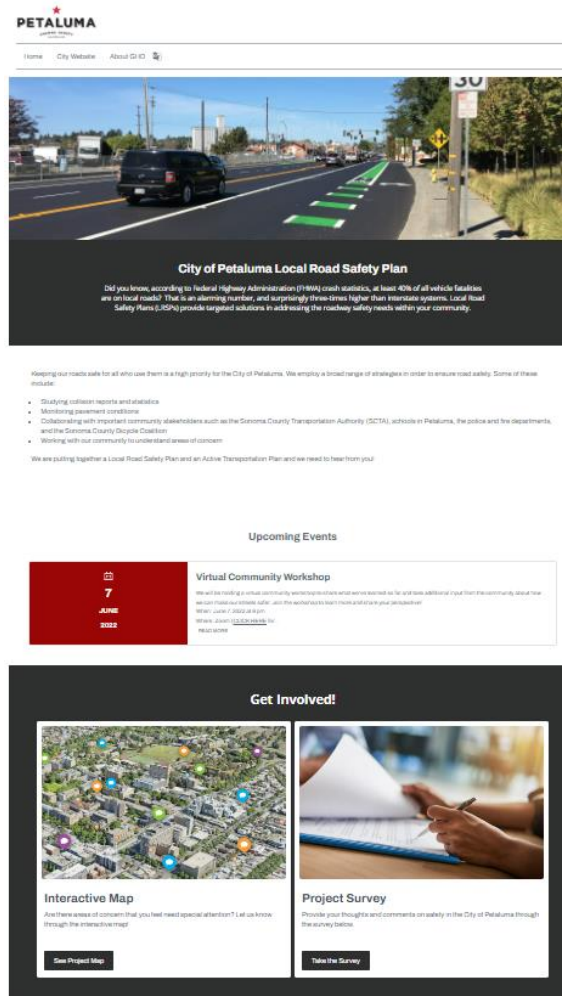


Figure 25 Public Website Home Page

Overall, over 220 unique community members interacted with the website, and it received 313 interactive map comments and 114 survey responses. These comments were all reviewed, incorporated as applicable, and summarized in **Appendix A: Community Engagement**.

5.1.1 Interactive Map

The interactive map feature on the website allowed the public to drag icons to a location within the city and leave a comment regarding driving, pedestrian, or bicycle suggestions at that location. Many comments were related to pedestrian safety (39%). **Figure 26** shows the interactive map feature from the website.

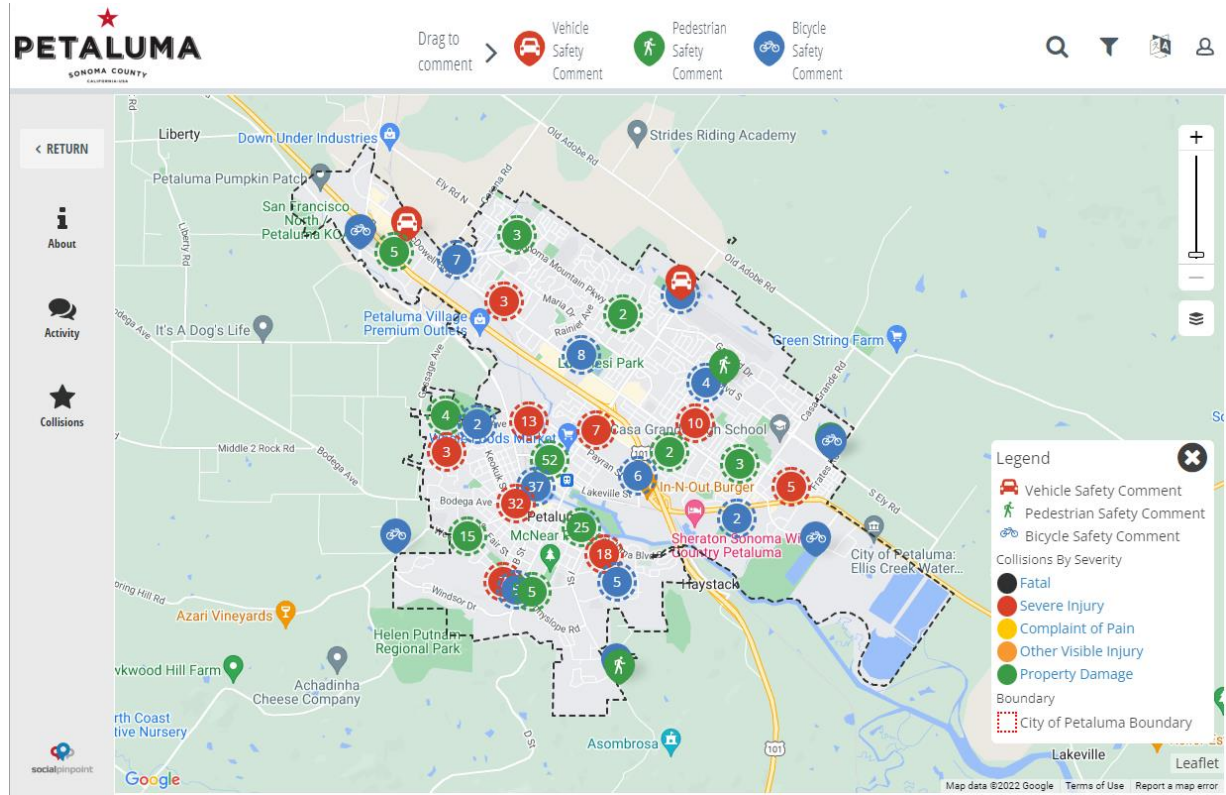


Figure 26 Public Website Interactive Map

Further discussion on the public comments received through the interactive map is included in **Section 6.3**.

5.1.2 Public Survey

The City of Petaluma Public Survey asked three questions relating to the LRSP. The survey received 114 responses. A summary of the survey responses is shown below in **Figures 27-29**.

Q1: In your opinion, what is the most significant factor leading to collisions in Petaluma?

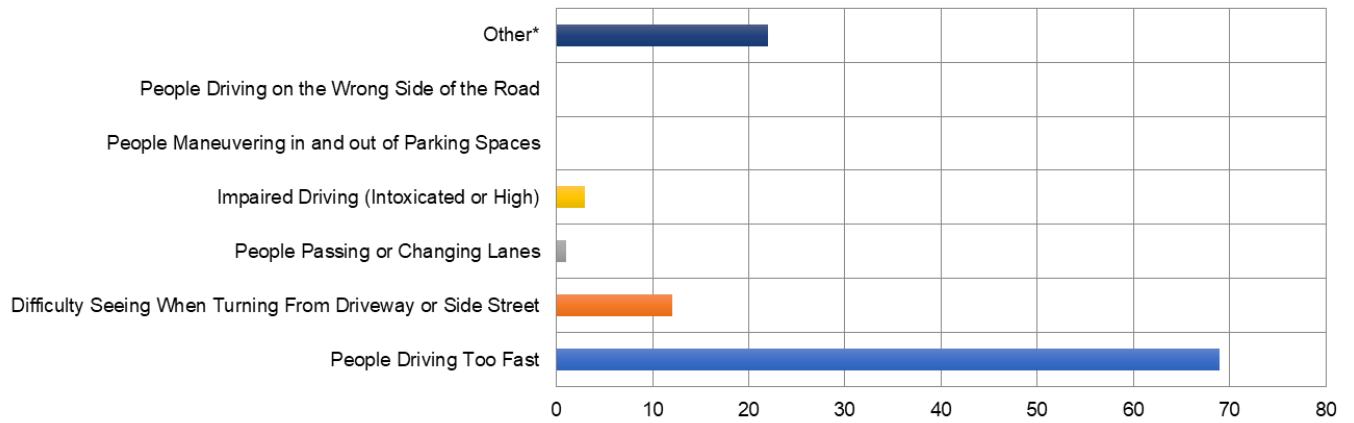


Figure 27 Survey Responses to Question 1

Q2: In your opinion, what should the City focus on to reduce traffic collisions?

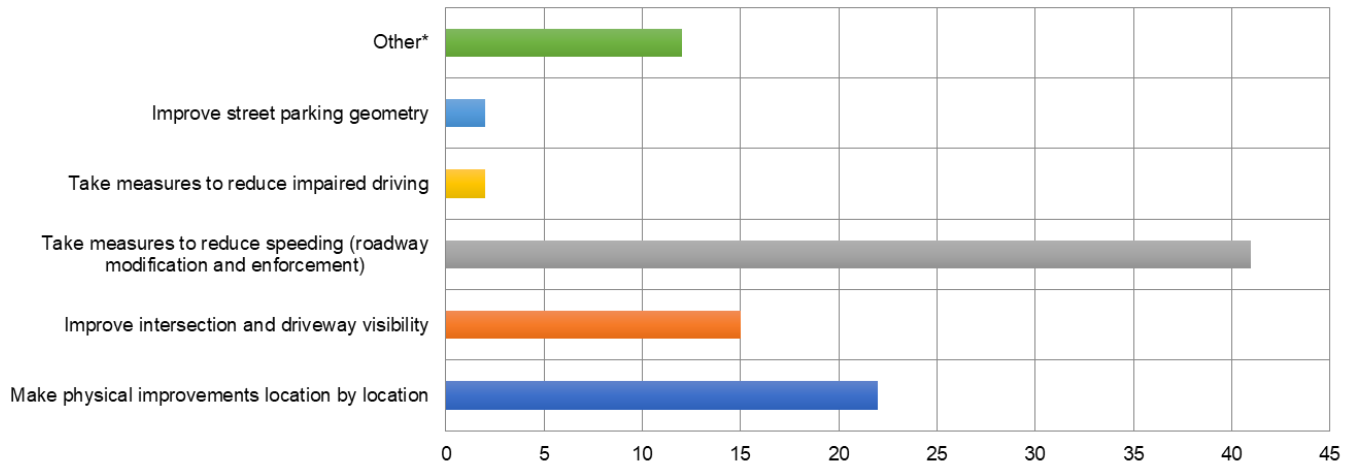


Figure 28 Survey Responses to Question 2

Q3: What are the most effective ways that the City can reduce collisions?

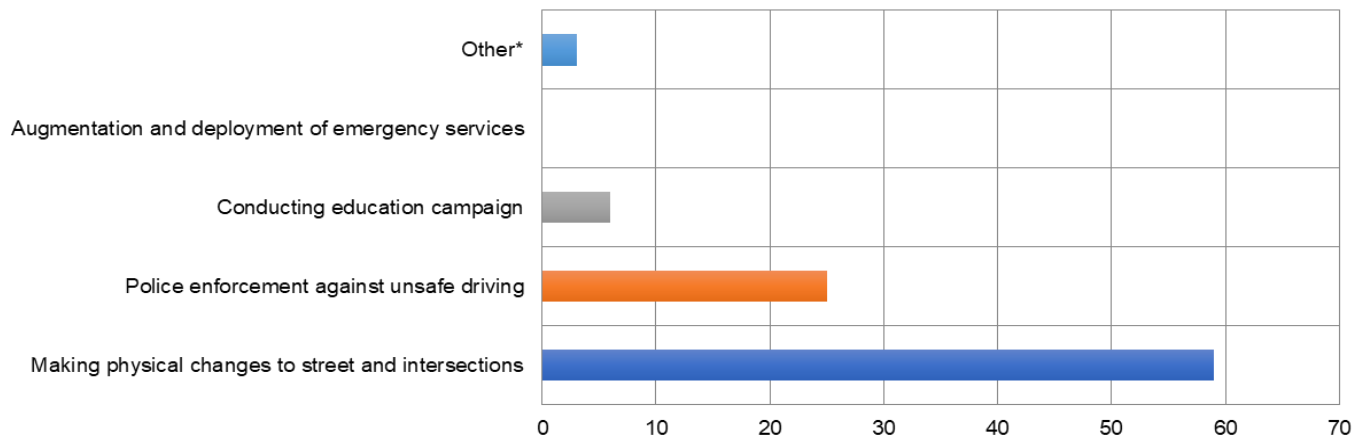


Figure 29 Survey Response to Question 3

5.1.3 Draft LRSP Document

The draft LRSP document was posted on the project website for comments for a two-week period. All comments are included and addressed in **Appendix A: Community Engagement**.

5.2 Community Meeting

A virtual community meeting was hosted by City and GHD on June 7, 2022, to provide details on the LRSP and gather feedback. This meeting included discussion of the goals and vision of the LRSP, overview of relevant collision data and time for a live question and answer session towards the end of the meeting. The meeting also included polls where community members could provide their input on preferred countermeasures. The results of these polls are shown in **Figures 30, 31, 32, and 33** below.

Pedestrian Safety Improvements (select top 3)

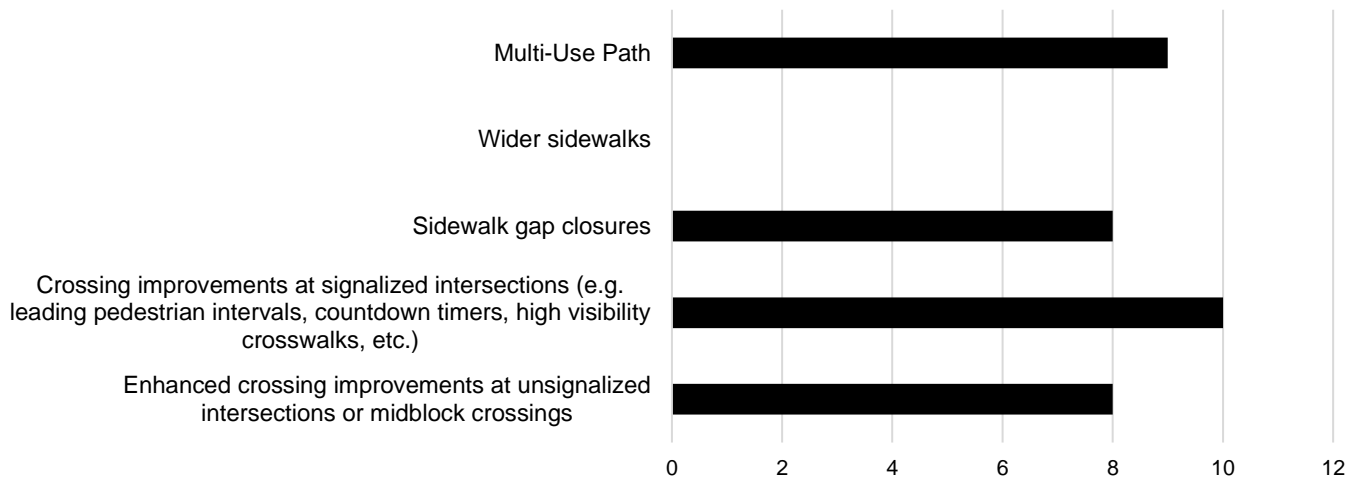


Figure 30 Survey Response to Poll 1

Bicycle Safety Improvements (select top 3)

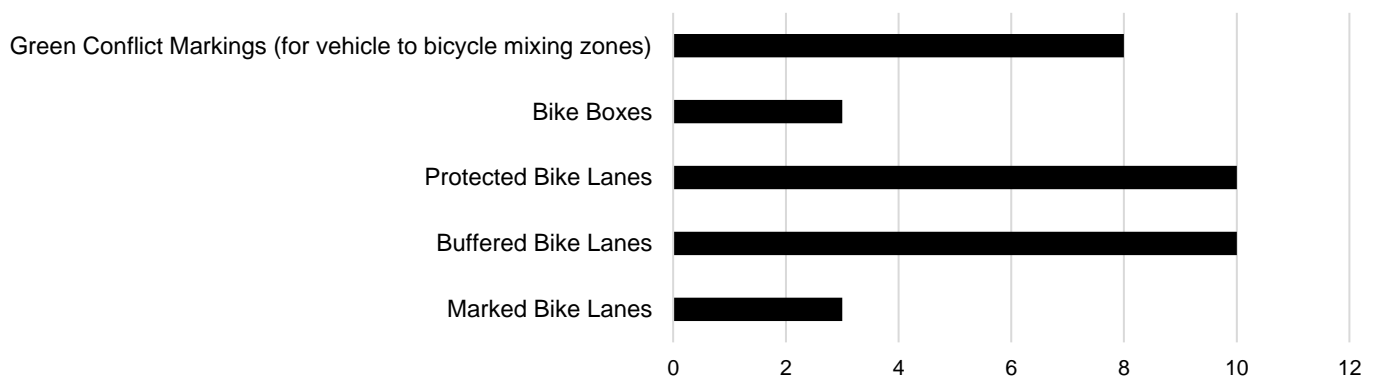


Figure 31 Survey Response to Poll 2

Intersection Improvements (select top 3)

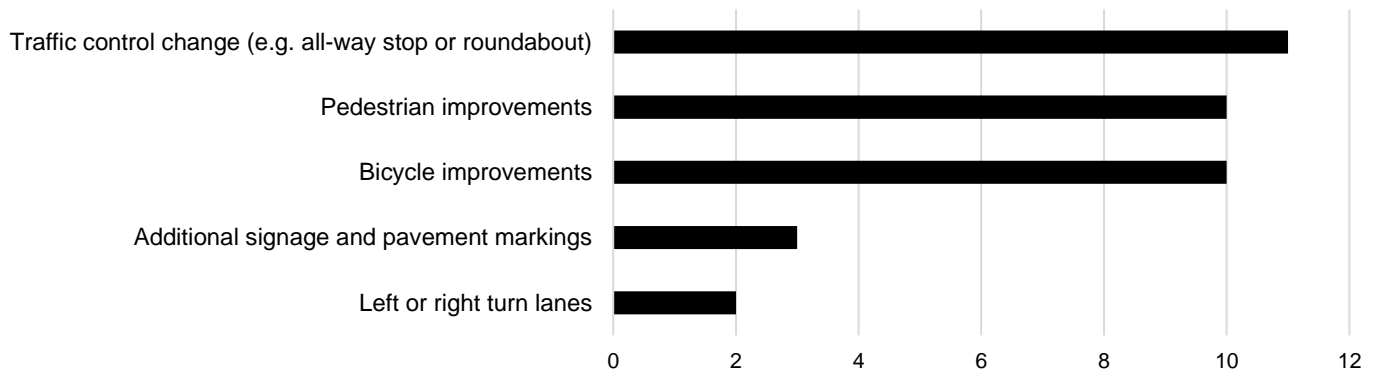


Figure 32 Survey Response to Poll 3

Non-Engineering Improvements (select top 4)

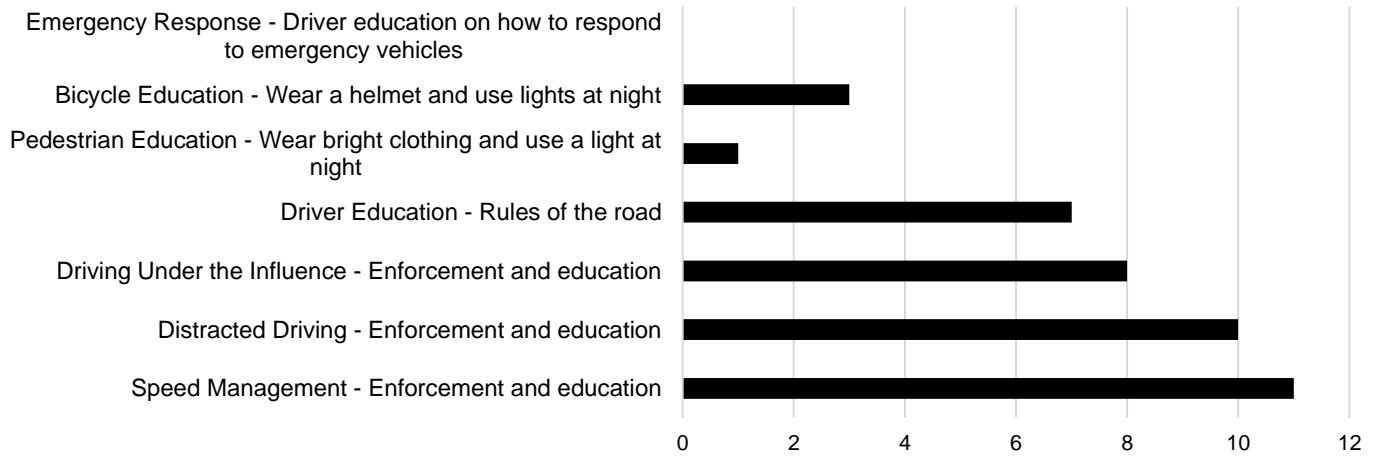


Figure 33 Survey Response to Poll 4

Comments from the meeting are included in **Appendix A: Community Engagement**.

6. Identify Strategies

Through coordination and feedback from the City of Petaluma, LRSP working group, school feedback, and public outreach, safety projects and strategies were identified for the Local Roadway Safety Plan. Countermeasure development was coordinated with the City to collect feedback and identify recommended countermeasures.

The LRSP will reference specific location engineering projects and systemic safety applications. In addition, safety strategies and projects that address the other E's to include Enforcement, Education, Emergency Response, and Emerging Technologies will be discussed below.

6.1 Engineering Strategies

Per the HSIP program, engineering countermeasures are available for grant funding. Recommended countermeasures for the priority locations were chosen per the most recent Caltrans, Local Roadway Safety Manual (Version 1.6), April 2022, guidance from the stakeholders on preferred countermeasures, crash characteristics, public input from the project website, and observations from Google Maps.

6.1.1 Locations Identified through Collision Analysis

The locations and characteristics of priority intersections and segments on City roadways are shown in **Table 5** and **Table 6** below (see **Section 4.2.1** for the procedure on how locations were prioritized).

Table 5 Priority Intersection Characteristics

Location	Control	Crash Characteristics												
		LRSM Relative Severity (EPDO)	Total Crashes	Top Type of Collision (Number of Collisions)	Top Violation Category (Number of Collisions)	Fatal + Severe Injury	% at Night	Wet	Ped	Bike	Involv. w/Fixed Object	Pedestrian Not in Crosswalk	DUI	Dark with No Streetlights
City Jurisdiction														
S McDowell Blvd / Caulfield Ln	Signal	440	25	Rear End (19)	Unsafe Speed (14)	2	32%	3	2	0	0	0	1	0
McDowell Blvd / E Washington St	Signal	166	51	Rear End (29)	Unsafe Speed (17)	0	35%	7	1	2	2	0	7	0
N McDowell Blvd / Professional Dr	Signal	432	12	Broadside (6)	Traffic Signals and Signs (4)	2	33%	3	1	4	0	0	0	0
Petaluma Blvd N / Sycamore Ln/Shasta Ave	Signal	418	13	Rear End (7)	Unsafe Speed (7)	2	31%	3	1	0	2	0	2	0
Ely Blvd S / Caulfield Ln	AWSC	292	17	Broadside (12)	Traffic Signals and Signs (8)	1	24%	3	1	1	0	0	1	0
Washington St / Keller St	TWSC	288	23	Broadside (13)	Automobile Right of Way (8)	1	17%	2	2	0	1	1	1	0
E Washington St / Lakeville St	Signal	138	48	Rear End (18)	Unsafe Speed (15)	0	25%	6	0	2	14	0	2	0
E D St / Lakeville St	Signal	76	31	Rear End (10)	Improper Turning (8)	0	39%	1	0	1	1	0	1	0
E Washington St / Ellis St/Johnson St	Signal	70	25	Rear End (11)	Unsafe Speed (8)	0	32%	3	0	2	1	1	1	0
Caltrans Jurisdiction														
SR 116 / S McDowell Blvd (W)	Signal	449	19	Rear End (8)	Unsafe Speed (5) / Traffic Signals and Signs (5)	2	16%	0	1	1	1	0	1	0
SR 116 / US 101 SB Ramps	Signal	237	12	Rear End (4) / Sideswipe (4)	Unsafe Speed (4)	1	33%	1	0	2	3	0	0	0
SR 116 / Pine View Way	TWSC	225	10	Broadside (6)	Automobile Right of Way (8)	1	30%	1	0	0	2	0	0	1
SR 116 / S McDowell Blvd Ext	TWSC	214	4	Broadside (2)	Varies	1	0%	2	0	0	1	0	0	0
E Washington St / US 101 NB Ramps	Signal	109	29	Broadside (12)	Traffic Signals and Signs (9)	0	28%	4	2	3	0	0	1	0
SR 116 / Casa Grande Rd	Signal	237	17	Rear End (9)	Unsafe Speed (6)	1	29%	1	1	0	1	0	0	0
SR 116 / Baywood Dr	Signal	85	25	Rear End (16)	Unsafe Speed (12)	0	4%	2	0	0	0	0	1	0
SR 116 / Marina Ave	Signal	84	24	Rear End (19)	Unsafe Speed (13)	0	17%	2	0	0	0	0	2	0

Table 6 Priority Segment Characteristics

Location	Length (mi)	Crash Characteristics												
		LRSM Relative Severity (EPDO)	Total Crashes	Top Type of Collision (Number of Collisions)	Top Violation Category (Number of Collisions)	Fatal + Severe Injury	% at Night	Wet	Ped	Pedestrian Not in Crosswalk	Bike	Involv. w/Parked Car	Involv. w/Fixed Object	DUI
City Jurisdiction														
N McDowell Blvd (Old Redwood Hwy/Petaluma Blvd N to Lynch Creek Way)	2.53	1018	58	Rear End (15)	Unsafe Speed (22)	5	19%	11	2	2	5	1	14	2
Lakeville St (Wilson St to Caulfield Ln)	0.38	381	13	Broadside (7)	Automobile Right of Way (5)	2	38%	1	1	1	0	0	0	0
Corona Rd (N McDowell Blvd to Industrial Ave)	0.37	335	7	Broadside (3)	Automobile Right of Way (2) / Improper Turning (2)	2	14%	1	1	1	0	0	2	0
E Washington St (McDowell Blvd to Lakeville St)	0.95	319	50	Sideswipe (18)	Unsafe Speed (12)	1	26%	4	1	1	3	0	7	4
N McDowell Blvd (Lynch Creek Way to E Washington St)	0.46	158	38	Broadside (14)	Automobile Right of Way (12)	0	11%	6	2	1	4	2	2	1
E Washington St (Howard St to Lakeville St)	0.61	283	29	Rear End (8)	Unsafe Speed (8) / Improper Turning (8)	1	31%	6	1	1	3	4	5	2
Caltrans Jurisdiction														
SR 116 (US 101 NB Ramps to Frates Rd)	1.25	470	47	Rear End (30)	Unsafe Speed (23)	2	17%	6	0	0	0	2	3	1
SR 116 (Pine View Way to S of Silace Rd near S City Limit)	1.10	389	21	Hit Object (6) / Sideswipe (6)	Improper Turning (5)	2	52%	3	0	0	0	1	5	2

Recommended countermeasures for the priority locations were chosen per the most recent LRSM, guidance from the stakeholders on preferred countermeasures, crash characteristics, public input from the project website and Community Meeting, and roadway observations.

Table 7, Table 8, and Table 9 present a list of possible recommended safety countermeasures for each priority intersection and segment, along with a subsequent Crash Reduction Factor (CRF). One or many of the countermeasures can be selected for applications. It is noted that if more than one countermeasure is applied at a location the Combined Crash Reduction Factor (CCRF) is adjusted multiplicatively by the following equation (CCRF_i = 1- [(1-CRF1)*(1-CRF2)*(1-CRF3)] etc.).

Table 7 Recommended Countermeasures for Priority Intersections

Intersection	Control	Relevant Challenge Area(s)	Countermeasure Number	Crash Reduction Factor	Funding Eligibility	Recommended Countermeasures	Reasoning
City Jurisdiction							
S McDowell Blvd / Caulfield Ln	Signal	Intersections	S02	15%	100%	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	19 rear end collisions.
		Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	19 rear end collisions. 2 pedestrian collisions due to pedestrians failing to wait for the proper pedestrian crossing phase. Multiple priority locations along McDowell Blvd.
		Pedestrians	S21PB	60%	100%	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	2 pedestrian collisions: 1 fatal and 1 severe injury.
		Intersections	-	-	-	Install right turn lane	On southbound approach.
McDowell Blvd / E Washington St	Signal	Intersections	S02	15%	100%	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	29 rear end collisions.
		Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	Review clearance timing on all phases.
		Pedestrians, Bicyclists	S20PB	15%	100%	Install advance stop bar before crosswalk (Bicycle Box)	2 bicycle collisions and 1 pedestrian collision.
		Intersections	-	-	-	Increase enforcement	7 collisions with DUI as a primary collision factor. 2 collisions due to bicycles travelling on the wrong side of the road.
N McDowell Blvd / Professional Dr	Signal	Intersections	S03	15%	50%	Improve signal timing (phases, red, yellow, or operation)	Multiple priority locations along McDowell Blvd.
		Pedestrians, Bicyclists	S20PB	15%	100%	Install advance stop bar before crosswalk (Bicycle Box)	3 bicycle collisions and 1 pedestrian collision. 2 of the 3 bicycle collisions were severe injuries.
		Pedestrians, Bicyclists	S21PB	60%	100%	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	3 bicycle collisions and 1 pedestrian collision. 2 of the 3 bicycle collisions were severe injuries.
Petaluma Blvd N / Sycamore Ln/Shasta Ave	Signal	Intersections	S02	15%	100%	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	7 rear end collisions, including 1 severe injury. Sycamore Ln/Shasta Ave approaches to intersection are skewed.
		Pedestrians, Bicyclists	S21PB	60%	100%	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	1 pedestrian collision resulting in a severe injury.
		Intersections	-	-	-	Upgrade intersection lane markings	Replace existing Botts dots with thermoplastic striping.
		Pedestrians	-	-	-	Restripe crosswalks	Crosswalks on minor road appear faded.
Ely Blvd S / Caulfield Ln	AWSC	Intersections	NS07	25%	100%	Upgrade intersection pavement markings (Stop Ahead)	8 collisions due to a traffic signals and signs violation, including 1 severe injury. Install "STOP AHEAD" pavement markings on approaches to intersection.
Washington St / Keller St	TWSC	Intersections	NS06	15%	100%	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	13 broadside collisions. To clarify that intersection is two-way stop controlled.
		Intersections	NS15	50%	90%	Create directional median openings to allow (and restrict) left-turns and u- turns	13 broadside collisions. Existing northbound left turns are restricted.
		Intersections	NS02	50%	100%	Evaluate conversion to all-way STOP control (from 2-way or Yield control)*	13 broadside collisions.
		Intersections	NS03	30%	100%	Evaluate installing signals*	13 broadside collisions.
E Washington St / Lakeville St	Signal	Intersections	S02	15%	100%	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	18 rear end collisions. Align northbound Washington St signal pole and indications.
		Intersections	S09	10%	100%	Install raised pavement markers and striping (Through Intersection)	For eastbound and westbound approaches.
		Intersections	S16	Varies	100%	Evaluate converting intersection to roundabout (from signal)	
E D St / Lakeville St	Signal	Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	Install signal interconnect and coordinate with Washington St / D St. Review and increase signal clearance timing as necessary.
		Bicyclists	-	-	-	Install bike lane striping and lane assignment storage	On northbound approach.
		Intersections	S16	Varies	100%	Evaluate converting intersection to roundabout (from signal)	
E Washington St / Ellis St/Johnson St	Signal	Intersections	S02	15%	100%	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	11 rear end collisions.
		Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	Review clearance timing on all phases.
		Intersections	-	-	-	Install advance intersection lane control sign (R3-8A, per MUTCD)	On westbound approach

* Intersection must meet CA MUTCD warrants to implement countermeasure

Table 8 Recommended Countermeasures for Priority Interchanges

Intersection	Control	Relevant Challenge Area(s)	Countermeasure Number	Crash Reduction Factor	Funding Eligibility	Recommended Countermeasures	Reasoning
Caltrans Jurisdiction							
SR 116 / S McDowell Blvd (W)	Signal	Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	8 rear end collisions. Several priority intersections along SR 116 corridor.
		Pedestrians	S21PB	60%	100%	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	1 fatal pedestrian collision.
SR 116 / US 101 SB Ramps	Signal	Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	4 rear end collisions. Several priority intersections along SR 116 corridor.
		Bicyclists	-	-	-	Install green conflict markings on bicycle lanes	2 bicycle collisions, including 1 severe injury.
SR 116 / Pine View Way	TWSC	Distracted Driving	NS06	15%	100%	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	1 fatal collision due to automobile right of way. Install advance warning sign on minor road approach.
		-	-	-	-	Install yield signs for right turn movements	No current yield signs.
		OR				Evaluate installing signals*	8 collisions due to an automobile right of way collision, including 1 fatality.
SR 116 / S McDowell Blvd Ext	TWSC	Distracted Driving	NS06	15%	100%	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	2 broadside collisions.
E Washington St / US 101 NB Ramps	Signal	Pedestrians	S21PB	60%	100%	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	2 pedestrian collisions.
		Intersections	-	-	-	Traffic control enforcement	9 collisions due to automobile right of way violations.
		Intersections	-	-	-	Upgrade ramps per NACTO signage and striping guidance	3 bicycle collisions.
		Bicyclists	-	-	-	Install green conflict markings on bicycle lanes	3 bicycle collisions.
SR 116 / Casa Grande Rd	Signal	Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	9 rear end collisions. Several priority intersections along SR 116 corridor.
		Intersections	S10	30%	100%	Install flashing beacons as advance warning	9 rear end collisions.
		Pedestrians	S21PB	60%	100%	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	1 pedestrian collision resulting in a severe injury.
SR 116 / Baywood Dr	Signal	Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	16 rear end collisions. Several priority intersections along SR 116 corridor.
SR 116 / Marina Ave	Signal	Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	19 rear end collisions. Several priority intersections along SR 116 corridor.
* Intersection must meet CAMUTCD warrants to implement countermeasure							

Table 9 Recommended Countermeasures for Priority Segments

Segment	Length (mi)	Relevant Challenge Area(s)	Countermeasure Number	Crash Reduction Factor	Funding Eligibility	Recommended Countermeasures	Reasoning
City Jurisdiction							
N McDowell Blvd (Old Redwood Hwy/Petaluma Blvd N to Lynch Creek Way)	2.53	Aggressive Driving / Speed Management	R26	30%	100%	Install dynamic/variable speed warning signs	22 unsafe speed collisions. Concentration of collisions between Redwood Way and Corona Rd. This segment is curvilinear in comparison to other portions of the roadway.
Lakeville St (Wilson St to Caulfield Ln)	0.38	-	R01	35%	100%	Add segment lighting	5 collisions at night, including 1 fatality and 1 severe injury. Lighting is only on the southern side of the roadway.
		-	R08	25%	90%	Install raised median	5 collisions due to automobile right of way violations. Between East Ct and Caulfield Ln.
Corona Rd (N McDowell Blvd to Industrial Ave)	0.37	Aggressive Driving / Speed Management	R26	30%	100%	Install dynamic/variable speed warning signs	On speed limit signs on curve north of Industrial Ave. Public request to mitigate speeds along Corona Rd.
		Pedestrians, Bicyclists	R34PB	80%	90%	Install sidewalk/pathway (to avoid walking along roadway)	1 fatal pedestrian collision. No existing sidewalk or paths for pedestrians. Consider widening bridge to add facilities for pedestrians.
E Washington St (McDowell Blvd to Lakeville St)	0.95	Bicyclists	-	-	-	Install wayfinding signs to alternate bicycle routes	3 bicycle collisions. No existing bike lanes. Corridor leads to downtown area.
		-	-	-	-	Resurface the roadway	Multiple public requests to repave overpass. Pavement has cracking and potholes.
		-	-	-	-	Restripe roadway with thermoplastic striping	18 sideswipe collisions. To increase visibility of lanes. Several locations where striping is either Botts dots or faded.
N McDowell Blvd (Lynch Creek Way)	0.46	Bicyclists	R32PB	35%	90%	Install bike lanes	4 bicycle collisions.
		-	-	-	-	Evaluate installing raised median	14 broadside collisions. For access management.
E Washington St (Howard St to Lakeville St)	0.61	Bicyclists	R32PB	35%	90%	Install bike lanes	3 bicycle collisions. No existing bike lanes. Corridor is in downtown area.
		Pedestrians	-	-	-	Evaluate reducing number of uncontrolled crosswalks	Several uncontrolled crosswalks in close proximity to one another.
		Aggressive Driving / Speed Management	-	-	-	Speed enforcement	8 collisions due to unsafe speed violations. Per public request.
Caltrans Jurisdiction							
SR 116 (US 101 NB Ramps to Frates Rd)	1.25	-	R08	25%	90%	Install raised median	On approaches to intersections. 1 head on collision that resulted in a fatality.
		Aggressive Driving / Speed Management	-	-	-	Speed enforcement	23 collisions due to unsafe speed violations.
SR 116 (Pine View Way to S of Silace Rd near S City Limit)	1.1	Distracted Driving	R30	20%	100%	Install centerline rumble strips/stripes	6 sideswipe collisions. High speed roadway with one lane in each direction.
		Distracted Driving	R31	15%	100%	Install edgeline rumble strips/stripes	6 hit object collisions and 3 head on collisions, including 1 fatality.

Countermeasures were also recommended for some intersections that had high densities of collisions or that had high numbers of bicycle or pedestrian collisions. **Table 10** includes the lists of these countermeasures.

Table 10 Recommended Countermeasures for Other Intersections

Intersection	Control	Relevant Challenge Area(s)	Countermeasure Number	Crash Reduction Factor	Funding Eligibility	Recommended Countermeasures	Reasoning
City Jurisdiction							
D St / 5th St	TWSC	Intersections	NS02	50%	100%	Evaluate conversion to all-way STOP control (from 2-way or Yield control)*	
		Distracted Driving	NS06	15%	100%	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	Install intersection warning signs.
		Intersections	NS07	25%	100%	Upgrade intersection pavement markings	
D St / 6th St	Signal	Intersections	S02	15%	100%	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	
		Distracted Driving	S10	30%	100%	Install flashing beacons as advance warning	
		Intersections	-	-	-	Upgrade intersection pavement markings	
		Intersections	-	-	-	Monitor vegetation and proactively perform trimming	
E Washington St / Maria Dr	Signal	Intersections	-	-	-	Install right turn lane	On eastbound and westbound approaches.
		Intersections	-	-	-	Refresh intersection markings	On eastbound and westbound approaches.
		Bicyclists	-	-	-	Install green conflict markings for bicycles	On eastbound and westbound approaches.
D St / Petaluma Blvd S	Signal	Intersections	S03	15%	50%	Improve signal timing (coordination, phases, red, yellow, or operation)	Install right turn signal phase and prohibit right turn on red for westbound right turns.
N McDowell Blvd / E Madison St	Signal	Intersections	S08	30%	100%	Convert signal to mast arm (from pedestal-mounted)	
		Pedestrians	S21PB	60%	100%	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	
		Intersections	-	-	-	Upgrade intersection pavement markings	Install green conflict markings on sharrow.
		Pedestrians	-	-	-	Install high visibility crosswalk	No existing crosswalk on northbound approach.
S McDowell Blvd / McKenzie Avenue/Maria Drive	Signal	Intersections	S08	30%	100%	Convert signal to mast arm (from pedestal-mounted)	
		Intersections	-	-	-	Upgrade school zone signing and striping to most current MUTCD and NACTO guidance	
		Distracted Driving	-	-	-	Conduct targeted enforcement during school hours and events	
		Pedestrians, Bicyclists	-	-	-	Education campaign on rules of the road for McDowell Elementary School	
		Pedestrians, Bicyclists	-	-	-	Consider flagging or crossing guard(s) during events	
D St / 4th St	TWSC	Intersections	NS02	50%	100%	Evaluate conversion to all-way STOP control (from 2-way or Yield control)*	
Caulfield Ln / St Francis Dr	AWSC	Intersections	-	-	-	Refresh intersection markings	On eastbound and westbound approaches.
		Bicyclists	-	-	-	Install green conflict markings for bicycles	On eastbound and westbound approaches.
Caulfield Ln / Payran St	Signal	Intersections	-	-	-	Refresh intersection markings	On eastbound and westbound approaches.
		Bicyclists	-	-	-	Install green conflict markings for bicycles	On eastbound and westbound approaches.
S McDowell Blvd / Casa Grande Rd	AWSC	Bicyclists	-	-	-	Extend existing bicycle lanes to intersection	
		OR					
		Intersections	S16	Varies	100%	Evaluate converting intersection to roundabout (from signal)	13 collisions, including 4 bicycle related collisions. Public request.

* Intersection must meet CA MUTCD warrants to implement countermeasure

6.1.2 Identified Challenge/Emphasis Areas

Per the SHSP, the identified challenge/emphasis areas for the LRSP were as follows:

1. **Bicycling** – Bicycling safety countermeasures/projects were recommended at multiple locations.
2. **Distracted Driving** – Prevention of distracted roadway usage is addressed through education and enforcement component of the non-engineering strategies. These strategies can be communicated through the police department, social media channels, and through the schools.
3. **Aggressive Driving / Speed Management** – Aggressive driving can include improper speeds, improper turning and improper passing. Engineering strategies were identified for intersections and segments at locations where these issues were identified. Non-engineering strategies to prevent aggressive driving includes enforcement in selective areas with a speed management education campaign.
4. **Intersections** – Projects were identified for the top intersections with collision severity and frequency.
5. **Pedestrians** – Providing pedestrian accommodations to include crossing enhancements. Other locations for pedestrian improvements are identified in the engineering strategies. Non-engineering strategies to improve pedestrian safety will be discussed in a later section of the report.

6.1.3 Systemic Safety Countermeasures

When selecting countermeasures, just focusing on locations with a current collision issue is a reactive approach to roadway safety planning. A reactive approach targets recent hot-spots and specific challenges that are associated with these locations; as a result of this approach, locations with low traffic volumes but with similar safety issues as hot spot locations are not addressed. In order to mitigate collisions in a both a reactive and proactive approach, Caltrans' Local Roadway Safety Manual suggests agencies utilize a comprehensive approach that includes systemic and hot spot location improvements in developing a safety plan.

While analyzing crash characteristics at the priority locations in the city, patterns in crashes were identified. Potential countermeasures that can be applied systemically throughout various locations in the city are presented in **Table 11** below.

Table 11 Recommended Systemic Countermeasures

Location	Type of Countermeasure	Countermeasure	Reasoning
Signalized Intersections	Engineering	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size and number, provide pedestrian countdown timers and updated push buttons, AND Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	Several signalized intersections with rear end collisions. Intersections and pedestrians are challenge/emphasis areas in the LRSP. Crossing improvements at signalized intersections was the top preferred pedestrian safety improvement from the public workshop.
Washington Street; McDowell Boulevard	Engineering	Resurface and restripe roadway	Roadways appear to have many cracks and potholes. Many public requests to improve pavement quality along these roadways.
Near schools	Engineering	Pedestrian and bicycle improvements	Schools requested pedestrian and bicycle improvements such as providing continuous sidewalk, crossing enhancements, and bike lanes. Pedestrians and bicyclists are challenge/emphasis areas in the LRSP.
Citywide	Engineering	Pedestrian and bicycle improvements	Evaluate where pedestrian and bicycle improvements can be provided through grants and maintenance projects. Evaluate and implement road diets as feasible to add bike lanes. Wayfinding signage is also important for the bike routes.
Citywide	Enforcement	Speed enforcement	Unsafe speed was top violation category in the City. Many public requests to mitigate speeds. Speed management was the top preferred non-engineering improvement from the public workshop.
Citywide	Education	Distracted driving campaign	Distracted driving enforcement and education was one of the top preferred non-engineering improvements from the public workshop. Distracted driving is a challenge/emphasis area in the LRSP.
Citywide	Education	Education campaign for bicyclists and pedestrians about rules of the road	Bicycle collisions from bicycles travelling on the wrong side of the road. Many pedestrian collisions from pedestrian violations (crossing at a signal before proper phase, walking in the road, etc.). Bicyclists and pedestrians are challenge/emphasis areas in the LRSP.

6.1.4 Active Transportation

Petaluma has an active walking and biking community, with many multimodal improvements already on the roadways or in planning and design. In evaluating future transportation projects, it is important to look for opportunities to incorporate facilities and safety improvements for bicycle, pedestrians, and transit, including evaluating protected bicycle and pedestrian pathways. This will help to provide a safe alternative to driving and reduce greenhouse gases while increasing the health and vitality of the community.

6.1.5 Disadvantaged Communities





According to Sonoma County Transportation Authority’s disadvantaged communities map, the City of Petaluma does not have any Portrait of Sonoma County Priority Places or Equity Priority Communities from Plan Bay Area 2050. However, the city has three 2020 Active Transportation Program (ATP) Disadvantaged Schools. The ATP Disadvantaged Schools in the city are as follows: McDowell Elementary School, San Antonio High School (an alternative education program), and Miwok Valley Elementary Charter School.

6.2 Non-Engineering Strategies

It is important to recognize that not all safety issues can be addressed through an infrastructure improvement alone. A comprehensive approach to selecting safety countermeasures involves all 5 E’s of traffic safety, not just engineering.

Table 12 shows some of the identified non-engineering strategies utilized to provide a comprehensive approach to improving traffic safety in Petaluma.

Table 12 Non-Engineering Strategies

Strategy Type	Recommended Strategy
 Education	Bicycle and pedestrian safety campaigns
	Driver education and campaigns related to driving under the influence and distracted driving
	Safe Routes to School maps and outreach at schools
	Social media blasts with education campaigns
	Seek opportunities for public service advertisements such as billboards and public utility box wraps in the downtown area. Include options for alternative rides to help prevent DUIs.
	Dangers of speeding/speed management campaigns (e.g. Keep Kids Alive Drive 25)
	Partner with Sonoma County Health and SCTA with public information
 Emerging Technologies	Video/bicycle detection
	Intelligent Transportation System (ITS) infrastructure, web/mobile applications (apps) and smart cities practices
	Upgraded controllers for flashing yellow arrows (FYAs) and leading pedestrian intervals
	Installing touchless Accessible Pedestrian Signals (APS)
	Communication with traffic signals
 Enforcement	Changeable message signs
	Targeted speed enforcement focused on areas of concern from public feedback
	Prioritize patrol patterns and overall presence at high incident locations
	Continue conduct DUI checkpoints within impaired driving collision concentrations. Advertise as required, engage with media outlets (i.e. DUI Checkpoints).
	Increase the number of traffic officers
 Emergency Response	Distracted driving enforcement
	Consider emergency vehicle pre-emption at signalized intersections
	Continue to conduct training targeted at responding to speed-related collisions
	Improvements to roadways to increase access, reduce congestion, and potentially shorten response times

6.3 Projects Suggested Through Public Input

The interactive map tool on the public website for the plan gathered many suggestions from community members for areas of improvement. The suggestions from the interactive map comments are listed below, in order of highest number of comments to lowest. To view the locations associated with the suggestions, see **Appendix A: Community Engagement**.

- Evaluate speed limit and/or implement speed mitigation measures
- Pedestrian crossing enhancements
- Improve bicycle safety
- Evaluate conversion to roundabout
- Install crosswalk
- Traffic safety enforcement
- Install bike lane
- Install sidewalk
- Evaluate conversion to all-way stop control
- Improve pedestrian safety
- Evaluate intersection sight distance

- Evaluate lane configuration
- Repair pavement
- Improve signal timing
- Create alternate pedestrian/bicycle route
- Evaluate conversion to signal
- Consider installing photo enforcement
- Evaluate lane widths and/or geometry
- Install additional signage/striping
- Evaluate removing vehicular access
- Reduce number of lanes and install bicycle lanes (road diet)
- Convert to one-way street
- Upgrade/rehabilitate pavement markings
- Evaluate signal heads
- Remove objects from the roadway
- Consider relocating signal detector
- Evaluate opportunities to increase traffic flow
- Improve intersection safety
- Install street lighting

These improvements were considered in the development of the countermeasures included in this document.

7. Prioritize and Incorporate Strategies

7.1 Funding Sources

The City will look for opportunities to leverage existing funding for street paving and maintenance. Additional funding opportunities can come through grant funding to include Highway Safety Improvement Program (HSIP), Active Transportation Program (ATP), One Bay Area Grant 3 (OBAG 3), and Congestion Mitigation and Air Quality program (CMAQ).

The primary source of potential funding for projects recommended in this plan is HSIP funding. Each cycle has available project funding for BCR and funding set-aside projects. BCR projects use expected benefit and estimated cost to determine eligibility and likelihood for receiving funding. The expected benefit is determined using the crash history and the predicted collision reduction from the recommended countermeasures. On the other hand, funding set-aside projects do not require a collision history. The set-aside countermeasures available to agencies consisted of guardrail upgrades, pedestrian crossing enhancements, installing edge lines, bike safety improvements, and tribes. These set-aside countermeasures can be applied at multiple locations (systemically) as long as the requested funding was within the amount available per agency.

ATP funding for engineering projects is primarily for installing or improving non-mobilized transportation infrastructure. Projects are more likely to receive this type of funding if it helps to increase the number of walkers and bikers, in a disadvantaged community, or improves the safety of children, specifically at school zones. Ultimately, the goal of this type of funding is to increase the use of active transportation.

7.2 Prioritized Projects

In evaluating how to implement safety projects, prioritized lists of projects are included below. Note that some countermeasures, such as roundabouts, will require further investigation into their feasibility before implementation. **Tables 13** and **14** contain lists of the proposed intersection projects on city roadways and their respective expected benefits from the HSIP Cycle 11 Analyzer. These tables also show potential funding opportunities.

In addition, in the last HSIP call for projects, Cycle 10, the awarded projects through the BCR application started at a BCR of 12. Even though the minimum for the grant application was a BCR of 3.5, the projects submitted were very competitive. Some of this was due to funding shortfalls with COVID lockdowns and the HSIP grant application deadline extension which allowed more agencies to submit. Therefore, the maximum project cost is also included for a BCR of 10.

Systemic countermeasures are preferred by Caltrans in the HSIP process. Therefore, with locations with high benefit-to-cost ratios, it is recommended to add other similar high-risk locations that could benefit from the same countermeasures in applying the improvements systemically. This approach will reduce the BCR but provide a more competitive application.

Table 13 *Expected Benefits for Recommended Intersection Countermeasures*

Intersection	Recommended Countermeasures	Max Project Cost for B/C Ratio of 10	Total Expected Benefit	HSIP Funding Reimbursement Ratio	HSIP Set-Aside**
<i>City Jurisdiction</i>					
S McDowell Blvd / Caulfield Ln	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	\$556,464	\$5,564,640	100%	-
	Improve signal timing (coordination, phases, red, yellow, or operation)			50%	-
	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)			100%	-
	Install right turn lane			-	-
McDowell Blvd / E Washington St	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	\$153,701	\$1,537,009	100%	-
	Improve signal timing (coordination, phases, red, yellow, or operation)			50%	-
	Install advance stop bar before crosswalk (Bicycle Box)			100%	-
	Increase enforcement			-	-
N McDowell Blvd / Professional Dr	Improve signal timing (phases, red, yellow, or operation)	\$569,216	\$5,692,161	50%	-
	Install advance stop bar before crosswalk (Bicycle Box)			100%	-
	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)			100%	-
Petaluma Blvd N / Sycamore Ln/Shasta Ave	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	\$305,644	\$3,056,436	100%	-
	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)			100%	-
	Upgrade intersection lane markings			-	-
	Restripe crosswalks			-	-
Ely Blvd S / Caulfield Ln	Upgrade intersection pavement markings (Stop Ahead)	\$217,151	\$2,171,511	100%	-
Washington St / Keller St	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	\$920,298	\$9,202,978	100%	-
	Create directional median openings to allow (and restrict) left-turns and u- turns			90%	-
Washington St / Keller St	Evaluate conversion to all-way STOP control (from 2-way or Yield control)*	\$428,046	\$4,280,455	100%	-
Washington St / Keller St	Evaluate installing signals*	\$513,655	\$5,136,546	100%	-
E Washington St / Lakeville St	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	\$96,870	\$968,704	100%	-
	Install raised pavement markers and striping (Through Intersection)			100%	-
E Washington St / Lakeville St	Evaluate converting intersection to roundabout (from signal)	\$34,893	\$348,933	100%	-
E D St / Lakeville St	Improve signal timing (coordination, phases, red, yellow, or operation)	\$58,215	\$582,154	50%	-
	Install bike lane striping and lane assignment storage			-	-
E D St / Lakeville St	Evaluate converting intersection to roundabout (from signal)	<i>Dependant on traffic volumes</i>	<i>Dependant on traffic volumes</i>	100%	-
E Washington St / Ellis St/Johnson St	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	\$319,508	\$3,195,080	100%	-
	Improve signal timing (coordination, phases, red, yellow, or operation)			50%	-
	Install advance intersection lane control sign (R3-8A, per MUTCD)			-	-
<i>Caltrans Jurisdiction</i>					
SR 116 / S McDowell Blvd (W)	Improve signal timing (coordination, phases, red, yellow, or operation)	\$319,508	\$3,195,080	50%	-
	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)			100%	-
SR 116 / US 101 SB Ramps	Improve signal timing (coordination, phases, red, yellow, or operation)	\$74,236	\$742,364	50%	-
	Install green conflict markings on bicycle lanes			-	-
SR 116 / Pine View Way	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	\$100,448	\$1,004,480	100%	-
	Install yield signsfor right turn movements			-	-
SR 116 / Pine View Way	Evaluate installing signals*	\$401,792	\$4,017,919	100%	-
SR 116 / S McDowell Blvd Ext	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	\$95,489	\$954,887	100%	-
	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)			-	-
E Washington St / US 101 NB Ramps	Traffic control enforcement	\$43,608	\$436,082	-	-
	Upgrade ramps per NACTO signage and striping guidance			-	-
	Install green conflict markings on bicycle lanes			-	-
	Install flashing beacons as advance warning			-	-
SR 116 / Casa Grande Rd	Improve signal timing (coordination, phases, red, yellow, or operation)	\$327,839	\$3,278,388	50%	-
	Install flashing beacons as advance warning			100%	-
	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)			100%	-
SR 116 / Baywood Dr	Improve signal timing (coordination, phases, red, yellow, or operation)	\$37,884	\$378,843	50%	-
SR 116 / Marina Ave	Improve signal timing (coordination, phases, red, yellow, or operation)	\$37,857	\$378,573	50%	-

¹ Non-engineering countermeasure

² Not HSIP Cycle 10 countermeasure

³ Not included in project benefit, as HSIP applications limit the number of countermeasures to 3

* Includes 30% contingency

**PCE = Pedestrian Crossing Enhancements, B = Bike Safety Improvements, E = Install Edgelines

Table 14 Expected Benefits for Recommended Segment Countermeasures

Segment	Recommended Countermeasures	Max Project Cost for B/C Ratio of 10	Total Expected Benefit	HSIP Funding Reimbursement Ratio	HSIP Set-Aside**
City Jurisdiction					
N McDowell Blvd (Old Redwood Hwy/Petaluma Blvd N to Lynch Creek Way)	Install dynamic/variable speed warning signs	\$909,504	\$9,095,037	100%	-
	Add segment lighting	\$826,642	\$8,266,421	100%	-
Lakeville St (Wilson St to Caulfield Ln)	Install raised median			90%	-
	Install dynamic/variable speed warning signs	\$968,651	\$9,686,514	100%	-
Corona Rd (N McDowell Blvd to Industrial Ave)	Install sidewalk/pathway (to avoid walking along roadway)			90%	-
	Install wayfinding signs to alternate bicycle routes			-	-
E Washington St (McDowell Blvd to Lakeville St)	Resurface the roadway	\$0	\$0	-	-
	Restripe roadway with thermoplastic striping			-	-
N McDowell Blvd (Lynch Creek Way to E Washington St)	Install bike lanes	\$84,990	\$849,895	90%	B
	Evaluate installing raised median			-	-
E Washington St (Howard St to Lakeville St)	Install bike lanes	\$392,163	\$3,921,632	90%	B
	Evaluate reducing number of uncontrolled crosswalks			-	-
	Speed enforcement			-	-
City Jurisdiction					
SR 116 (US 101 NB Ramps to Frates Rd)	Install raised median	\$702,565	\$7,025,651	90%	-
	Speed enforcement			-	-
SR 116 (Pine View Way to S of Silace Rd near S City Limit)	Install centerline rumble strips/stripes	\$370,939	\$3,709,393	100%	-
	Install edgeline rumble strips/stripes			100%	-

¹ Non-engineering countermeasure

² Not HSIP Cycle 10 countermeasure

³ Not included in project benefit, as HSIP applications limit the number of countermeasures to 3

* Includes 30% contingency

**PCE = Pedestrian Crossing Enhancements, B = Bike Safety Improvements, E = Install Edgelines

8. Evaluation Process

To evaluate the success of this plan, yearly collision analysis, along with requests for public feedback, can take place and be compared to the established goals.

Goal 1

Maintain existing Crossroads database and standardized reporting practices.

Measure of Success: Crossroads database has an increase in accurately reported collision information including coordinates, collision types, violation categories, etc.

Goal 2

Reduce pedestrian and bicycle collisions with improved accommodations.

Measure of Success: Pedestrian and bicycle collisions trend downward in a five-year period.

Goal 3

Improve safety and accessibility for vulnerable road users.

Measure of Success: The number of residents choosing active transportation more often noticeably increases. Residents report feeling safe while using active transportation facilities. This can be captured through a public survey.

Goal 4

Improve safety around schools with a connected multimodal system, enhanced crossings, enforcement of school zones, education campaigns about school drop off/pick up, bicycle and pedestrian safety, and driver awareness.

Measure of Success: Residents will feel more comfortable choosing multimodal transportation to travel to and from school zones and express an increased feeling of safety in these areas. This can be captured through a survey from the schools.

Goal 5

Reduce improper turning related collisions through engineering, enforcement, and education strategies.

Measure of Success: Collisions are reviewed every five years and improper turning related collisions trend downward over a five-year period.

Goal 6

Develop an implementation priority for identified countermeasures. Implement countermeasures utilizing strategies across all traffic safety disciplines, engineering, enforcement, education, & emergency services.

Measure of Success: Priority for implementing countermeasures is planned. Implemented countermeasures not only incorporate engineering strategies, but also other disciplines such as emerging technologies, enforcement, education, and emergency services.

Goal 7

Implement speed management strategies and increase enforcement presence.

Measure of Success: Road users increasingly obey traffic laws, specifically related to speed. Strategies targeted towards managing speed are prioritized.

Goal 8

Regularly engage with partner agencies, stakeholders, advocacy groups, and the public to enhance identification of collision patterns and countermeasures.

Measure of Success: Collisions are reviewed every five years and the LRSP is updated accordingly to address emerging trends and concerns.

9. Next Steps

The Local Roadway Safety Plan was unanimously adopted by City Council on August 1, 2022. This safety plan will be a living document and will guide the city's roadway safety needs for the next five years. It will be updated as needed and the goals will be monitored.

10. References

Traffic Data

- Crossroads Collision Reports, City of Petaluma, 2016-2020.

Manuals, Plans, and Studies

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- “Highway Safety Manual”, American Association of State Highway Officials (AASHTO), 1st Edition, 2014 supplement.
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Websites

- California Department of Transportation, “Strategic Highway Safety Plan (SHSP)”, <https://dot.ca.gov/programs/safety-programs/shsp>.
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- California Department of Transportation, “HSIP Cycle 10”, <https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/highway-safety-improvement-program/apply-now>.
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- City of Petaluma, “Climate Emergency Action Framework”, https://storage.googleapis.com/proudcity/petalumaca/uploads/2021/02/Climate-Action-Framework_Final.pdf

Surveys

- Local Road Safety Plan Project Survey, <https://lrsp.mysocialpinpoint.com/city-of-petaluma-lrsp>.

Appendix A

Community Engagement

Appendix B

Existing Safety Efforts

Appendix C

Collision Data