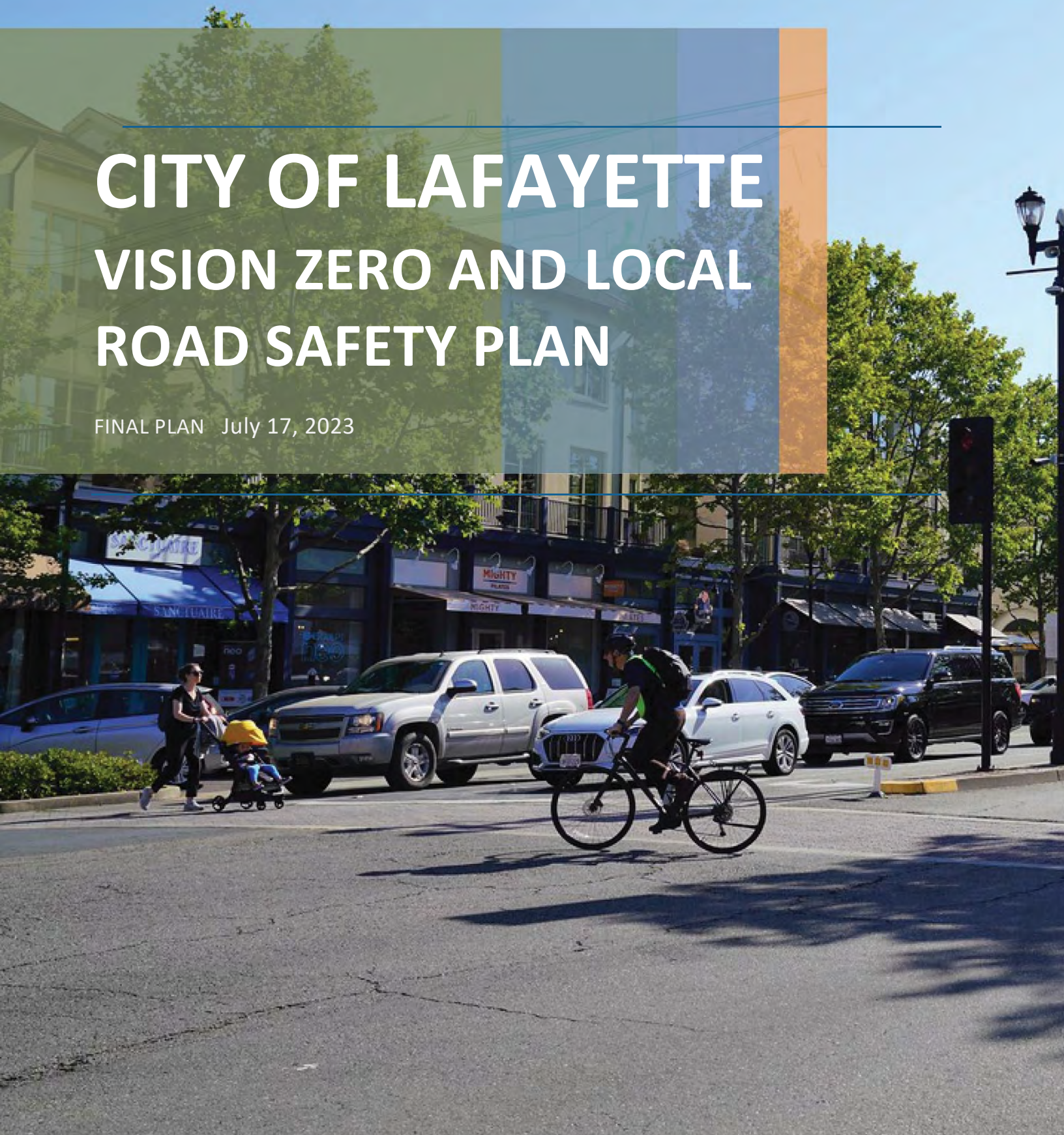
CITY OF LAFAYETTE
VISION ZERO AND LOCAL ROAD SAFETY PLAN

FINAL PLAN July 17, 2023



ACRONYMS

ADA – Americans with Disabilities Act
CCTA – Contra Costa Transportation Authority
CHP – California Highway Patrol
CMFs – Crash Modification Factors
EPDO - Equivalent Property Damage Only
FHWA – Federal Highway Administration
GIS – Geographic Information System
HIN – High Injury Network
HSIP – Highway Safety Improvement Program
KSI – Killed or Seriously Injured
LRSP – Local Road Safety Plan
MTC – San Francisco Bay Area Metropolitan Transportation Commission
NHTSA - National Highway Traffic Safety Administration
SS4A -- Safe Streets and Roads for All
SWITRS – Statewide Integrated Traffic Records System
TIMS – Transportation Injury Mapping System
TDM – Travel Demand Management
TransCirc – Transportation & Circulation Commission
VMT – Vehicle Miles Traveled
VZAP – Vision Zero Action Plan

KEY TERMS

Vision Zero – A strategy to eliminate all roadway deaths and serious injuries while increasing safe, healthy, and equitable mobility for all.[1]

Safe System Approach – A proven methodology to achieve Vision Zero that seeks to dramatically reduce killed and serious injury crashes on our roadways through a systems-based approach to prioritizing safety. The Safe System Approach recognizes that humans make mistakes and therefore focuses on eliminating killed and serious injury crashes instead of *all* crashes.[2]

Local Road Safety Plan – A plan that provides a framework for identifying, analyzing, and prioritizing roadway safety improvements on local roads. The Local Road Safety Plan development process and content are tailored to local issues and needs, resulting in a prioritized list of issues, risks, actions, and improvements that can be used to reduce killed and serious injury crashes on local roads.[3]

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[1] "What is Vision Zero?" Vision Zero Network, https://visionzeronetwork.org/about/what-is-vision-zero/.

[2] "Zero Deaths and Safe System." Federal Highway Administration, https://highways.dot.gov/safety/zero-deaths.

[3] "Local Road Safety Plans." Federal Highway Administration, https://highways.dot.gov/safety/proven-safety-countermeasures/local-road-safety-plans.

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CITY OF LAFAYETTE STAFF

- Patrick Golier, Transportation & Circulation Program Manager
- Mike Moran, Director of Engineering and Public Works

LOCAL ROAD SAFETY PLAN TASK FORCE

- Chief Ben Alldritt, Lafayette Police Department
- Chris Bachman, Contra Costa Fire Protection District
- Greg Barnes, Lafayette School District
- Greg Brown, Transportation & Circulation Commission
- Susan Candell, Lafayette City Council
- Colin Clarke, Contra Costa County Transportation Authority
- Mark Dreger, At Large Community Member
- Teresa Gerringer, Lafayette City Council
- Luz Gomez, Contra Costa Health Services
- Jenifer Paul, At Large Community Member
- Kirstin Riker, 511 Contra Costa County
- Tommy Rodriguez, Acalanes Union High School District
- Katie Santos, Lafayette Chamber of Commerce
- Emily Warming, Contra Costa Health Services
- Stella Wotherspoon, Transportation & Circulation Commission (Alternate)

CONSULTANT TEAM

Toole Design Group

- Sarah Abel, Principal in Charge
- Alison Mills, Project Manager
- Diane Xiao, Project Manager
- Brian Almdale, Project Manager
- Lauren Pepe, Planner
- Adam Russell, Planner
- Joanna Wang, Planner

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PUSH
BUTTON TO
TURN ON
WARNING
LIGHTS
15

INTRODUCTION

A Local Road Safety Plan (LRSP) provides a roadmap to identify and address key local safety issues in order to eliminate the number of killed and serious injury crashes in a community. The LRSP analyzes local data and conditions, identifies specific needs, and develops a customized set of actions and improvements to proactively lay the groundwork for future safety projects. LRSPs follow state and national guidance and processes which make the community eligible for project funding through grant programs including the Highway Safety Improvement Program (HSIP) and Safe Streets and Roads for All (SS4A).

A CALL FOR SAFER ROADS IN LAFAYETTE

In September 2021, a volunteer crossing guard lost his life as he pushed children out of the way of an oncoming vehicle outside of Stanley Middle School in Lafayette. This tragic incident underscored the need for immediate action to improve roadway safety and save lives in Lafayette. Two months later, in November 2021, the Lafayette City Council unanimously adopted a Vision Zero Policy that committed the City to eliminating deaths and serious injuries among all system users.[4]

Lafayette has established a goal of eliminating road deaths and serious injuries in the city by 2033.

Compared to many other cities, road deaths and serious injuries in Lafayette are relatively low, with 14 reported killed or serious injury (KSI) crashes between 2017 and 2021. However, the goal of Vision Zero is to reach zero deaths and serious injuries on roadways and Lafayette has set a target date of 2033 for this milestone. The intent of this LRSP is to help Lafayette meet this goal by identifying specific actions and projects.

VISION ZERO AND THE SAFE SYSTEM APPROACH

Vision Zero, as defined by the Vision Zero Network, is a global initiative to eliminate all roadway deaths and serious injuries while increasing safe, healthy, and equitable mobility for all.[5] Its core belief is simple—no one should be killed or seriously injured by roadway crashes. Compared to a traditional transportation safety approach, Vision Zero and the Safe System Approach present a different way of looking at roadway safety. It acknowledges that while humans make mistakes, roadway deaths can be prevented if we ensure our entire road system is safe and designed to anticipate these mistakes to

[4] "Adoption of a City Vision Zero Policy." City of Lafayette Staff Report, 2021, https://lafayette.granicus.com/MetaViewer.php?view_id=&clip_id=5874&meta_id=142829,

[5] What is Vision Zero?" Vision Zero Network, https://visionzeronetwork.org/about/what-is-vision-zero/.

prevent people from being killed or seriously injured. Figure 1 compares the traditional approach versus Vision Zero.

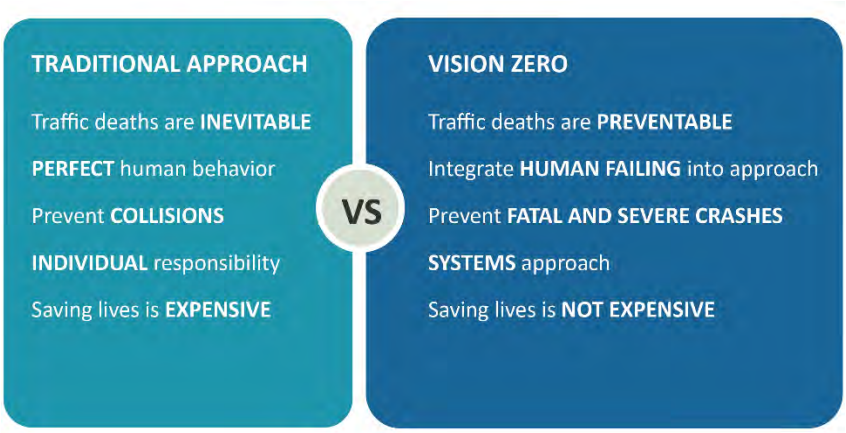


Figure 1. Traditional approach to roadway safety compared to Vision Zero. Source: Vision Zero Network

The City of Lafayette has committed to using the Safe System Approach to reach the goal of Vision Zero. The Safe System Approach is a proven approach to eliminating death and serious injuries on roads and is intended to be the lens through which roadway safety decisions are made and directly inform policy, practice, program, and especially project decisions in The principles of the Safe System Approach, as defined by FHWA, are:

- Death/serious injury is unacceptable
- Humans make mistakes
- Humans are vulnerable (i.e., there is a limit to which the human body can tolerate crash forces before death occurs)
- Responsibility is shared among roadway users, transportation system managers, and vehicle manufacturers
- Safety is proactive (i.e., risks must be mitigated before crashes occur, not after)
- Redundancy is crucial (i.e., all parts of the transportation system should be strengthened so there are still multiple parts protecting people in the event that one fails)[6]

Figure 2. Principles and Elements of the Safe System Approach. Source: FWHA

[6] "The Safe System Approach." Federal Highway Administration, https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/FHWA_SafeSystem_Brochure_V9_508_200717.pdf.

The five elements of the Safe System Approach should be evaluated and incorporated into every road safety decision to reach the goal of Vision Zero in Lafayette. And all the Safe System Approach principles and elements should be used to create one system that is safe for all road users. These principles and the elements of the Safe System Approach are depicted in Figure 2.

The Safe System Approach framework, shown in Figure 3, should be used in every roadway project to ensure that if a crash occurs, it does not result in a death or serious injury. This can be achieved by separating users in space, separating users in time, increasing visibility and attentiveness, and reducing speeds and impact forces.

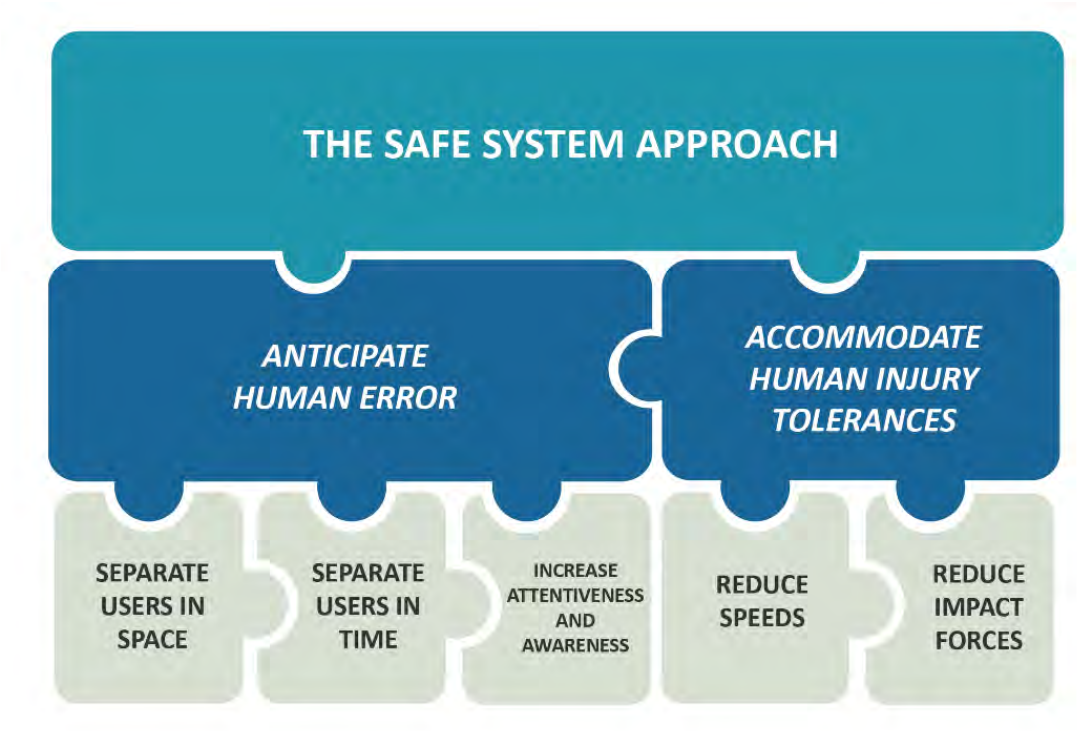


Figure 3. How the Safe System Approach elements function together to eliminate KSI crashes


Moraga Rd
1000
LAFAYETTE
RESERVOIR
RD

BACKGROUND

Lafayette's 2021 Vision Zero Policy resolution set the stage for this LRSP by laying out safety needs and actions on Lafayette's roads. The LRSP outlines actions and projects needed to prevent death and serious injuries on roads in Lafayette.

Road safety efforts should be integrated with other plans that also impact transportation decisions in Lafayette. These plans and policies must work together to create one transportation system that is safe, equitable, and accessible.

EXISTING TRANSPORATION PLANS

The City of Lafayette has a number of existing plans, programs, and other efforts that advance roadway safety. The visions, goals, and strategies of the LRSP are aligned with the following efforts. The safety priorities and recommendations established in the LRSP do not preclude the City from implementing projects and safety measures identified in these other bodies of work, even if they are not specified as priorities in this LRSP. Other transportation-related plans that should work in tandem with the LRSP are referenced in this section.

CITY OF LAFAYETTE GENERAL PLAN (2020)


CHAPTER II

CIRCULATION

PURPOSE

PUBLIC PARTICIPATION

The General Plan for Lafayette is a long-range, comprehensive plan that serves as a blueprint for how and where the City will change over the next 20 years.[7] Every city and county in California is required by State law to have a General Plan. Master plans, Specific Plans, zoning ordinances, and guidelines must be in conformance with the General Plan.

A General Plan includes a Circulation Element to set goals for making the transportation network work as efficiently and safely as possible for all users given the expected build-out of land uses. Per State requirements, the Circulation Element and the Land Use Element must correlate, and special attention should be paid to ensure that all transportation facilities are designed to be safe, accessible, and connected for all users.

An update to the Circulation Element will be initiated in 2024. Consistent with the LRSP, the Circulation Element Update is expected to include new and revised Goals and Policies to provide for a balanced transportation network that will support and encourage walking, bicycling, and transit ridership.

[7] "General Plan." City of Lafayette, https://www.lovelafayette.org/city-hall/city-departments/planning-building/general-master-specific-plans/general-plan.

The Lafayette General Plan's Safety Element was recently updated. The Safety Element Update includes a Vulnerability Assessment of the City's susceptibility to climate change hazards, including wildfire. Alignment between the LRSP and the Safety Element is important, particularly so that road and intersection improvements consider potential impacts on evacuation routes and are designed in coordination with emergency responders.

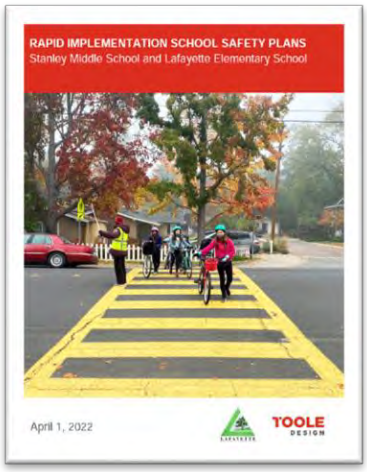
BIKEWAYS MASTER PLAN (2006)


CITY OF LAFAYETTE
BIKEWAYS MASTER PLAN
Adopted September 25, 2006

The Lafayette Bikeways Master Plan provides a broad vision and specific strategies and actions for improving bicycling in Lafayette.[8] It articulates a vision for a connected network of bicycle facilities to allow for safe, efficient, and convenient bicycle travel within Lafayette and between Lafayette and regional destinations. In addition, the Bikeways Master Plan provides recommendations for infrastructure projects and supporting programs that are intended to work together to improve conditions for cyclists. Consistent with the LRSP, the Bikeways Master Plan sets out goals to prioritize bikeway projects and capital improvement projects that address safety issues for cyclists and provide access to major destinations. The Master Plan also makes recommendations for upgrades and enhancements to the existing bicycle network to promote safety and outlines new educational and promotional programs to complement the infrastructure projects. An expected future update to the Bikeways Master Plan will align with the LRSP's direction on identifying appropriate infrastructure, policies, and programs based on crash patterns and Lafayette's unique roadway characteristics.

[8] "Lafayette Bikeways Master Plan." City of Lafayette, 2006, https://www.lovelafayette.org/city-hall/city-departments/engineering/transportation/walking-biking/bikeways-plan.

LAFAYETTE RAPID IMPLEMENTATION SCHOOL SAFETY PLANS (2022)



In support of Vision Zero, the City initiated Rapid Implementation School Safety Plans in 2021 to study safety issues around the City's schools and identify roadway projects to improve safety for students and caregivers walking, bicycling, and driving to and from the City's seven schools. As part of this effort, City Staff, along with its consulting team, engaged with the community and school district staff to learn about safety concerns near schools.[9] This work was the basis for the development of short-, medium-, and long-term projects for seven schools, and has resulted in the design and implementation of a subset of the recommended safety improvements that had been prioritized by the City's Transportation & Circulation Commission.

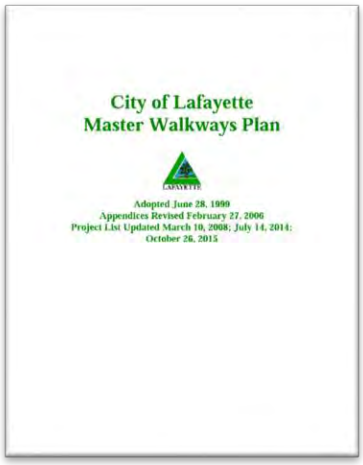
DOWNTOWN SPECIFIC PLAN (2012)

The City's Downtown Specific Plan provides design guidance to support the land uses in the downtown area and preserve the downtown character. [10] It also seeks to improve circulation in and through downtown through management of traffic congestion, but also by facilitating safe and convenient walking, biking, and transit use. The vision for active transportation in the City's downtown is articulated through a number of goals, policies, and programs. As an example, the Plan states that in the downtown retail district "the pedestrian experience in this district is a high priority, and sidewalks are preferred over walkways." A Mt. Diablo Boulevard Corridor Plan is expected in 2024 and would be influenced by the direction set in the LRSP for a safe and comfortable active transportation network along Lafayette's primary commercial destinations.

[9] "Traffic Safety Around Schools," City of Lafayette, 2022, https://www.lovelafayette.org/home/showpublisheddocument/7346/638225150206830000.

[10] "City of Lafayette Downtown Specific Plan." City of Lafayette, 2012, https://www.lovelafayette.org/home/showpublisheddocument/1507/637661097717270000.

MASTER WALKWAYS PLAN (1999 WITH 2015 UPDATE)


City of Lafayette
Master Walkways Plan

Adopted June 28, 1999
Appendices Revised February 27, 2006
Project List Updated March 10, 2008; July 14, 2014;
October 26, 2015

The City's Master Walkways Plan sets out a vision for the pedestrian network through the provision of a system of walkways that afford safe and efficient pedestrian movement. [11] The pedestrian network is intended to include an arrangement of walkways in the downtown area, but also to provide connections between residential neighborhoods with key destinations such as public transportation, schools, community amenities, parks, trail systems, and downtown. Walkways are defined in the Plan as spaces for pedestrians that provide safe separation between vehicles and pedestrians. The Plan identifies the criteria for the selection and prioritization of walkway segments that have not been constructed. An expected future update to the Walkways Master Plan is envisioned and would be aligned with the direction set by the LRSP.

LAFAYETTE TRANSPORTATION ACTION REQUEST FORM

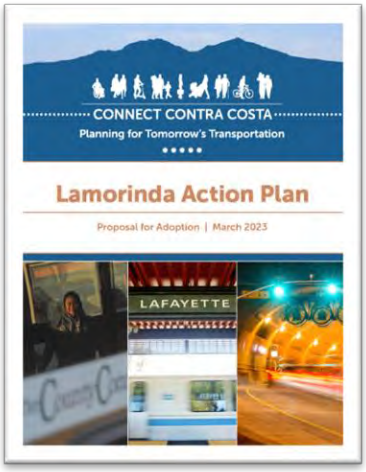

CITY OF LAFAYETTE
Transportation Action Request Form

Residents, business-owners, and visitors can submit a Transportation Action Request form (TAR) to City staff to identify a transportation-related concern or issue on Lafayette's roadways. [12] The TARs are one of the primary ways for the City to be made aware of some of the street-safety concerns and conditions that may impact drivers, pedestrians, and bicyclists. TARs will continue to supplement the City's understanding of street safety identified through the Local Road Safety Plan.

[11] "Master Walkways Plan." City of Lafayette, 2015, https://www.lovelafayette.org/city-hall/city-departments/engineering/transportation/walking-biking/walkways-plan.

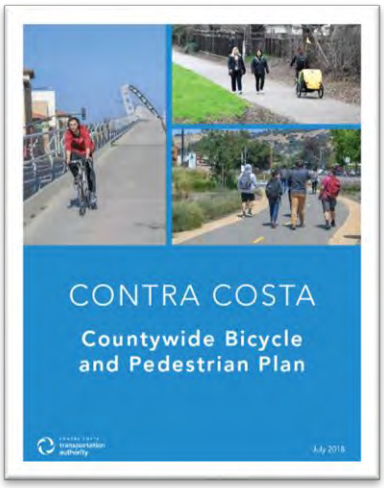
[12] Lafayette Transportation Action Request Form." City of Lafayette, 2023, https://www.lovelafayette.org/city-hall/city-departments/engineering/transportation/transportation-action-requests.

LAMORINDA ACTION PLAN (2017 WITH 2023 UPDATE)



The Contra Costa Transportation Authority (CCTA) is responsible for the delivery of five Action Plans –one for each subarea of Contra Costa County—to comply with the voter-approved Measure J Transportation and Growth Management Plan. The purpose of the Lamorinda Action Plan is to identify and address regional transportation issues that span jurisdictional boundaries. [13] The Plan establishes overall goals, identifies Routes of Regional Significance (RRS), creates performance measures called Regional Transportation Objectives (RTOs), and establishes actions that will support achievement of the RTOs. Improving the safety of Lamorinda's transportation network for all modes is one of the goals of the Action Plan, with a particular emphasis placed on safety for more vulnerable users, such as those using active transportation and near schools. The latest Lamorinda Action Plan was adopted in 2017, and a 2023 update to the Plan has been proposed for adoption. This Plan, and the four other Action Plans prepared for other County subregions, will help inform the development of the Countywide Transportation Plan.

CONTRA COSTA COUNTYWIDE BIKE AND PEDESTRIAN PLAN (2018)

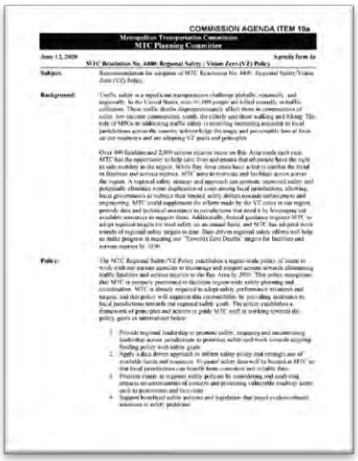


Finalized in 2018, the Contra Costa Countywide Bicycle and Pedestrian Plan (CBPP) updates policies, best practices for developing the primary pedestrian and bicycle facilities in Contra Costa County, and standards that had been developed in the previous decade, as well as those in recently adopted local active transportation plans. [14] Further, it expands on the goals, policies, and strategies set out in the Countywide Transportation Plan (CTP). Both plans set goals for increasing walking and bicycling and identify actions the CCTA and its partners, including Lafayette, should take to achieve them. Importantly, the updated Plan's implementation chapter includes new issues and concerns such as Vision Zero and redefines the Countywide Bikeway Network as a low-stress and connected system of facilities designed to serve all ages and abilities.

[13] "Lamorinda Action Plan." Contra Costa Transportation Authority, 2023. https://ccta.net/wp-content/uploads/2023/03/Draft-Lamorinda-Action-Plan_03-13-23_Clean.pdf.

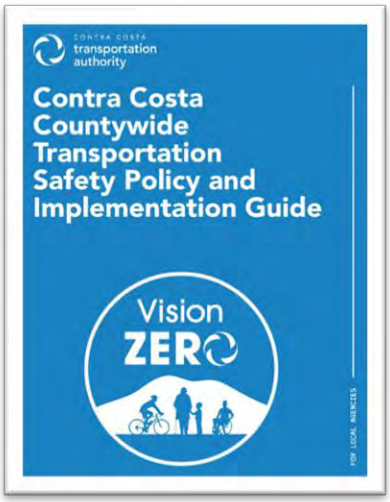
[14] "Countywide Bicycle and Pedestrian Plan." Contra Costa Transportation Authority, 2018, https://ccta.net/projects/countywide-bicycle-and-pedestrian-plan/.

METROPOLITAN TRANSPORTATION COMMISSION VISION ZERO POLICY (2020)


COMMISSION AGENDA ITEM 10a
Metropolitan Transportation Commission
MTC Planning Committee

The Metropolitan Transportation Commission (MTC) Regional Safety/Vision Zero Policy establishes a region-wide policy of intent to work with its partner agencies to encourage and support actions towards eliminating roadway deaths and serious injuries in the Bay Area by 2030.[15] In addition, in order to make the region's roadways safer for pedestrians, bicyclists, and others, MTC is developing a region-wide Safety Data Repository and Safety Analysis Tool that will integrate information and data about crashes, infrastructure, equity, demographics, and additional data that becomes available over time. For Lafayette, this data can be used to identify specific safety challenges and develop safety-enhancing countermeasures. MTC is also leading a Bay Area Vision Zero Working Group, which includes City of Lafayette staff, to share information about safety initiatives and approaches in cities across the Bay Area.

CONTRA COSTA TRANSPORTATION AUTHORITY VISION ZERO SAFETY POLICY AND IMPLEMENTATION GUIDE (2021)



This Guide, created by the Contra Costa Transportation Authority (CCTA), represents a collaborative effort among the county and its cities to develop a Vision Zero framework that supports safe travel in Contra Costa County.[16] The guide identifies safety challenges that are unique to Contra Costa's roadways and leverages best practices to recommend transportation safety policies, programs, and projects to address the challenges and issues. Additionally, through the CCTA's Vision Zero process, Safety Priority Locations and Emphasis Areas were identified. Guidance from the Vision Zero Safety Policy and Implementation Guide informed the development of the Lafayette LRSP.

[15] "MTC Regional Safety/Vision Zero Policy." Metropolitan Transportation Commission, 2020, https://mtc.ca.gov/sites/default/files/10a%2020-0788%20-%20ResoNo%204400%20Regional%20Safety%20VZ%20Policy.pdf.

[16] "Contra Costa Countywide Transportation Safety Policy and Implementation Guide." Contra Costa Transportation Authority, 2021, https://ccta.net/wp-content/uploads/2021/09/CCTA_VZ_How_To_Guide_Aug2021.pdf.

CITY OF LAFAYETTE CAPITAL IMPROVEMENT PROGRAM (2022)

City of Lafayette
Staff Report

The City of Lafayette's 5-Year Capital Improvement Program (CIP) is a multi-year planning and management tool to create a 5-year plan for priority capital improvements, including construction and maintenance.[17] The financial plan is prepared by staff and adopted by City Council as a guide for prioritization of projects that will achieve various citywide goals. The improvements identified in future CIPs will be informed, in part, by the safety countermeasures and projects identified in the LRSP.

[17] "Capital Improvement Program Update and Proposed 5-Year Projects." City of Lafayette, 2022, https://lafayette.granicus.com/MetaViewer.php?view_id=19&clip_id=6205&meta_id=151494.

WHAT GOES INTO A LOCAL ROAD SAFETY PLAN?

LRSP CONTENTS AND PURPOSE

This LRSP will serve as an Action Plan, establishing strategies and actions that utilize the Safe System Approach to reach the goal of zero roadway deaths and serious injuries in Lafayette. It follows the best practices of local road safety planning as well as guidance provided by the Federal Highway Administration (FHWA) and Caltrans. Figure 4 details the steps of the FHWA LRSP development process. Adoption of the LRSP will allow Lafayette to apply for federal and state funding to support the implementation of its identified recommendations. As this LRSP will include all roads in the community, coordination and collaboration with partner agencies with jurisdiction over other roads in Lafayette will be essential. Partner agencies include the Lafayette and Acalanes School Districts, the Contra Costa Transportation Authority (CCTA), Caltrans, and local emergency responders including the Lafayette Police Department, among others.

Figure 4. The LRSP Development Process. Source: FHWA

Resources and requirements related to LRSPs and the Highway Safety Improvement Program (HSIP) in California can be found on the Caltrans Local Roadway Safety Plan and Systemic Safety Analysis Report Program webpage.[18]

An LRSP balances a data-driven approach with the lived experience of community members to create a proactive plan to reach zero roadway deaths and address safety factors before a crash occurs, rather than after. The LRSP identifies policy, program, and practice actions; location-specific projects where roadway safety improvements are needed on a High Injury Network; and proactive citywide systemic safety countermeasures that can improve overall roadway safety.

There are two road safety fundamentals that guided the development of the Lafayette LRSP and are core to its implementation:

- Emphasis Areas are the key trends and contributing factors that the City should address to improve safety and achieve the goal of zero roadway deaths and serious injuries.

[18] "Local Roadway Safety Plan (LRSP) and Systemic Safety Analysis Report Program (SSARP)." Caltrans, 2023, https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/highway-safety-improvement-program/local-roadway-safety-plans.

- The High Injury Network (HIN) consists of roadway segments within Lafayette where KSI crashes, or a higher density of all crashes, have historically taken place.

Figure 5 illustrates the LRSP inputs that identified the Emphasis Areas and HIN as well as the types of safety strategies that will be applied to reduce crashes and eliminate deaths on Lafayette roadways.

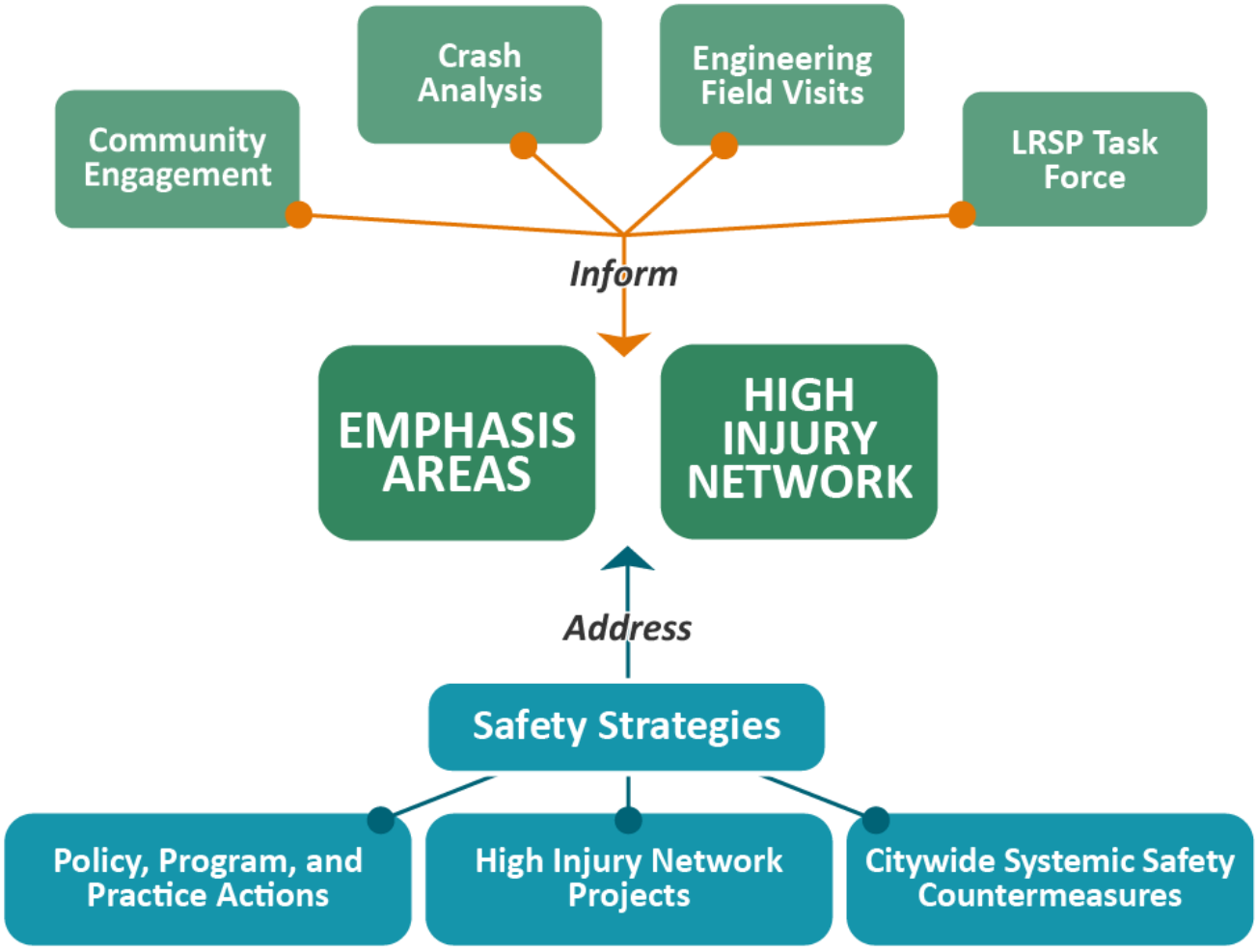


Figure 5. Relation of LRSP components

PLAN GOALS AND OBJECTIVES

Every LRSP should be tailored to each community's road safety needs and engage local leadership. The process of developing this LRSP included several project development meetings with a multidisciplinary LRSP Task Force made up of community members and local agency representatives with expertise in transportation, education, public health, emergency response, equity, transit, biking, and walking, as well as two presentations given to the City's Transportation & Circulation Committee (TransCirc).

At the beginning of the planning process, the LRSP Task Force developed a set of goals and objectives to guide development of the LRSP. Each goal describes an outcome that the LRSP seeks to achieve and identifies corresponding objectives that are necessary to achieving each goal. The goals are introduced below, and the goals and objectives are included in the *Policy, Program, and Practice Actions* section of the LRSP.

GOAL 1: Engage with the local community, stakeholders, and different City agencies to better understand factors that are affecting the safety of roadway users within the City of Lafayette.

GOAL 2: Promote a safety culture throughout the community and within different agencies.

GOAL 3: Implement a data-driven approach, supplemented by public input, to identify where and why roadway crashes resulting in deaths and serious injuries and near misses are occurring; which locations feel unsafe; and which locations have risk factors that may result in crashes in the future.

GOAL 4: Prioritize roadway safety actions and programmatic recommendation investments to advance Lafayette's Vision Zero goals.

GOAL 5: Produce a plan to build safer roadways for all.

For detail on each goal's objectives and their implementation status, please refer to the *Policy, Program, and Practice Actions* section of the LRSP.


Lafayette Circle
BANK
BNP PARIB

LEADERSHIP: UNDERSTANDING ROAD SAFETY ISSUES IN LAFAYETTE

The first step to develop an LRSP is to bring together local safety stakeholders. A diverse set of community representatives offer multiple perspectives that contribute to the plan recommendations. The need to understand local safety challenges requires a multi-pronged process that includes a data-driven approach as well as thoughtful community engagement to identify key concerns and ideas on how to improve roadway safety. An LRSP Task Force was convened to help lead the process.

LRSP TASK FORCE

The LRSP Task Force was established to provide local leadership and help guide the LRSP development process. The LRSP Task Force provided critical input in all stages of LRSP development and assisted in reviewing data and connecting dots between the data and the community's lived experiences.

The LRSP Task Force included members who represent the wide range of agencies, groups, and perspectives who are directly impacted by road safety, including:

- The City of Lafayette's Transportation & Circulation Commission
- Lafayette City Council
- Public Works and Engineering Departments
- Contra Costa Transportation Authority (CCTA)
- Lafayette School District
- Acalanes Union High School District
- Lafayette Police Department
- Contra Costa Fire Protection District
- 511 Contra Costa
- Contra Costa Health Services (2)
- Chamber of Commerce
- At Large Community Members (2)

LRSP Task Force members provided subject-matter expertise, communicated community priorities, provided input and feedback at critical project milestones, and engaged their constituent communities or agencies throughout the LRSP development process. The Task Force members provided guidance and community input to identify the Emphasis Areas, the key factors which the City should focus on to achieve its goal of zero roadway deaths. Four LRSP Task Force meetings and one joint meeting between the LRSP Task Force and TransCirc were conducted as part of the development of the LRSP. All meetings included an update on the project and an opportunity for LRSP Task Force members, Commissioners, and the public to provide input.

COMMUNITY ENGAGEMENT

The public engagement process used a range of methods to reach as much of the Lafayette community as possible, with the two main efforts being an interactive web map survey and a virtual open house. Community members also provided input about road safety and the LRSP through email and by phone. The City also maintained and continuously updated the Lafayette LRSP webpage to keep the public updated throughout the project, sharing project materials and recordings.[19] Figure 6 outlines key plan development meetings.

Figure 6. Key Plan Development Meetings

Community feedback received throughout the LRSP development process was used to help determine Emphasis Areas. Additionally, this feedback will be valuable in informing future safety projects on the HIN but will not preclude community engagement at the time of project development.

VIRTUAL OPEN HOUSE

A virtual open house took place on December 1, 2022, at 6 PM using the Zoom platform. Approximately 45 people attended (including the project team, volunteers from the City, and LRSP Task Force members). The meeting began with a short presentation to inform attendees about the LRSP process, followed by three breakout rooms facilitated by City and Toole Design staff and LRSP Task Force Members. Each breakout room included about 10-15 people (including facilitators) and was catered toward small group discussion. A guided discussion focused around four themes – unsafe roadway behaviors, unsafe roadway elements, solutions, and locations – and was led by staff using two tools: the Miro interactive whiteboard platform and the web map portion of the online survey. An example of a Miro board is shown in Figure 7. Participants were additionally encouraged to think about how their feelings towards unsafe roadway behaviors and roadway elements might change given the land use context (e.g., downtown versus near a

[19] "Lafayette Local Roadway Safety Plan." City of Lafayette, 2022, https://www.lovelafayette.org/city-hall/city-departments/engineering/transportation/local-road-safety-plan.

school). The open house was an opportunity to have in-depth facilitated conversations to fully capture the nuances of sentiments from a variety of stakeholders.

Within each breakout room, community members discussed the four key themes and considered how a range of safety factors work together under the Safe System Approach. The members used the interactive virtual boards to post and share ideas within these categories. When it came to unsafe behaviors, community members identified distracted driving, reckless driving, and speeding as common occurrences within Lafayette, as well as instances of all roadway users not following the rules of the road.

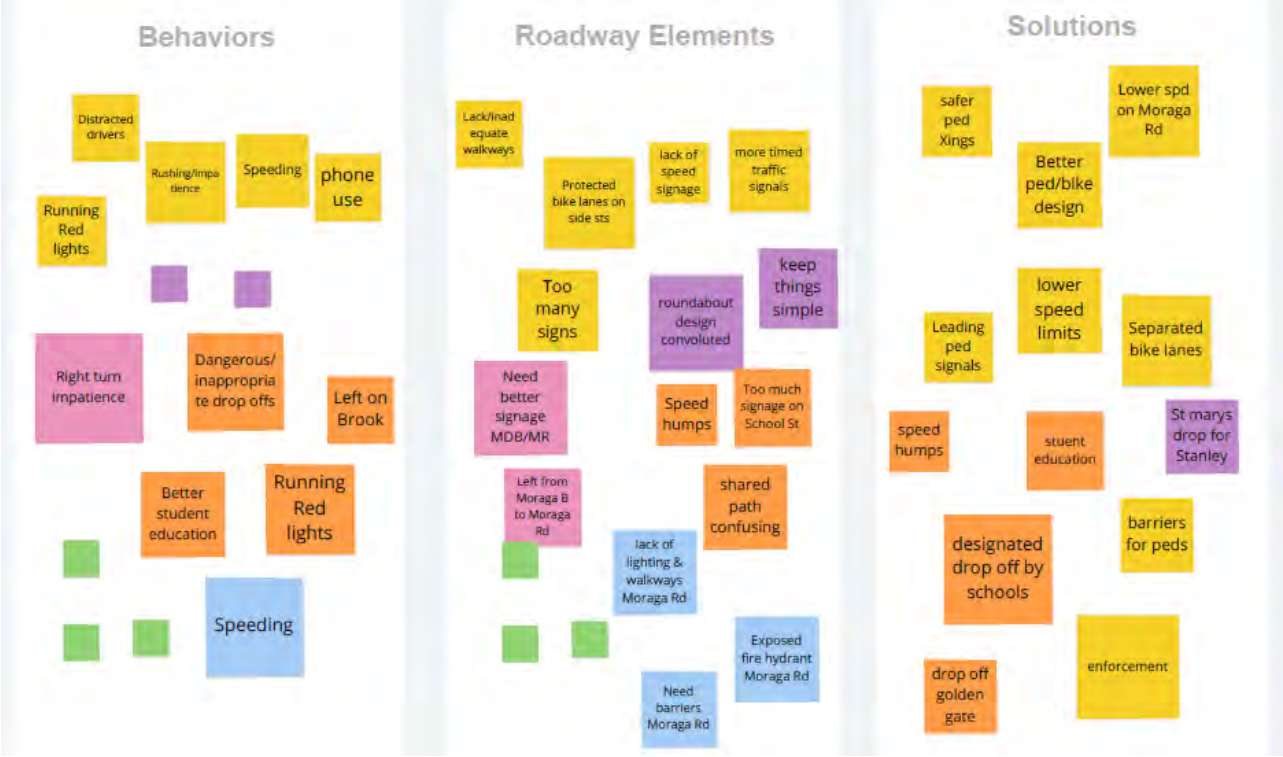


Figure 7. Sample of comments collected during the public meeting

Attendees noted that they were most concerned about dangerous intersections, roadways with high posted speed limits, and roadways that lacked adequate safety elements for pedestrians and bicyclists. Specific locations cited included downtown Lafayette (especially the Mt. Diablo Boulevard/Moraga Road intersection), winding parts of arterial roads, areas near schools, and roadway intersections with the Lafayette/Moraga Trail. When prompted for ideas for solutions, some attendees supported education and enforcement on the rules of the road for all users.

WEB MAP SURVEY

A web map survey, which included both survey questions and a map-based exercise, was available for public input from October 24 through December 4, 2022. The purpose of the survey portion was to collect information about travel behaviors, road safety concerns, challenges, and ideas. The purpose of the web map was for the community to identify specific locations within Lafayette where people feel safe or unsafe, and to solicit ideas about how road safety may be improved.

When visiting the survey page, respondents could:

- Read a brief overview of the LRSP effort and learn more about the project via a link to the project webpage,
- Take a survey to provide information on their travel behaviors and feedback about roadway safety, and
- Participate in a mapping exercise.

The web map survey was promoted to the community through a variety of methods, including:

- The City of Lafayette's social media channels
- Advertising at popular public facilities such as the Library and Community Center
- Pop-up events where promotional materials with a QR code were distributed
- Direct outreach to many stakeholder groups including the families served by the Lafayette School District, senior citizens, and families of pre-school children
- LRSP Task Force members

Over 1,200 unique visitors answered survey questions. Respondents were first asked in what ways they primarily get around Lafayette. A series of safety-related questions were then asked to identify what behaviors and conditions make people feel unsafe. Programmatic and design changes options were provided to understand what the community thinks will help improve safety. The demographic questions at the end of the survey were intended to provide background on the survey respondents.

All questions were optional, and respondents had the option to skip directly to the mapping exercise. Not all respondents answered every question and many questions allowed respondents to select more than one answer. Demographic questions had a very low response rate and were therefore not compared to citywide demographics. Results of this survey are not considered scientifically or statistically significant.

Online survey responses were consistent with the input collected at the virtual open house. Respondents cited speeding traffic, distracted driving, unsafe intersections, stop sign and traffic light violations, and lack of separation from traffic as key concerns. They also sought to see design changes that reduce vehicle speeds and improve crossing safety for people biking and walking. Enforcement was the preferred solution, followed by distracted driving and educational campaigns. Figure 8 shows words that appeared frequently in responses.

Figure 8. Common words from web map responses regarding behaviors that make the City of Lafayette community unsafe

Respondents also provided about 1,800 inputs on the web map by dropping location-specific pins and providing clarifying narrative in an open-ended format. When asked where they feel unsafe and uncomfortable, respondents identified the intersection of Mt. Diablo Boulevard and Moraga Road more than any other location. Additional locations identified by survey respondents as feeling unsafe include, but are not limited to, the following.

- Moraga Road and Brook Street
- Moraga Road and School Street
- St. Mary's Road by Stanley Middle School
- School Street by Stanley Middle School
- The CA-24 interchange at Mount Diablo Boulevard and Pleasant Hill Road
- Pleasant Hill Road and Stanley Boulevard
- Pleasant Hill Road and Olympic Boulevard
- Glenside Drive and the Lafayette/Moraga Trail

The areas where respondents most often reported feeling safe included some portions of central and downtown Lafayette, and near Burton Valley Elementary School. Pinned "safe" and "unsafe" locations from web map respondents provided insight into areas where community members see needs for improvements, and what areas have characteristics of safe roadways.[20]

Respondents were also asked to drop pins at locations where they had safety improvement ideas. The 343 idea pins were largely focused around the downtown area and the Mt. Diablo Boulevard/Moraga Road intersection. Ideas for improvements included new traffic signals and crosswalks as well as bike lanes and extended sidewalks.

The resulting maps in Figure 10 and Figure 11 illustrate the density and distribution of pins dropped across the map. A GIS map that can be accessed from a link on the project webpage provides the web map responses.

Figure 9. Students walk along School Street. Source: City of Lafayette

[20] "Local Road Safety Plan Web map Survey – Public Comments (10/24/22 – 12/4/22)." City of Lafayette, 2022, https://cityoflafayettep.maps.arcgis.com/apps/instant/sidebar/index.html?appid=d299ee8d4d9946e9931c2d0bca034898&center=-122.1151;37.8891&level=18.

COMMUNITY ENGAGEMENT KEY TAKEAWAYS

While some people feel Lafayette does not need to improve roadway safety, most respondents identified specific concerns as well as strategies to improve safety.

In terms of roadway design, respondents were most concerned about:

- Dangerous intersections, including lack of visibility at uncontrolled locations and stop sign/red light running,
- Speeding and/or high posted speed limit, and
- Improving safety for pedestrians and bicyclists through measures such as
    - improving crossings,
    - creating more space and time separation from motor vehicles, and
    - installing more sidewalks

Specific locations that the public is concerned about include:

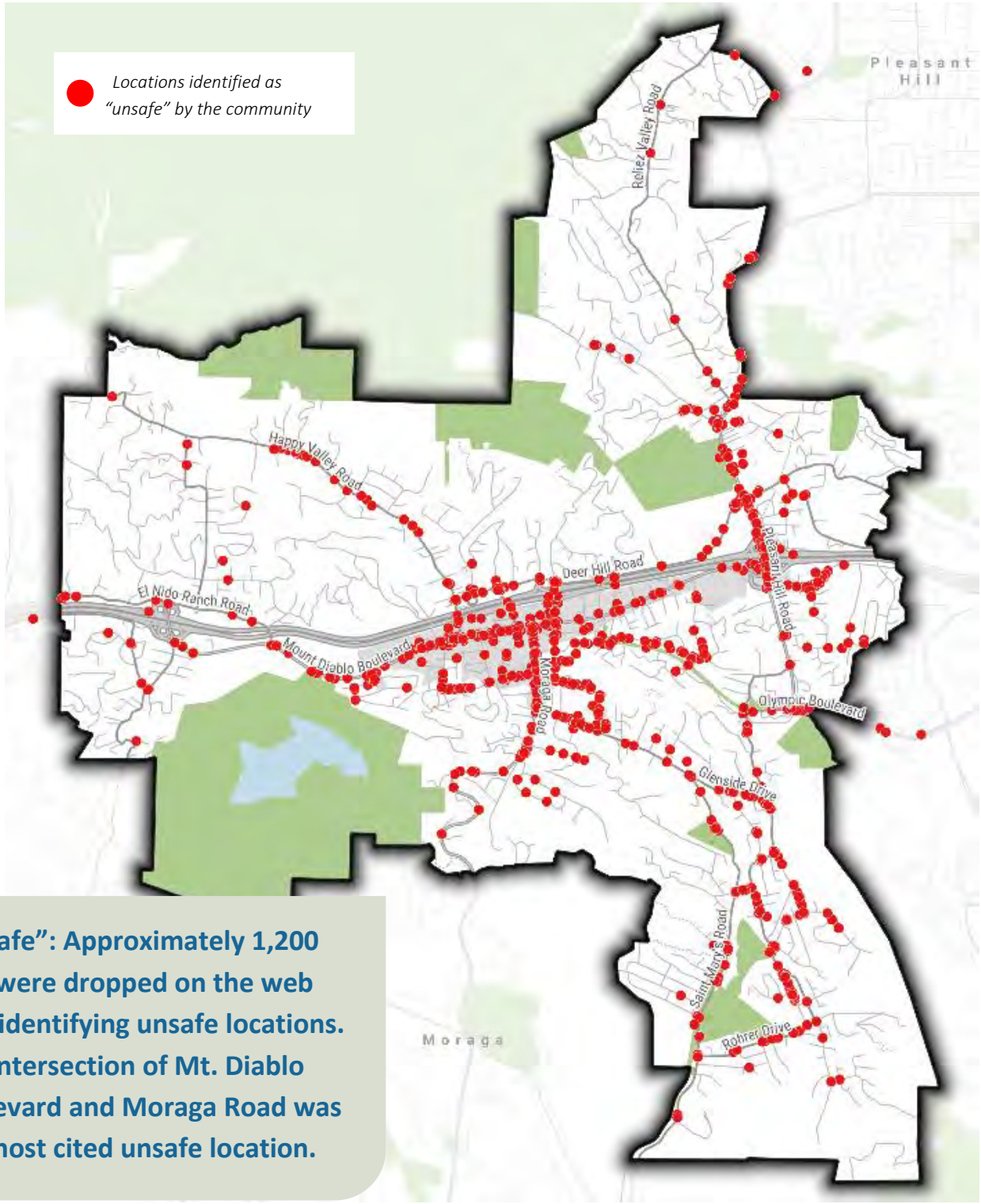
- Downtown (particularly around the Mt. Diablo Boulevard/Moraga Road intersection)
- Near schools
- On winding roads
- Where the Lafayette/Moraga Trail intersects with roadways (notably, Glenside Drive)

Respondents felt the most unsafe roadway behaviors were:

- Speeding
- Distracted driving/walking (usually involving phones)
- Roadway users not following or knowing the rules of the road

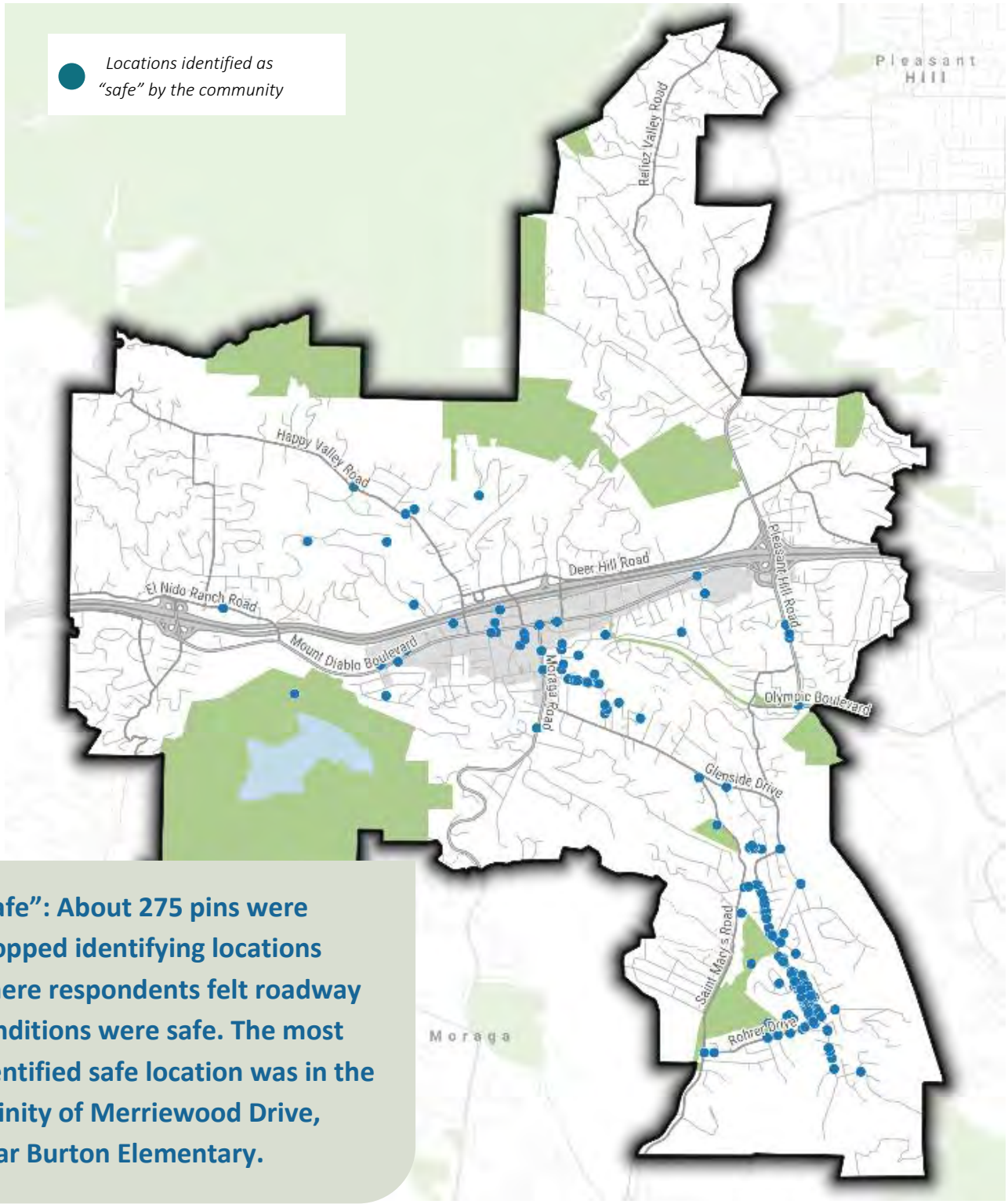
While survey respondents emphasized enforcement as a key behavioral change strategy, meeting attendees focused more on education for all roadway users. Even those who believe they know the rules of the road can benefit from education, particularly when it comes to interacting with other modes of transportation.

While driving is the primary mode of travel in Lafayette, the community did want to see increased safety for people walking and biking, particularly downtown, and many community members noted that they use more than one mode when traveling in Lafayette.



"Unsafe": Approximately 1,200 pins were dropped on the web map identifying unsafe locations. The intersection of Mt. Diablo Boulevard and Moraga Road was the most cited unsafe location.

Figure 10. Web Map Results of Community-Identified Unsafe Locations



"Safe": About 275 pins were dropped identifying locations where respondents felt roadway conditions were safe. The most identified safe location was in the vicinity of Merriewood Drive, near Burton Elementary.

Figure 11. Web Map Results of Community-Identified Safe Locations


SHOP LOCAL

ANALYZE SAFETY DATA

Analyzing recent crash data identifies areas with high concentrations of crashes as well as common factors in crashes, so that LRSP recommendations address specific needs and priorities and their prioritization.

The LRSP relies on a data-driven approach to understand where crashes took place in the five-year period from 2017 through 2021 and the contributing factors of crashes on local roads in Lafayette. Since the goal is to eliminate death and serious injuries in roadway crashes, the LRSP analysis focused on these data:

- **Fatal injuries** are coded as a K on the KABCO injury severity scale and are a "death as a result of injured sustained in a collision or an injury resulting in death within 30 days of the collision."
- **Serious injuries** are defined as injuries other than a death that result in broken bones, dislocated limbs, severe lacerations or unconsciousness and are coded as an A on the KABCO injury severity scale.[21]

There were 14 killed or serious injury crashes in Lafayette out of 47 total local road crashes between 2017 and 2021.

For the purposes of this LRSP, fatal and serious injury codes are referred to as killed or seriously injured (KSI) crashes. Broadly, crash reports are required to be completed by the police if a crash is reported to 911 per the California Collision Report Form.[22] Crash reports document key crash details, including the location of the crash, roadway context, and dynamics between the parties involved. Key information from the crash reports is then entered into a database of crashes across California.

The crash data for the LRSP's analysis were from the California Highway Patrol's (CHP) Statewide Integrated Traffic Records System

[21] "KABCO Injury Classification Scale and Definitions." Federal Highway Administration https://safety.fhwa.dot.gov/hsip/spm/conversion_tbl/pdfs/kabco_ctable_by_state.pdf.

[22] "Traffic Collision Report." State of California Department of Highway Patrol, https://one.nhtsa.gov/nhtsa/stateCatalog/states/ca/docs/CA_CHP555_sub6_2012.pdf.

(SWITRS) accessed via the Transportation Injury Mapping System (TIMS).[23,24] The crash analysis included any reported injury crash on locally owned roads operated by the City of Lafayette within the last five years of available data, from 2017-2021. Crashes on the state highway and at interchanges with the state highway were excluded because these roadway segments are under the jurisdiction of Caltrans, not Lafayette. The safety analysis focuses on KSI crashes in order to focus strategies on locations with the greatest need.

Crash mapping and a descriptive crash analysis were completed to inform the LRSP. The crash mapping analysis included crash severity location mapping, sliding windows analysis, development of HINs, and a systemic, proactive Safer Streets Model mapping for pedestrians and bicyclists. The descriptive crash analysis included statistical analysis using pivot tables and equivalent property damage only (EPDO) methods. The intent of the analyses was to provide an understanding of the locations across Lafayette where crashes have occurred and where they are likely to occur.

WHERE ARE CRASHES OCCURING IN LAFAYETTE?

Between 2017 and 2021, 14 KSI crashes took place on local roads in Lafayette from 47 total crashes. These include crashes involving motor vehicles, motorcycles, bicycles, and pedestrians. As seen in Figure 12, KSI crashes occurred on Olympic Boulevard, Pleasant Hill Road, Mount Diablo Boulevard, Moraga Road, Deer Hill Road, and Reliez Valley Road, along with several residential roadways. Crash data used is provided in *Appendix A: All Local Crashes.*

[23] "SWITRS – Statewide Integrated Traffic Records System." California Highway Patrol, https://www.chp.ca.gov/programs-services/services-information/switrs-internet-statewide-integrated-traffic-records-system.

[24] "Transportation Injury Mapping System." UC Berkeley Safe Transportation Research and Education Center, https://tims.berkeley.edu/.

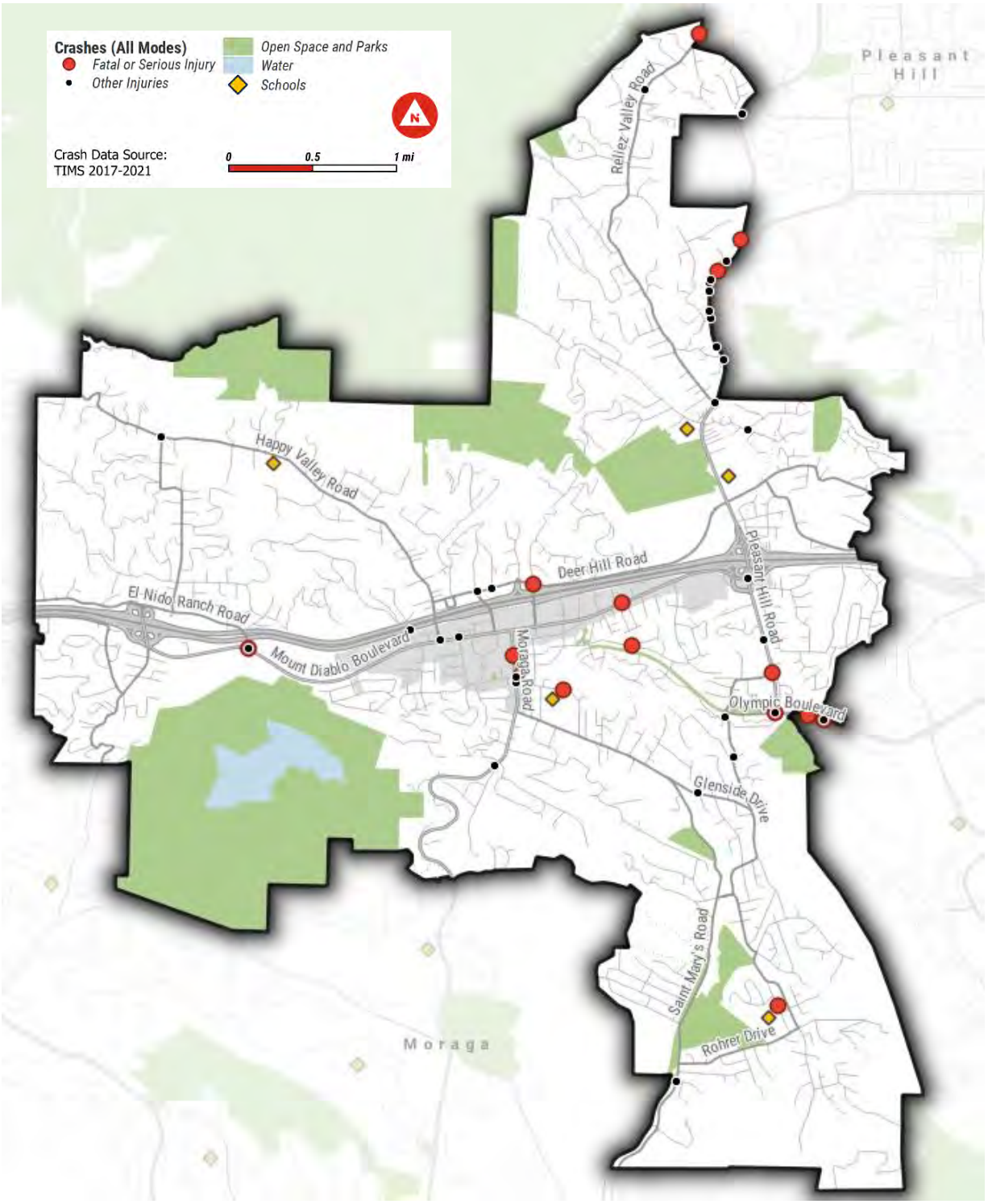


Figure 12. Locations of all reported injury crashes, including KSI crashes, in Lafayette from 2017-2021 based on recorded crashes in TIMS

SLIDING WINDOWS ANALYSIS

The sliding windows analysis identified segments with the highest crash density and weighted these by crash injury severity. The analysis was done by determining the number and injury severity of crashes in a 1/2 mile "window" on a roadway, and shifting that window along the roadway by 1/10-mile increments as illustrated in Figure 13. This analysis determined roadways with the highest concentration of total crashes and KSI crashes using historical crash data and set the foundation for the development of HIN.

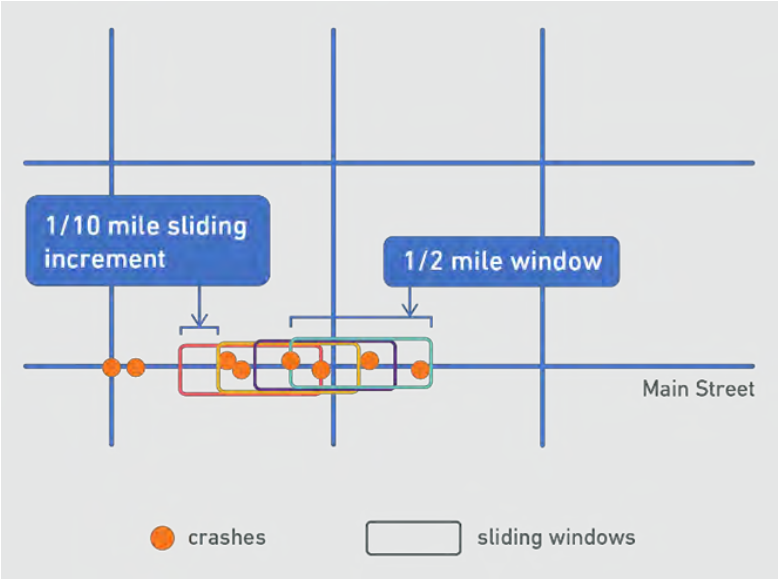


Figure 13: Example of a sliding window analysis. Source: Toole Design

HIGH INJURY NETWORK

The HIN was developed to identify roadways with the highest crash frequency and severity using weighted crash scores calculated from the sliding window analysis. These are roadways with at least one KSI crash and one non-KSI crash, or at least four other crashes. Crashes along roadways were scored based on injury severity and total number of crashes.

The crash analysis also included modes involved, identified as pedestrian, bicycle, motorcycle, and motor vehicle. From the sliding windows analysis results, threshold scores were included in HIN maps by mode. The HIN network maps for each mode varied slightly, and all three were ultimately combined to produce the overall HIN map, listed in Table 1 and shown in Figure 14.

Many of the HIN segments connect to downtown Lafayette and parallel or intersect CA-24. The exact extents of several segments have been adjusted slightly to account for roadway context and based on LRSP Task Force recommendations.

Table 1. List of HIN Segments

City of Lafayette HIN		
1	Olympic Boulevard	between Reliez Station Road and Newell Court
2	Moraga Road	between Mount Diablo Boulevard and Old Jonas Hill Road
3	School Street	between Moraga Road and Topper Lane
4	Reliez Valley Road	between the northern city limit and Sterling Heights Lane
5	Moraga Boulevard	between Moraga Road and Victoria Avenue
6	Mount Diablo Boulevard	between Willow Drive and Pleasant Hill Road
7	Pleasant Hill Road	between Taylor Boulevard and Olympic Boulevard
8	Deer Hill Road	between Happy Valley Road and Miller Drive
9	Mount Diablo Boulevard	between Acalanes Road and Risa Road

The HIN is where KSI crashes have historically occurred and where the majority of resources should be dedicated to improving roadway safety and preventing future KSI crashes. Once the effectiveness of safety improvements at addressing KSI crashes on the HIN is better understood, the City can identify similar conditions on other City roadways where crashes could occur and make equivalent safety improvements at those locations.

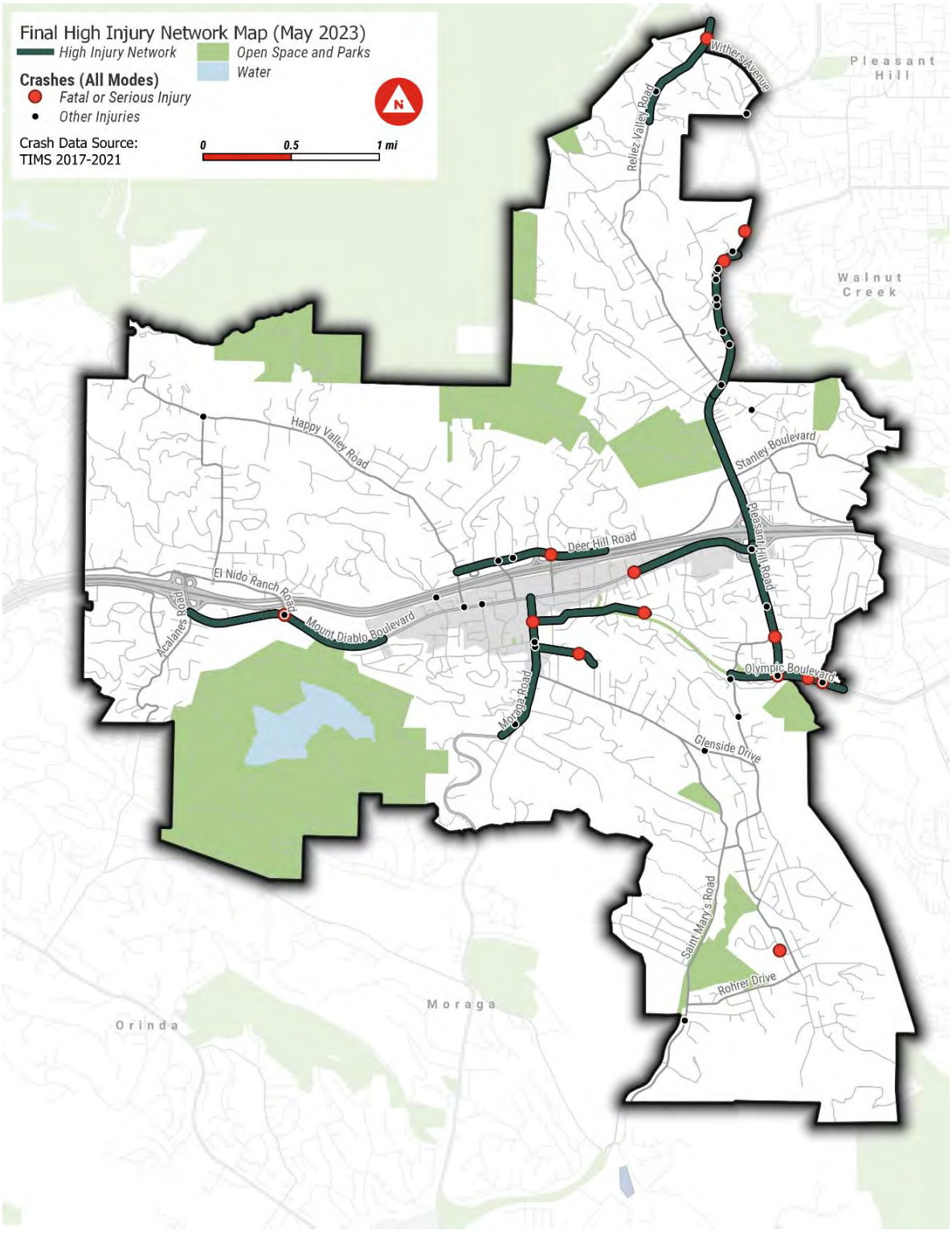


Figure 14. Lafayette HIN based on 2017-2021 TIMS data

SAFER STREETS MODEL

As depicted in Figure 15, the Safer Streets Model brought the sliding window analysis results into a Bayesian statistical framework to estimate crash risk for pedestrian and bicyclist crashes throughout the city. This framework incorporated external information about how many crashes might be expected—called a Bayesian prior—alongside the observed crash history.

The model estimated crash risk rates per mile for each road segment and each crash mode (pedestrian and bicyclist only) and severity. These values were then converted to crash cost estimates based on the costs assigned to each crash severity.

The Safer Streets Model assigned a base level of risk to segments based on census tract and functional class, using the national average rate of crashes involving a death per mile on a roadway based on its functional class. Segments without any observed crash risk may still have a crash risk calculated. Since there is a low number of crashes in Lafayette, the Safer Street Model was used as a supplemental corridor review to support the HIN. Figure 16 and Figure 17 are the maps that were generated by the Safer Streets Model for both pedestrian and bicycle crash risk.

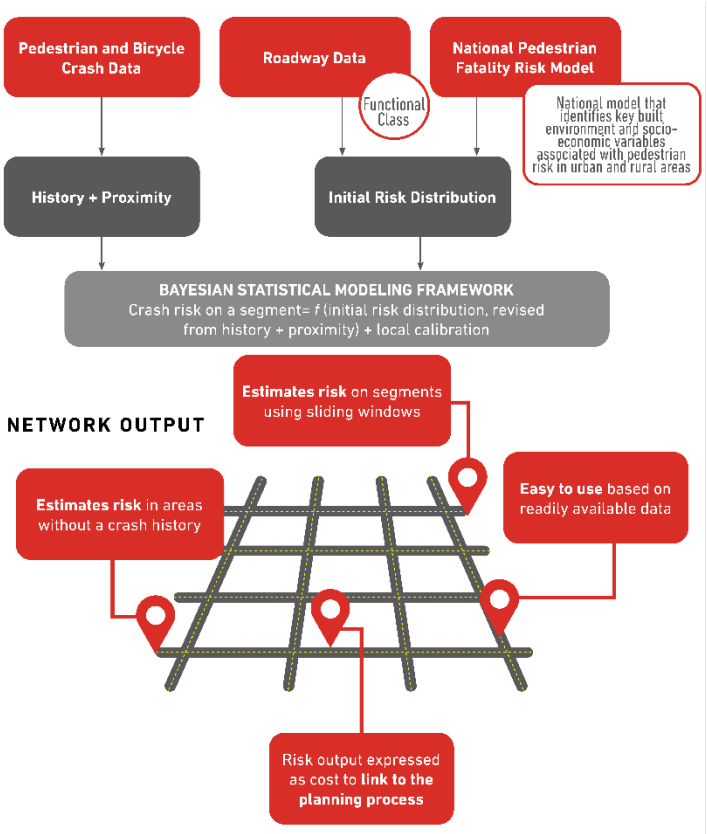


Figure 15: The Safer Street Priority Finder (SSPF) Tool. Source: Toole Design

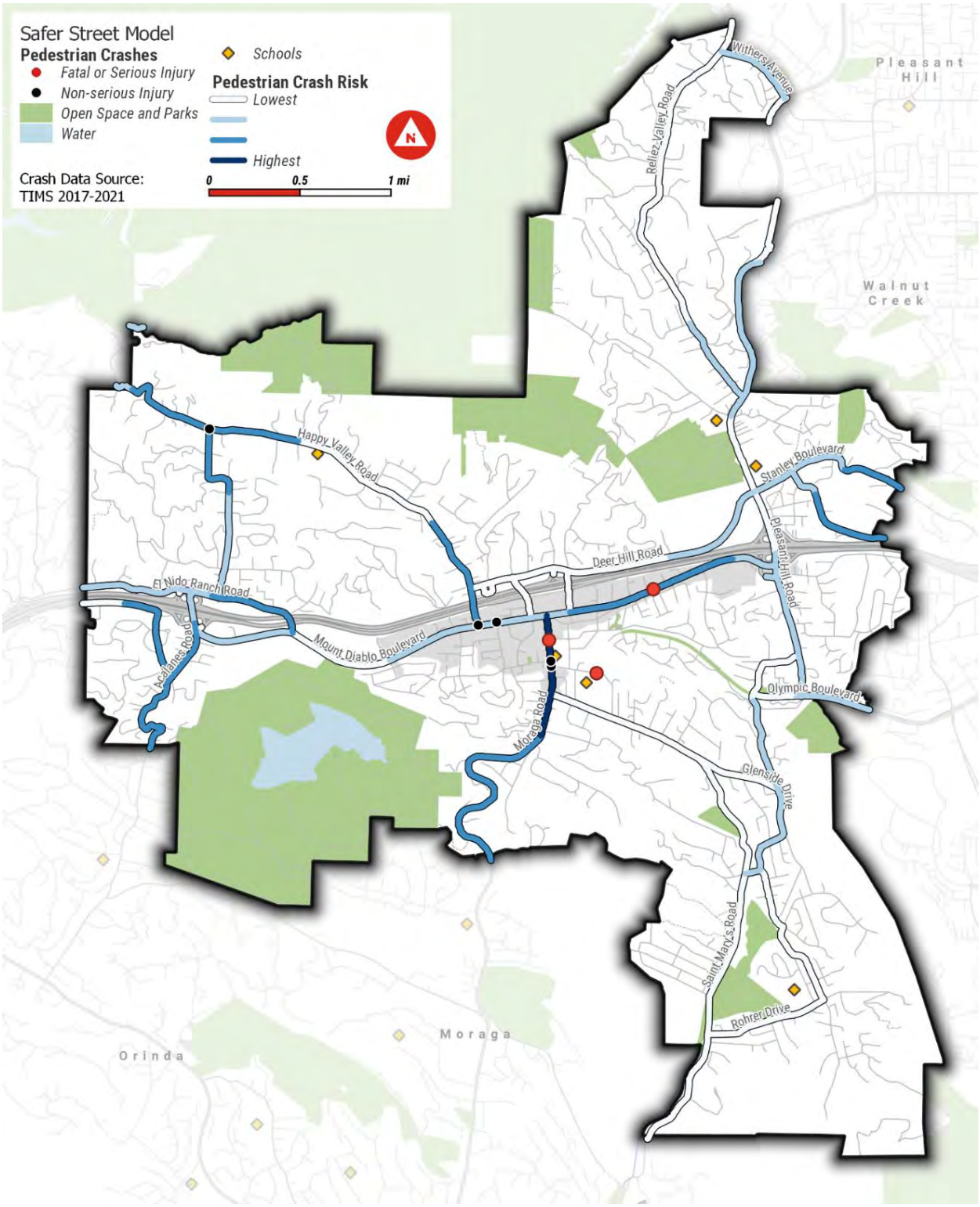


Figure 16. Pedestrian Safer Street Model Map

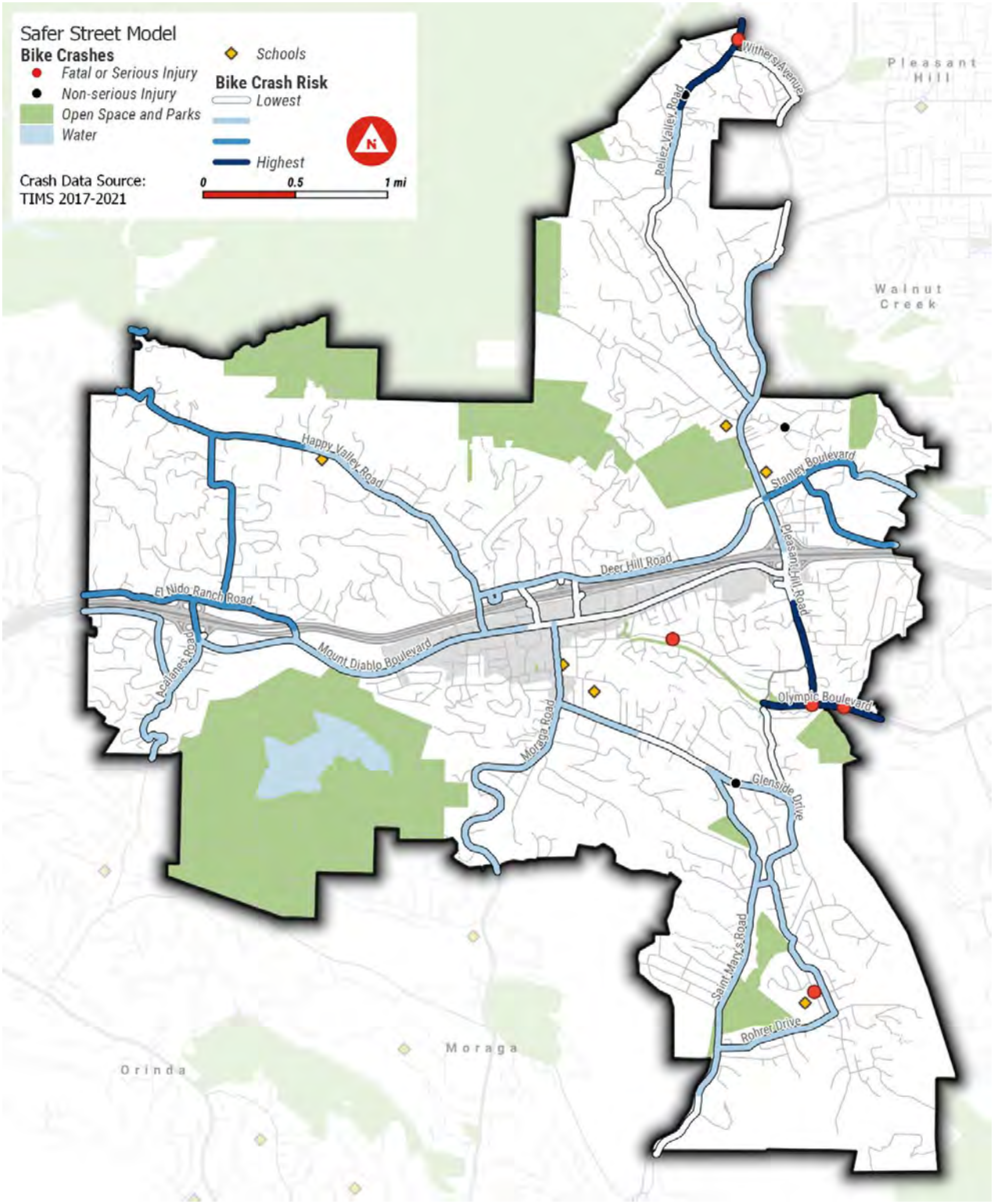


Figure 17. Bicyclist Safer Street Model Map

DESCRIPTIVE CRASH ANALYSIS KEY FINDINGS

To understand the safety performance of the roadway network, a high-level descriptive crash analysis was conducted for the study area. A series of high-level descriptive summaries, tables, and figures below capture relationships between crash data, infrastructure data, and contextual variables. This section summarizes and visualizes notable patterns and valuable insights that guide and inform the plan recommendations.

- Year of crash data: 2017-2021
- Total crashes on local roads: 47
- Total KSI crashes on local roads: 14

Crashes by Year: As shown in Figure 18, the highest number of crashes were in 2019. 2021 had the second highest number of crashes.

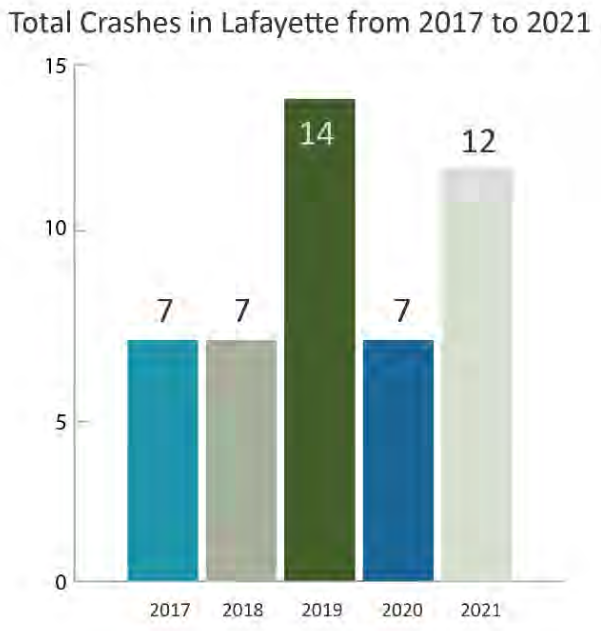


Figure 18. Total Crashes by Year, 2017-2021

Crashes by Mode: Motor vehicle crashes accounted for the largest share of overall crashes (57%), followed by pedestrian crashes (19%), bicycle crashes (17%), and motorcycles (6%). Vulnerable roadway users (pedestrians, bicyclists, and motorcyclists) accounted for nearly two-thirds of KSI crashes, but just over 40% of overall crashes as shown in Figure 19.

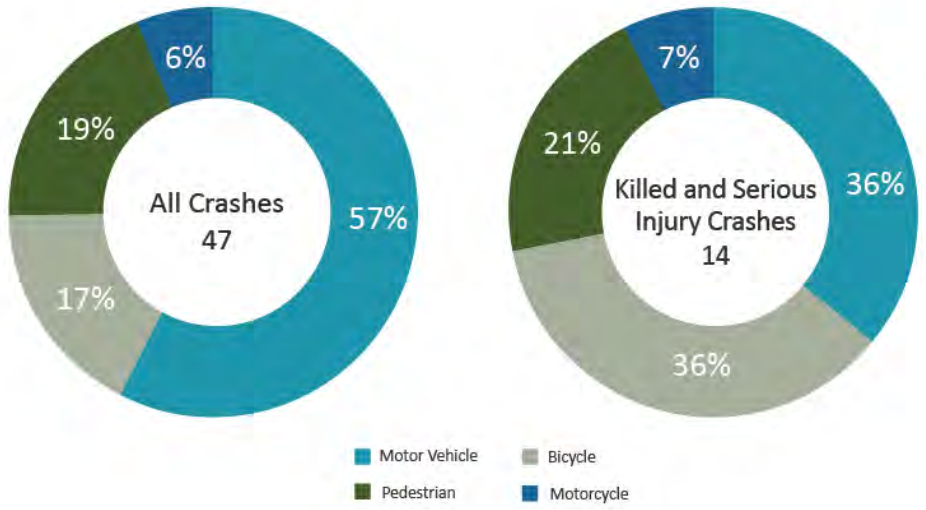


Figure 19. Share of crashes compared to the percent of crashes that resulted in a KSI, 2017-2021

As seen in Figure 20, 63% of all bicyclist crashes result in KSI, followed by 33% of pedestrian crashes and motorcycle crashes, and 19% of motor vehicle. This suggests vulnerable roadway users have a higher probability of being involved in a crash with a KSI outcome.

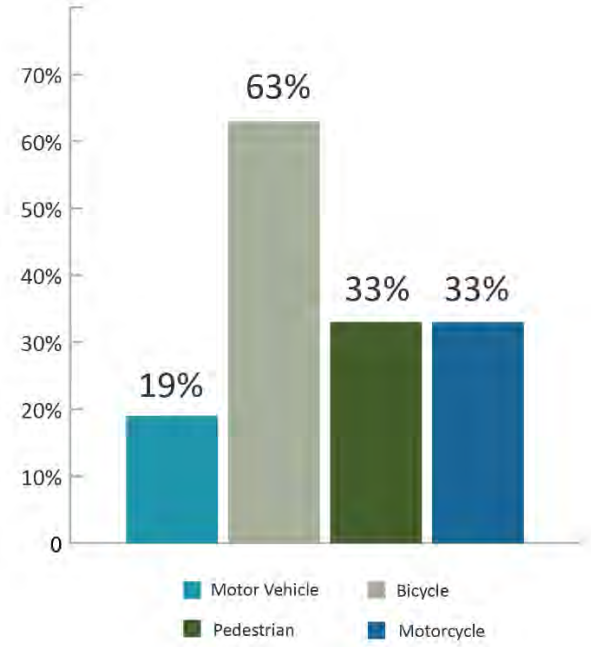
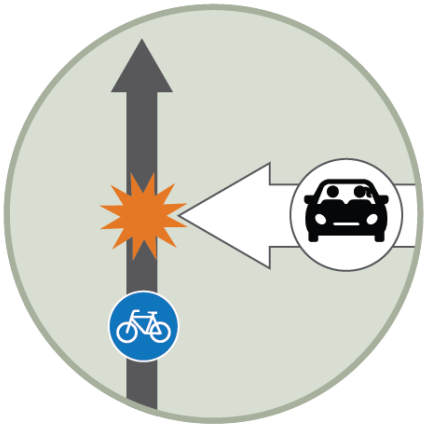


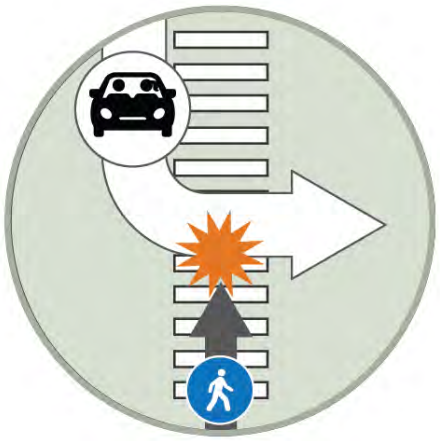
Figure 20. Share of crashes by mode that resulted in a KSI, 2017-2021



Crash Location (Intersection vs. Segment): Most crashes with "automobile right of way" as the primary violation occurred at unsignalized locations in which motorists failed to yield while making a left turn (or U-turn) or occurred at a two-way stop-controlled intersection and failed to yield to traffic not controlled by the stop sign.

Bicycle Crash Types: In general, five of the eight bicycle crashes involved a motorist proceeding straight at the time of the crash.

Pedestrian Crash Types: Most pedestrian crashes occurred at crosswalks. These crashes occurred along Mt Diablo Boulevard, Happy Valley Road, and Moraga Road. Four of the nine crashes involved a motorist turning while a pedestrian was in a crosswalk.

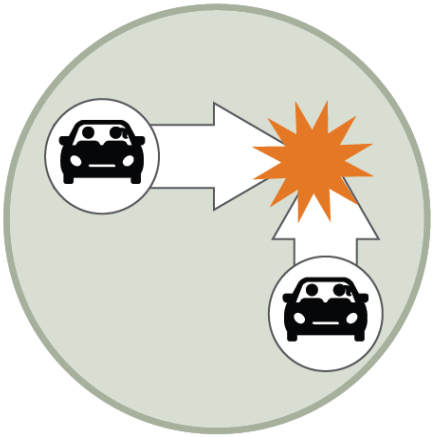


Motor Vehicle Crash Types: Solo motor vehicle crashes involving a motorist proceeding straight or driving off the road were the most common.

Crash Type: The top crash types by crash frequency include:

- Hit Fixed Object (21% of crashes).
- Broadside (17% of crashes).
- Vehicle/Pedestrian (15% of crashes).

More than half of the fixed object crashes occurred along Pleasant Hill Road, primarily in the segment north of Reliez Valley Road. Broadside crashes occurred at unsignalized intersections, typically involving a user not yielding to the right of way or disregarding a stop sign.



Movement Type: Crashes involving only solo motor vehicle accounted for the largest share of crashes (34%) and KSI crashes (36%). Eleven of the 16 solo crashes occurred along Pleasant Hill Road, with the most common crash types being striking a fixed object or overturning a vehicle.

Reported Violation Type: Unsafe lane change (23% crashes, 14% KSI), automobile right of way (19% crashes, 29% KSI), and improper turning (13% crashes, 14% KSI) were the three most common violation types. For unsafe lane change, seven of the 11 unsafe lane changes involved only a single motor vehicle in which the motorists struck a fixed object.

Daylight/Nighttime Conditions: Most crashes occurred during daylight conditions.

Posted Speed Limit: Streets with a posted speed limit of 35 mph accounted for the largest share of overall crashes (49%) and KSI crashes (50%).

Transit Stop: Intersections with a bus stop had a higher crash rate than intersections without a bus stop. Additionally, seven of the nine reported pedestrian crashes occurred at intersections with a bus stop.

The crash analysis key findings were used to help inform the Emphasis Areas, which are the key trends and contributing factors that the City should address to most effectively improve safety and achieve its goal of zero roadway deaths and serious injuries. The crash data itself will serve as an important starting point for project development that is focused on eliminating KSI crashes.

EQUIVALENT PROPERTY DAMAGE ONLY (EPDO)

The total equivalent property damage only (EPDO) method is a weighted score used to evaluate crash factors related to the societal costs.[25] An EPDO score is a data point used to evaluate the frequency and severity of crashes. Crash analysis typically evaluates the total number of crashes, total number of KSI crashes, percent of crashes resulting in a KSI, and the total EPDO score. The EPDO method normalizes crashes to a base unit of property damage only (PDO) crashes to allow for comparison. One crash involving a death is approximately 120-190 PDO crashes. An EPDO score of crashes between 2017 and 2021 was used in the Descriptive Crash Analysis to evaluate the safety risk of key crash factors, such as road classification, speed limit, crash type, weather conditions, and age of persons involved.

[25] "Improving Safety on Rural Local and Tribal Roads – Safety Toolkit." Federal Highway Administration, October 2013, https://safety.fhwa.dot.gov/local_rural/training/fhwasa14072/sec4.cfm#:~:text=In%20this%20method%2C%20weighting%20factors,frequency%20and%20severity%20of%20crashes.

ENGINEERING FIELD VISITS

Engineering field visits were conducted for all HIN segments identified through the crash analysis. On each HIN segment, engineers reviewed geometric design, traffic control devices, and observed road user behaviors to confirm existing conditions, determine potential safety issues, and consider engineering countermeasures to address the existing safety issues. A series of photos were taken during field visits including those shown in Figure 21 and Figure 22.

Figure 21. A bicyclist uses shared lane markings at Mt. Diablo Boulevard and Moraga Road

The visits noted where critical safety infrastructure was missing or deficient, and where conditions on the segments had been recently changed, for instance through repaving or recent projects. Common observations included limited visibility, faded and missing signage and striping, large corner radii, and insufficient lighting. Key observations from the Engineering Field Visits informed the Location Profiles for each of the HIN segments. These Profiles include land use context and reflect crash history.

Figure 22. Crosswalk striping on Reliez Valley Road

LOCATION PROFILES

A Location Profile was developed based in part on observations from field visits with qualitative and quantitative descriptions of the characteristics, features, and available data for each HIN segment. Location Profiles contain:

- A description of the segment's roadway characteristics including number of lanes, speed limits, and presence of pedestrian and bicycle facilities,
- Crash history, and
- Key observations from field visits.

By consolidating this information, each Location Profile will help city staff and community members understand the characteristics of a given segment, and serve as a starting point to identify appropriate safety countermeasures and projects along the HIN that would be most likely to improve safety. More detail is available in the *Selecting Safety Countermeasures* section. The information in these profiles was considered, along with community input, when determining Emphasis Areas.

As an example, Table 2 shows key observations in the Location Profile for Moraga Road between Mount Diablo and Old Jonas Hill Road. Location Profiles for all HIN segments are located in *Appendix B: Lafayette LRSP Location Profiles and Emphasis Areas*

Table 2. Moraga Road Location Profile Key Observations

Key Observations	
Inconsistency in signage	Poor visibility at driveways
Some signage does not comply with the California Manual on Uniform Traffic Control Devises	Uncontrolled left turns across Moraga Road
Poor visibility of lane line markings	Marked pedestrian crossings across Moraga Road are infrequent
Sidewalks are not consistent along both sides of the roadway	Most crosswalks are not high-visibility
No bicycle facilities	Lack of lighting
Failure to yield to pedestrians	

EMPHASIS AREAS

Emphasis Areas represent Lafayette-specific populations, travel behaviors and roadway design elements that are areas of safety concern and that should be proactively and systemically addressed throughout Lafayette to eliminate fatal and serious injury crashes.

As illustrated in Figure 23, the Emphasis Areas were determined from safety risks identified from the crash analysis, engineering field visits, community engagement activities, and LRSP Task Force meetings. Emphasis Areas are where additional road safety attention and resources are most needed to eliminate KSI crashes in Lafayette by 2033. Emphasis Areas are a LRSP planning best practice, but the identification of these specific Emphasis Areas was based on the specific safety needs, context, and priorities for Lafayette.

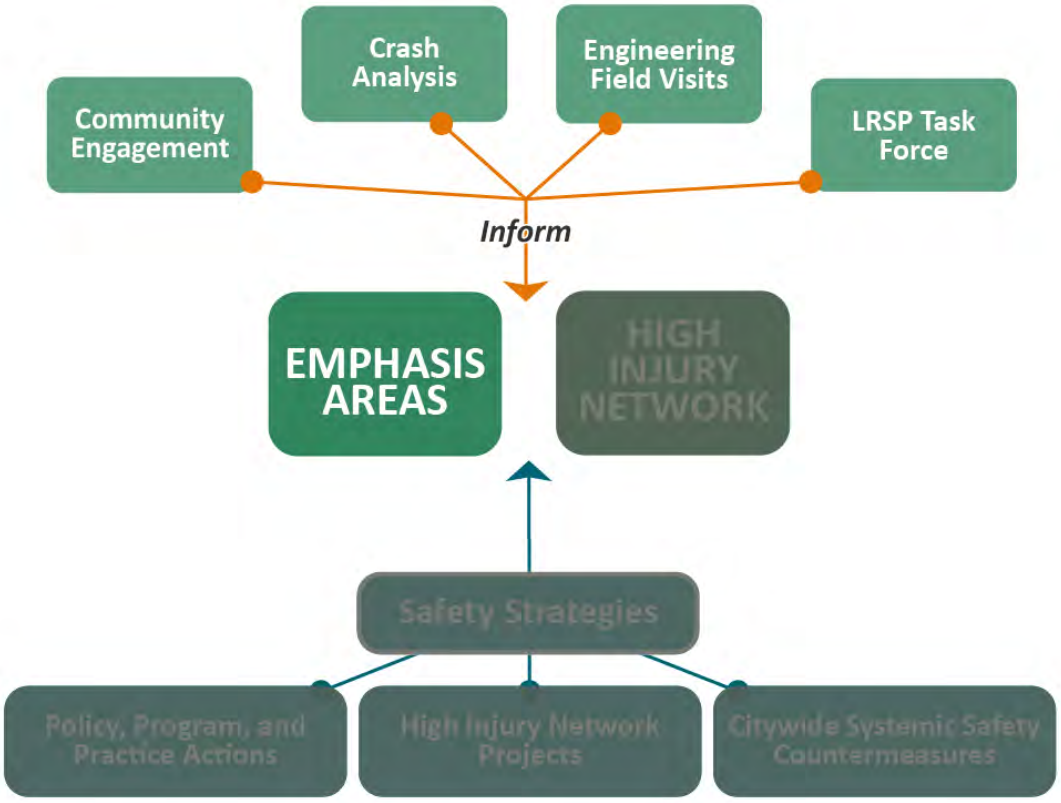


Figure 23. Emphasis Areas and HIN relations

The Emphasis Areas for the LRSP described below help identify and organize the safety strategies outlined in the *Safety Strategies* section later in the LRSP. The following Emphasis Areas are not presented in any priority order.

Bus Stops at Intersections

Intersections with a bus stop had a higher crash rate than intersections without a bus stop. Additionally, seven of the nine reported pedestrian crashes occurred at intersections with a bus stop. Roadway design and signage should communicate to drivers to expect pedestrians near bus stops, and improvements should enhance safe access for riders.

It is important to note that the bus stop information obtained was based on data available from 2018, and several bus routes have been updated since then. Further, Lamorinda school bus routes data were not included in the analysis, presenting a further analysis the City may undertake to focus improvement locations.

Distracted Driving

Through survey responses and the community workshop, community members observed that distracted driving was a common behavior that makes people feel unsafe on the roadways. Concerns were especially focused on areas around schools and downtown where there are high levels of pedestrian activity. Education and enforcement, as well as roadway design interventions that maintain high levels of attentiveness on arterials, would work to decrease potential violations such as lane departure or failure to yield that may result from distracted driving.

Failure to Yield

In Lafayette, failure to yield violations typically occurred at stop signs, against oncoming traffic, or when pedestrians were in crosswalks. Motorists failing to yield the right of way was the most reported violation for KSI crashes (29%), and 44% of failure to yield crashes led to a KSI. In the online survey, community members noted “stop sign running by cars or bikes” as the second most selected unsafe behavior. Additionally, community members expressed interest in improving crossing safety by increasing yield compliance with pedestrians and bicyclists. Where enforcement and design improvements can improve driver yielding behavior, roadway users will benefit from better separation and increased driver responsibility.

Improper Turning

Improper turning was the third most reported violation for KSI crashes (14%), with failure to yield when turning left or making a U-turn being the most common violation. Motorists making a left or right turn while a pedestrian is crossing at a crosswalk is the most common violation (44%). Illegal turning was identified during the public engagement process as unsafe roadway behavior and a concern. While dangerous driver behavior can be difficult to control, improved intersection and signal design can help reduce the incidences of crashes from unsafe turns.

Interactions between Bicyclists and Motorists

Bicyclist crashes make up 17% of all crashes but 36% of KSI crashes. Bicyclist crashes are typically more serious, with 63% of all bicyclist crashes resulting in KSI outcomes. Based on concerns raised by the public and field visits, crashes between motorists and bicyclists often result from general confusion about who has the right of way at an intersection. Trail crossings, too, emerged through public engagement as sites of high concern for conflicts between vehicles

Interactions between Pedestrians and Motorists

Pedestrians were involved in 19% of all crashes and 21% of KSI crashes. Pedestrian crashes are concentrated in Downtown Lafayette along Moraga Road, School Street, and Mount Diablo Boulevard at intersections with marked crosswalks. These crashes involved motorists failing to yield to pedestrians or motorists making an improper turn.

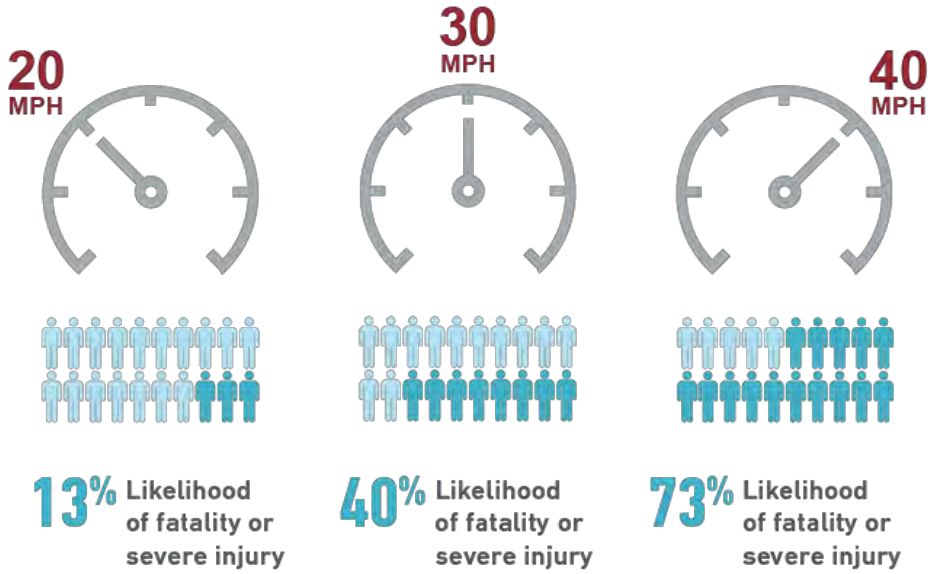
Lane Departure

Lane departure, or unsafe lane changes represent 14% of the violations cited in KSI crashes, making the type tied for the second most reported violation in KSI crashes. Seven of the 11 citations of unsafe lane changes involved only a single motor vehicle, in which the motorist struck a fixed object. Feedback during the community workshop also noted winding roads as unsafe locations, where speeding can lead to lane departure concerns.

Speeds

Higher travel speeds increase crash risk, frequency, and the likelihood that a crash will result in a KSI. Vehicle speeds directly correlate with the likelihood of a KSI outcome, as shown in Figure 24. In Lafayette, roadways with posted speed limits of 40 and 55 miles per hour had a higher crash rates and more serious injuries relative to roadways with lower posted speed limits. The comment that "traffic is too fast or doesn't stop" was the top unsafe roadway factor that the public reported in the survey.

Setting context-appropriate speed limits for the safety of all road users and designing roadways so that motor vehicles operate at that safe speed are critical components of Vision Zero and the Safe System Approach.



Data Citation: Tefft, B.C. (2011). *Impact Speed and a Pedestrian's Risk of Severe Injury or Death* (Technical Report). Washington, D.C.: AAA Foundation for Traffic Safety.

Figure 24. Speed and pedestrian crash severity correlation

Trail Crossings

Bicyclist crashes primarily occurred near trail access points, such as the intersection of Olympic Boulevard and Moraga Boulevard near the Lafayette/Moraga Regional Trail, and along Reliez Valley Road near the Reliez Valley Trail. The community expressed interest in opportunities to increase access to trails, especially as an established Safe Routes to School intervention. Intersection and facility improvements that create greater separation in time and space between vehicles and trail users would increase safety and expand access to more users.

Unsignalized Intersections

In Lafayette, unsignalized intersections were the location for 43% of all crashes and 50% of KSI crashes. From the survey responses, "dangerous intersections" was the second-most selected factor that made people feel unsafe. Generally, the community noted a lack of visibility at uncontrolled locations, especially for people walking and biking. Improvements that enhance visibility at unsignalized intersections, or that slow turning movements to give roadway users more time to react, will better separate people in time during potential conflicts at unsignalized intersections.

EMPHASIS AREA ORIGINS

To ensure consistency and build upon earlier planning efforts in Contra Costa County and the Bay Area, potential Emphasis Areas were compared to priorities identified in two other regional Vision Zero planning efforts including the Contra Costa Common Collision Patterns, as identified through the Contra Costa Transportation Authority Vision Zero framework (CCTA VZ) [26], and the Metropolitan Transportation Commission (MTC) Challenge Areas.[27, 28] The overlap resulted in the final Emphasis Areas in Table 3 below, which shows which effort supported their inclusion as an Emphasis Area.

[26] "Countywide Vision Zero." Contra Costa Transportation Authority, https://ccta.net/planning/countywide-vision-zero/.

[27] "Bay Area Vision Zero Action Plan." Metropolitan Transportation Commission, June 2022, https://mtcdrive.app.box.com/s/21shj9mn5rtdtceujsieuavllfbdtn6v/file/977263275562.

[28] "MTC High Injury Network Map." Metropolitan Transportation Commission, https://reports.mysidewalk.com/413fcf7619.

Table 3. Emphasis Area Origins

Emphasis Areas	Crash Analysis	Field Visit	Public Feedback	CCTA VZ	MTC
Bus Stops at Intersections	X			X	
Distracted Driving			X		
Failure to Yield	X	X	X		
Improper Turning	X		X	X	
Interactions between Bicyclists and Motorists	X	X	X	X	X
Interactions between Pedestrians and Motorists	X	X	X		X
Lane Departure	X	X	X		X
Speeds	X	X	X	X	X
Trail Crossings		X	X	X	
Unsignalized Intersections	X	X	X		

SAFETY STRATEGIES

Safety Strategies are the steps that will be taken to specifically address the Emphasis Areas. They are based on the safety factors, data, and trends identified in previous steps of the LRSP process.

This section presents recommended Safety Strategies for the Lafayette, which fall into three categories as shown in Figure 25.

1. Policy, Program, and Practice Actions
2. HIN Projects
3. Citywide Systemic Safety Countermeasures

These strategies comprise the City's strategic approach to achieving Vision Zero using the Safe System Approach framework. They were developed with the LRSP Task Force members representing various perspectives of roadway safety: transportation, enforcement, public and environmental health, business, emergency services, schools, and the public. National transportation engineering and planning best practices were considered when identifying these strategies. The strategies work together to specifically target and address safety for both the HIN and the Emphasis Areas identified in previous sections and are meant to build on existing citywide plans and programs related to roadway safety.

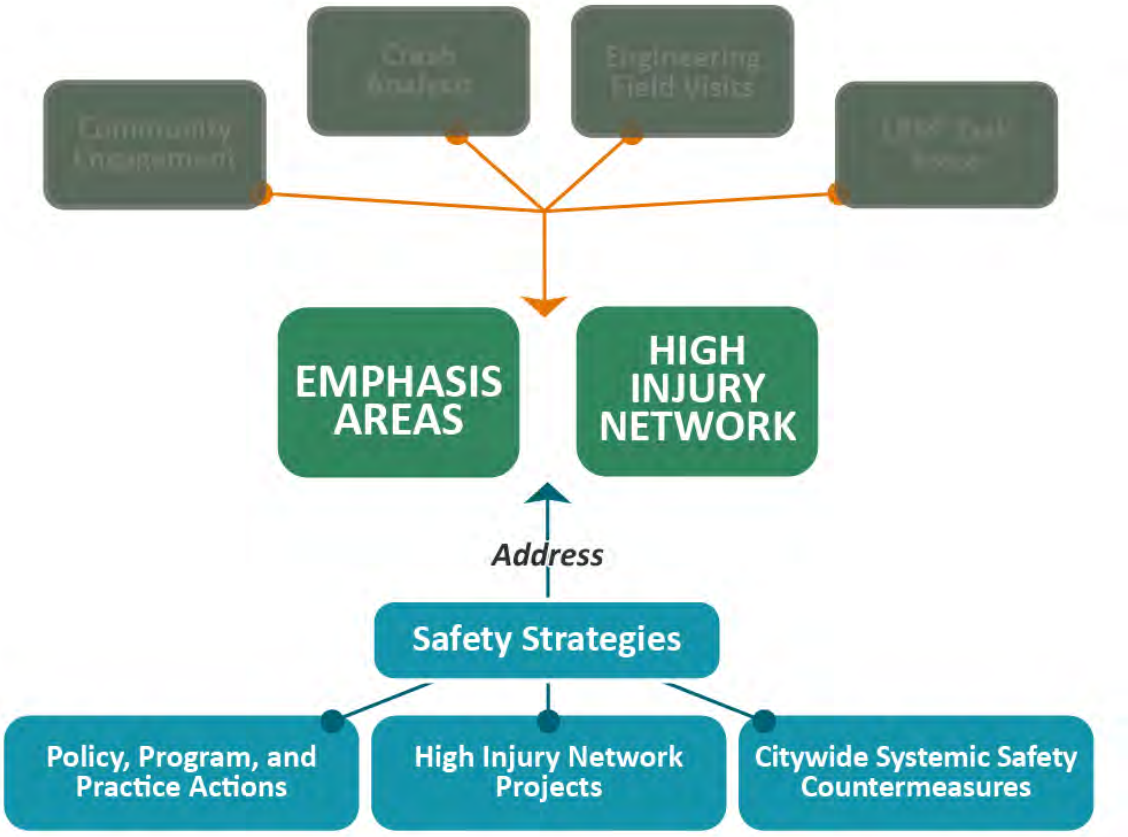


Figure 25. Safety Strategies Framework

1. POLICY, PROGRAM, AND PRACTICE ACTIONS

Policy, Program, and Practice Actions promote a paradigm shift in how we view and approach safety to better reflect the Safe System Approach and more closely coordinate safety-related efforts. The aim is to move away from assigning blame to users when a crash occurs and instead focus on education that might decrease crashes from occurring in the first place. One of the most important actions from the LRSP is the adoption of a goal year to reach zero roadway deaths and serious injuries by 2033. This goal was established by recommendation of the LRSP Task Force members.

USING THE ACTIONS TABLE

Table 4 outlines a detailed series of actions and steps that can be taken by the variety of agencies, groups, and other city partners to work toward zero KSIs within Lafayette and is a core product of the LRSP. Within the table, strategies are sorted by three types:

- Policies are overall, systematic changes that guide how priorities are set and culture is established.
- Programs are ongoing efforts that include both changes to existing programs and departments as well as recommendations to established ones.
- Practices are more detailed actions that propose distinct approaches and strategies.

Within each of these categories, actions identify the overarching strategy and can be achieved through the associated groups of steps (e.g., 2a, 2b and 2c). An achievement metric is identified for each action and step, noting which outcomes indicate that a step is complete. Each action is also tied to corresponding Emphasis Areas, demonstrating how their completion will address key safety factors within Lafayette.

The table is intended to be used as a living document to track implementation and updates to the actions and steps in this LRSP. Goals and Objectives established by the LRSP Task Force have also been included as actions and steps, so that their completion may be tracked and documented. As Lafayette departments and stakeholders complete actions and steps, the table should be updated regularly.

Table 4: Policies, Programs, and Practice Action Table

Policies, Programs, and Practices						
Safety Actions and Steps			**Emphasis Areas**	**Timeline**	**Who Should Be Involved?**	**Achievement**
Policies *Defining roles, responsibilities, and new approaches to City priorities*				*Immediate (<1 year), Medium (2-3 years), Longterm (3-5 years), Ongoing, or Completed*	*Stakeholder agencies and groups*	*Metric or outcome marking completion*
Action	**1**	**Incorporate a safety checklist into all City roadway projects**				
	a	Create a post construction review process to ensure improvements are reducing killed and serious injury crashes and evaluation of any safety adjustments or further improvements needs are documented	All	Immediate	Public Works, Engineering	Review process
	b	Refine project design based on post-project evaluation	All	Ongoing	Public Works, Engineering	Project refinements
Action	**2**	**Develop approach to lower speeds at locations along the HIN**				
	a	Develop list of areas, such as schools and business districts, where speed limits can be lowered based on state law	Speeds	Ongoing	Engineering	Implement lower speed limits, as appropriate
	b	Create an interim low-cost safety countermeasure checklist for any speed reduction project on the HIN until permanent road geometry changes can be made	All	Immediate	TransCirc, Public Works, Engineering, CCTA	Project planning sheet
	c	Focus any speed management resources, such as traffic calming or speed limit setting, on HIN corridors where speed limits or speeding are safety concerns	Speeds, Failure to yield	Immediate	Public Works, Engineering, TransCirc, Police Department	Policy update
Action	**3**	**Focus enforcement on the High Injury Network and behaviors related to safety issues**				
	a	Enforce speeding, red-light violations, distractions, and pedestrian right-of-way violations	Speeds, Failure to yield, Motorist-pedestrian interactions, Distracted driving	Immediate	Police Department	Enforcement approach
	b	Strategically deploy speed radar stations to collect speed information and move towards a data-driven enforcement approach	Speeds	Ongoing	Police Department, Engineering	Speed radar stations deployed
	c	Ensure collaboration and coordination between City partners in their data collection efforts so that traffic safety efforts reflect the locations with the highest need	All	Ongoing	Police Department, Engineering	Regular coordination
Action	**4**	**Adopt goal to reach zero roadway deaths and serious injuries by 2033.**				
Programs *Regular, ongoing efforts*						
Action	**5**	**Develop a project Task Force and engage the public to help guide the development of the LRSP. (LRSP Goal established through Task Force)**				
	a	Develop project webpage to share LRSP progress, engagement opportunities, project updates, draft deliverables, and roadway safety educational materials	All	Completed	TransCirc, Task Force	Project website
	b	Host a public meeting and launch an online survey to engage the public to share project updates and collect local knowledge, concerns, and opportunities	All	Completed	Engineering, Task Force	Public meeting, online survey
	c	Provide project updates and collect input/feedback through public hearings with City Council and the City's Transportation & Circulation Commission	All	Completed	Engineering, Task Force	Public hearings
	d	Develop an interactive webmap and survey to collect from the public location-based safety related concerns	All	Completed	Engineering, Task Force	Interactive webmap

Safety Actions and Steps			Emphasis Areas	Timeline	Who Should Be Involved?	Achievement
Action	**6**	**Establish and maintain a Safe Routes to School (SRTS) program led by the Lafayette and Acalanes School Districts**				
	a	Assess previous SRTS planned projects and identify where projects complement HIN corridors, prioritizing those for implementation as funding opportunities allow	Motorist-pedestrian interactions, Intersections with bus stops	Medium	Lafayette School District, Acalanes School District, Engineering, CCTA	List of SRTS projects
	b	Coordinate with the Lafayette and Acalanes School Districts community to establish a SRTS educational outreach program to develop and share safety educational materials and presentations with students and parents	Motorist-pedestrian interactions, Intersections with bus stops	Medium	Lafayette School District, CCTA, 511 Contra Costa	Educational materials
	c	Gather feedback from the Lafayette and Acalanes School Districts community through the SRTS program to inform safety projects	Motorist-pedestrian interactions, Intersections with bus stops	Medium	Lafayette School District, CCTA, Engineering	Collected feedback
	d	Regularly evaluate performance of implemented safety improvements in school zones, collecting data on vehicle speeds and crashes	Motorist-pedestrian interactions, Intersections with bus stops, Speeds	Immediate	Lafayette School District, CCTA, Public Works, Engineering	Project evaluation, crash data (ongoing)
Action	**7**	**Establish an ongoing Vision Zero Program within the City to guide roadway safety work and updates**				
	a	Maintain a Vision Zero subcommittee through TransCirc that meets periodically to evaluate progress and implemented projects	All	Immediate	City staff, TransCirc	VZ subcommittee established
	b	Through the program, formalize and share a standardized data collection process. The process should be conducted before or after any projects to evaluate safety improvements, with safety goals identified at the start of project.	All	Medium	Public Works, Engineering, CCTA	Data collection process established
	c	Develop and share standard Vision Zero and roadway safety language for use across City departments, agency partners, and in community communications	All	Medium	City staff, CCTA	Safety language standards document
	d	Conduct crash mapping annually to monitor where killed and serious injury crashes continue to happen, and compare to projects implemented through the Vision Zero process	All	Medium	Lafayette Police Department, Engineering, CCTA	Annual maps generated
Action	**8**	**Incorporate safety project implementation into Pavement Management during maintenance or paving projects**				
	a	Develop approach to align Pavement Management program with incorporating safety countermeasures	All	Ongoing	Public Works, Engineering	Pavement Management approach
	b	Establish Paving Management program schedule that prioritizes HIN streets	All	Immediate	Public Works, Engineering	Refined program schedule
Practices *Distinct methods or approaches*						
Action	**9**	**Promote a safety culture throughout community and within agencies (LRSP Goal established through Task Force)**				
	a	Maintain regular communication with City partners on importance of roadway safety and shared stakeholder responsibility	All	Immediate	TransCirc, City staff, CCTA	Regular plan updates
	b	Include partners from various departments, agencies, businesses and community in the development of LRSP	All	Completed	TransCirc, City staff, CCTA	Number of stakeholder groups engaged
	c	Promote an external safety culture with community members through methods such as social media and school outreach, involving broader community in safety projects and plans	All	Immediate	TransCirc, City staff, CCTA, Lafayette School District, Acalanes School District	Materials generated and distributed

Safety Actions and Steps			Emphasis Areas	Timeline	Who Should Be Involved?	Achievement
Action	**10**	**Implement a data-driven planning approach, supplemented by public input, to identify where and why roadway collisions resulting in deaths and serious injuries and near misses are occurring (LRSP Goal established through Task Force)**				
	a	Conduct a systemic and proactive collision analysis of Lafayette's roadway network	All	Completed	Engineering	Crash analysis memorandum
	b	Use quality data and the latest analytical processes to better understand crash causation and crash risk	All	Completed	Engineering	Crash analysis memorandum
	c	Identify high priority locations using historical crash data and analysis, proactive systemic safety analysis, stakeholder and public input, and in-person field visits	All	Completed	Engineering	High Injury Network
Action	**11**	**Prioritize roadway safety actions and programmatic recommendation investments to advance Lafayette's Vision Zero goals (LRSP Goal established through Task Force)**				
	a	Identify actions utilizing strategies across all roadway safety disciplines, engineering, enforcement, education, and emerging technologies	All	Completed	Task Force, City staff	Safety Actions spreadsheet
	b	Develop a safety actions toolbox that includes systemic and effective short-and longer-term actions that are specific to Lafayette's crash patterns	All	Completed	Task Force, City staff	Safety Countermeasure Toolbox
	c	Produce a list of engineering projects pulling from resources included in the safety action toolbox aimed at improving roadway safety for all	All	Ongoing	Task Force, City staff	List of projects
	d	Include an assessment of current policies, plans, guidelines, and/or standards to identify opportunities to improve how processes prioritize safety	All	Completed	Task Force, City staff	Adopted LRSP
Action	**12**	**Produce an LRSP to build safer streets for all (LRSP Goal established through Task Force)**				
	a	Use the safety actions toolbox and priority locations to proactively address crash risk throughout Lafayette	All	Immediate	Public Works, Engineering	Number of actions achieved, countermeasures implemented
	b	Utilize the best available data and publicly collected feedback to produce a prioritized list of engineering projects that can be submitted for grant application processes	All	Ongoing	TransCirc, Engineering	List of projects and countermeasures
	c	Apply for Caltrans and other grant programs to fund improvements and steps in this Action Plan	All	Medium	TransCirc, City staff, City Council	Applications submitted
	d	Ensure that the plan includes recommendations and tools that will enable the city to measure safety trends, update the progress of the plan over time, and be competitive for grant funding	All	Ongoing	TransCirc, City staff, City Council	List of recommendations
Action	**13**	**Centralize Vision Zero-related data in accessible and useful formats**				
	a	Conduct crash mapping annually to monitor where killed and serious injury crashes continue to happen, and compare to projects implemented through the Vision Zero process	All	Immediate	Engineering, Police Department	Creation of VZ map, dashboard, or other resource
	b	Share Vision Zero progress with the community, including crash statistics, mapped crashes, and any changes to the program. The LRSP Task Force may support through guidance and review of performance evaluation results.	All	Ongoing	TransCirc, Engineering, Task Force	Annual VZ report
Action	**14**	**Provide progress updates to community on safety evaluation results and project implementation**				
	a	Conduct regular community outreach as part of HIN projects and subsequent safety improvements to inform, educate, and collect continued feedback	All	Medium	TransCirc, Task Force, City staff	Community feedback collected, outreach materials and events
	b	Regularly report progress on LRSP actions and HIN projects via established VZ program channels and involved City departments, via monitoring steps as described in the LRSP	All	Medium	TransCirc, Task Force, City staff	LRSP progress reports

Safety Actions and Steps			Emphasis Areas	Timeline	Who Should Be Involved?	Achievement
Action	**15**	**Improve user safety and visibility at intersections following the Safe Systems Approach**				
	a	Implement Systemic Actions, such as Leading Pedestrian Intervals, at HIN intersections to improve pedestrian safety and visibility. See: Systemic Countermeasures Table.	Motorist-pedestrian interactions, Failure to yield	Ongoing	Engineering	Implemented countermeasures
Action	**16**	**Identify gaps in pedestrian and bicycling networks and apply the Safe Systems Approach of separating users in time and space to increase user safety**				
	a	Review HIN for gaps in pedestrian and bicyclist networks	Motorist-pedestrian interactions, Motorist-bicyclist interactions, Trail crossings	Medium	Engineering	Identified list of gaps
	b	Identify potential project opportunities to address gaps	Motorist-pedestrian interactions, Motorist-bicyclist interactions, Trail crossings	Medium	Engineering, Emergency Services	Project list

POLICY PROGRAM AND PRACTICE ACTIONS

- A detailed series of actions and steps to work toward zero KSIs
- Achievement metric identified for each action and step
- Located in a living document to track implementation

HIN PROJECTS

- Location specific safety improvements based on historical crashes on a HIN segments
- Analyze crash causes, context, and modes involved to determine best set of safety countermeasures to eliminate killed and serious injury crashes

CITYWIDE SYSTEMIC SAFETY COUNTERMEASURES

- Install certain safety countermeasures that are good for safety citywide or at least on the HIN first
- Does not require much further analysis or complex engineering to implement

2. HIN PROJECTS

The LRSP prioritizes roadway safety improvements along the HIN segments. These segments were identified through crash analysis and confirmed through community engagement and engineering field observations. HIN projects are comprised of location-specific safety countermeasures selected from the Safety Countermeasure Toolbox, located in *Appendix C: Safety Countermeasure Toolbox*, based on conditions and behaviors indicated by crash data to address the specific factors that contributed to KSI crashes.

In Table 5, HIN segments are prioritized by the number of KSI crashes recorded and the corresponding number of web map “unsafe” points indicated during community engagement is provided. If resources are limited to implement all the safety improvements needed on the HIN segments, priority should be given to those at the top of the list.

Table 5. Prioritized HIN Segments

Rank	Corridor	Limits	Number of KSI	Number of Web Map Unsafe Points
1	Olympic Boulevard	Reliez Station Road to East of Newell Court	3	37
2	Pleasant Hill Road	Taylor Boulevard to Olympic Boulevard	2	59
3	Moraga Road	Mount Diablo Boulevard to Old Jonas Hill Road	1	220
4	Mount Diablo Boulevard (West)	Acalanes Road to Risa Road	1	66
5	Moraga Boulevard	Moraga Road to Victoria Avenue	1	49
6	School Street	Moraga Road to Topper Lane	1	46
7	Deer Hill Road	Happy Valley Road to Miller Drive	1	32
8	Mount Diablo Boulevard (East)	Willow Drive to Pleasant Hill Road	1	12
9	Reliez Valley Road	Gloria Terrace to Sterling Heights Lane	1	1

SELECTING SAFETY COUNTERMEASURES

The Location Profiles and Emphasis Areas describe crash causes, context, and modes involved for each the HIN segment, as described in *Appendix B: Lafayette LRSP Location Profiles and Emphasis Areas*. Safety countermeasures for each segment can be identified based on guidance in the Safety Countermeasure Toolbox. This tool, located in *Appendix C: Safety Countermeasure Toolbox*, includes information on how to select safety countermeasures based on the crash and context, through the Safe System Approach framework, and has crash modification factor (CMF) information to begin to assess the possible effectiveness of the safety countermeasures to reduce crashes.

The Safety Countermeasure Toolbox provides additional detail on where specific improvements are considered applicable and most effective, along with instruction on how to analyze multiple CMFs used on the same HIN segment. The exact combination of the safety countermeasures used and the designs of each will be tailored to the corridor to prevent future KSI crashes from occurring. Some of the countermeasure tools may require additional consideration by local emergency responders prior to implementation to reflect the need to minimize impacts on key evacuation routes.

Using the Safety Countermeasures Toolbox

1. Evaluate crash causes, contributing factors, and roadway context that may have contributed to crashes.
2. Use the Safety Countermeasure Toolbox to develop a list of possible roadway safety countermeasures to eliminate crash types.
3. Review countermeasure(s) through the lens of the Safe System Approach framework.
4. Use crash modification factors to estimate if the roadway safety countermeasures selected will eliminate KSI crashes.
    a. Select a method to analyze multiple CMFs based on FHWA guidance
    b. Apply a method to analyze multiple CMFs based on FHWA guidance
5. Build safety improvements.
6. Implement evaluation to determine the effectiveness of safety improvements and document actual crash reductions.
7. Add additional safety countermeasures or make field adjustments based on actual crash data.

POST IMPLEMENTATION EVALUATION

The performance of the safety countermeasures implemented in a HIN Project should be evaluated. If results indicate that the safety countermeasures have been effective in reducing KSI crashes, applying these same countermeasures at locations with similar conditions should be considered. Otherwise, the approach should be adjusted and alternate safety countermeasures should be explored.

Moraga Road HIN Example

The following example explains the process of selecting safety countermeasures to improve pedestrian safety along Moraga Road from Mount Diablo Boulevard to Old Jonas Hill Road.

Crash data for this segment is summarized in Table 6. Consideration of this data should be prioritized so that safety countermeasures are focused on crash types and factors that resulted in KSI crashes.

Table 6: Crash history for Moraga Road from Mount Diablo Boulevard to Old Jonas Hill Road

<table>
<tr><th>Project</th><th>Limits</th><th># of deaths</th><th># of KSI</th><th>Total Crashes</th><th>Leading Crash Types</th><th>Violation Type</th><th>Modes Involved in Crashes</th><th>Intersection?</th><th>Signalized?</th></tr>
<tr><td rowspan="5">Moraga Road</td><td rowspan="5">Mount Diablo Boulevard to Old Jonas Hill Road</td><td rowspan="5">1</td><td rowspan="5">1</td><td rowspan="2">1 Death</td><td>Ped crossing in Crosswalk at Intersection, MV Making Left Turn</td><td rowspan="2">Fail to Yield to pedestrian</td><td rowspan="4">3 Pedestrian Crashes</td><td>Moraga Road</td><td rowspan="5">Yes</td></tr>
<tr><td>Ped crossing in Crosswalk at Intersection, MV Making Right Turn</td><td>Yes</td></tr>
<tr><td rowspan="3">3 Complaint of Pain</td><td>Ped crossing in Crosswalk at Intersection, MV Proceeding Straight</td><td>Fail to Yield to driver</td><td>Brook Street</td></tr>
<tr><td rowspan="2">Rear End, Multi-Motor Vehicle</td><td>Other Improper Driving</td><td rowspan="2">Segment</td></tr>
<tr><td>Unsafe passing</td><td>1 Motorist Crash</td></tr>
</table>

Along this segment, one pedestrian was killed, two additional pedestrians were injured in non-KSI crashes, and one motorist was injured in a non-KSI crash. The prevailing crash types based on this data include:

- failure to yield
- unsafe passing
- other improver driving.

This key information from crash data should be reviewed the Safety Countermeasures Toolbox, to determine safety countermeasures proven effective for mitigating these crash types. For the purposes of this example, safety countermeasures selected are related to improving pedestrian safety.

Community input is another factor to consider when developing HIN projects. For instance, during community engagement for the LRSP, Moraga Road had 220 “unsafe” points from web map respondents, the most of any location within the city. Community members suggested solutions such as more visible signage, hardened centerlines at turns, and new lights at bus stops. In addition, Moraga Road is also a segment contained within the Stanley Middle School and Lafayette Elementary School Rapid

Implementation School Safety Plans, which proposed project types such as protected left turn phases at School Street, leading pedestrian intervals, and enhanced biking and walking facilities.

Potential safety countermeasures are listed in Table 7. The table also identifies whether or not the safety countermeasure is systemic. See the *Citywide Systemic Safety Countermeasures* section below for more information on systemic safety countermeasures.

All safety countermeasures selected as part of this example are starting recommendations, but would require additional analysis by the City before being included in a HIN project.

Table 7: Safety countermeasures based on crash data to improve pedestrian safety

Safety Countermeasures	Systemic
Curb extensions	Yes
Leading Pedestrian Intervals	Yes
Pedestrian refuge islands	Yes
Prohibit right-turn on red	No
Reduce corner radii	Yes
Harden centerline	Yes
Lighting at segments	No

CITYWIDE SYSTEMIC SAFETY COUNTERMEASURES

Citywide systemic safety countermeasures are a subset of the Safety Countermeasures Toolbox. These countermeasures should be implemented broadly to proactively improve safety proactively throughout the city as capacity, need, and resources allow. These safety countermeasures are proven effective and are beneficial for the overall safety of all roadway users. It is recommended that these systemic safety countermeasures first be implemented along the HIN segments and then citywide, subject to funding availability and feasibility.

Systemic safety countermeasures can be applied proactively to improve safety, rather than HIN location-specific projects that are based on information about historical crashes. Systemic safety countermeasures do still require some level of decision making before being installed at each specific location. The improvements should follow City policies and appropriate guidance and may require collaboration with partner agencies such as the School Districts and emergency responders.

The set of systemic safety countermeasures outlined in Table 8 address certain Emphasis Areas, with a focus on those that address multiple Emphasis Areas, such as intersection treatments and speeds. Reducing corner radii, for example, slows vehicles turning at intersections and increases awareness of pedestrians crossing the road. This set of improvements was also identified as being applicable to a variety of roadway types and less dependent on individual roadway contexts. For information on where and in what instances the improvement types should be selected, see *Appendix C: Safety Countermeasure Toolbox*.

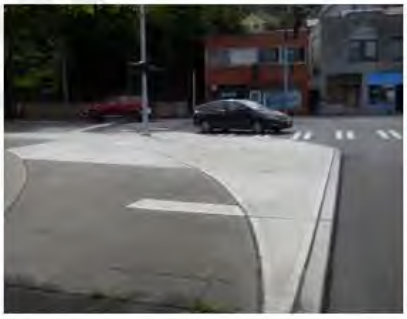
The implementation of systemic safety countermeasures may require a change identified in or supported through the Policies, Programs, and Practices Actions mentioned above. These proactive systemic safety countermeasures and all roadway improvements should be decided upon and implemented through the lens of the Safe System Approach framework[29]. Figure 26 is an example of three safety countermeasures.

[29] "Safe Systems Framework." *Institute of Transportation Engineers*, 2019, https://www.ite.org/pub/?id=C8B1C6F9-DCB5-C4F3-4332-4BBE1F58BA0D.

Table 8. Citywide Systemic Safety Countermeasures

Systemic Safety Countermeasures	Relevant Emphasis Areas	Relevant Roadway Type
Install leading pedestrian intervals	Motorist-Pedestrian Interactions	All
Install and upgrade to high-visibility crosswalks (continental)	Motorist-Pedestrian Interactions, Failure to Yield	All
Install stop bars at existing crosswalks	Motorist-Pedestrian Interactions, Failure to Yield	All
Reduce corner radii	Speeds, Improper Turning	All
Harden centerlines at intersections	Speeds, Improper Turning	Arterial, collector
Install centerline and edgeline rumble strips and stripes	Speeds, Lane Departure	Arterial
Install chevron signs at curves	Lane Departure	Arterial
Pedestrian refuge islands	Motorist-Pedestrian Interactions, Failure to Yield	All
Curb extensions	Speeds, Improper Turning	All

Continental crosswalk and stop bar (Source: Toole Design)



Tightened corner turning radii, temporary treatment (Source: Toole Design)

Hardened intersection centerline, concept graphic (Source: NYCDOT)

Figure 26. Example systemic safety countermeasures

PROGRAM EVALUATION

The final step in LRSP development is to evaluate progress in reducing and eliminating KSI crashes. As projects are implemented and actions completed, continuous evaluation will inform adjustments to existing projects, future projects, and safety-related plans to ensure continued progress toward the City's Vision Zero goal and creating a safe system for all roadway users.

KSI crash data, as described in the *Analyze Safety Data* section, should be acquired annually to monitor whether these are decreasing. Mapping KSI data will help to indicate if projects that have been implemented on HIN segments are improving safety. This exercise could also reveal future priority locations for safety improvements.

To achieve Vision Zero, it is important to prioritize roadway safety where need and impact are greatest until the goal of zero deaths and serious injuries on roadways across Lafayette is reached by 2033.

Figure 27 charts a path to reducing deaths and serious injuries annually until Vision Zero is realized. Comparing the number of annual KSI crashes to this chart will allow the City of Lafayette to understand if steps and projects being implemented are effective or need to be adjusted to reach the goal of Vision Zero by 2033. The path may look different than the graph below, but total annual KSI crashes should follow or be below this general trend over time. If the estimated number of KSI crashes fall in the orange areas, goals are not being met and more resources and/or shifts in roadway safety decisions are needed. Ideally, all involved partners should be striving for fewer KSI crashes than Figure 27 indicates.

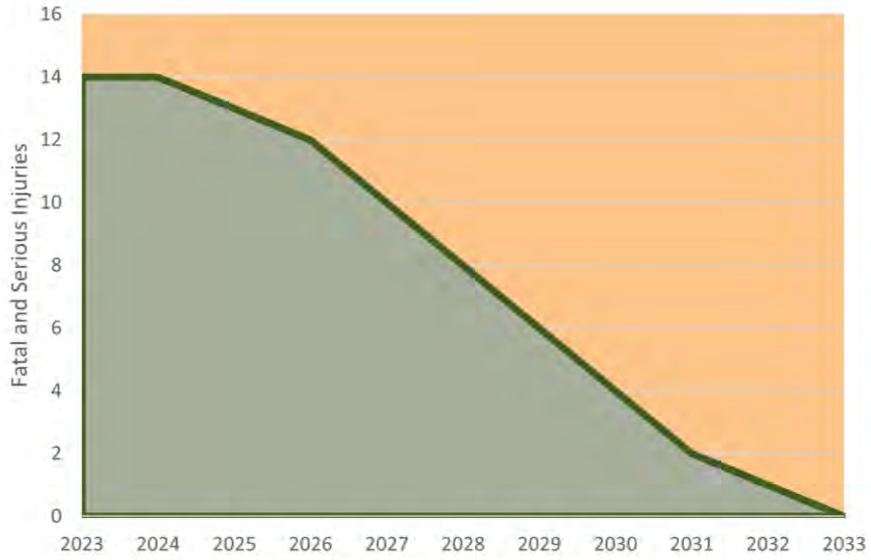


Figure 27. Path to Zero Killed and Serious Injury Crashes by 2033

The City of Lafayette should track the following key quantitative indicators to help indicate if the Lafayette community is on the path to reaching Vision Zero by 2033:

- Number of KSI crashes decreasing annually
- Number of safety improvements implemented where need and impact are greatest, including on HIN segments and locations with similar conditions once effectiveness of safety countermeasures is confirmed
- Number of crashes by type, modes involved, and location decreasing citywide
- (Once zero KSI crashes are reached) Number of non-KSI crashes decreasing annually

The City of Lafayette should also monitor the progress of individual actions and steps from . The achievement column offers a metric or outcome that marks the completion of the corresponding step. If certain step's achievements are continually not being met within the estimated timeline this may indicate that the City should reassess and adjust the current approach. As discussed in the *Policy, Program, and Practice Actions* section.

The outcomes program evaluation described here should be communicated to the community to keep them informed of the program's progress and continue to raise awareness around the City's commitment to zero KSIs by 2033.

MAINTAINING THE MOMENTUM

The process of Vision Zero is to prioritize roadway safety where need and impact are the greatest until the goal of zero roadway deaths and serious injuries by 2033 is realized in Lafayette. The following summarizes the core themes of the LRSP and offers next steps that extend the Safe System Approach into succeeding years. These themes should be reviewed and updated every two to five years.

SHIFTING THE PARADIGM FOR SAFE MOBILITY

Instead of assigning blame in the event of a crash, the Safe System Approach framework first looks at the people involved in a crash by considering the severity of the crash. This means that instead of asking, "Why did that person crash?" we ask, "Why was that person so seriously injured in the crash and what can we do?" This change in thinking represents a significant shift from an individual or a department's responsibility (e.g., Public Works or Police Department) to a public health perspective.[30]

FORMALIZING THE PROCESS

While the City has already been progressively tackling projects with known safety concerns, this Plan formalizes the process and provides background to key stakeholders and community members by identifying what the safety issues are, where the focus should be, what should be done, and why these strategies are important. Formalizing the process puts everyone on the same page about what to expect next and creates transparency between the City and the public.

EXPANDING THE DATA COLLECTED

Data transparency is important to maintain accountability and generate public support for Vision Zero and safety projects. The City is committed to moving toward a data-driven approach.

The crash data collection process can be more equitable and should include more than just where and how crashes happen. The City must also consider additional data, such as the demographics of impacted communities, any enforcement inputs, and hospital injury reports, if available and identify any disproportionate impacts on certain communities.

COLLABORATION IS KEY

This LRSP represents a commitment to prioritizing roadway safety issues. Implementing these actions will require collaboration between all key stakeholders, as well as other supporting organizations and government agencies. It will also require the support of people who live in, work in, and visit Lafayette. In addition, to continue working on the strategies listed in Safety Strategies, the City is committed to

[30] "How does Vision Zero differ from the traditional traffic safety approach in U.S. communities?" *Vision Zero Network*, 2016, http://visionzeronetwork.org/wp-content/uploads/2016/03/VZN-Case-Study-1-What-makes-VZ-different.pdf.

updating the LRSP every five years. Another fundamental outcome of this plan is the City's establishment of a target zero KSIs by the year 2033.

COMMUNICATING PROGRESS

Progress towards achieving Lafayette's Vision Zero goals should be measured to gain an understanding of whether the actions and improvements that have been implemented have contributed towards meeting the goals of this Plan. Progress should be clearly communicated with the public and stakeholders as a reminder of the importance of traffic safety, the successes, and challenges in moving towards Vision Zero, and lessons learned.

INVOLVING THE PUBLIC IN VISION ZERO

We're all in this together. To carry out many of the actions presented in this Plan and to successfully eliminate roadway deaths and serious injuries by 2033, we need everyone's help. We all have a personal responsibility to make the right choices and to spread the word about why roadway safety matters — making the City's efforts even more effective.

APPENDIX A: ALL LOCAL CRASHES

APPENDIX A: ALL LOCAL CRASHES (2017 – 2021)

Speed Limit	Functional Classification	Street Name(s)	Crash Date	Primary Violation Factor	KSI	Bike	MC	MV	Ped
25	Residential	Dolores Dr	2019-01-03	Unsafe Speed	No			1	
		Rancho View Dr and Billington Court	2017-03-29	Unsafe Lane Change	No			1	
			2018-09-02	Unsafe Speed	No			1	
		Merriewood Dr and Indian Way	2020-07-28	Automobile Right of Way	Yes	1			
		Quandt Rd and Summit Rd	2020-09-19	Improper Turning	No	1			
		School St and Paradise Court	2021-09-08	Improper Turning	Yes				1
		Victoria Ave and Moraga Blvd	2021-09-15	Traffic Signals and Signs	Yes	1			
30	Tertiary	Glenside Dr and Arroyo Court	2017-01-23	Other Hazardous Violation	No	1			
		Driftwood Dr	2018-09-07	Automobile Right of Way	No			1	
			2021-07-09	Automobile Right of Way	No			1	
		Beechwood Dr and Reliez Station Rd	2019-11-30	Unsafe Lane Change	No			1	
		Richelle Court and Reliez Station Rd	2019-12-30	Unsafe Lane Change	No			1	
		Upper Happy Valley Rd and Happy Valley Rd	2020-02-24	Improper Turning	No				1
35	Primary	Pleasant Hill Rd.	2020-07-31	Improper Turning	No		1		
			2018-07-24	Improper Turning	Yes		1		
			2020-12-31	Other Than Driver (or Pedestrian)	No			1	
			2018-10-02	Improper Turning	No			1	
	Secondary	Moraga Rd and Moraga Blvd	2017-07-24	Pedestrian Right of Way	Yes				1
		Pleasant Hill Rd	2020-08-17	Traffic Signals and Signs	No			1	
			2021-05-01	Unknown	No			1	
		Mount Diablo Blvd and El Nido Ranch Rd	2019-03-19	Unknown	No			1	
			2021-06-22	Automobile Right of Way	Yes			1	
		Moraga Rd and Brook St	2017-04-17	Automobile Right of Way	No				1
			2019-03-05	Other Improper Driving	No				1
		School St and Moraga Rd	2019-02-05	Automobile Right of Way	No				1
		Mount Diablo Blvd and Happy Valley Rd	2019-03-21	Pedestrian Right of Way	No				1
		Mount Diablo Blvd and Willow Dr	2019-08-07	Pedestrian Right of Way	Yes				1
		Dewing Ave and Mount Diablo Blvd	2021-02-19	Pedestrian Right of Way	No				1

Speed Limit	Functional Classification	Street Name(s)	Crash Date	Primary Violation Factor	KSI	Bike	MC	MV	Ped
		Old Jonas Hill Rd and	2021-05-05	Following Too Closely	No			1	
		Olympic Bl and Pleasant Hill Rd	2021-04-13	Automobile Right of Way	Yes	1			
			2021-11-25	Unsafe Lane Change	No			1	
	Tertiary	Reliez Valley Rd	2017-01-16	Unknown	No	1			
			2018-08-02	Improper Passing	Yes	1			
		Deer Hill Rd and Orchard Rd	2019-10-03	Automobile Right of Way	No		1		
		1st St and Deer Hill Rd	2019-12-16	Automobile Right of Way	Yes			1	
		Deer Hill Rd and Oak Hill Rd	2021-05-04	Unsafe Lane Change	No			1	
40	Primary	Pleasant Hill Rd	2019-11-08	Unsafe Lane Change	No			1	
		Pleasant Hill Rd and Reliez Valley Rd	2017-03-26	Unsafe Lane Change	No			1	
		Pleasant Hill Rd and Greenvalley Drive	2019-09-03	Hazardous Parking	No			1	
	Secondary	Reliez Station Rd and Pleasant Hill Rd	2019-06-09	Unsafe Lane Change	Yes			1	
		Pleasant Hill Rd and Condit Rd	2020-01-26	Unsafe Lane Change	No			1	
45	Secondary	Olympic Blvd	2018-01-28	Unsafe Lane Change	Yes			1	
			2019-05-23	Unsafe Speed	Yes	1			
			2021-06-07	Unsafe Speed	No			1	
55	Primary	Pleasant Hill Rd and Taylor Blvd	2021-05-09	Unsafe Speed	No			1	
		Taylor Blvd	2017-03-24	Driving or Bicycling Under the Influence of Alcohol or Drug	Yes			1	
			2018-02-16	Unsafe Lane Change	No			1	
Total						**8**	**3**	**27**	**9**

APPENDIX B: LAFAYETTE LRSP LOCATION PROFILES AND EMPHASIS AREAS

TOOLE DESIGN

1322 WEBSTER STREET
SUITE 208
OAKLAND, CA 94612

510.298.0740
TOOLEDESIGN.COM

APPENDIX B: LAFAYETTE LRSP LOCATION PROFILES AND EMPHASIS AREAS

Note: The information contained within this memorandum was current to the Lafayette LRSP project as of January 2023.

Executive Summary

This memorandum summarizes the priority locations, location profiles, and emphasis areas to determine safety focuses, actions, and improvements in the City of Lafayette Local Road Safety Plan (LRSP) as part of the City's Vision Zero goal adopted unanimously by City Council in November 2021. The memorandum is divided into three sections below and the purpose of each section is outlined below:

- The Priority Locations section identifies key locations where the City of Lafayette should prioritize safety improvements that have the greatest impact on reducing road deaths and serious injury crashes.
- The Location Profiles section provides more detailed information about each of the ten priority locations to better understand key information to inform safety improvements.
- The Emphasis Areas section is intended to take the information collected and heard so far to identify where road safety that will contribute to a positive road safety culture, changed behaviors, and consistent roadway design on streets in Lafayette.

Priority Locations

Priority Locations were identified from the prior Lafayette LRSP Crash Analysis Memorandum and Lafayette LRSP Crash Map Memorandum based on where fatal and serious injury (KSI) crashes have occurred. Locations with at least one KSI crash and one non-KSI crash, or at least four non-KSI crashes on a given corridor on all modes of high injury network (HIN) map were determined to be the greatest priority for safety improvements and on the list of priority locations.

Additional data sources were reviewed to determine overlap in safety concerns along these locations. Additional sources included:

- Public feedback based on the webmap exercise. A heatmap is included in the Lafayette Community Engagement Summary
- Safer Streets Model maps for estimated future risk for pedestrians and bicyclists is included in the Lafayette LRSP Crash Analysis Memorandum
- Contra Costa Transportation Authority (CCTA) Vision Zero Safety Priority Locations
- Metropolitan Transportation Commission (MTC)'s High-Risk Network

Table 1 summarize the priority locations and the overlap between all the sources.

Table 1: Priority Locations and Overlap

Priority Locations			HIN	Webmap Heatmap	Safer Streets Model	CCTA VZ	MTC
1	Olympic Boulevard	between Reliez Station Road and Newell Court	X	X	X	X	
2	Moraga Road	between Mount Diablo Boulevard and Old Jonas Hill Road	X	X	X	X	
3	School Street	between Moraga Road and Topper Lane	X	X			
4	Reliez Valley Road	between the northern city limit and Sterling Heights Lane	X		X		
5	Moraga Boulevard	between Moraga Road and Victoria Avenue	X	X			
6	Mount Diablo Boulevard	between Willow Drive and Pleasant Hill Road	X				X
7	Pleasant Hill Road	between Springhill Road and Taylor Boulevard/Townsend Place	X			X	X
8	Deer Hill Road	between Happy Valley Road and Miller Drive	X				
9	Pleasant Hill Road	between Mount Diablo to Olympic Boulevard	X	X	X	X	X
10	Mount Diablo Boulevard	between Acalanes Road and Risa Road	X				X

Priority Location Analysis

The priority locations capture the greatest safety need in Lafayette. Of the 47 total crashes from 2017 through 2021 from the Crash Analysis Report, 13 (93%) KSI crashes and 33 (70%) total crashes occurred along Priority Locations as shown in Table 2.

For bicyclist crashes, four of five KSI crashes (80%) and five of eight total bicyclist crashes (63%) occurred in the Priority Locations. For pedestrian crashes, all three KSI crashes and six of nine non-KSI crashes (67%) are represented in the Priority Locations. Pedestrian crashes and all KSI crashes are concentrated in downtown Lafayette. For motorist and motorcyclist crashes, all five KSI crashes and 24 of 30 non-KSI crashes (80%) are represented in the Priority Locations. Motorist/motorcycle crashes are the most common at the Priority Locations and in Lafayette as a whole.

Table 2: Crash Summary for Priority Locations By Mode

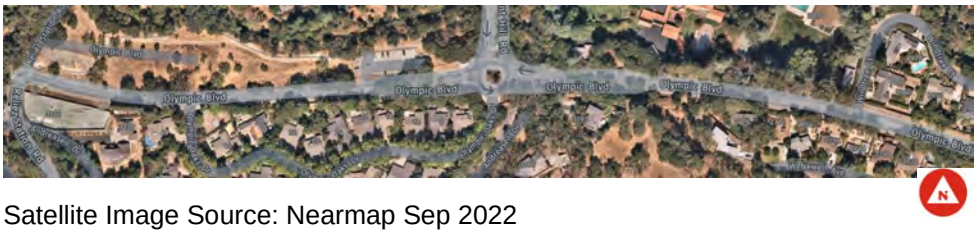
Mode	# of All Local Crashes	# of All Local KSI	# of Priority Location Crashes	# of Priority Location KSI	% of Local Crashes Included	% of Local KSI Included
Pedestrian	9	3	6	3	67%	**100%**
Bicyclist	8	5	5	4	63%	**80%**
Motorcyclist/Motorist	30	6	22	6	72%	**100%**
Total	**47**	**14**	**33**	**13**	**70%**	**93%**

Location Profile Existing Conditions

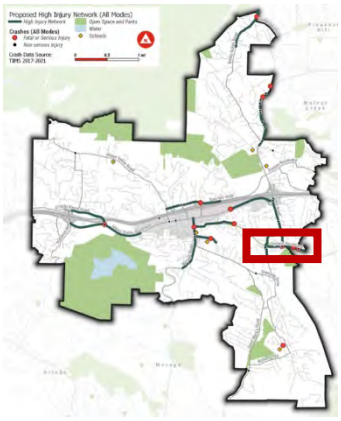
The following Location Profiles summarize the crash history, roadway geometries, land use context, and observed behaviors. The goal of the location profile is to identify safety issues and context that increases safety risk. Key observations are built off crash history, a desktop review, and an engineering field visit that was conducted on January 5, 2023.

1. Olympic Boulevard from Reliez Station Road to Newell Court

This is a two-lane street. There is a roundabout at Pleasant Hill Road with an advisory speed limit of 15 mph. The speed limit from Reliez Station Road to Pleasant Hill Road is 30 mph, and the speed limit from Pleasant Hill Road to Newell Court is 40 mph. Speed limit signage is limited along the segment. There are sidewalks along the south side of the segment west of the Pleasant Hill Road intersection and no sidewalk east of the intersection. There are class II bike lanes with a connection to Lafayette Moraga Trail, a multi-use regional trail.



Satellite Image Source: Nearmap Sep 2022



Key Observations

- Slip lane with uncontrolled crossing (at Newell Court)
- Bike lanes do not continue through intersections
- Marked pedestrian crossings along Olympic Boulevard are infrequent
- Roadway had recently been resurfaced
- Class II bike lanes may be inappropriate for speed and volume
- Appears to be excessive signage/striping at the roundabout at Pleasant Hill Road

Crash History:

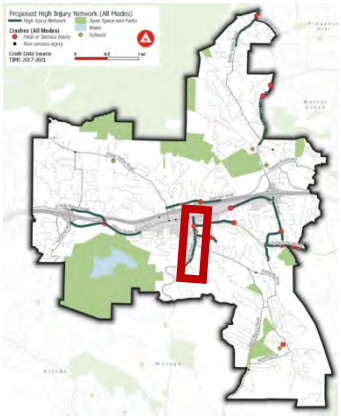
Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Olympic Boulevard	Reliez Station Road to East of Newell Court	**2**	**3**	**2 Fatal**	Hit Object; Solo-Motor Vehicle	Failed to drive within one lane	1 Motorist Crashes	Segment	
					Other	Failure to yield at an intersection	2 Bicyclist Crash	Pleasant Hill Road	No
				1 Serious Injury	Overturned, Solo Bike	Too fast for condition		Segment	
				1 Complaint of Pain	Rear End, Multi-Motor Vehicle	Too fast for condition	2 Motorist Crashes		
				1 Other Visible Injury	Hit Object, Solo Motor Vehicle	Failed to drive within one lane		Pleasant Hill Road	No

2. Moraga Road from Mount Diablo Boulevard to Old Jonas Hill Road

This is a four-lane street with a speed limit of 25 mph and 20 mph near Lafayette Elementary when children are present. There are sidewalks along both sides from Mount Diablo Boulevard to Tanglewood Drive. There is only sidewalk on the east side from Tanglewood Drive to Old Jonas Hill Road. There are no bicycle lanes. Parking is available on certain parts of the street along the west side north of St Mary's Road. This street is the main route for buses.

This segment is a part of Stanley Middle School and Lafayette Elementary School Rapid Implementation School Safety Plans. Observations from the school field visit are summarized here. Information from the Safety Plan will be used for countermeasure recommendations. Additional field observations were conducted for the intersection of Moraga Road and Mount Diablo Boulevard.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Inconsistency in signage
- Some signage does not comply with the California Manual on Uniform Traffic Control Devices (CA MUTCD)
- Poor visibility of lane line markings
- Sidewalks are not consistent along both sides of the roadway
- No bicycle facilities
- Poor visibility at driveways
- Uncontrolled left turns across Moraga Road
- Marked pedestrian crossings across Moraga Road are infrequent
- Most crosswalks are not high-visibility
- Lack of lighting
- Failure to yield to pedestrian

Intersection: Moraga Road and Mount Diablo Boulevard

This intersection is highlighted as the top location of public concern during the webmap exercise and a recent crash occurred at the intersection.

- Northbound right turn visibility on Mount Diablo obstructed by trellis
- Motorist violations of pedestrian right of way (ROW) for pedestrians crossing on the east leg
- Heavy right turns on red
- Right Turns Yield sign lights up when the pedestrian crossing is activated, the placement of the sign appears could be missed by motorists
- Northbound/southbound split phasing extends cycle length and wait time. This could lead to impatient drivers. Observations made of northbound right turning vehicles not yielding ROW to pedestrians

Intersection: Moraga Road and Moraga Boulevard

- Commercial driveway is very close to the intersection
- No stop bars on northbound and westbound approaches
- No leading pedestrian interval

Intersection: Moraga Road and Brook Street

- No pedestrian heads for diagonal crosswalk
- Blank Out Sign disallowing southbound right not current standard
- Vehicles disobey northbound left restriction from 9 am to 4 pm
- Nonstandard “Left Turn Yields to Pedestrians” sign

Intersection: Moraga Road and St Mary Road

- Vehicles appear to be traveling at high speeds through the westbound channelized right turn
- Lack of a center turn lane in the four-lane section seems to cause excessive weaving and queuing when vehicles are waiting to take a left

Crash History:

<table>
<tr><th>Project</th><th>Limits</th><th># of Fatal</th><th># of KSI</th><th>Total Crashes</th><th>Leading Crash Types</th><th>Violation Type</th><th>Modes Involved in Crashes</th><th>Intersection?</th><th>Signalized?</th></tr>
<tr><td rowspan="4">Moraga Road</td><td rowspan="4">Mount Diablo Boulevard to Old Jonas Hill Road</td><td rowspan="4">1</td><td rowspan="4">1</td><td>1 Fatal</td><td>Ped Crossing in Crosswalk at Intersection, MV Making Left Turn</td><td>Fail to yield to pedestrian</td><td rowspan="3">3 Pedestrian Crashes</td><td>Moraga Boulevard</td><td rowspan="3">Yes</td></tr>
<tr><td rowspan="3">3 Complaint of Pain</td><td>Ped Crossing in Crosswalk at Intersection, MV Making Right Turn</td><td>Fail to yield to driver</td><td rowspan="2">Brook Street</td></tr>
<tr><td>Ped Crossing in Crosswalk at Intersection, MV Proceeding Straight</td><td>Other Improper Driving</td></tr>
<tr><td>Rear End, Multi-Motor Vehicle</td><td>Unsafe passing</td><td>1 Motorist Crashes</td><td colspan="2">Segement</td></tr>
</table>

3. School Street from Moraga Road to Topper Lane

This is a two-lane street with a speed limit of 20 mph. There is parking on both sides and no bike lanes. Sidewalks are discontinuous throughout the whole segment. This street is adjacent to Lafayette/Moraga Regional Trail, Stanley Middle School, and Lafayette Elementary School.

This segment is part of Stanley Middle School and Lafayette Elementary School Rapid Implementation School Safety Plans. School field visits from the Safety Plan for School Street are summarized here based on observations. Information from the Safety Plan will be used for countermeasure recommendations.

Satellite Image Source: Nearmap Sep 2022

Key Observations

- Large corner radii
- No stop bars in advance of existing crosswalks
- At intersections, crosswalks are not on all approaches
- Many students walk and bike to school via the Lafayette/Moraga Trail, so there are high volumes of pedestrians and bicyclists on the northern sidewalk between the trail access and the north/south crosswalk at Paradise Court
- In the afternoon, children bike on the wrong side of the street adjacent to the sidewalk to access the trail since the sidewalk is filled with pedestrians and people walking their bikes
- Sidewalks are not consistent along both sides of the roadway
- No sidewalks along Topper Lane
- Children are forced to walk in the street around the School Street/Topper Lane curve because there is no sidewalk
- Limited visibility for pedestrians
- Narrow 4.5-5 foot sidewalks on School Street with heavy pedestrian and bike volumes
- Utility poles centered within the northern sidewalk create a pinch point
- No stop bar in advance of existing crossings
- No leading pedestrian interval
- The length of the crosswalk in front of the pick-up/drop-off loop may increase pedestrian exposure (at Paradise Court)

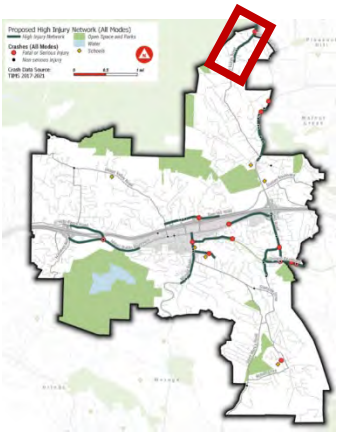
Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
School Street	Moraga Road to Topper Lane	**1**	**1**	**1 Fatal**	Unknown	Improper Turn	2 Pedestrian Crashes	Paradise Court	No
				1 Complaint of Pain	Ped Crossing in Crosswalk at Intersection, MV Making Left Turn	Failure to yield while making a turn		Moraga Road	Yes

4. Reliez Valley Road from Gloria Terrace to Sterling Heights Lane

This is a two-lane street with speed limit of 30 mph. There are sidewalks on the west side and discontinuous sidewalks on the east side and no bike lanes. This street provides access to the Reliez Valley Trail Head.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Narrow sidewalk
- Sidewalk only on one side
- No bike lanes
- No marked pedestrian crossings
- Atypical intersection geometry at Withers Avenue/Ivanhole Avenue
- Lack of lighting

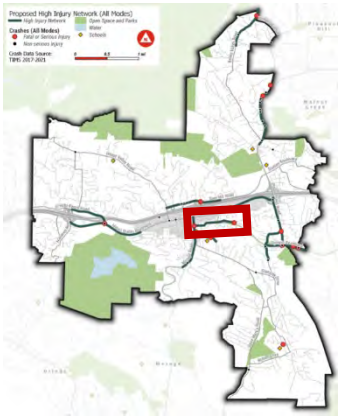
Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Reliez Valley Road	Gloria Terrace to Sterling Heights Lane	**1**	**1**	**1 Fatal** **1 Complaint of Pain**	Bike Proceeding Straight, MV Proceeding Straight	Overtaking Three Feet Safety	2 Bicyclist Crashes	Segment	

5. Moraga Boulevard from Moraga Road to Victoria Avenue

This is a two-lane street with parking on the south side. There are sidewalks on both sides, but sidewalks discontinue on the north side closer to Victoria Avenue and there are no bike lanes. This street access Briones to Las Trampas Trail.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Sidewalk not continuous
- Most crosswalks are not high-visibility
- Marked pedestrian crossings of Moraga are infrequent
- Narrow roadway with on-street parking and no dedicated bike lanes
- Lack of lighting

Intersection: Moraga Boulevard and Victoria Avenue

- Large corner radii
- Parking in the intersection
- Active driveway near the intersection

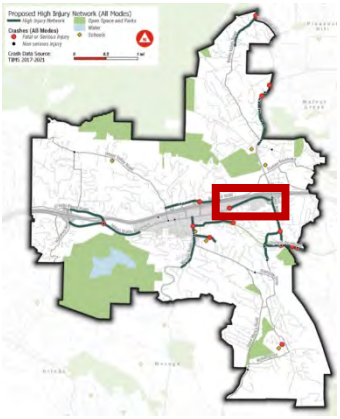
Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Moraga Boulevard	Moraga Road to Victoria Avenue	-	1	**1 Serious Injury**	Bike Making Left Turn, MV Proceeding Straight	Improper stop	1 Bicyclist Crash	Victoria Avenue	No

6. Mount Diablo Boulevard from Willow Drive to Pleasant Hill Road

This is a four-lane street with a mix of median islands and center turn pockets to access side streets or businesses. The speed limit is 35 mph and the segment includes several uncontrolled crossings and signalized intersections. There are sidewalks on both sides with Class II bike lanes.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Unprotected pedestrian crossing over five lanes of traffic at Hampton Road
- Class II bike lanes on a wide, high-speed roadway
- Bike lanes do not continue through intersections
- Most crosswalks are not high-visibility (except two on the east end)
- On the western end (Acalanes to Dolores), marked pedestrian crossings of Mount Diablo are 0.4-0.6 miles apart
- Signal heads do not have retroreflective backplates
- High driveway and side street density. Density increases east of Mountain View Drive.
- Uncontrolled left turns across Mount Diablo Boulevard
- Lack of lighting
- Vehicles parked on-street may create visibility issues for vehicles coming out of driveways.
- Bike lanes may be ambiguous in certain areas due to striping

Intersection: Mount Diablo Boulevard & Willow Drive

- Crossing times did not seem adequate across Mount Diablo Boulevard
- Large corner radii
- Uncontrolled left turns across two opposing lanes of traffic
- There may be poor visibility between angled parking just downstream of Willow Drive

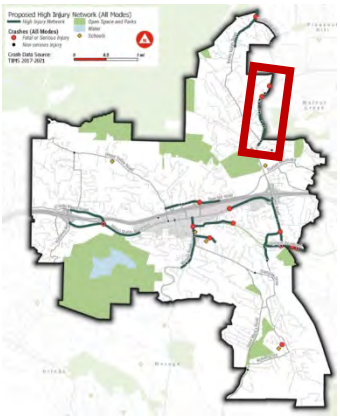
Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Mount Diablo Boulevard	Willow Drive to Pleasant Hill Road	-	**1**	**1 Serious Injury**	Ped Crossing in Crosswalk Not at Intersection, MV Proceeding Straight	Fail to yield to pedestrian	1 Pedestrian Crash	Willow Drive	No

7. Pleasant Hill Road from Springhill Road to Taylor Boulevard/Townsend Place

This is a four-lane street with a mix of median islands and center turn pockets to access side streets or businesses. The speed limit varies in both directions from 35 mph to 45 mph. There are sidewalks on the west side south of Hillview Lane and class II bike lanes. This street provides access to the Lafayette Ridge Staging Area.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Speed limit varies in both directions and ranges from 35mph to 45mph
- Class II bike lanes on a wide, high-speed roadway
- Bike lanes do not continue through intersections
- Slip lanes with wide, uncontrolled crossings
- No sidewalks
- Lack of lighting
- Lack of marked crossings at signalized intersections
- Most crosswalks are not high-visibility
- Signal heads do not have retroreflective backplates
- Signalized intersections have dedicated right turn lanes with no right turn on red restriction
- At Pleasant Hill and Taylor Boulevard– potential for high-speed merge and lane drop

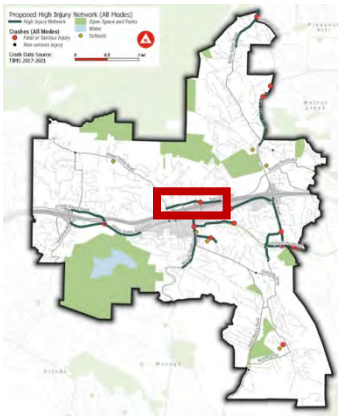
Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Pleasant Hill Road	Springhill Road to Taylor Boulevard	-	1	**1 Serious Injury**	Overturned, Solo-Motorcycle	Improper Turn	1 Motorcycle Crash	Segement	
				5 Complaint of Pain	Hit Object; Solo-Motor Vehicle	Improper Turn	8 Motorist Crashes		
					Sideswipe, Multi-Motor Vehicle	Unattended vehicle			
					Rear End, Multi-Motor Vehicle	Too fast for conditions			
				3 Other Visible Injury	Hit Object; Solo-Motor Vehicle	Failed to drive within one lane		Rancho View Drive	Yes
					Head-on, Solo-Motor Vehicle	Failed to drive within one lane		Reliez Valley Road	Yes
					Overturned, Solo-Motor Vehicle	Too fast for conditions		Segement	-

8. Deer Hill Road from Happy Valley Road to Miller Drive

West of First Street is a four-lane street with turn pockets with a center median islands and center turn pockets with speed limit of 35 mph. West of First Street provides access to Bay Area Rapid Transit (BART) and entrances to the BART parking lots with sidewalk on the north and south side. East of First Street is a two-lane street with no sidewalks and speed limit of 45 mph. There is class II bike lanes along this street.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Sidewalks are not consistent along both sides of the roadway
- Bike lanes do not continue through intersections
- Lack of lighting
- Signalized intersections have dedicated right lanes with no right turn on red restriction
- Class II bike lanes
- Potentially high-volume uncontrolled left turns across Deer Hill Road due to residential neighborhoods
- Large intersections that may be uncomfortable to navigate for all modes
- Parts of roadway with few stops seem to be conducive to higher speeds given wide lanes, curvature
- Road seems heavily traveled
- West of First Street had frequent stops (all-way stops, signalized intersections) while east of First Street had two-way stops

Intersection: Deer Hill Road and First Street

- Bike lanes do not continue through the intersection
- Slip lanes, including one with a large radius, with uncontrolled crossings
- No retroreflective backplates
- Permissive left turns across two lanes of traffic

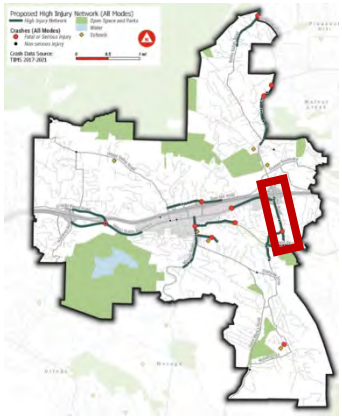
Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Deer Hill Road	Happy Valley Road to Miller Drive	-	1	**1 Serious Injury**	Rear End, Multi-Motor Vehicle	Failure to yield while making a turn	Motorist Crash	First Street	Yes
				2 Complaint of Pain	Broadside, Multi-Motorcycle		Motorcycle Crash	Orchard Road	No
					Hit Object, Solo Motor Vehicle	Failed to drive within one lane	Motorist Crash	Oak Hill Road	

9. Pleasant Hill Road from Mount Diablo Boulevard to Olympic Boulevard

This segment is a predominantly four-lane street with a center median islands and center turn pockets. The speed limit south of Pleasant Hill Road is 40 mph. There are sidewalks on both sides of the street and class II bike lanes.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Class II bike lanes on a wide, high-speed roadway
- Bike lanes do not continue through intersections
- Bike lanes dropped through long-distance, potentially high-speed channelized crossings
- Most crosswalks are not high-visibility
- Lack of marked crossings at signalized intersections
- Slip lanes with uncontrolled crossings
- Lack of lighting
- Signal heads do not have retroreflective backplates
- Signalized intersections have dedicated right turn lanes with no right turn on red restriction
- No sidewalks

Intersection: Pleasant Hill Road and Reliez Station Road

- Median separated left turn on Pleasant Hill may not be adequately signed on approach
- Crosswalks are not high-visibility
- Uncontrolled left turn across two opposing lanes of traffic
- Poor visibility between northbound vehicles and southbound left vehicles due to landscaped buffer
- Poor visibility for vehicles on minor street crossing or turning left onto a major street
- Dark lighting condition on the southeast corner across the channelized northbound right

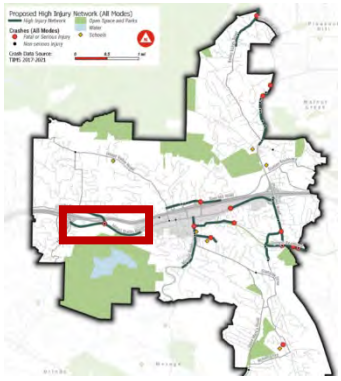
Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Pleasant Hill Road	Mount Diablo to Olympic Boulevard	-	1	**1 Serious Injury**	Head-on, Solo-Motor Vehicle	Failed to drive within one lane	4 Motorist Crashes	Reliez Station Road	No
				2 Complaint of Pain	Broadside, Multi-Motor Vehicle	Disregard signal		Mount Diablo Boulevard	Yes
						Unknown			
				1 Other Visible Injury	Hit Object; Solo-Motor Vehicle	Failed to drive within one lane		Condit Road	No

10. Mount Diablo Boulevard from Acalanes Road to Risa Road

This segment is a four-lane street with a mix of median islands or center turn pockets to access side streets or businesses. The speed limit is 45 mph and the segment include several unsignalized intersections.

Satellite Image Source: Nearmap Sep 2022



Key Observations

- Speed limit is 45 mph with wide travel lanes. Vehicles appear to be traveling at high rates of speed.
- Circular solid lane line indicators have poor visibility
- Residential driveway near intersections (ex. Acalanes Road)
- Class II bike lanes on a wide, high-speed roadway
- Bike lanes do not continue through intersections
- Most crosswalks are not high visibility (except two on the east end)
- On the western end (Acalanes to Dolores), marked pedestrian crossings of Mount Diablo are 0.4-0.6 miles apart
- Signal heads do not have retroreflective backplates
- High driveway and side street density – need to turn left across two lanes in opposing directions. Density of driveways and side streets increases east of Mountain View Drive.
- Lack of lighting

Intersection: Mount Diablo Boulevard and El Nido Ranch Road

- Slip lanes, including one with a large radius, with uncontrolled crossings
- Uncontrolled crossings
- Bike infrastructure drops through the intersection
- Unprotected left turn
- Crosswalks are not high visibility

Crash History:

Project	Limits	# of Fatal	# of KSI	Total Crashes	Leading Crash Types	Violation Type	Modes Involved in Crashes	Intersection?	Signalized?
Mount Diablo Boulevard	Acalanes Road to Risa Road	-	**1**	**1 Serious Injury**	Broadside, Multi-Motor Vehicle	Failure to yield while making a turn	2 Motorist Crashes	El Nido Ranch Road	No
				1 Other Visible Injury	Head-on, Multi-Motor Vehicle	Unknown			

Emphasis Areas

This section identifies emphasis areas based on crash analysis, priority location findings, engineering field visits, and public input. Emphasis areas identify where Lafayette should focus on road safety, these recommendation touch-on road user behavior, policy, and roadway design. It is important to take look at the emphasis areas through the Safe System Approach.

Table 8 summarizes the overlap of the indicated emphasis area between different sources. A comparison of the emphasis area to other relevant studies such as Contra Costa Common Collision Patterns (CCTA VZ) and Metropolitan Transportation Commission (MTC) Challenge Areas list was included in Table 8. Screenshots of the CCTA VZ and MTC documents are attached in Appendix A and Appendix B.

Table 3: Ten Emphasis Areas and Overlap

Emphasis Areas	Crash Analysis	Field Visit	Public Feedback	CCTA VZ	MTC
Speeds	X	X	X	X	X
Unsignalized intersections	X	X	X		
Lane Departure	X	X	X		X
Failure to yield	X	X	X		
Improper turning	X		X	X	
Bus Stop at Intersection	X			X	
Vulnerable users - bicyclist	X	X	X	X	X
Vulnerable users - pedestrian	X	X	X		X
Distracted driving			X		
Trail Crossing		X	X	X	

Description of Emphasis Areas

Speeds

From the survey responses, “traffic is too fast or doesn’t stop” was the top roadway factor that people felt is unsafe. Streets with higher posted speed limits had a higher crash rate, and KSI crash rate per mile relative to streets with lower posted speed limits.

Unsignalized Intersections

The majority of crashes occurred at unsignalized intersections. Unsignalized intersection made up 43% of all crashes and 50% of KSI crashes. From the survey responses, “dangerous intersections” was the second most selected factor that made people feel unsafe on roads in Lafayette. Generally, people felt a lack of visibility at uncontrolled locations.

Lane Departure

Unsafe lane change was the top reported violation for all crashes (23%). The majority of these crashes occurred along Pleasant Hill Road with hit-objects and head-on as the leading crash types which are characteristic of lane

departure concerns[1]. Field observation along Pleasant Hill Road and public feedback about speeding along winding roads can also lead to lane departure concerns.

Failure to Yield

Motorist failing to yield the right of way was the second most reported violation for all crashes (19%) with motorists failing to yield at stop signs, oncoming traffic, or pedestrian crossing at crosswalks. From the survey responses, “stop sign running by cars or bikes” was the second most selected behavior, and “traffic is too fast or doesn’t stop” was the top factor that made people feel unsafe. The public also voiced concerns about motorists not yielding to pedestrians in crosswalks. Failure to yield to pedestrians occurred in downtown Lafayette and often during situations with long traffic signal cycle lengths, poor visibility of signage, or stop bar placement as observed during field observation.

Improper Turning

Improper turning was the third most reported violation for all crashes (13%) with failure to yield when turning left or making a U-turn being the most common violations. When looking at motorist pre-crash movement, motorists making a left turn is the most common movement for crashes involving multi-motorist crashes and motorist movement during the pedestrian crossing. In addition, illegal turning was voiced by the public as unsafe roadway behavior.

Bus Stops at Intersections

From crash analysis, intersections with a bus stop had a higher crash rate than intersections without a bus stop. Additionally, seven of the nine reported pedestrian crashes occurred at intersections with a bus stop. Bus stop information obtained was based on data available from 2018 and several bus routes have been updated since then. However, based on public feedback, locations near transit are an area of interest.

Vulnerable Users - Bicyclist

People biking and walking on the roadway network are the most vulnerable users, and because they are not traveling within the protection that a motor vehicle provides, crashes involving pedestrians and bicyclists are more likely to result in serious injury or death. Bicyclist crashes make up 17% of all crashes but 36% of KSI crashes. Bicyclist crashes are more severe, with 63% of all bicyclist crashes resulting in a KSI outcome.

Based on concerns raised by the public and field visits, conflicts that results in crashes between motorist and bicyclist often result from general confusion on who has the right of way. Along priority locations where bicyclist KSI crashes have occurred (Olympic Boulevard, Reliez Valley Road, and Moraga Boulevard) these streets are near trail access and either have no bike lanes or class II bike lanes

Vulnerable Users - Pedestrian

Pedestrians accounted for the second largest share of all crashes (19%) and KSI crashes (21%), followed by motorist crashes. Pedestrian crashes result in more serious injuries, with 33% of pedestrian crashes resulting in a KSI outcome. Pedestrian crashes are concentrated in downtown Lafayette along Moraga Road, School Street, and Mount Diablo Boulevard at intersections with marked crosswalks. These crashes involve motorists failing to yield to pedestrians crossing or motorists making an improper turn.

Distracted Driving

[1] https://highways.dot.gov/safety/RwD

From the survey responses, distracted driving was the top behavior that makes people feel unsafe. Distracted driving was one of the top concerns near schools and downtown and generally for younger motorists.

Trail Crossings

Bicyclist crashes primarily occurred at intersections near trail access, such as Olympic Boulevard and Moraga Boulevard for the Lafayette/Moraga Regional Trail and along Reliez Valley Road near the Reliez Valley Trail. Lafayette/Moraga Regional Trail is also heavily used by students attending Stanley Middle School and Lafayette Elementary School. There are concerns about unmarked crossings along School Street related to the trail. The public is interested in opportunities to increase access to trails, especially where Lafayette/Moraga Trail intersects with roadways (ex. Glenside Drive). In addition, the public is interested in improving safety at crossings by increasing yield compliance (e.g., stop signs).

Addendum A – CCTA Common Collision Patterns

Contra Costa Common Collision Patterns based on 2008 through 2017 crash analysis.

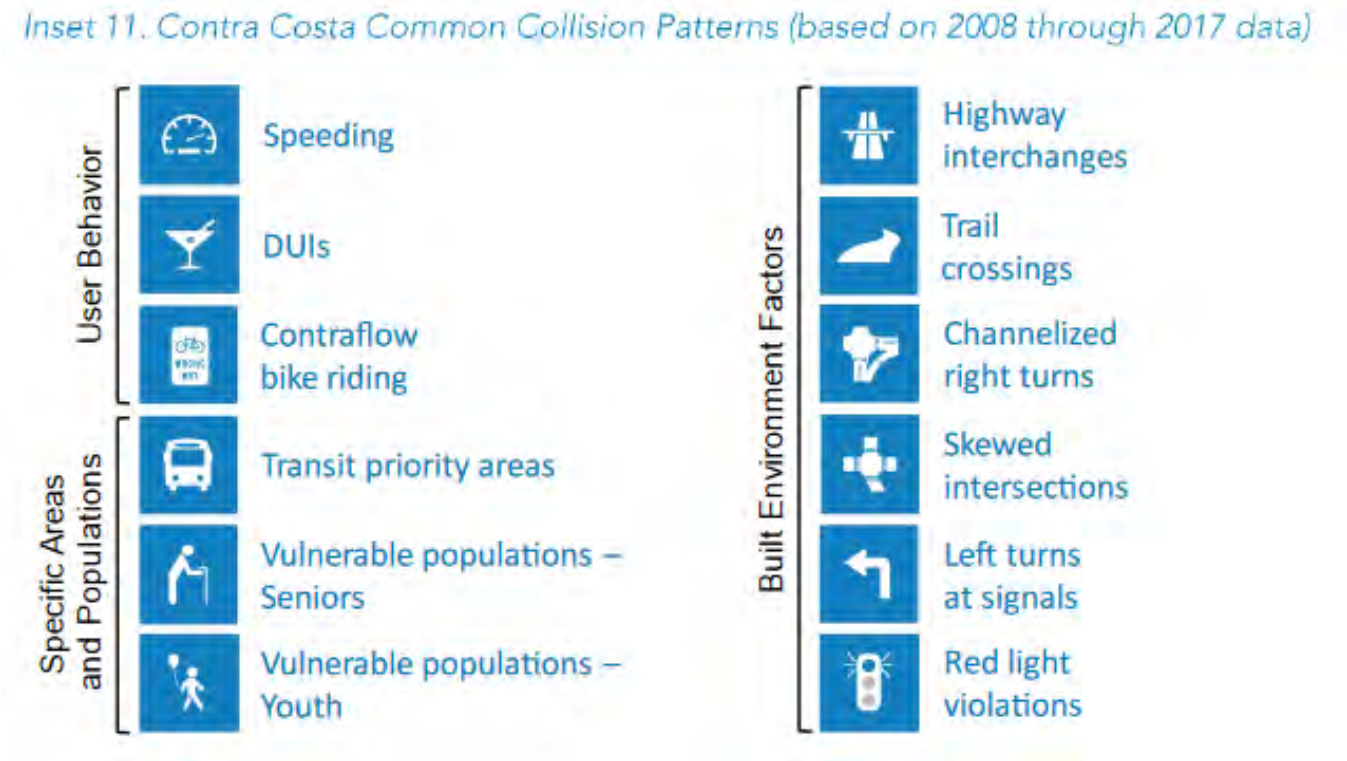


Figure 1: CCTA Common Collision Patterns from Vision Zero Plan

Addendum B- MTC Challenge Areas

Metropolitan Transportation Commission (MTC) Challenge Areas list based on the 2016 through 2020 crash analysis

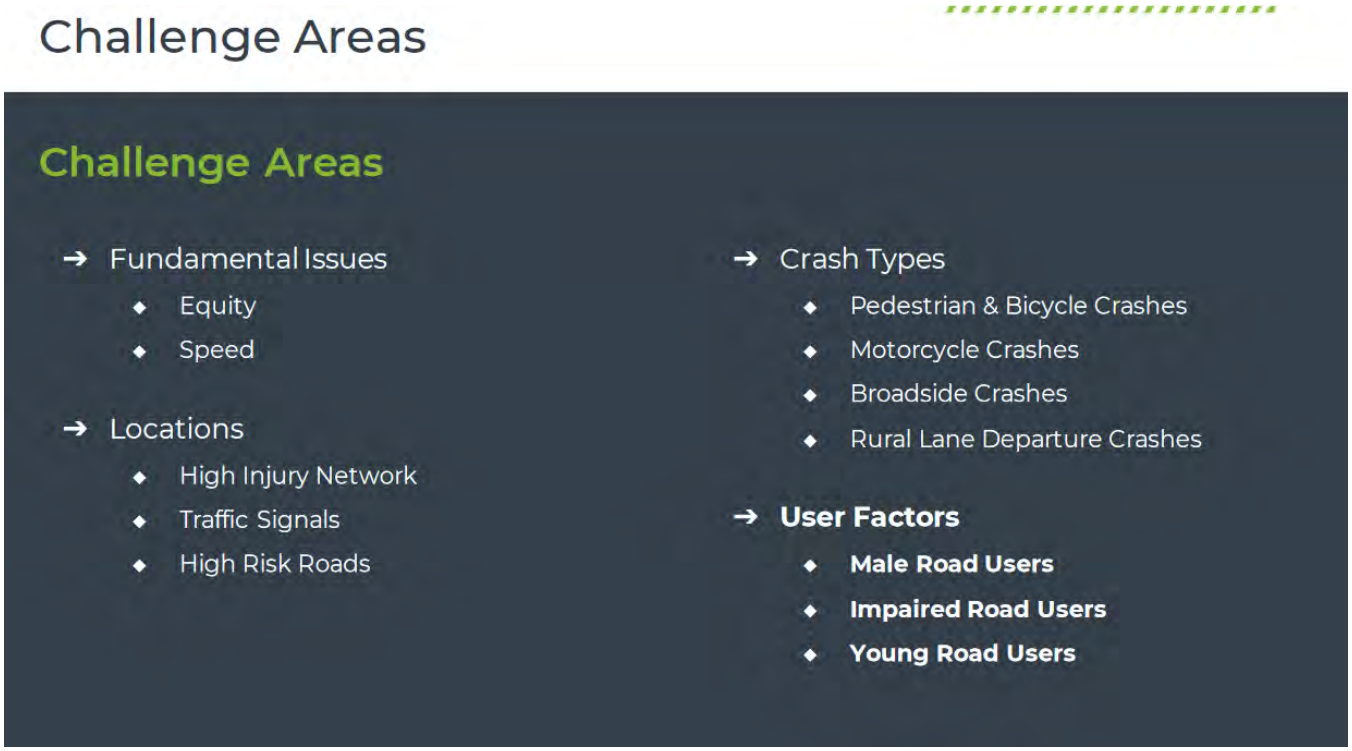


Figure 2: MTC Challenge Areas Compared to Caltrans

APPENDIX C: SAFETY COUNTERMEASURE TOOLBOX

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APPENDIX C: SAFETY COUNTERMEASURE TOOLBOX FOR LAFAYETTE

ABOUT THE SAFETY COUNTERMEASURE TOOLBOX

Please note this is intended to be a framework for identifying the most effective safety countermeasures in initial planning. Actual application of each safety countermeasure should be further studied and designed on an actual project-by-project basis.

The safety countermeasures presented in the toolbox were identified based on targeting Lafayette's 10 emphasis areas. The safety countermeasure list references FHWA's Proven Safety Countermeasures, Contra Costa Countermeasure Toolbox, and then cross-references the Caltrans Local Road Safety Manual (Caltrans LRSM).

The toolbox contains additional information for each safety countermeasure and is grouped into the following sections: effectiveness, and relevant application.

The effectiveness section provides information on CRF, emphasis area, type, and guidance on how to use the Safe System Approach Framework to select safety countermeasures in a way that prevents a crash from resulting in a fatal or serious injury.

The relevant application section of the toolbox contains information related to applicable roadway type based on Lafayette street classification, safety countermeasures based on their appropriateness for signalized intersections, non-signalized intersections, and roadway segments based on Caltrans LRSM categorization.

HOW TO USE THE SAFETY COUNTERMEASURE TOOLBOX

When selecting safety countermeasures for a specific area in Lafayette, consider how the Safe System Approach Framework applies to the crashes that have occurred in that area. For example, if an area has a history of fatal crashes involving vehicles hitting pedestrians, separating users in time might be an important piece of the framework to consider. A safety countermeasure that separates users in time might be implementing leading pedestrian intervals.

1. Evaluate crash causes, contributing factors, and roadway context that may have contributed to crashes.

2. Use Lafayette LRSP Safety Countermeasure Toolbox to develop a list of possible roadway safety countermeasures to eliminate crash types.

3. Review countermeasure(s) through the lens of the Safe System Approach framework.

4. Use crash modification factors (CMFs) to estimate if the roadway safety countermeasures selected will eliminate KSI crashes.

    4a. Selecting a Method to Analyze Multiple CMFs
    4b. Applying a Method to Analyze Multiple CMFs

5. Build safety improvements.

6. Implement evaluation to determine the effectiveness of safety improvements and document actual crash reductions.

7. Add additional countermeasures or make field adjustments based on actual crash data.

TERMINOLOGY

CRASH REDUCTION FACTOR (CRF)

A CRF is the percentage crash reduction that might be expected after implementing a given countermeasure at a specific site. A CRF is the inverse of a CMF. The higher the CRF percentage is, the more effective the countermeasure is in improving safety.

A specific CRF should be determined for each unique scenario. For a selection of specific CRFs for specific locations in Lafayette, explore the CMF clearinghouse and apply all relevant factors.

SAFETY COUNTERMEASURE

An action taken to counteract a danger or threat. In the context of safety – a safety countermeasure is an action designed to counteract a threat to safety.

SYSTEMIC COUNTERMEASURE

The systemic approach considers multiple locations with similar risk characteristics, selecting the preferred countermeasure(s) appropriate and affordable for widespread implementation.

SAFE SYSTEM APPROACH

The Federal Highway Administration's (FHWA) Safe System Approach seeks to dramatically reduce serious injury and fatal crashes on our roadways through a systems-based approach to prioritizing safety. The Safe System Approach focuses on eliminating fatal and serious injury crashes instead of all crashes. This approach has been effective over the last decade in Sweden, the Netherlands, Australia, and New Zealand.

The Safe System Approach involves the following six principles:

Death/Serious Injury is Unacceptable
Humans Make Mistakes
Humans are Vulnerable
Responsibility is Shared
Safety is Proactive
Redundancy is Crucial

SAFE SYSTEM APPROACH FRAMEWORK

The Safe System Approach framework is critical to determining how to apply the Safe System Approach in practice. The framework includes the following as a lens to apply to projects to prioritize safety:

Anticipate Human Error
Separating Users in Space
Separating Users in Time
Increase Attentiveness and Awareness
Increasing Visibility
Increasing Attentiveness
Reducing Impairment
Accommodate Human Injury Tolerances
Reduce Speeds
Reduce Impact Forces

Lafayette LRSP Roadway Safety Countermeasure Toolbox

Countermeasure	Effectiveness				Relevant Application			
	Crash Reduction Factor (CRF)[1]	Emphasis Area[5]	Safe System Framework Metric Addressed[2]	Type[1]	Roadway Type[3]	Signal-ized	Non-Signalized	Seg-ments
Speed Management								
Radar Speed Signs	5%[4]	Speeds	Increasing Attentiveness Reduce Speeds		Arterial			x
Variable Speed Limits	30%	Speeds	Increasing Attentiveness Reduce Speeds	Operation/ Warning	Arterial			x
Coordinated Signal Operation	15%	Speeds	Increasing Attentiveness Reduce Speeds	Signal Mod.	Arterial, Collector	x		
Speed Humps	40%	Speeds	Reduce Speeds		Local			x
Road Diets (Roadway Configuration)	35%	Bicyclist Pedestrian Speeds	Increasing Attentiveness Reduce Speeds	Geometric Mod.	All			x
Lane Narrowing	24%[4] 48%[4]	Bicyclist Pedestrian Speeds	Increasing Attentiveness Reduce Speeds		All			x
Lane Departure								
Centerline Rumble Strips and Stripes	20%	Distracted Driving Lane Departure	Increasing Attentiveness	Operation/ Warning	Arterial			x
Edgeline Rumble Strips and Stripes	15%	Distracted Driving Lane Departure	Increasing Attentiveness	Operation/ Warning	Arterial			x
Install or Widen Edge Lines	25%	Lane Departure	Increasing Attentiveness	Operation/ Warning	Arterial			x
Chevron Signs at Curves	40%	Lane Departure	Increasing Attentiveness Increasing Visibility	Operation/ Warning	Arterial			x
Install Curve Advance Warning Signs	25%	Lane Departure	Increasing Attentiveness Increasing Visibility	Operation/ Warning	Arterial			x
Median Barriers	25%	Lane Departure	Increasing Attentiveness Reduce Impact Forces	Remove/ Shield Obstacles	Arterial			x
Cable Barrier or Guardrail at Curves	25%	Lane Departure	Increasing Attentiveness Reduce Impact Forces	Remove/ Shield Obstacles	Arterial			x
Lighting at Segments	35%	Bicyclist Lane Departure	Increasing Visibility	Lighting	All			x
All Intersections								
Reduce Corner Radii	44%[4]	Pedestrian Failure to Yield Unsignalized Intersections	Increasing Attentiveness Increasing Visibility Reduce Speeds		All	x	x	
Harden Centerlines	TBD	Failure to Yield Speeds Unsignalized Intersections	Increasing Attentiveness Increasing Visibility Reduce Speeds		Arterial, Collector	x	x	
Left Turn Lane	55%	Failure to Yield Improper Turning Unsignalized Intersections	Separating Users in Space Separating Users in Time	Signal Mod.	All	x	x	

Countermeasure	Effectiveness				Relevant Application			
	Crash Reduction Factor (CRF)[1]	Emphasis Area[5]	Safe System Framework Metric Addressed[2]	Type[1]	Roadway Type[3]	Signal-ized	Non-Signalized	Seg-ments
Unsignalized Intersections								
Improve Sight Distance to Intersection	20%	Unsignalized Intersections	Increasing Visibility	Operation/ Warning	All		x	
Convert Two-Way Stop to All-Way Stop	50%	Unsignalized Intersections	Increasing Visibility	Control	Collector, Local		x	
Convert Intersection to Roundabout (All Way Stop)	Varies	Improper Turning Speeds Unsignalized Intersections	Increasing Attentiveness Reduce Speed	Control	Not Specified		x	
Convert Intersection to Roundabout (Two-Way Stop)	Varies	Improper Turning Speeds Unsignalized Intersections		Control			x	
Convert Intersection to Mini-Roundabout	30%	Speeds Unsignalized Intersections		Control	Local		x	
Lighting at Unsignalized Intersections	40%	Bicyclist Bus Stop at Intersection Pedestrian Trail Crossing Unsignalized Intersections	Increasing Visibility	Lighting	All		x	
Signalized Intersections								
Dedicated Left Turn Phase	30%	Failure to Yield Improper Turning Pedestrian	Separating Users in Space Separating Users in Time	Signal Mod.	All	x		
Prohibit Right-Turn-on-Red	See equation on CMF Clearinghouse	Failure to Yield Improper Turning Pedestrian	Separating Users in Space Separating Users in Time		All	x		
Improve Signal Timing	15%	Bicyclist Pedestrian Speeds	Separating Users in Time	Signal Mod.	All	x		
Convert Intersection to Roundabout (Signalized)	Varies	Improper Turning Speeds	Increasing Attentiveness Reduce Speed	Geometric Mod.	All	x		
Lighting at Signalized Intersections	40%	Bicyclist Bus Stop at Intersection Pedestrian Trail Crossing	Increasing Visibility	Lighting	All	x		
Pedestrian Scramble	40%	Bus Stop at Intersection Pedestrian	Separating Users in Space Separating Users in Time	Ped and Bike	All	x		
Leading Pedestrian Interval	60%	Bicyclist Bus Stop at Intersection Pedestrian	Increasing Visibility Separating Users in Space Separating Users in Time	Ped and Bike	All	x		
Pedestrian Facilities								
High-Visibility Continental Crosswalks	35%	Bicyclist Bus Stop at Intersection Pedestrian Trail Crossing	Increasing Attentiveness Increasing Visibility	Ped and Bike	All	x	x	

Countermeasure	Effectiveness				Relevant Application			
	Crash Reduction Factor (CRF)[1]	Emphasis Area[5]	Safe System Framework Metric Addressed[2]	Type[1]	Roadway Type[3]	Signal-ized	Non-Signalized	Seg-ments
Add Stop Bars in Advance of Crosswalks	15%	Bicyclist Bus Stop at Intersection Pedestrian	Increasing Attentiveness Increasing Visibility	Ped and Bike	All	x	x	
Pedestrian Refuge Islands	45%	Bus Stop at Intersection Pedestrian	Increasing Attentiveness Increasing Visibility	Ped and Bike	All	x	x	
Curb Extensions	35%	Bus Stop at Intersection Pedestrian	Increasing Visibility Separating Users in Space	Ped and Bike	All	x	x	
Rectangular Rapid Flashing Beacons (RRFB)	35%	Bus Stop at Intersection Pedestrian	Increasing Attentiveness Increasing Visibility	Ped and Bike	All		x	x
Separation Between Pedestrians and Vehicles (ex. Walkways)	80%	Bicyclist Bus Stop at Intersection Pedestrian Trail Crossing	Increasing Visibility Reduce Impact Forces Separating Users in Space	Ped and Bike	All			x
Raised Pedestrian Crosswalks	30%	Bus Stop at Intersection Pedestrian	Increasing Visibility Separating Users in Space	Ped and Bike	All	x	x	
Lighting	21%[4]	Bicyclist Bus Stop at Intersection Pedestrian Trail Crossing	Increasing Visibility		All	x	x	x
Bicycle Facilities								
Bike Path (Class I)	25%	Bicyclist	Increasing Visibility Reduce Impact Forces Separating Users in Space	Ped and Bike	All			x
Conventional Bike Lanes (Class II)	35%	Bicyclist	Increasing Visibility Separating Users in Space	Ped and Bike	All			x
Bike Routes (Class III)	65%	Bicyclist	Increasing Visibility	Ped and Bike	All			x
Separated Bike Lanes (Class IV)	45%	Bicyclist	Increasing Visibility Separating Users in Space	Ped and Bike	All			x
Bicycle Box	15%	Bicyclist	Increasing Visibility Separating Users in Space	Ped and Bike	All			x
Access Management								
Consolidation/Minimization of Access Points	44%[4]	Improper Turning	Separating Users in Space		Arterial	x	x	x

1. Referenced from the 2022 Caltrans LRSM
2. Safe System Framework includes:
   - Separating Users in Space
   - Separating Users in Time
   - Increasing Visibility
   - Increasing Attentiveness
   - Reducing Impairment
   - Reduce Speeds
   - Reduce Impact Forces
3. Roadway type is based on Lafayette street classification
4. FHWA CMF Clearinghouse was referenced if safety countermeasure was not available in Caltrans LRSM
5. Lafayette's 10 Emphasis Areas
   - Bicyclist
   - Bus Stop at Intersection
   - Distracted Driving
   - Failure to Yield
   - Improper Turning
   - Lane Departure
   - Pedestrian
   - Speeds
   - Trail Crossing
   - Unsignalized Intersections

EXTERNAL COUNTERMEASURE REFERENCES	CATEGORY
FHWA CMF Clearinghouse	National
Safe System Approach	National
Safe System Approach Framework	National
FHWA Proven Safety Countermeasures	National
2022 Caltrans Local Road Safety Manual (Caltrans LRSM)	State
CCTA Countywide Toolbox for Designing Safer Travel for People Walking and Bicycling	Local