

City of Lake Elsinore Local Road Safety Plan

2024



Prepared By:

FEHR  PEERS

Statement of Protection of Data from Discovery and Admissions

Section 148 of Title 23, United States Code

REPORTS DISCOVERY AND ADMISSION INTO EVIDENCE OF CERTAIN REPORTS, SURVEYS, AND INFORMATION —
Notwithstanding any other provisions of law, reports, surveys, schedules, lists, or data compiled or collected for any purpose relating to this section, shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at the location identified or addressed in the reports, surveys, schedules, lists, or other data.

This study applies a systemic safety approach that identifies certain features on particular roadways that are correlated with specific collision types and frequencies. This broad approach is necessitated by the inherent nature of covering an entire agency's facilities in one study and the limited scope/budget available to prepare Local Road Safety Plans. Limited time is available to perform field observations throughout the study area to contextualize the data, and therefore, it is beyond the scope of work to perform in-depth "hot spot" evaluations at all locations.

Acknowledgments

The 2024 City of Lake Elsinore Local Road Safety Plan was developed through a task force consisting of staff from the City Public Works Department, partner public agencies, and local stakeholders. Fehr & Peers assisted the City of Lake Elsinore in preparing the plan. This report is dedicated to the more than 100 people who lost their lives on roadways within the City of Lake Elsinore over the past seven years. Their loss reminds us that every life is precious and inspires us all to continue our efforts toward the vision of zero traffic deaths.

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Glossary

AB Assembly Bill

ADA American with Disabilities Act

AHSC Affordable Housing and Sustainable Communities

ATP Active Transportation Program

AWSC All Way Stop Control

AV Autonomous Vehicles

B/C Benefit/Cost

BIL Bipartisan Infrastructure Law

BTA Bicycle Transportation Account

BUILD Better Utilizing Investments to Leverage Development

CA California

CAL FIRE California Department of Forestry and Fire Protection

Caltrans California Department of Transportation

CEQA California Environmental Quality Act

CIP Capital Improvement Program

CRF Crash Reduction Factor

DUI Driving Under the Influence

EIT Engineer-In-Training

FHWA Federal Highway Administration

HSIP Highway Safety Improvement Program

IJA Infrastructure Investment and Jobs Act

ITE Institute of Transportation Engineers

ITS Intelligent Transportation System

KSI Killed or Severely Injured

LED Light-emitting Diode

LPI Leading Pedestrian Interval

LPP Local Partnership Program

LRSM Local Road Safety Manual

LRSP Local Road Safety Plan

LSRP Local Streets and Roads Program

LTF Local Transportation Funds

MUTCD Manual of Uniform Traffic Control Devices

NHTSA National Highway Traffic Safety Administration

OTS Office of Traffic Safety

PDO Property Damage Only

PE Professional Engineer

PHB Pedestrian Hybrid Beacon

RAISE Rebuilding American Infrastructure with Sustainability and Equity

RSP Roadway Safety Professional

RRFB Rectangular Rapid Flashing Beacon

RTA Riverside Transit Agency

RTP Regional Transportation Plan

SB Senate Bill

SCAG Southern California Association of Governments

SHSP Strategic Highway Safety Plan

SRTS Safe Routes to School

SS4A Safe Streets and Roads for All

SWITRS Statewide Integrated Traffic Records System

TAP Transportation Alternatives Program

TCC Transformative Climate Communities

TDA Transportation Development Act

TIGER Transportation Investment Generating Economic Recovery

TIMS Transportation Injury Mapping System

TNC Transportation Networking Company

USDOT United States Department of Transportation

WRCOG Western Riverside Council of Governments

V2I Vehicle-to-Infrastructure

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Chapter 1 - Introduction

The City of Lake Elsinore is committed to prioritizing safety and eliminating traffic related deaths and serious injuries on City-maintained roadways. This Local Road Safety Plan (LRSP) proactively identifies and evaluates hot spots and systemic risk factors throughout the City of Lake Elsinore and identifies proven countermeasures that can be implemented through roadway design changes and partnerships with stakeholders. This plan applies a Safe System approach, an international best practice framework that provides the foundation for this LRSP.

Local Road Safety Plan Background

A Local Road Safety Plan is a means for providing the City of Lake Elsinore with an opportunity to address targeted roadway safety needs while contributing to the success of the California Strategic Highway Safety Plan and statewide safety goals. The process of preparing an LRSP creates a framework to systemically identify and analyze safety problems and recommend safety improvements. Preparing an LRSP facilitates the development of local agency partnerships and collaboration, resulting in a prioritized list of improvements and actions that can demonstrate a defined need and contribute to the statewide plan. The LRSP is a proactive approach to addressing safety needs and demonstrates City of Lake Elsinore's responsiveness to safety challenges.

This will be the second comprehensive safety plan for the City of Lake Elsinore; the first was completed in 2019. This LRSP builds on the City's prior roadway safety efforts and will serve as a resource for the City when it applies for future safety infrastructure funding. The Local Highway Safety Improvement Program (HSIP) distributed through the California Department of Transportation (Caltrans) and the Safe Streets and Roads for All (SS4A) grant program requires an action plan, such as a LRSP, to be eligible for Implementation Grant funding. This LRSP satisfies the requirements outlined in the SS4A Self-Certification Eligibility Worksheet.

What is the Safe System approach?

The Safe System approach aims to eliminate fatal and serious injuries for all road users by reducing impacts on the human body and accommodating human mistakes. Embedded in this approach is an effort to address every aspect of crash risks through the five elements of the Safe System and promoting a holistic approach to safety across the entire roadway system. Each day, people are killed and seriously injured on our roads. Crashes can irreversibly change the course of human lives, touching victims, their families and loved ones, and society as a whole. A Safe System acknowledges the vulnerability of the human body—in terms of the amount of kinetic energy transfer a body can withstand—when designing and operating a transportation network to minimize serious consequences of crashes. According to the World Health Organization, the goal of a Safe System is to ensure that if crashes occur, they “do not result in serious human injury.”¹



The Safe System approach is founded on the principle that people make mistakes, and that the road system should be adapted to anticipate and accommodate human mistakes and the physiological and psychological limitations of humans.² Countries that have adopted the Safe System approach have had significant success reducing highway fatalities, with reductions in fatalities between 50 and 70%.³

The Institute of Transportation Engineers (ITE) and the Road to Zero Coalition's Safe Systems Explanation and Framework articulate that to anticipate human mistakes, a Safe System seeks to:

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- Separate users in a physical space (e.g., sidewalks, dedicated bicycle facilities);
- Separate users in time (e.g., pedestrian scramble, dedicated turn phases);
- Alert users to potential hazards; and
- Accommodate human injury tolerance through interventions that reduce speed or impact force.

Creating a Safe System means shifting a major share of the responsibility from road users to those who design the road transport system. "Individual road users have the responsibility to abide by laws and regulations"⁴ and do so by exhibiting due care and proper behavior on

The Safe System Approach

Source: Fehr & Peers for FHWA

The Safe System approach addresses includes the five elements and six principles of a safe transportation system. This approach to roadway safety has been adopted at both the national and state levels, and guides the development of this LRSP.



The Importance of Addressing Speed in a Safe System

If Hit By a Person Driving At

Results in a Fatality

Person Survives the Collision

20 mph



90%

30 mph



60%

40 mph



20%

ITE Safe System Framework: Focus on Safe Speeds

The ITE Safe System framework provides important context for the focus on safe speeds within a Safe System approach. For vulnerable users speed is a determining factor in survivability – a human's chance of surviving being struck by a vehicle increases from 20% at 40 miles per hour to 60% at 30 miles per hour to 90% at 20 miles per hour. Reducing speed in the presence of vulnerable users is a key Safe System strategy. Approaches include:

- Physical roadway designs (width, horizontal alignment) to limit free flow speeds,
- Traffic calming treatments that induce slower speeds,
- Traffic signal timing that minimizes high speed flow,
- Traditional or automated enforcement that discourages speeding.

the transportation system. While road users are responsible for their own behavior, this is a shared responsibility with those who design, operate, and maintain the transportation network: including the automotive industry, law enforcement, elected officials, and government bodies.⁵ In a Safe System, roadway system designers and operators take on the highest level of ethical responsibility.

The Safe System approach is the foundation for the National Safety Strategy released by the United States Department of Transportation (USDOT) in 2022. The new federal Safe Streets and Roads for All (SS4A) grant program takes steps to formalize the Safe System approach in local safety planning documents through its Comprehensive Safety Action Plan requirements. The Safe System approach is also the foundation for the Caltrans Strategic Highway Safety Plan (SHSP), and the California Department of Transportation (Caltrans) has adopted a Vision Zero goal for California.

The Safe System approach addresses the five elements of a safe transportation system – safe road users, safe vehicles, safe speeds, safe roads, and post-crash care – in an integrated manner, through a wide range of interventions.

Safe Roads

Prioritize roadway design changes throughout the City of Lake Elsinore that address the factors contributing to severe injury and fatal collisions, including improvements that separate modes in time and space, and reduce severity if collisions do occur.

Safe Road Users

Focus on human vulnerability when planning and implementing street safety strategies, with an emphasis on people who travel by foot, bicycle or wheelchair, children, and seniors. Prioritize equitable strategies that will best serve the community. Identify funding opportunities to support local law enforcement efforts and establish metrics for tracking success.

Safe Speeds

Use a multidisciplinary approach - roadway design, policy, education, and enforcement strategies - that induces drivers to travel at safe speeds that will reduce injuries even when human error inevitably leads to collisions.

Safe Vehicles

Proactively plan for a connected and autonomous vehicle fleet, accounting for related safety considerations, prioritizing investments in advanced signal infrastructure and other ITS projects.



Post-Crash Care

Partner with law enforcement and emergency response to identify strategic investments in areas such as collision response, collision site assessment, and collision reporting and database management practices.

What is Vision Zero?

Vision Zero strives to eliminate traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all. First implemented in Sweden in the 1990s, Vision Zero has proved successful across Europe — and now it's gaining momentum in major American cities.

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

- Vision Zero recognizes that people will sometimes make mistakes, so the road system and related policies should be designed to ensure those inevitable mistakes do not result in severe injuries or fatalities.
- Vision Zero is a multidisciplinary approach, bringing together diverse and necessary stakeholders to address this complex problem.

Vision Zero is a key component of implementing the Safe System approach. This plan includes a Vision Zero aspiration and a timeline for achieving that aspiration, which aligns with the recently adopted Caltrans 2050 Vision Zero goal.

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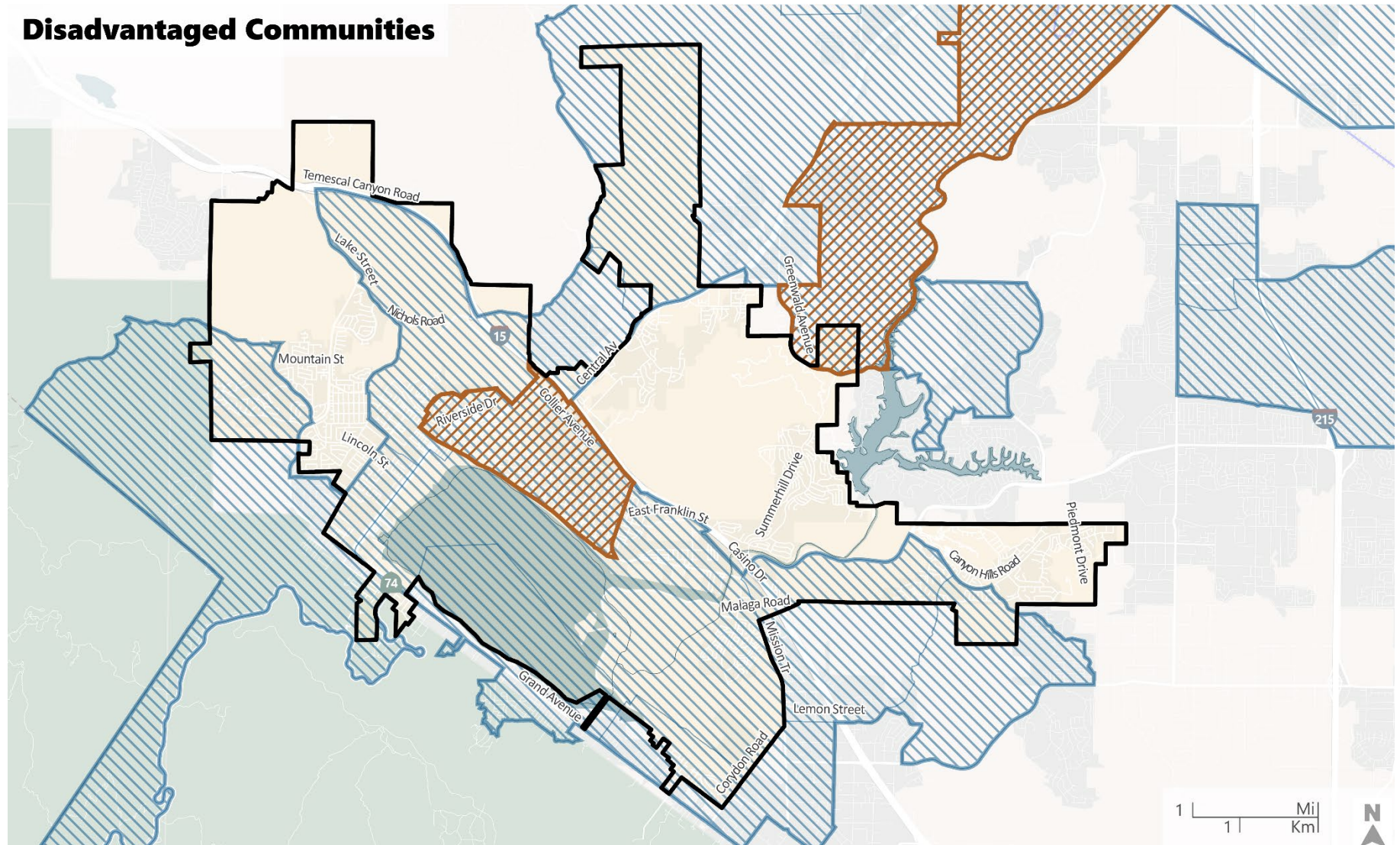
About Lake Elsinore

The City of Lake Elsinore is home to approximately 72,000 people and is located within Riverside County, California. Lake Elsinore's population is 60 percent Hispanic, 26 percent non-Hispanic white, 3 percent Black, 7 percent Asian, and 4 percent Other⁶. 42 percent of residents speak a language other than English at home.⁷

Approximately 13 percent of Lake Elsinore residents are living in poverty, and approximately 6 percent live with a disability. About 92 percent of workers in Lake Elsinore commute to work via car, about 1 percent walk, and less than 1 percent take public transportation.⁷

Two of the census tracts within Lake Elsinore fall within the State of California's definition of Disadvantaged Communities, based on health, economic and environmental factors.⁸ 11 of the census tracts within Lake Elsinore fall within the Federal Government's definition of Disadvantaged Communities.⁹ Many of these areas often experience disproportionate burden in roadway safety outcomes.

Disadvantaged Communities



- Lake Elsinore City Boundary
- Federally Designated Disadvantaged Community
- State Designated Disadvantaged Community



Endnotes:

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Chapter 2 – Visions & Priorities

City of Lake Elsinore's Vision Statement

The City of Lake Elsinore will work, in collaboration with multi-disciplinary partners, to create a safe multimodal transportation system for people of all ages, abilities, and backgrounds.

Vision Zero Aspiration

The City of Lake Elsinore is striving towards zero traffic fatalities and serious injuries on our roadways by 2050.

Guiding Principles

1. Prioritize traffic safety programs and infrastructure investments at locations with high collision rates and severity.
2. Consistent with the Safe System Approach, foster a citywide culture of safety where all road users have a shared responsibility to exhibit due care and proper behavior on the roadway system.
3. Incorporate equity and considerations of accessibility in decision-making, with a focus on investment in underserved communities and reducing disparities in roadway safety outcomes.
4. Partner with a multi-disciplinary group, including emergency response, law enforcement, public health officials, education institutions, local businesses, and community members to achieve roadway safety goals.

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Chapter 3 – Task Force

The City of Lake Elsinore received valuable input from a multidisciplinary stakeholder group (i.e., safety task force) on roadway safety concerns, priority locations, collision trends, and partnership opportunities. The safety task was responsible for the plan's development and will oversee implementation and monitoring.

City of Lake Elsinore Public Works

The Lake Elsinore Public Works Department provides a broad base of services through its six divisions: Administration, Streets, Parks and Streetscape, Lake Operations, Facilities, and Fleet. The Public Works Department is involved in the planning, funding, and delivery of safety projects. The Public Works Department is leading the development of this LRSP and will be the primary advocate for its successful implementation.

Riverside County Fire Department

The Riverside County Fire Department is a leader in fire protection and emergency services that are essential to the Post-Crash Care Element of the Safe System approach. Emergency response is a key factor in the survivability of victims involved in severe collisions, making the Riverside County Fire Department a key stakeholder in the implementation of LRSP goals.

Riverside County Sheriff's Office

Sworn officers provide valuable input on trends they observe on the roads and are important partners in focusing enforcement resources on behaviors that are most closely associated with injuries and fatalities. The Riverside County Sheriff's Office is responsible for traffic law enforcement on roadways in Lake Elsinore. The Sheriff's Office was a key partner in prior safety efforts in the City, which include the focused evaluation of the Railroad Canyon Road corridor. The Riverside County Sheriff's Office operates the Homeless Outreach Team, which assists the community with

Equity Considerations

Equity is an important component of analyzing and improving roadway safety through the Safe System approach. Low-income communities and communities of color have experienced decades of disinvestment in transportation infrastructure, resulting in inequitable roadway safety outcomes and disproportionate burden from enforcement. Vulnerability to injury on the roadway varies from person to person, and is influenced by travel mode, age, ability and location.

The process for developing the LRSP took equity into consideration through data analysis, stakeholder engagement, selection of priority locations and projects, and recommendations for implementation of programs and evaluation. The following items are documented in this plan:

- Inclusive and representative engagement with community representatives and people experiencing homelessness.
- The identification of Disadvantaged Communities and assessment of collision rates based on race/ethnicity, age, and gender through data.
- The identification of proposed engineering projects and strategies within Disadvantaged Communities.
- Recommendations tied with non-engineering strategies to ensure equitable community engagement and enforcement activities.
- Evaluation metrics include recommendations for reporting demographics related to collisions.



Public Engagement

Local residents, business and community groups were invited to collaborate on the LRSP through a series of outreach and engagement events.

In November 2023, local residents were invited to attend a public meeting at the Lake Elsinore Cultural Center to discuss proposed improvements at the I-15/SR-74 interchange. This public meeting represents one of many that will be held for capital improvement and safety projects that require coordination with Caltrans.

In December 2023 and January 2024, subsequent engagement events were held jointly with the General Plan update. The purpose of these engagement events were to solicit feedback on transportation network gap closures, transportation safety policies and goals, and amendments to the City of Lake Elsinore's Complete Streets vision.

Feedback from the outreach and engagement events included the identification of transportation network deficiencies, and many of those locations coincided with the Safety Focus Area identified in the LRSP. The Task Force also collaborated with community members to identify locally preferred engineering and non-engineering countermeasures.

issues related to homelessness through education and outreach. The Sheriff's Office also conducts outreach to local schools in Lake Elsinore to provide education on traffic safety.

Riverside Transit Agency

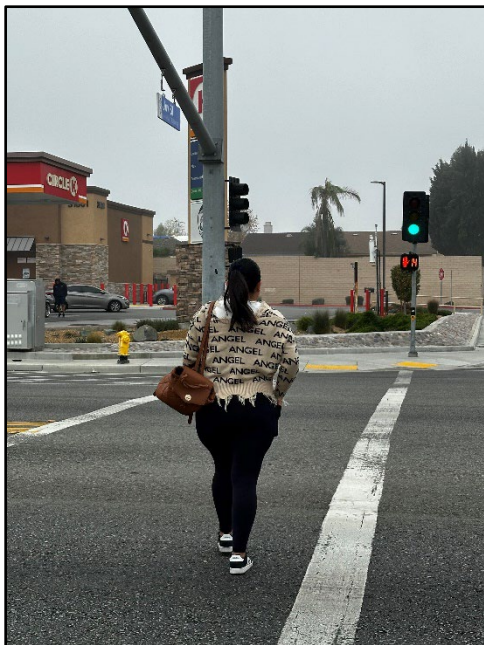
The Riverside Transit Agency provides local and regional transit services throughout Riverside County. The Riverside Transit Agency is committed to providing transit service that is accessible for all and riders can report accessibility comments on their website. There are currently three bus routes that service the City of Lake Elsinore. Most transit users walk or bike to stations, representing vulnerable users on the Lake Elsinore roadway network.

Western Riverside Council of Governments

The Western Riverside Council of Governments (WRCOG) is a regional collective of 18 cities including the City of Lake Elsinore, the Riverside County Board of Supervisors, and the regional Municipal Water Districts. WRCOG strengthens intra-governmental cooperation, collaboration, and communication between its member agencies and seeks to elevate the quality of life throughout the subregion. WRCOG operates a regional traffic fee program that is used to fund transportation improvements.



Public Engagement Meeting at Lake Elsinore Cultural Center.



Pedestrian crossing at signalized intersection on Riverside Dr (SR-74). Street-Based Outreach near Transit Stations along SR-74.



Walk Audit in Downtown Lake Elsinore.

Stakeholder Meetings

The stakeholder group met in October and December 2023, to discuss the City's vision for roadway safety, collision analysis results, and safety countermeasures. The stakeholder meetings included representatives from multiple divisions of the Lake Elsinore Public Works Department, the Riverside County Fire Department, the Riverside County Sheriff's Office, Riverside Transit Agency, and WRCOG. Meeting topics included an interactive survey of plan priorities, discussion of data analysis results, and stakeholder feedback on proposed safety enhancements.

Feedback from stakeholders and community members were incorporated into the development of this plan, as well as the identification of priority projects within each collision profile.

Street-Based Outreach

Meeting people where they are is a principle that guides street-based outreach; the people who uses the transportation facilities on a daily basis are experts in their own right. In December 2023, members of the task force conducted field visits to observe existing conditions and traffic patterns at high priority locations throughout the City. These field visits included discussion with local business owners and unhoused community members, regarding their traffic safety concerns near the high priority locations.

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Chapter 4 – Existing Safety Efforts

The City of Lake Elsinore has made investments in roadway safety through project and program implementation, traffic education and enforcement, pursuing funding through grant applications, roadway maintenance, and adoption of planning documents that identify transportation safety priorities and future projects. Planning documents that have specific safety-related goals, policies, projects, and recommendations were reviewed to set the foundation for this LRSP. This summary organizes the City's existing roadway safety efforts into the five categories of a Safe System, as defined by FHWA: safe roads, safe road users, safe speeds, safe vehicles, and post-crash care.

The planning documents reviewed include:

- Active LE (Active Transportation Plan), 2019.
- Lake Elsinore Capital Improvement Program, Fiscal Year 2023 to 2028, adopted in 2022.
- Lake Elsinore General Plan, adopted in 2011, and General Plan Update, currently in progress.
- Lake Elsinore Municipal Code, last updated in June 2023.
- Lake Elsinore Specific Plans (22 total, including the Downtown Elsinore Specific Plan), prepared in various years.
- Railroad Canyon Road LRSP, 2022.
- Riverside Transit Agency, Short Range Transit Plan, Fiscal Year 2024 to 2026, created in 2023.
- Riverside Transit Agency, First and Last Mile Mobility Plan, 2017.
- Systemic Safety Analysis Report, 2019.
- Western Riverside County Active Transportation Plan, 2018.

Safe Roads

The Safe Roads Element of the Safe System Approach includes the physical design or improvement of roadways, the separation of users in time and space, and enhancements that accommodate human mistakes and injury tolerance levels. This subsection highlights a few of the City's completed and planned projects with a focus on safety enhancements.



Completed or Planned Improvements (As of October 2023)

The City has a Capital Improvement Program (CIP) that is responsible for the development, design, funding, and construction of the City's capital or physical assets (streets, gutters, sidewalks, traffic signals, etc.) The City has completed multiple CIP projects and has more planned, in the design stage, or currently under construction. The improvements documented below contribute to roadway safety and are included in the City's CIP.

Pavement Rehabilitation: The City has rehabilitated the pavement for Summerhill Drive, Auto Center Drive, Collier Avenue, Minthorn Street, La Laguna Tract Local Streets, and Sprong Street. The City plans to provide pavement rehabilitation for residential tracts adjacent to Mountain Street and Broadway Avenue.

Sidewalks and Curb Ramps: The City has implemented ADA compliant improvements (sidewalks, curb ramps, curbs, and gutters) on Spring Street. The City is currently implementing ADA-compliant improvements along Sumner Avenue, Chestnut Street, Lakeshore Drive, and other locations throughout the Downtown area. The City also plans to provide ADA compliant improvements to Main Street.

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Pedestrian Crossing Improvements: The City plans to implement pedestrian safety improvements (Decorative pavement, stamped colored concrete, and paver or brick inlays) along Main Street. Solar-Powered Rectangular Rapid Flashing Beacon (RRFB) systems and pedestrian countdown heads will be installed at various locations throughout the City using funding from the Highway Safety Improvement Program (HSIP) Cycle 9.

Intersection Modifications: All-way stops were recently installed at the intersections of Nichols Road and Terra Cotta Road, and Dexter Avenue and 3rd Street. Traffic signals will be installed at the intersections of Gunnerson Street and Riverside Drive, Camino del Norte and Main Street, and the I-15 and Main Street interchange ramp terminal intersections. Advanced dilemma zone detection and protected left turns will be installed at various locations throughout the City using funding HSIP Cycle 9.

Roadway Improvements: There are numerous roadway improvements and new roadways planned throughout the City. Although not specified in the CIP, along Railroad Canyon Road, high friction pavement and higher visibility chevron signs were recently installed on curved roadway segments as a result of the Railroad Canyon Road LRSP.

Adopted Plans

Safety Plans: The City's Systemic Safety Analysis Report and subsequent focused study on the Railroad Canyon Road corridor are predecessors to this Citywide Local Road Safety Plan. These plans were used to identify corridors and intersections with high collision rates, provided engineering and non-engineering countermeasures, and were used to apply for HSIP grant funding.

Active LE: Active LE is the City's Active Transportation Plan. The plan lays the foundation for improving mobility for all modes of travel, specifically pedestrians and bicyclists, within the City of Lake Elsinore. The plan identifies ways to improve connectivity and safety for all users of the transportation network and is inclusive of age and ability.

General Plan and Specific Plans: The City's General Plan and Specific Plans in areas throughout the City establishes design standards for streets and cross-sections along local roadways. The Mobility/Circulation Elements in each plan often provide multimodal recommendations, safety and lighting requirements, and other development standards.

Riverside Transit Agency Plans: Infrastructure deficiencies at select bus stations and recommendations documented in the Riverside Transit Agency's First and Last Mile Mobility Plan. Recommendations included pedestrian and bicycle network gap closures, crossing enhancements, and lighting.

Grant Funded Projects

HSIP Grant Funding: The City received HSIP Grant Funding in Cycle 9 and 11. The funds will be used to implement flashing beacon systems at existing pedestrian crossings, advanced dilemma zone detection, and protected left turns at various locations throughout the City.

Maintenance Programs

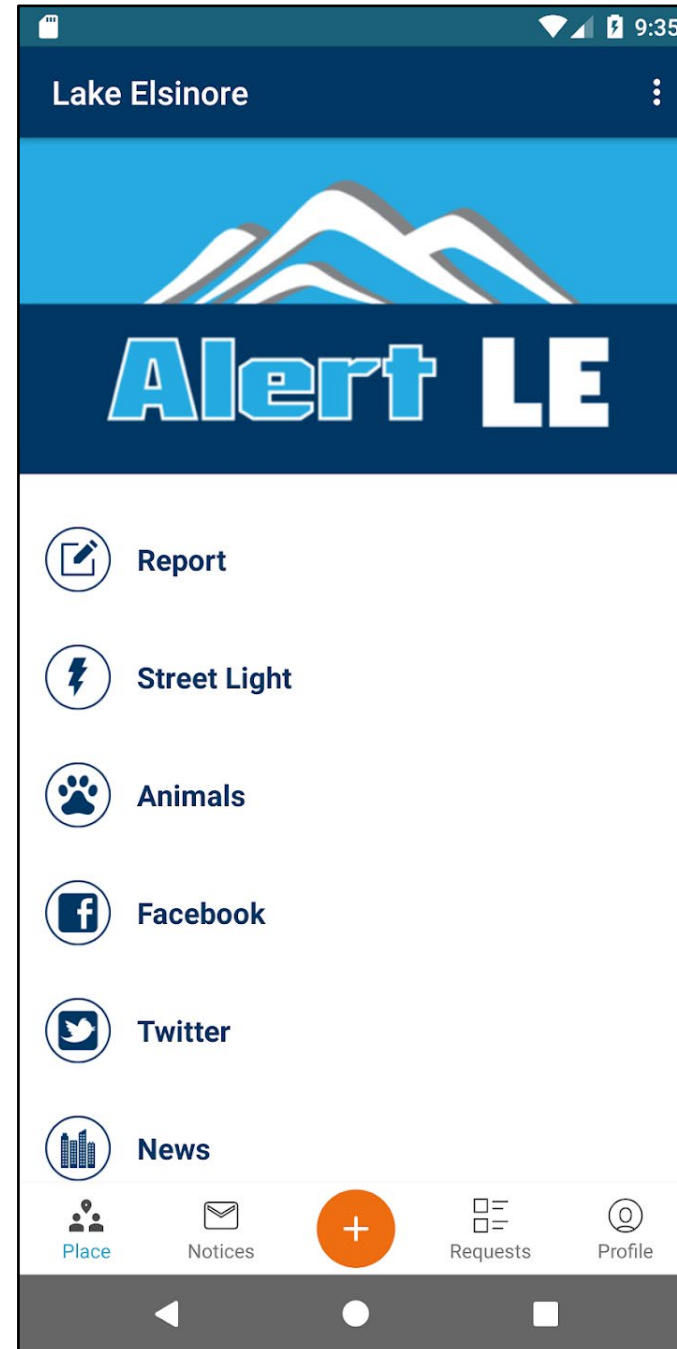
Maintenance & Operations Division: This division is part of the City's Public Works Department and oversees the operation and maintenance of roads, sidewalks, traffic signals, street lighting, street signs, etc. The division implements the following programs:

- Standby Program – This program ensures that Public Works Staff are available to address after hour emergencies. Employees are required to respond to an emergency within one hour.



- Streetlight Inspections – Regular streetlight inspections are conducted throughout the City to identify street lights that are not functioning.
- Curb, Gutter, and Sidewalk Repair Program – The purpose of this program is to repair the City’s inventory of curb, gutter, and sidewalk. The program’s goal is to eliminate hazardous conditions and minimize the possibility of injury to residents due to cracks or tripping hazards.
- Pavement Striping and Marking Program – This program consists of repainting existing crosswalks, legends, centerline, and other striping and markings on asphalt pavement. Currently all striping and markings are painted once per year in fall.
- Crack Seal Program – The purpose of this program is to seal cracks in asphalt pavement to prevent the intrusion of water, which leads to road failure.
- Dirt Road Paving Program – The purpose of this program is to reduce the remaining dirt roads within the city and reduce mud debris that flows along roadways due to inclement weather and eliminate potential hazards that can damage vehicles driving on dirt roads.

Alert LE: The City of Lake Elsinore is accepting non-emergency requests and reports through the Alert LE mobile application and web tool. Requests and reports cover a wide range of topics, such as traffic signals repairs, guardrail and curb damage, and sidewalk issues, and are routed to the relevant department.



Alert LE mobile application reporting system.

Safe Road Users

The Safe Road Users element of the Safe System Approach addresses safety from a behavioral perspective by focusing on education, engagement, and enforcement.

Education & Engagement

There are several ongoing educational efforts, such as the traffic safety education programs led by the Riverside County Sheriff's Department and coordination between City departments and school districts to identify safety needs. Targeted traffic safety educational campaigns are present at all schools with a focus at high schools on young drivers. Other educational campaign target driving under the influence (i.e., "Know Your Limit"), distracted driving, motorcycle safety, and traffic violations.

Engagement with the community is also performed during the development of planning efforts such as Active LE. An objective of the Active LE was to share information with community members regarding how active transportation infrastructure promotes a healthy community and benefits the local economy. One way the City plans to accomplish this objective is by pairing the installation of new facilities with educational programs for motorists, bicyclists, and pedestrians.

Enforcement

The City's Traffic Bureau conducts various enforcement details including school zones, traffic complaints, and special events. The Traffic Bureau participates in several grants through the California Office of Traffic Safety including the "Click It or Ticket" Seatbelt Enforcement Program and DUI Awareness and Enforcement. The Traffic Bureau's primary focus is to enhance traffic safety through partnering with the community to solve traffic problems and through the enforcement of traffic safety laws.

Safe Speeds

The Safe Speeds element of the Safe Systems Approach focuses on infrastructure and policy changes that specifically target speed as a major factor in collisions and collision severity.



Speed is a major concern for active transportation safety in Lake Elsinore and was highlighted in both the Systemic Safety Analysis Report and Railroad Canyon Road LRSP. The City collects speed data and performs a speed limit review regularly, most recently completed in 2022.

The City has a traffic calming program with design guidelines for bulb-outs, narrow lanes, traffic circles, speed awareness signs, and increased speed enforcement. The City installed speed radar signs on Railroad Canyon Road and recently installed more throughout the City paired with traffic calming measures.

Safe Vehicles

The Safe Vehicles Element calls for vehicles to be designed and regulated to minimize the occurrence and severity of collisions using safety measures that incorporate the latest technology. At the federal level, the safety of motor vehicles and related equipment and technology is regulated by the National Highway Traffic Safety Administration (NHTSA). Vehicle safety features, such as seat belts and airbags, were mandated in 1968 and 1998, respectively, and more recently in 2018, all new light-weight vehicles in the United States are required to come equipped with backup cameras.

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Some on-board vehicle technologies require investments in public infrastructure in order to function properly. For example, lane departure warning technology that is becoming increasingly common on newer vehicles requires regular maintenance of roadway striping and the use of highly retroreflective materials to maximize effectiveness. Emerging Vehicle-to-Infrastructure (V2I) technologies, referring to a wireless exchange of data between vehicles and roadway infrastructure, will likely require integration with existing infrastructure systems. Lake Elsinore has made significant investments in roadway maintenance and in updating traffic signal detection systems, providing a strong foundation in support of safe vehicles.

The Safe Vehicles element also includes policies to encourage or regulate vehicle size, as larger vehicles are more likely to cause severe injuries during a collision. In Lake Elsinore, the City's Municipal Code provides weight, parking, and routing restrictions for commercial vehicles on local roads.

Post-Crash Care

While much of the Safe System Approach centers on collision prevention, the Post-Crash Care Element focuses on reducing fatalities or life-changing complications when collisions do occur. Within road design, Post-Crash Care

involves the balance of prioritizing access for active transportation modes while considering emergency vehicle access needs.

The City's Traffic Bureau provides an Accident Investigation Team. These officers are subject to call 24/7 and respond to all major injury and fatal traffic accidents in the City. The officers have been through specialized schooling and on-the-job training to investigate and complete a highly detailed report and if needed reconstruction of the collision.

The Riverside County Fire Department recently worked with the City of Lake Elsinore to install emergency vehicle detection at a number of traffic signals to improve emergency response times and to reduce conflicts with emergency vehicles at intersections.

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Chapter 5 – Safety Analysis

Killed or Severely Injured (KSI)

Severe injuries resulting from a traffic collision can result in a number of catastrophic impacts, including permanent disability, lost productivity and wages, and ongoing healthcare costs.

Throughout this plan, the acronym KSI is used to denote collisions where someone was killed or severely injured.

This section summarizes the collision analysis for local roadways in the City of Lake Elsinore. Collisions on Interstate 15 are not included in the analysis unless they occurred at the ramp terminal intersections that provide access to local roads.

This analysis identified several collision trends and risk factors in the City of Lake Elsinore, including:

- The total number of collisions generally increased between 2018 and 2021, except for 2022.
- People walking and biking are involved in 9 percent of all collisions but are disproportionately involved in 19 percent of all killed and severe injury (KSI) collisions, most of which occurred at night.
- Motorcyclists are particularly over-represented in KSI collisions, as they are involved in 8 percent of all collisions but 24 percent of all KSI collisions.
- The most common collision type was Broadside (i.e., T-bone), representing one in three collisions and one in four KSI collisions.
- The most common primary collision factor was Unsafe Speed, playing a role in 30 percent of all collisions and 22 percent of KSI collisions.
- One in three KSI collisions involved driving or bicycling under the influence.
- Despite making up less than fifty percent of roadways, over two thirds of collisions occurred on roadways with posted speeds of 40 miles per hour or greater.
- Most collisions occur at intersections.
- Collisions occur disproportionately within or near Disadvantaged Communities.

Comparison with Neighboring Cities

According to the California Office of Traffic Safety (OTS) 2020 statewide data, the City of Lake Elsinore ranks 45th out of 106 for total number traffic fatalities and injuries among California cities with a population between 50,001 – 100,000 people (a rank of 1 is the worst).

Compared with neighboring cities, Lake Elsinore ranks 3rd in total fatal and injury victims per capita on local roadways.

City	Fatal & Injury Victims per Capita	Rank
City of Perris	.0052	1
City of Temecula	.0036	2
City of Lake Elsinore	.0030	3
City of Menifee	.0026	4
City of Murrieta	.0022	5
City of Wildomar	.0012	6



Collision Data Overview

The collision analysis examines injury collisions acquired from the Transportation Injury Mapping System (TIMS) from 2018 through 2022. Collisions resulting in property-damage-only (PDO) are not included in the analysis. Collision databases have been found to have certain reporting biases, including:

- Collisions involving people walking, bicycling, or on motorcycles are less likely to be reported than collisions only involving people driving;
- Younger people are less likely to report collisions; and
- Alcohol-involved collisions may be under-reported.

Race, income, immigration status, and English proficiency may also impact reporting, but there is limited research on these factors.

Contextual Data Overview

To better understand systemic collision patterns in the City of Lake Elsinore, several contextual factors were analyzed in conjunction with collision characteristics. By merging roadway and intersection features with collision data, relationships can be uncovered between contextual factors and the risk of frequent and severe collisions. The proximity to each contextual factor varied based on its area of influence (e.g., a school has a much larger area of influence than a bus stop).

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Contextual Factors

Roadway Element	Distance
Bicycle Facilities	100'
Bus Stops	250'
Roadway Characteristics	
Posted Speed Limit	100'
Roadway Classification	100'
Average Annual Daily Traffic	100'
Intersection Control	250'
Land Use Types	
Schools	¼ mile
Parks	¼ mile
Disadvantaged Communities	¼ mile

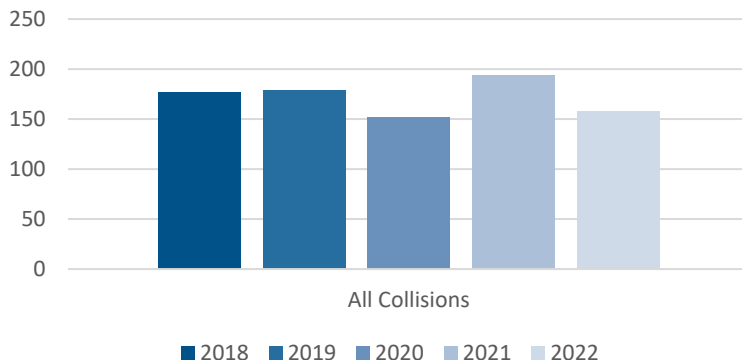
Data from connected vehicles were also included as contextual factors. Connected vehicle data such as excessive speeding, aggressive acceleration (i.e., stepping on the gas), and aggressive deceleration/hard-breaking (i.e., slamming on the brakes) were geospatially linked to roadway segments and used as indicators of atypical driving behavior.

Generally, excessive speeding events tend to be an indicator of reckless behavior. Locations with excessive speeding events are those where the 85th percentile travel speed exceeded the posted speed by 5 miles per hour. Aggressive acceleration or deceleration events are the observation of abnormal changes in speed, whether they are positive or negative. Generally, aggressive acceleration events tend to be an indicator of reckless behavior whereas rapid deceleration or hard braking tends to be an indicator of evasive action, though the inverse is sometimes true as well.

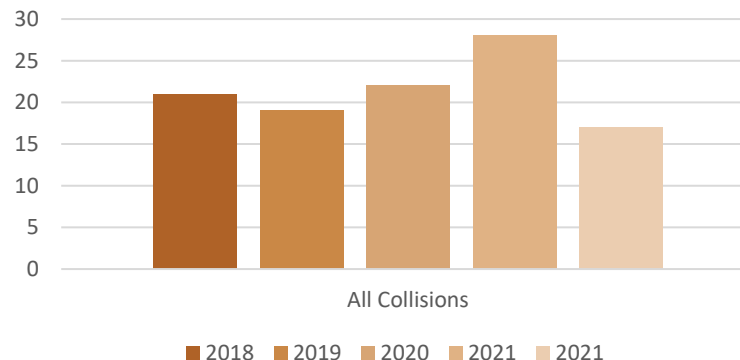
COLLISIONS BY YEAR

From 2018 to 2022, there were **860 total injury collisions**, **107** (or **12 percent**) of which included victims who were **killed or severely injured (KSI)**. On average, **6 people** are killed each year on local roadways in the City of Lake Elsinore by traffic collisions.

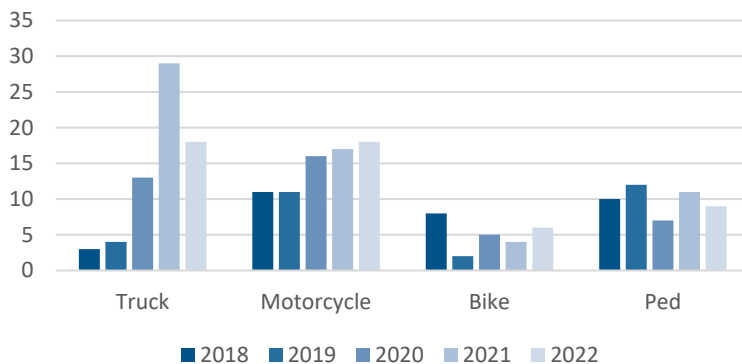
Total Number of Collisions



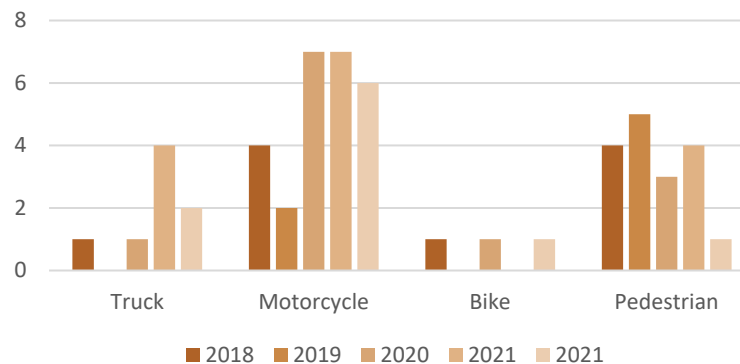
Total Number of KSI Collisions



Total Number of Collisions



Total Number of KSI Collisions



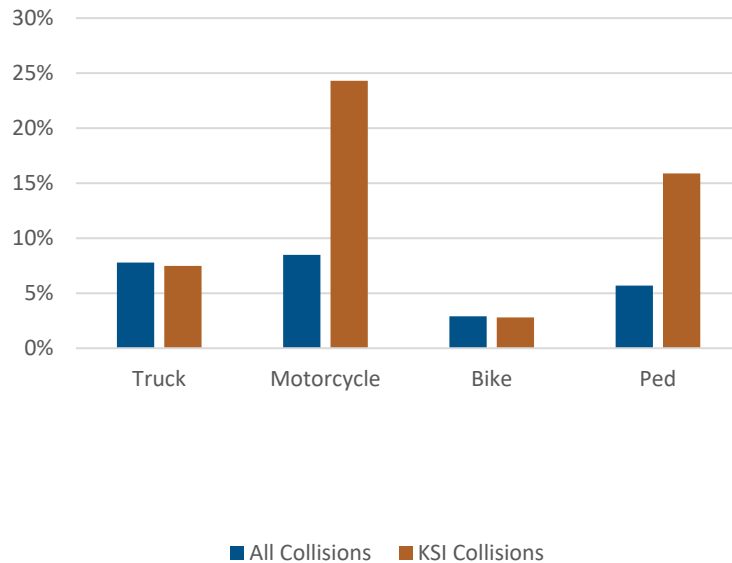


COLLISIONS BY MODE

People walking and biking are involved in **9 percent** of all collisions in the City of Lake Elsinore but are disproportionately involved in **19 percent** of all KSI collisions.

Motorcyclists are particularly over-represented in KSI collisions, as they are involved in **8 percent** of all collisions but **24 percent** of all KSI collisions.

Collisions By Mode

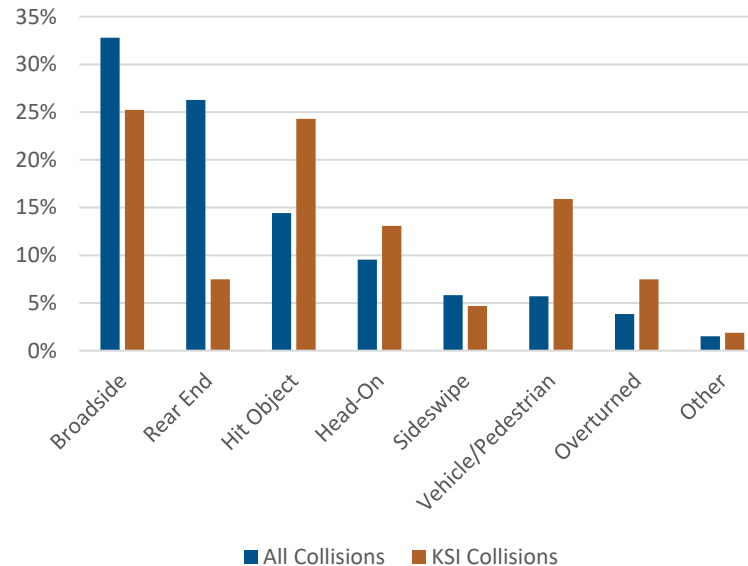


COLLISIONS BY TYPE

The four most common collision types in the City of Lake Elsinore are Broadside (**33 percent**), Rear End (**26 percent**), Hit Object (**14 percent**), and Head-On (**10 percent**) collisions.

For KSI collisions, Broadside collisions account for the largest share of collision types (**25 percent**), followed by Hit Object (**24 percent**), Vehicle/Pedestrian (**16 percent**), and Head-On (**13 percent**).

Collisions By Type



Vehicle Right-of-Way Violation:

When a party of any mode does not yield to the driver's right-of-way or the driver observes their right-of-way improperly, depending on which party is listed at fault.

Improper Turning:

When a driver ignores traffic signals, turns before it is their turn, or turns from the wrong lane.

Traffic Signals and Signs:

Failure to obey any sign or signal erected or maintained.

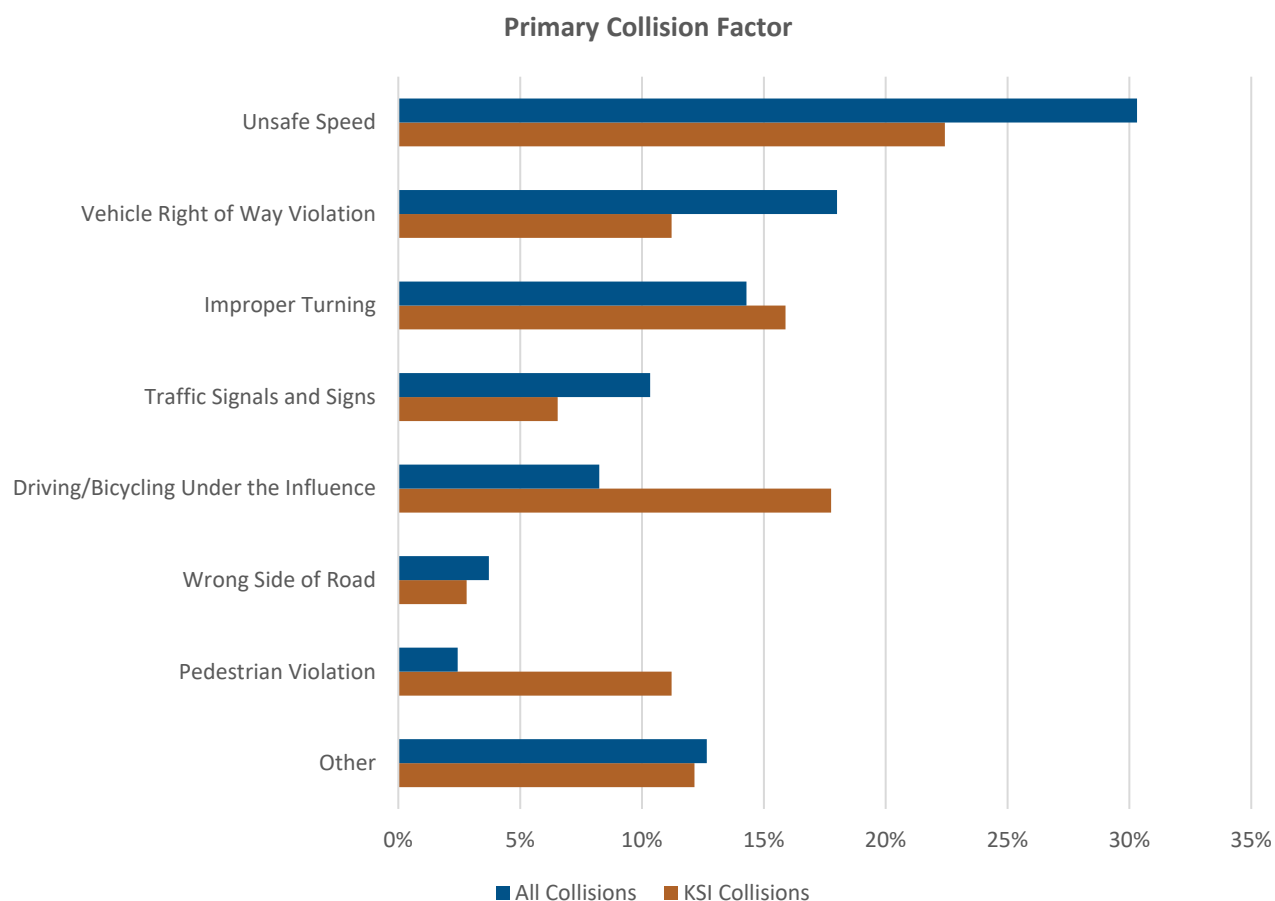
Pedestrian Violation:

When a pedestrian does not yield to other road users at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection.

PRIMARY COLLISION FACTOR

There may be multiple factors at play in any given collision. The primary collision factor is the one element or driving action which in an officer's opinion best describes the main cause of the collision. In the City of Lake Elsinore, the most common primary collision factors are Unsafe Speed (**30 percent**), Vehicle Right-of-Way (**18 percent**), Improper Turning (14 percent), and Traffic Signals and Signs (10 percent).

For KSI collisions, the most common primary collision factors are Unsafe Speed (**22 percent**), Driving or Bicycling Under the Influence (**18 percent**), Improper Turning (**16 percent**), followed by a tie between Vehicle Right-of-Way and Pedestrian Violation (**11 percent**).





DRIVING/BIKING UNDER THE INFLUENCE

A driver or bicyclist under the influence of alcohol and/or drugs (DUI) increases the likelihood of a collision resulting in a severe injury or a fatality. From 2018 to 2022, **11 percent** of collisions involved a driver under the influence. The percentage significantly increases to **31 percent** for KSI collisions.

Collisions involving DUI increased from 2019 to 2021 and maintained rates above the five-year average in 2022. KSI collisions involving DUI peaked in 2022 over the last five years.

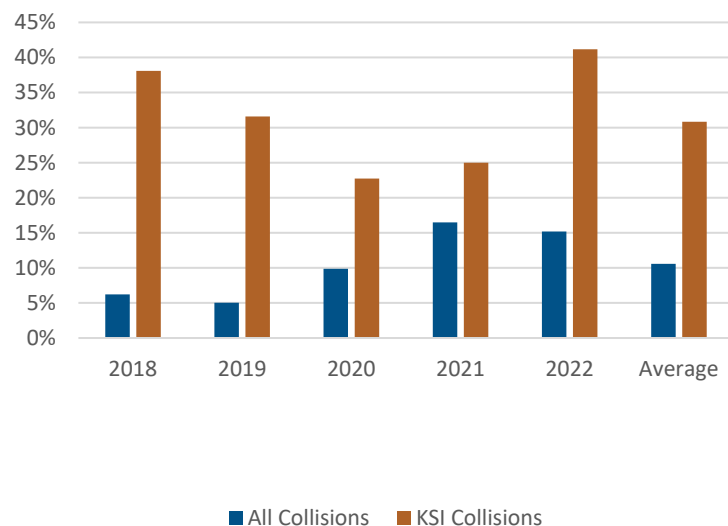
TIME OF DAY

Studying the timing of collisions can provide context about the surrounding traffic and lighting conditions, which informs the selection of countermeasures. A disproportionate share of collisions occurred in the evening between 3 PM and 6 PM (**20 percent**), which is when many people are returning from work and school. Collisions occurring between this period may also be affected by seasonal changes, such as Daylight Savings Time, which can influence visibility during sunset.

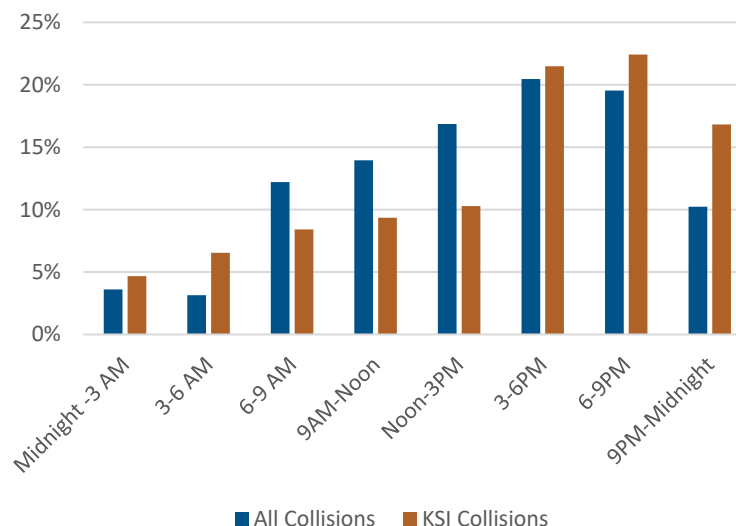
A disproportionate share of KSI collisions occurred in the evening or overnight between 6 PM and 9 PM (**22 percent**). This pattern indicates that there are night-related issues, such as visibility, DUI, and speeding when fewer cars are on the road.

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Driving/Biking Under the Influence



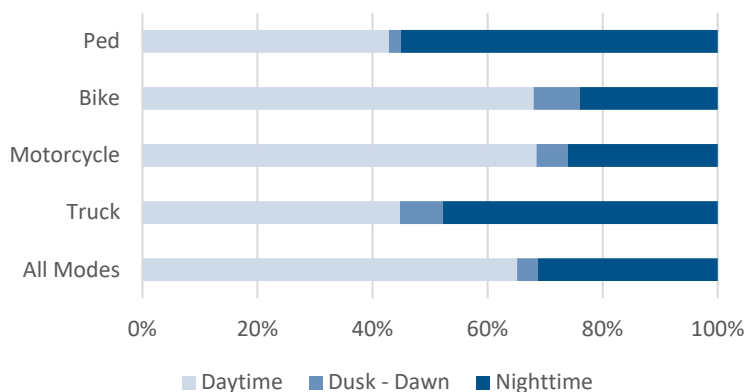
Time of Day



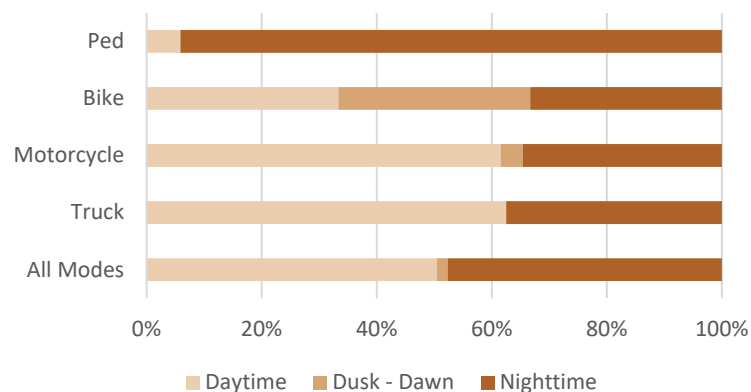
LIGHTING CONDITIONS

Roadway lighting conditions can influence the visibility of vulnerable roadway users, especially of pedestrian. **55 percent** of pedestrian collisions and **94 percent** of pedestrian KSI collisions occurred at night. Of the pedestrian collisions that occurred at night, **26 percent** of pedestrian collisions and **44 percent** of pedestrian KSI collisions occurred in locations not near a streetlight.

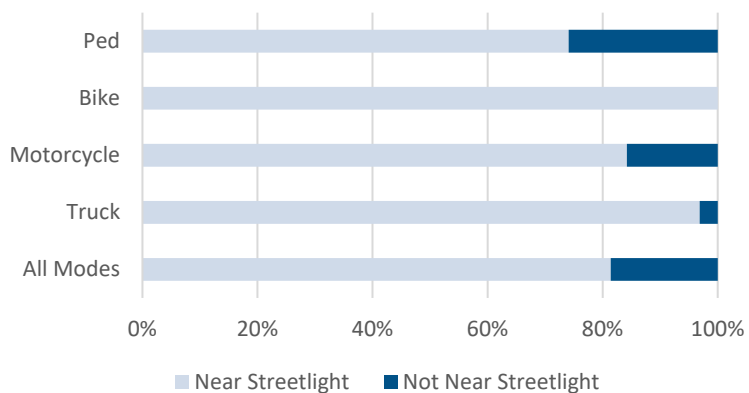
Lighting Conditions of All Collisions



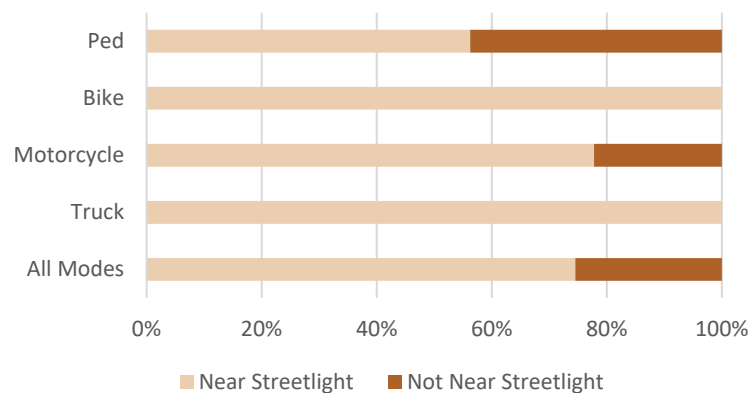
Lighting Conditions of KSI Collisions



All Collisions at Night



KSI Collisions at Night



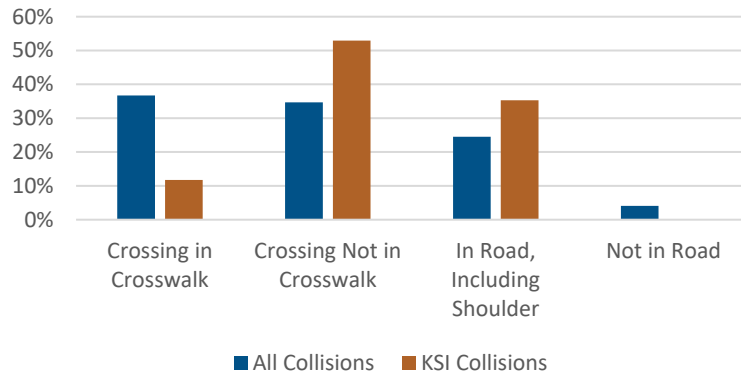


VULNERABLE USERS - PEDESTRIANS

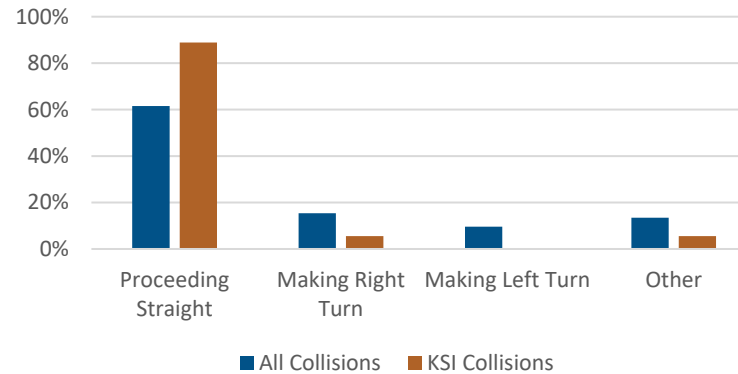
Most pedestrian collisions occurred when pedestrians are crossing a roadway, either at a marked crosswalk (**37 percent**) or not (**35 percent**). However, pedestrians crossing not in a marked crosswalk are disproportionately involved in **53 percent** of KSI collisions. Pedestrians crossing the street outside of crosswalks and walking in the road may indicate priority locations to evaluate for new crosswalks and sidewalks.

Most non-pedestrian parties, such as drivers and bicyclists, were proceeding straight prior to the collision; **62 percent** of non-pedestrian parties overall and **89 percent** of non-pedestrian parties in KSI collisions. While proceeding straight, drivers are able to travel at higher speeds, resulting in more severe collision outcomes.

Pedestrian Movement



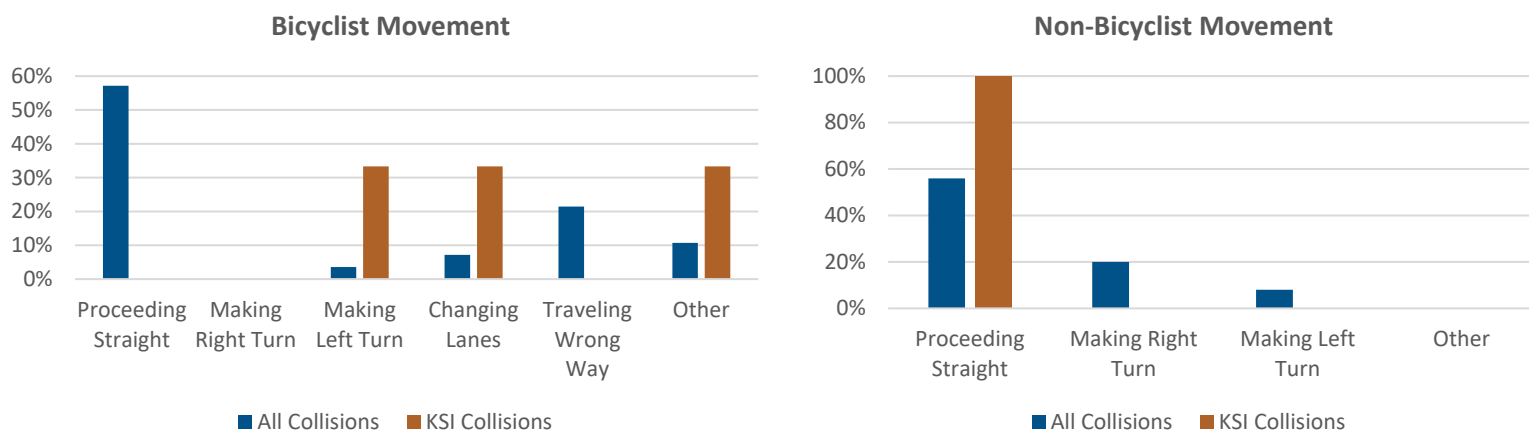
Non-Pedestrian Movement



VULNERABLE USERS - BICYCLISTS

Most bicycle collisions occurred when bicyclists were proceeding straight (**57 percent**), followed by bicyclists traveling the wrong way (**21 percent**). For KSI collisions, bicyclists were either changing lanes or turning left (**66 percent**).

Most non-bicyclist parties, such as drivers, were proceeding straight prior to the collision; **56 percent** of non-bicyclist parties overall and **100 percent** of non-bicyclist parties in KSI collisions. While proceeding straight, drivers are able to travel at higher speeds, resulting in more severe collision outcomes.



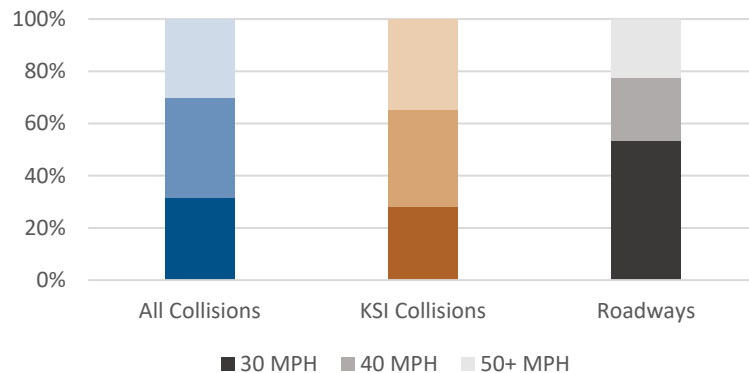


POSTED SPEED

Speed is the primary factor in determining the severity of a collision. Over two-thirds of all collisions and KSI collisions occurred on roadways with posted speeds of 40 miles per hour (mph) or greater, while these roads make up less than fifty percent of Lake Elsinore's roadways.

Despite making up 23 percent of Lake Elsinore's roadways (measured in centerline miles), **30 percent** of all collisions and **35 percent** of KSI collisions occurred on roadways with a posted speed of 50 mph or above.

Posted Speed



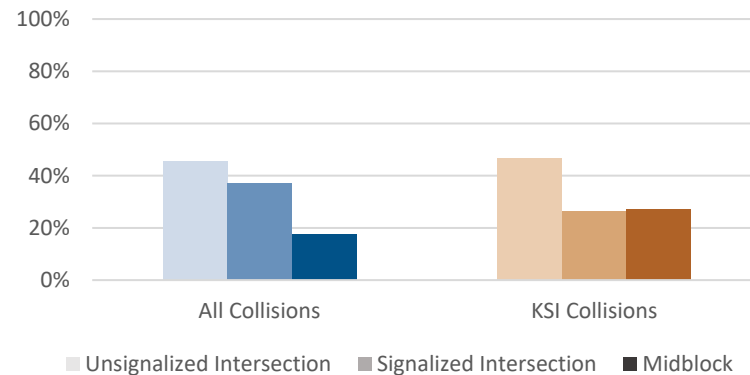
LOCATION TYPE

Most collisions occur within 250 feet of an intersection (**83 percent** of collisions and **73 percent** of KSI collisions).

Collisions are more likely to occur at intersections because people walking, biking, and driving are interacting with each other, changing directions, and making decisions.

Most of the intersection collisions occur at unsignalized locations; **45 percent** of all collisions (**53 percent** of all collisions that occurred at an intersection) and **47 percent** of KSI collisions (**64 percent** of KSI collisions that occurred at an intersection).

Location Type



PROXIMITY TO BUS STOPS

Areas near bus stops generally have higher pedestrian and bicycle activity as people are traveling to and from transit. In Lake Elsinore, **8 percent** of all collisions and **19 percent** of all KSI collisions near bus stops involved people walking and biking.

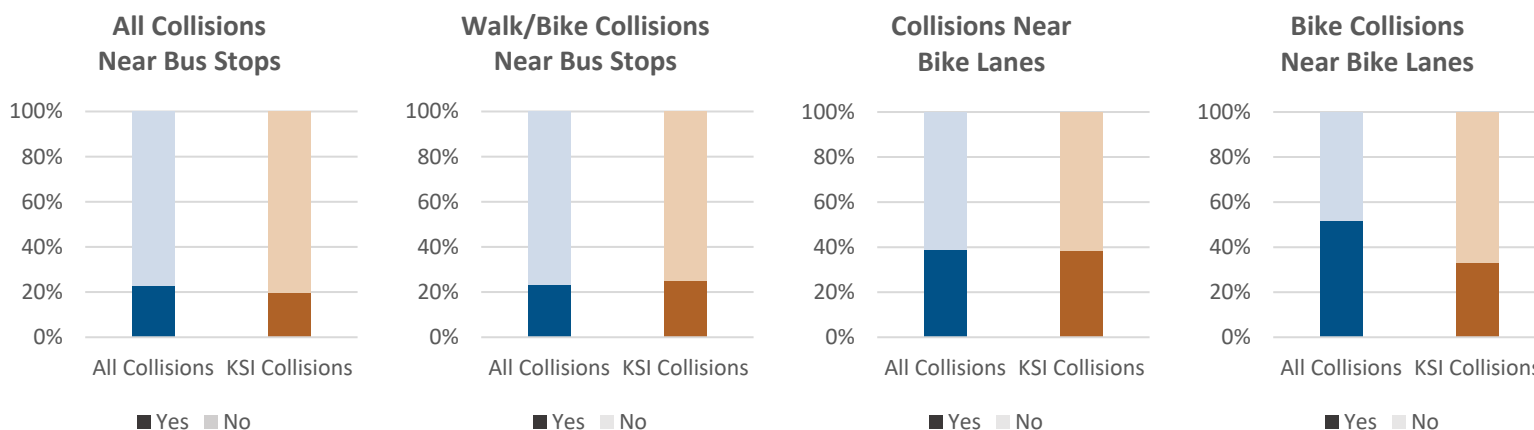
23 percent of all collisions and **20 percent** of all KSI collisions occurred within 250 feet of a bus stop. In comparison, **23 percent** of walk/bike collisions and **25 percent** of walk/bike KSI collisions occurred within 250 feet of a bus stop. KSI collisions involving people walking and biking are somewhat overrepresented near bus stops.

Some bus stops in Lake Elsinore lack surrounding pedestrian infrastructure; 44 percent of pedestrians hit near bus stops were not in a marked crosswalk of dedicated pedestrian facility.

PROXIMITY TO BICYCLE FACILITIES

People biking are more likely to use roadways with bicycle facilities. Despite only making up **3 percent** of all collisions and **3 percent** of all KSI collisions, **10 percent** of all collisions and **22 percent** of all KSI collisions near bicycle facilities involved people biking.

39 percent of all collisions and **38 percent** of all KSI collisions occurred near a bicycle facility. In comparison, **52 percent** of bike collisions and **33 percent** of bike KSI collisions occurred near a bicycle facility. Bicycle collisions on roadways with bicycle facilities tend to be less severe.





PROXIMITY TO SCHOOLS

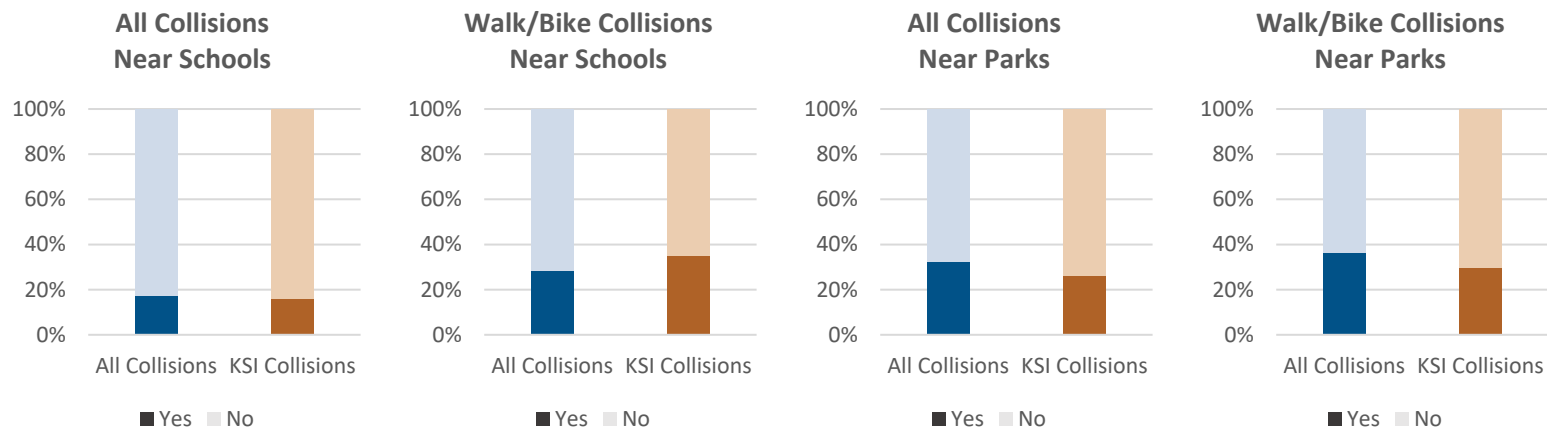
Schools have higher pedestrian and bicycle activity, especially during arrival and dismissal periods. Despite making up **9 percent** of all collisions and **19 percent** of all KSI collisions, **14 percent** of all collisions and **41 percent** of all KSI collisions near schools involved people walking and biking.

17 percent of collisions and **16 percent** of KSI collisions occurred within a quarter-mile of a school. In comparison, **28 percent** of walk/bike collisions and **35 percent** of walk/bike KSI collisions occurred within a quarter-mile of a school. Collisions involving people walking and biking are disproportionately overrepresented near schools.

PROXIMITY TO PARKS

Parks are another destination with high pedestrian and bicyclist activity. **10 percent** of all collisions and **21 percent** of all KSI collisions near parks involved people walking and biking.

33 percent of collisions and **26 percent** of KSI collisions occurred within a quarter-mile of a park. In comparison, **36 percent** of pedestrian and bicycle collisions and **30 percent** of pedestrian and bicycle KSI collisions occurred within a quarter-mile of a park. Collisions involving people walking and biking are somewhat overrepresented near parks.



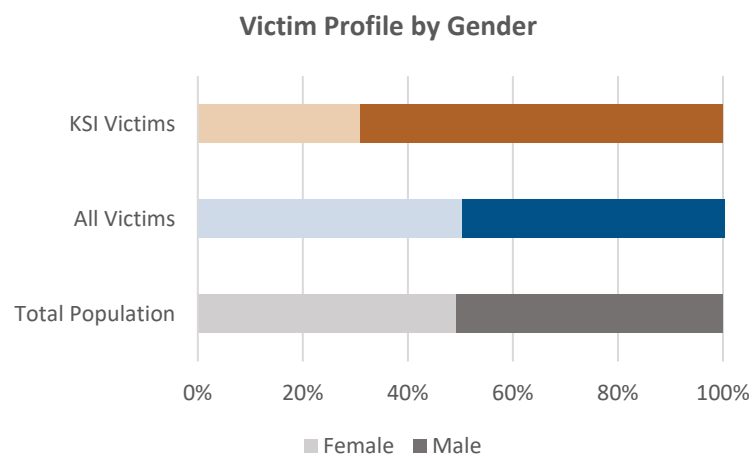
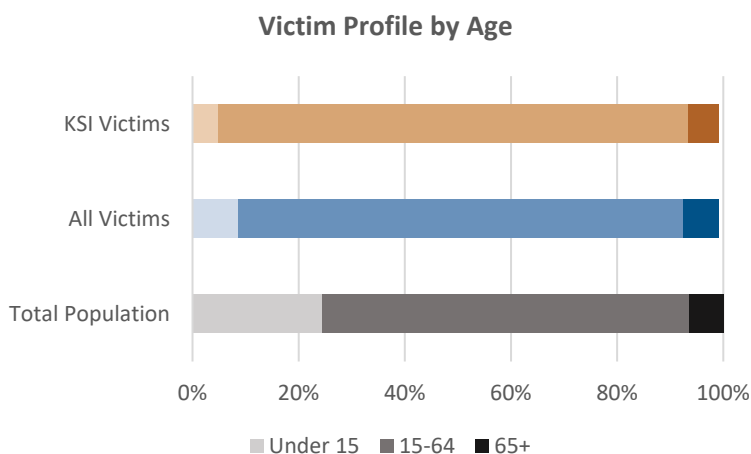
VICTIM PROFILE BY AGE & GENDER

Victims include anyone involved in a collision that experience some level of injury. Victim demographic information are reported at the party level; this means that if multiple people are present in a vehicle, only the driver's demographic information will be reported.

People between the ages of 15 and 65 experience a disproportionate share of collisions within the City of Lake Elsinore:

- People under the age of 15 comprise **24 percent** of Lake Elsinore's population but represent only **9 percent** of all injury victims and **5 percent** of all KSI victims.
- People between the ages of 15 and 65 comprise **69 percent** of Lake Elsinore's population but represent only **84 percent** of all injury victims and **89 percent** of all KSI victims.
- People 65 years and older comprise **6 percent** of the City's population but represent **7 percent** of all injury victims and **6 percent** of all KSI victims.

Gender breakdown is roughly evenly distributed for all injury victims with **50 percent** male and **50 percent** female victims. Male victims are overrepresented in KSI collisions, and account for **69 percent** of KSI victims.





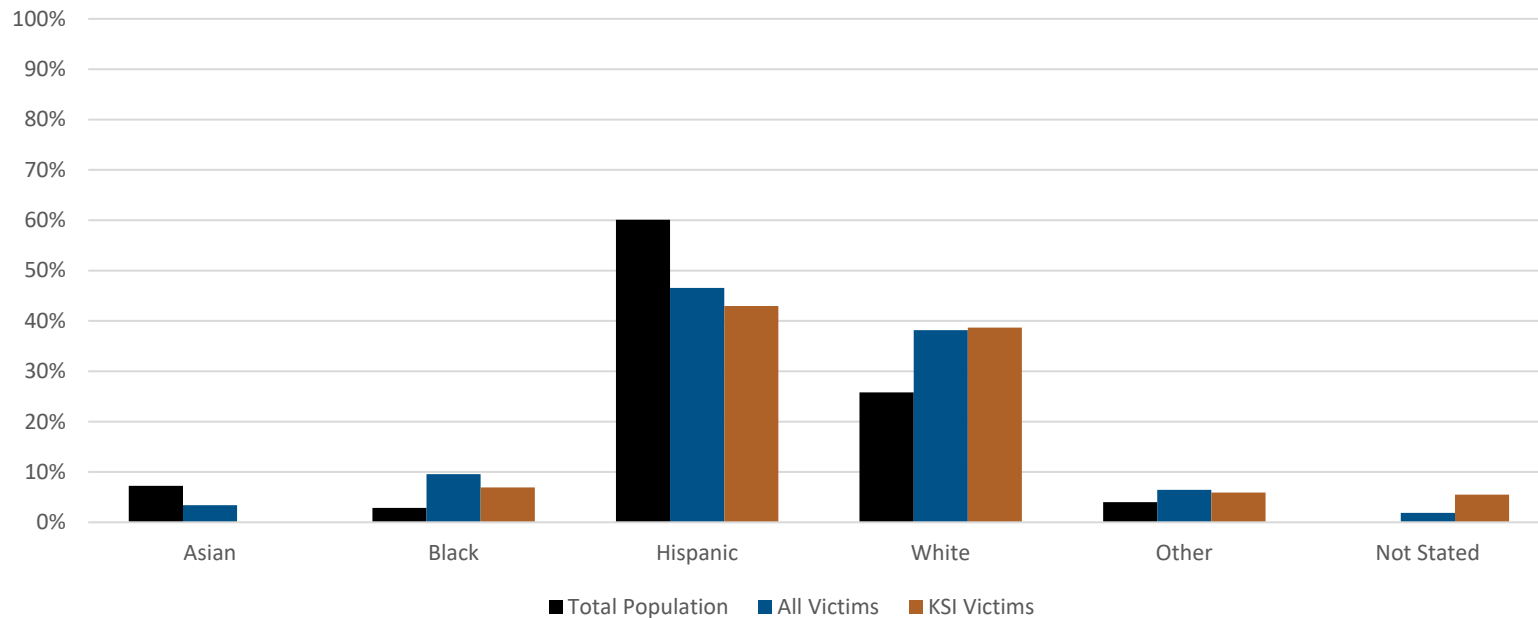
VICTIM PROFILE BY RACE

The victim's race is determined at the discretion of the reporting officer and is also only reported at the party level. This means that if people of multiple races are present in a vehicle, only the driver's race will be reported. Additionally, not all roadway users live within the City of Lake Elsinore, and racial breakdown of collision victims may be further influenced by regional demographics.

- People who were identified as Asian represent **3 percent** of all victims, **less than 1 percent** of KSI victims, and **7 percent** of the population in the City of Lake Elsinore.
- People who were identified as Black are overrepresented in collisions, representing **10 percent** of all victims, **7 percent** of KSI victims, and **3 percent** of the population in the City of Lake Elsinore.
- People who were identified as Hispanic represent **47 percent** of all victims, **43 percent** of KSI victims, and **60 percent** of the population in the City of Lake Elsinore.
- People who were identified as White are overrepresented in collisions, representing **38 percent** of all victims, **39 percent** of KSI victims, and **26 percent** of the population in the City of Lake Elsinore.

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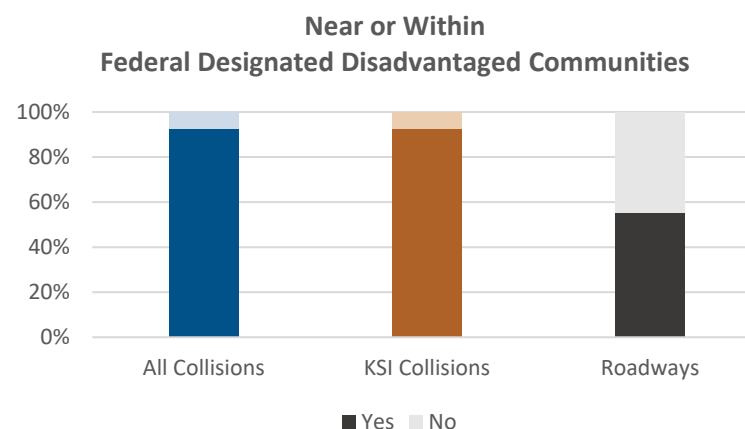
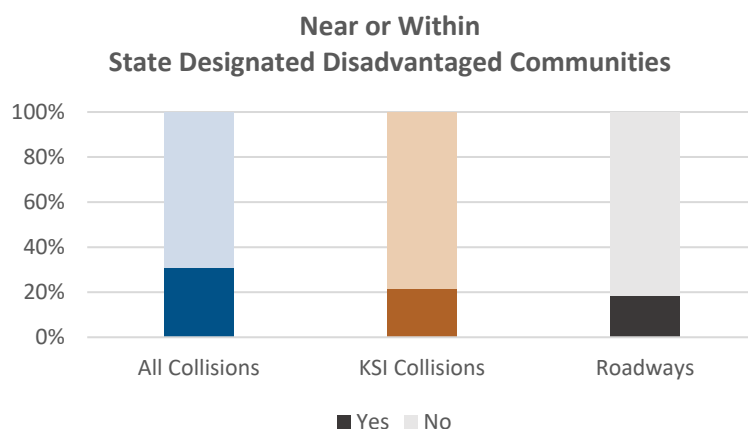
Victim Profile by Race



DISADVANTAGED COMMUNITIES

In the State of California, disadvantaged communities refers to census tracts which most suffer from a combination of economic, health, and environmental burdens. These burdens include poverty, high unemployment, air and water pollution, presence of hazardous wastes as well as high incidence of asthma and heart disease. Environmental and social justice seeks to come to terms with, and remedy, a history of unfair treatment of communities, predominantly communities of people of color and/ or low-income residents. **19 percent** of Lake Elsinore's roadways (measured in centerline miles) are located within a quarter-mile of a state designated disadvantaged community, however state designated disadvantaged communities disproportionately represent **31 percent** of all collisions and **21 percent** of KSI collisions.

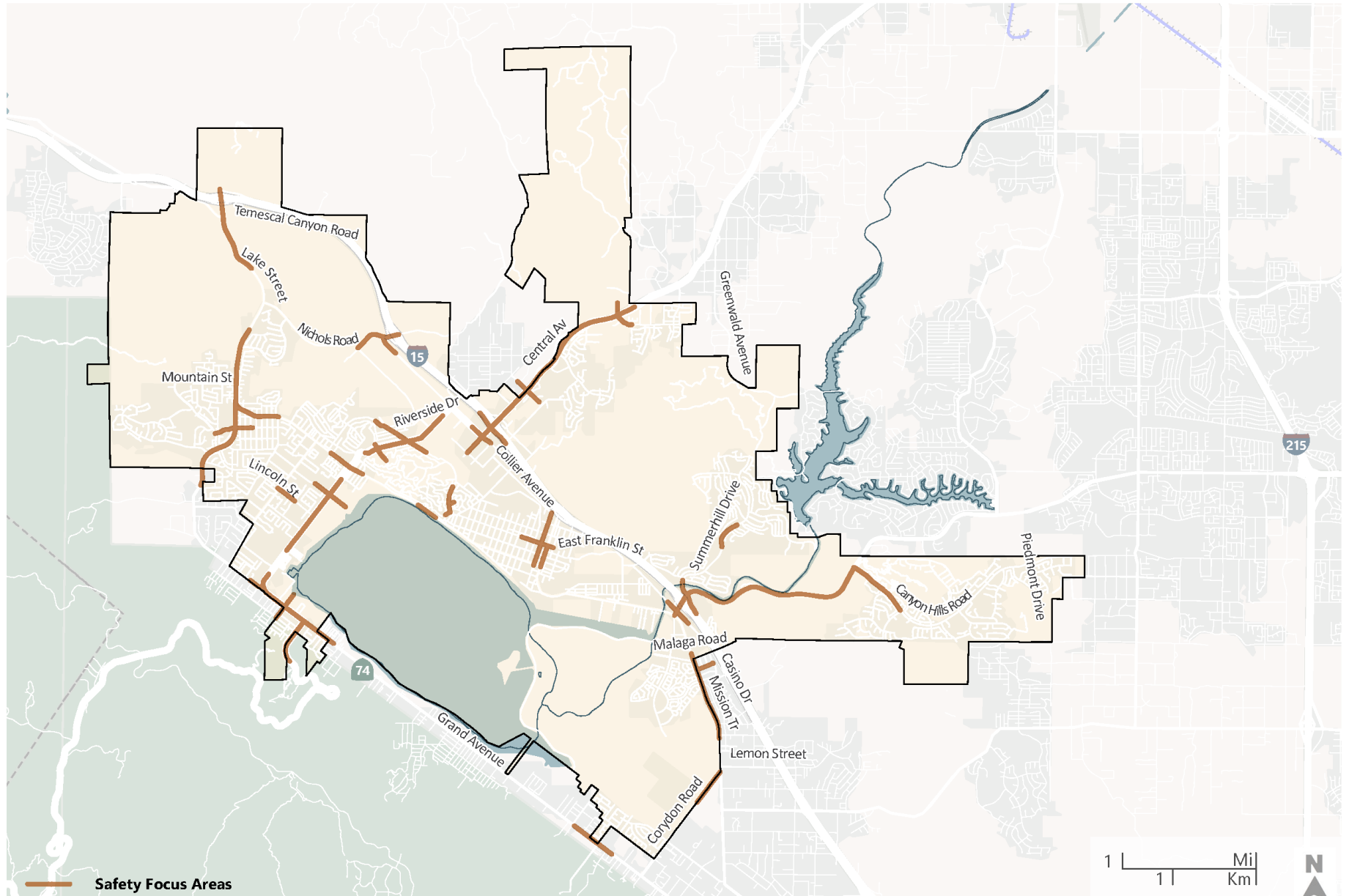
At the federal level, disadvantaged communities refers to census tracts that is at or above the threshold for one or more environmental, climate, or other burdens, and at or above the threshold for an associated socioeconomic burden. In addition, a census tract that is completely surrounded by disadvantaged communities and is at or above the 50% percentile for low income is also considered disadvantaged. Indicators include: 1) Climate Change, 2) Energy, 3) Health, 4) Housing, 5) Legacy Pollution, 6) Transportation, 7) Water and Wastewater, and 8) Workforce Development. **55 percent** of Lake Elsinore's roadways (measured in centerline miles) located within a quarter-mile of a federally designated disadvantaged community, however federally designated disadvantaged community disproportionately represent **93 percent** of all collisions and **93 percent** of KSI collisions.





Safety Focus Areas

Collisions were mapped to identify intersections and roadways with the highest concentration of collisions. The “Safety Focus Area”, used to describe these intersections and roadways, represents roughly 24 centerline miles, or approximately **8 percent** of Lake Elsinore’s roadways. The Safety Focus Area represents **65 percent** of all collisions and **79 percent** of KSI collisions that have occurred within the City of Lake Elsinore between 2018 and 2022.



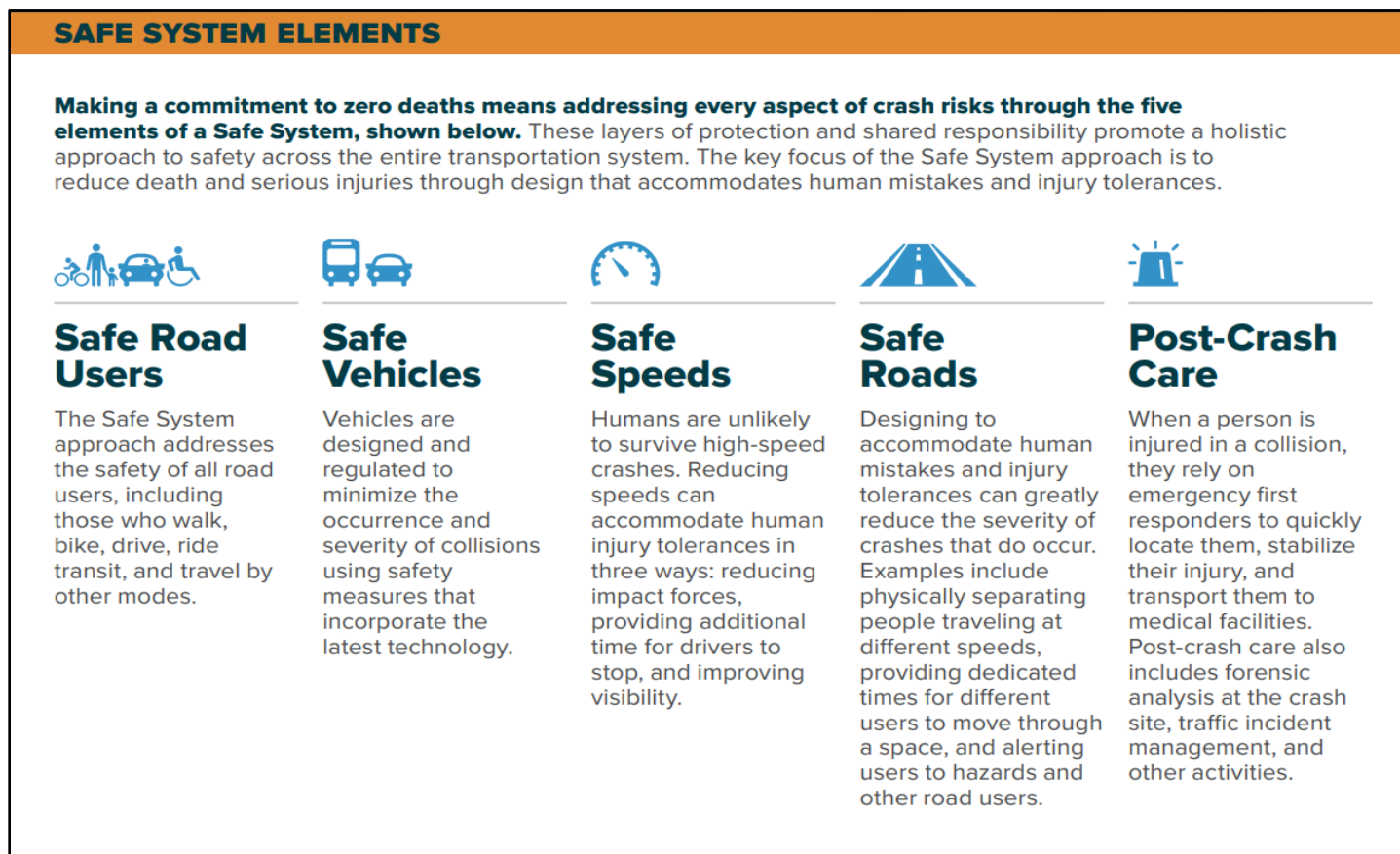
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Chapter 6 – Countermeasure Toolbox

This toolbox presents safety countermeasures covering safe road users, safe vehicles, safe speeds, safe roads, and post-crash care that address the collision trends identified through the comprehensive collision analysis. This toolbox furthers the work that the City of Lake Elsinore has done over the past several years to prioritize safer roadway design through the Systemic Safety Analysis Report adopted in 2019 and the recent Railroad Canyon Road LRSP completed in 2022.

This plan's focus on the elements of the Safe System approach and an emphasis on equity not only helps to provide alignment with current LRSP guidelines, but also positions the City of Lake Elsinore for federal/state funding opportunities and aligns their actions with emerging safety best practices.



Source: Fehr & Peers for FHWA



Engineering Countermeasures

Most of the engineering countermeasures are included in the 2022 Caltrans Local Roadway Safety Manual (LRSM) and can be advantageous for use in Caltrans Highway Safety Improvement Program (HSIP) grant funding applications. The toolbox identifies a Caltrans-approved Crash Reduction Factor (CRF), the expected duration of the project, the federal funding eligibility, the systemic opportunity for countermeasure implementation, and applicable collision type (e.g., all modes, bicycle and pedestrian collisions only, etc.) as outlined in the LRSM. The higher the CRF, the greater the expected reduction in collisions. There are many effective safety countermeasures beyond those listed in the LRSM, and several are included in this toolbox.

✓ Local Roadway Safety Manual (LRSM) Countermeasures

LIGHTING

- Intersection Lighting ✓
- Roadway Lighting ✓

CONTROL

- Install Stop Sign
- Install All-Way Stop Control ✓
- Install (Mini-) Roundabout ✓
- Install Signal ✓

SIGNAL MODIFICATION

- Retroreflective Signal Backplates ✓
- Extend Yellow and All Red Time ✓
- Advanced Dilemma Zone Detection
- Emergency Vehicle Preemption ✓
- Protected Left Turns ✓
- Red Light Camera

SHIELD OBSTACLES

- Install Median Barrier ✓
- Guardrails ✓
- Impact Attenuators ✓

GEOMETRIC

- Minor Road Splitter Islands ✓

- Raised Median ✓
- Create Directional Median Openings ✓
- Right-Turn Lane ✓
- Left-Turn Lane ✓
- Install Acceleration/Deceleration Lane ✓
- Two-Way Left-Turn Lane ✓
- Widen Shoulder ✓
- Widen Median
- Improve Pavement Friction ✓

OPERATION/WARNING

- Larger or Additional Warning Signs ✓
- Install Flashing Beacons ✓
- Chevron Signs on Horizontal Curves ✓
- Curve Advance Warning Signs ✓
- Speed Monitoring and Feedback
- Improve Intersection Sight Distance ✓
- Upgrade Intersection Pavement Markings ✓
- Delineators, Reflectors, and/or

Object Markers ✓

- Transverse Rumble Strips ✓
- Edgelines and Centerlines ✓
- Edgeline and Centerline Rumble Strips ✓

PEDESTRIAN & BICYCLE

- Install Bike Lanes ✓
- Install Sidewalks/Pathway ✓
- High Visibility Crosswalk ✓
- Raised Crosswalk/Intersection ✓
- Curb Extensions ✓
- Leading Pedestrian Interval ✓
- Pedestrian Countdown Signal Heads ✓
- Pedestrian Scramble ✓
- Rectangular Rapid Flashing Beacon ✓
- Pedestrian Hybrid Beacon ✓
- Raised Median/Refuge Island ✓
- Advanced Stop Bar ✓
- Advanced Yield Markings ✓
- Transit Amenities

LIGHTING

Intersection Lighting ✓

LSRM ID: NS01, S01



Adding **lighting** at an intersection, and on its approaches, improves safety during nighttime conditions by (1) making drivers more aware of their surroundings at an intersection (2) enhancing drivers' available sight distances, and (3) improving the visibility of non-motorists. Intersection lighting is also beneficial to non-motorized users by helping them navigate the intersection. Upgrading to LED lighting also has a documented safety benefit.

CRF: 40%

Crash Type: Night

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

Roadway Lighting ✓

LSRM ID: R01



Providing **roadway lighting** improves safety during nighttime conditions by making drivers more aware of their surroundings, enhancing drivers' available sight distances to perceive roadway characteristics in advance of the change, and improving non-motorist's visibility and navigation. Upgrading to LED lighting also has a documented safety benefit.

CRF: 35%

Crash Type: Night

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

CONTROL

Install Stop Sign ✓

LSRM ID: NS06



Installing a **stop sign** at an uncontrolled intersection helps determine the right-of-way of roadway users. When there are no traffic signs to indicate who should proceed first, users must rely on their general knowledge of state laws. Install stop signs is a low-cost countermeasure that reduces the risk for collisions at an intersection.

CRF: 15%

Crash Type: All

Expected Life (Years) 10:

HSIP Funding Eligibility 90%:

Systemic Opportunity: Very High



CONTROL

Install All-Way Stop Control ✓

LSRM ID: NS02



An **all-way stop-controlled (AWSC) intersection** requires all vehicles to stop before crossing the intersection. An AWSC intersection improves safety by removing the need for road users on a side-street stop-controlled intersection to cross free-flowing lanes of traffic, which reduces the risk of collision. An “ALL WAY” sign should be placed under the octagonal stop sign at AWSC intersections as required by the California Manual on Uniform Traffic Control Devices. Establishing All Way Stop Controls require that the intersection meet certain conditions specified by the manual.

CRF: 50%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: High

Install (Mini-) Roundabout ✓

LSRM ID: NS04, NS05, S16



A **roundabout** is a type of circular intersection in which road traffic is permitted to flow in one direction around a central island, and priority is typically given to traffic already in the junction. The types of conflicts that occur at roundabouts are different from those occurring at conventional intersections; namely, conflicts from crossing and left-turn movements are not present in a roundabout. The geometry of a roundabout keeps the range of vehicle speed narrow, which helps reduce the severity of crashes when they do occur.

Mini-roundabouts may be optimal traffic calming measure at an intersection where there is insufficient right-of-way for a standard roundabout installation.

CRF: Varies

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Low - Medium

Install Signal ✓

LSRM ID: NS03



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

CRF: 30%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Low

SIGNAL MODIFICATION

Retroreflective Signal Backplates ✓

LSRM ID: S02



Retroreflective borders and backplates enhance the visibility of traffic signals for aging and color-vision-impaired drivers, enabling them to understand which signal indication is illuminated. Retroreflective borders may also alert drivers to signalized intersections during periods of power outages when the signals would otherwise be dark, and non-reflective signal heads and backplates would not be visible. Signal heads that have backplates equipped with retroreflective borders are also more visible and conspicuous during nighttime conditions.

CRF: 15%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

Extend Yellow and All Red Time ✓

LSRM ID: S03



Extending yellow and all red time increases the time allotted for the yellow and red lights during a signal phase. This improves safety by allowing drivers and bicyclists to safely cross through an intersection before conflicting traffic movements are permitted to enter the intersection. See CA MUTCD Section 4D.26 for more details.

CRF: 15%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 50%

Systemic Opportunity: Very High

Advanced Dilemma Zone Detection



An **advanced dilemma zone detection** system minimizes the number of vehicles the intersection traffic control signal system exposes to an intersection-approach dilemma zone. This is accomplished by adjusting the start time of the yellow-signal phase either earlier or later, based on observed vehicle locations and speeds. The advanced dilemma zone detection system was not eligible for HSIP Cycle 11 funding, but in previous cycles, this countermeasure had a crash reduction factor of 40%.

CRF: N/A

Crash Type: All

Expected Life (Years): N/A

Federal Funding Eligibility: N/A

Systemic Opportunity: High



SIGNAL MODIFICATION

Emergency Vehicle Preemption ✓

LSRM ID: S05



Providing **emergency vehicle preemption** capability at a signal or along a corridor provides two major safety benefits. First, preemption may decrease the potential for a collision to occur as emergency vehicles try to navigate through intersections. Second, a signal preemption system can decrease emergency vehicle response times, therefore decreasing the time for victims to receive medical attention, which is a critical concept of the Post Crash Care element of the Safe Systems Approach. An agency may consider combining emergency vehicle preemption into a comprehensive signal improvement project.

CRF: 70%

Crash Type: Emergency Vehicles

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: High

Protected Left Turn ✓

LSRM ID: S06, S07



A **protected left turn** can be implemented at signalized intersections (with existing left turn pockets) that currently have a permissive left-turn or no left-turn protection and a high frequency of angle crashes involving left turning movements. Left turns are widely recognized as the highest-risk movements at signalized intersections. Providing protected left-turn phases significantly improves the safety for left-turn maneuvers by removing the need for the drivers to navigate through gaps in oncoming through vehicles.

CRF: 30-55%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Low-High

Red Light Camera



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

CRF: N/A

Crash Type: All

Expected Life (Years): N/A

HSIP Funding Eligibility: N/A

Systemic Opportunity: High

SHIELD OBSTACLES

Install Median Barrier ✓

LSRM ID: R03



Median barriers are installed where crash history indicates drivers are unintentionally crossing the median and the cross-overs are resulting in high severity crashes. This strategy is designed to prevent head-on collisions by providing a barrier between opposing lanes of traffic. The variety of median barriers available makes it easier to choose a site-specific solution. The main advantage is the reduction of the severity of the crashes.

CRF: 25%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

Guardrails ✓

LSRM ID: R04



Guardrails are installed to reduce the severity of lane departure crashes. However, guardrail can reduce crash severity only for those conditions where striking the guardrail is less severe than going down an embankment or striking a fixed object. Guardrail should only be installed where it is clear that crash severity will be reduced, or there is a history of run-off-the-road crashes at a given location that have resulted in severe crashes.

CRF: 25%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: High

Impact Attenuators ✓

LSRM ID: R05



Impact attenuators are typically used to shield rigid roadside objects such as concrete barrier ends, steel guardrail ends and bridge pillars from oncoming automobiles. Attenuators should only be installed where it is impractical for the objects to be removed.

CRF: 25%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: High



GEOMETRIC MODIFICATION

Minor Road Splitter Island ✓

LSRM ID: NS13



The installation of **minor road splitter islands** allows for the addition of a stop sign in the median to make the intersection more conspicuous. Additionally, the splitter island on the minor road reduces turning speeds and provides for a positive separation between turning vehicles on the through road and vehicles stopped on the minor road approach.

CRF: 40%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

Raised Median ✓

LSRM ID: NS14, S12, R09



Raised medians with left-turn lanes at intersections offer a cost-effective means for reducing crashes and improving operations at higher volume intersections. The raised medians also prohibit left turns into and out of driveways that may be located too close to the functional area of the intersection.

CRF: 25%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

Create Directional Median Openings to Allow (and Prohibit) Left-Turns ✓



LSRM ID: NS15, S14

As a form of access management, **creating directional median openings** channelizes left turn and U-turn movements from major roadways and prohibits left turn and U-turn movements from cross streets. Raised medians limit property access to right turns only and should be used in conjunction with efforts to provide alternative access and promote driveway spacing objectives. Turn prohibitions can be implemented quickly but impacts to businesses and other land uses must be considered and controversy can delay the implementation.

CRF: 50%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

GEOMETRIC MODIFICATION

Right-Turn Lane ✓

LSRM ID: NS17



Adding right-turn lanes can reduce the frequency of rear-end collisions resulting from conflicts between vehicles turning right and following vehicles, and vehicles turning right and through vehicles coming from the left on the cross street. Right-turn lanes also remove slow vehicles that are decelerating to turn right from the through-traffic stream, thus reducing the potential for rear-end collisions.

CRF: 20%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Low

Left-Turn Lane ✓

LSRM ID: NS18



Adding left-turn lanes removes vehicles waiting to turn left from the through-traffic stream, thus reducing the potential for rear-end collisions. Because they provide a sheltered location for drivers to wait for a gap in opposing traffic, left-turn lanes may encourage drivers to be more selective in choosing a gap to complete the left-turn maneuver. This strategy may reduce the potential for collisions between left-turn and opposing through vehicles.

CRF: 35%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Low

Install Acceleration/Deceleration Lane ✓



LSRM ID: R11

A lane that does not provide enough **deceleration** length and storage space for turning traffic may cause the turn queue to back up into the adjacent through lane. This can contribute to rear-end and sideswipe crashes. An **acceleration lane** is an auxiliary or speed-change lane that allows vehicles to accelerate to highway speeds (high speed roadways) before entering the through-traffic lanes of a highway. Additionally, if acceleration by entering traffic takes place directly on the traveled way, it may disrupt the flow of through-traffic and cause rear-end and sideswipe collisions.

CRF: 25%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Low



GEOMETRIC MODIFICATION

Two-Way Left-Turn Lane ✓

LSRM ID: R13



Two-way left-turn lanes provide a buffer between opposing directions of travel and separate left turning traffic from through traffic. They can also help to allow vehicles to begin to accelerate before entering the through-traffic lanes. They reduce the disruption of flow of through-traffic and reducing rear-end and sideswipe collisions.

CRF: 30%

Crash Type: All

Expected Life (Years): 20

Federal Funding Eligibility: 90%

Systemic Opportunity: Medium

Widen Shoulder ✓

LSRM ID: R15, R16



Adding a shoulder or widening an existing shoulder provides a greater area to regain control of a vehicle, as well as lateral clearance to roadside objects such as guardrails, signs, and poles. They may also provide space for disabled vehicles to stop or drive slowly, provide increased sight distance for through vehicles and for vehicles entering the roadway, and in some cases reduce passing conflicts between motor vehicles and bicyclists and pedestrians. Widening the shoulder on a curve also creates a recovery area for drivers to regain control of a vehicle, as well as lateral clearance to roadside objects.

CRF: 30-45%

Crash Type: All

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

Widen Median ✓



Widening the center median on high-speed roadways creates a horizontal buffer for cars in opposing directions to mistakenly drift, run over the centerline and then space to recover without crossing into opposing lane of traffic. This countermeasure can be paired with auditory centerline rumble strips to reduce head-on collisions.

CRF: N/A

Crash Type: All

Expected Life (Years): N/A

HSIP Funding Eligibility: N/A

Systemic Opportunity: Medium

GEOMETRIC MODIFICATION

Improved Pavement Friction ✓

LSRM ID: NS12, S11, R21



A roadway must have an **appropriate level of pavement friction** to ensure that drivers are able to keep their vehicles safely in the lane. Poor pavement conditions, especially wet pavement which reduces friction and may lead to hydroplaning, have been identified as one of the major contributing factors in roadway departure crashes. Traditional friction courses or high friction surface treatments should be considered for curves with numerous wet weather crashes or severe curves with higher operating speeds.

CRF: 55%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium - High

OPERATION/WARNING

Larger or Additional Warning Sign ✓

LSRM ID: NS06



The visibility of intersections and, thus, the ability of approaching drivers to perceive them can be enhanced by installing **larger regulatory and warning signs** at or prior to intersections. A key to success in applying this strategy is to select a combination of regulatory and warning sign techniques appropriate for the conditions on a particular unsignalized intersection approach.

CRF: 15%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

Install Flashing Beacons ✓

LSRM ID: NS08, NS09, S10



A **flashing beacon as advanced warning** is a blinking light with signage to notify motorists of an upcoming intersection or crosswalk. A flashing beacon improves safety by providing motorists more time to become aware of and slow down for an intersection or yield to pedestrians crossing at a crosswalk. Flashing beacons can also be installed on top stop signs. Alternatively, signs can also be enhanced with LED lights embedded in the sign to outline the sign itself or the words and symbols on the sign. The LEDs may be set to flash or operate in a steady mode. An LED-enhanced sign improves safety by improving the visibility of signs at locations with visibility limitations or with a documented history of drivers failing to see or obey the sign.

CRF: 15-30%

Crash Type: All

Expected Life (Years): 10

Federal Funding Eligibility: 90%

Systemic Opportunity: Medium - High



Install Chevron Signs on Horizontal Curves ✓



LSRM ID: R23

Post-mounted chevrons are intended to warn drivers of an approaching curve and provide tracking information and guidance to the drivers. While they are intended to act as a warning, it should also be remembered that the posts, placed along the roadside, represent a possible object with which an errant vehicle can crash.

CRF: 40%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

Install Curve Advance Warning Signs ✓



LSRM ID: R24, R25

This strategy primarily addresses problem curves and serves as an **advance warning** of an unexpected or sharp curve. It provides advance information and gives drivers a visual warning that their added attention is needed.

CRF: 25-30%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: High - Very High

Speed Monitoring and Feedback



Video or radar roadside sensors are used to monitor individual vehicle speeds. With **speed monitoring and feedback**, signs can notify motorists of excessive speed through a combination of dynamic roadside signage and vehicle-to-infrastructure (V2I) messaging. By notifying motorists of their speed, feedback signs may promote slower speeds and safer driver behavior.

CRF: N/A

Crash Type: All

Expected Life (Years): N/A

HSIP Funding Eligibility: N/A

Systemic Opportunity: Very High

OPERATION/WARNING

Improve Intersection Sight Distance ✓



LRSR ID: NS11

Improving intersection sight distance may require clearing roadside obstructions without major reconstruction of the roadway. Adequate sight distance for drivers at stop or yield-controlled approaches to intersections has been recognized as among the most important factors contributing to overall safety at unsignalized intersections. Obstructions may include vegetation, parked vehicles, signs, buildings, etc..

CRF: 20%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

Upgrade Intersection Pavement Markings ✓



LRSR ID: NS07, S09

Upgrading intersection pavement markings can include "Stop Ahead" markings and the addition of centerlines and stop bars. At signals, clear pavement markings and striping through intersections can guide motorists through complex intersections. These markings can improve safety by increasing the visibility of intersections for drivers. Pavement markings can be upgraded to be retroreflective, where ambient illumination assures adequate visibility, particularly at night.

CRF: 10-25%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

Delineators, Reflectors, and/or Object Markers ✓



LRSR ID: R27

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

CRF: 15%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High



Transverse Rumble Strips ✓

LRS ID: NS10



Transverse rumble strips are installed in the travel lane for the purposes of providing an auditory and tactile sensation for each motorist approaching the intersection. They can be used at any stop or yield approach intersection, often in combination with advance signing to warn of the intersection ahead. When motorists are traveling along the roadway, they are sometimes unaware they are approaching an intersection. This is especially true on rural roads, as there may be fewer clues indicating an intersection ahead. Due to noise concerns, rumble strips may not be suitable near residential neighborhoods.

CRF: 20%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: High

Edgelines and Centerlines ✓

LRS ID: R28



Installing edge-lines and centerlines where none exists or making significant upgrades to existing lines (paint to thermoplastic, adding audible disks/bumps in the thermoplastic stripes, or adding RPMs) are intended/ designed to help drivers who might leave the roadway because of their inability to see the edge of the roadway along the horizontal edge of the pavement or cross-over the centerline of the roadway into oncoming traffic. New pavement marking products tend to be more durable, are all-weather, more visible, and have a higher retroreflectivity than traditional pavement markings.

CRF: 25%

Crash Type: All

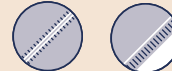
Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

Edgeline and Centerline Rumble Strips ✓

LRS ID: R30, R31



Rumble strips provide an auditory indication and tactile rumble when driven on, alerting drivers that they are drifting out of their travel lane, giving them time to recover before they depart the roadway or cross the center line. Additionally, rumble stripes (pavement marking in the rumble itself) provide an enhanced marking, especially in wet dark conditions. Due to noise concerns, rumble strips may not be suitable near residential neighborhoods.

CRF: 15-20%

Crash Type: All

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: High

PEDESTRIAN & BICYCLE

Install Bike Lanes ✓

LSRM ID: R32PB, R33PB



A **bike lane** provides dedicated street space, typically adjacent to outer vehicle travel lanes, with designated striping, pavement markings, and signage. Bike lanes improve safety by reducing conflicts between bicycles and vehicles on the road and by creating a road-narrowing effect with buffers or vertical barriers, which may reduce vehicle speeds.

CRF: 35-45%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: High

Install Sidewalk/Pathway ✓

LRSM ID: R34PB



Adding **sidewalks or pathways** provides a separate and continuous facility for people to walk along the roadway. Adding sidewalks or pathways also improves safety by minimizing the risk of vehicle and bicycle collisions with pedestrians.

CRF: 80%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

High Visibility Crosswalk ✓

LSRM ID: NS20PB, NS21PHB, R35PB



A **high-visibility crosswalk** has a striped pattern (beyond two white lines) with markings made of high-visibility material, such as thermoplastic tape, instead of paint. They may also include raised pavement markers at the leading edge for better visibility. A high-visibility crosswalk improves safety with a clearly marked pedestrian crossing so motorists exercise caution and yield to pedestrians. The crash reduction factor noted here only applies to locations currently without a marked crosswalk, but high-visibility crosswalk upgrades can be implemented at existing marked crosswalks. See Section 3B.18 of the CA MUTCD for more details.

CRF: 25-35%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium - High



PEDESTRIAN & BICYCLE

Raised Crosswalk/Intersection ✓

LRSM ID: R36PB



On lower-speed roadways, where pedestrians are known to be crossing roadways that involve significant vehicular traffic, a **raised crosswalk or intersection** has the opportunity to enhance safety. The raised crossing encourages motorists to reduce their speed and provide improved delineation for the portion of the roadway that is designated for pedestrian crossing.

CRF: 35%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

Curb Extension ✓

LRSM ID: NS20PB, NS21PHB, R35PB



Curb extensions visually and physically narrow the roadway, creating safer and shorter crossings for pedestrians while increasing the available space for street furniture, benches, plantings, and street trees. Curb extensions increase the overall visibility of pedestrians by reducing the crossing distance and period of exposure to motorists for pedestrians.

CRF: 25-35%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium - High

Leading Pedestrian Interval ✓

LRSM ID: S21PB



A **leading pedestrian interval (LPI)** gives pedestrians the opportunity to enter an intersection 3-7 seconds before vehicles are given a green indication. LPIs provide increased visibility of crossing pedestrians, reduced conflicts, increased likelihood of motorists yielding to pedestrians, and enhanced safety for pedestrians who may be slower to start into the intersection.

CRF: 60%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 10

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

PEDESTRIAN & BICYCLE

✓ Pedestrian Countdown Signal Heads



LSRM ID: S17PB

A **pedestrian countdown signal head** contains a timer display and counts down the number of seconds left to finish crossing the street. Countdown signals can reassure pedestrians who are in the crosswalk when the flashing “DON’T WALK” interval appears and that they still have time to finish crossing.

CRF: 25%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Very High

✓ Pedestrian Scramble

LSRM ID: S19PB



A **pedestrian scramble** is a dedicated phase at signalized intersections in which all vehicular traffic is required to stop, allowing pedestrians and bicycles to safely cross through the intersection in any direction, including diagonally. Pedestrian scrambles may be considered at signalized intersections with very high pedestrian/bicycle volumes, such as near schools, parks, and urban business districts.

CRF: 40%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: High

✓ Rectangular Rapid Flashing Beacon



LSRM ID: NS22PB, R37PB

A **rectangular rapid flashing beacon (RRFB)** is a pedestrian-activated flashing light with additional signage to alert motorists of a pedestrian crossing. An RRFB improves safety by increasing the visibility of marked crosswalks.

CRF: 35%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium



PEDESTRIAN & BICYCLE

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Pedestrian Hybrid Beacon ✓

LRS ID: N23PB



Pedestrian hybrid beacon (PHB), also known as a HAWK (High intensity Activated CrossWalk), is a flashing light that is activated by a pedestrian pushing a button or some other form of detection. A PHB is used at unsignalized intersections or mid-block crosswalks to notify oncoming motorists to stop with a series of red and yellow lights. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection. See CA MUTCD Section 4F for more detail.

CRF: 55%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Low

Raised Median/Refuge Island ✓

LRS ID: NS19PB



A **raised median/refuge island** is a raised curb in the center of the roadway that can restrict certain turning movements and provide a place for pedestrians to wait if they are unable to finish crossing the intersection. A Raised Median can improve safety by reducing the number of potential conflict points with designated zones for vehicles to turn, and a pedestrian refuge island improves safety by reducing the exposure time for pedestrians crossing the intersection.

CRF: 35%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium

Advanced Stop Bar ✓

LRS ID: NS20PB, NS21PHB, S18PB, R35PB



An **advanced stop bar** is a horizontal stripe painted ahead of the crosswalk at stop signs and signals to indicate where drivers should stop. An advanced stop bar improves safety by reducing instances of vehicles encroaching on the crosswalk. Creating a wider stop bar or setting the stop bar further back from the crosswalk may be appropriate for locations with known crosswalk encroachment issues. See CA MUTCD Section 3B.16 for more information. Current detection loops may need to be adjusted to accommodate advanced stop bars.

CRF: 25-35%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 10-20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium – Very High

PEDESTRIAN & BICYCLE

Advanced Yield Markings ✓

LSRM ID: NS20PB, NS21PHB, S18PB,
R35PB



Yield markings are placed 20 to 50 feet in advance of pedestrian crossings to alert drivers of an upcoming pedestrian crossing. Yield markings indicate where drivers should stop when pedestrians are crossing at the crosswalk.

CRF: 25-35%

Crash Type: Pedestrian & Bicycle

Expected Life (Years): 10-20

HSIP Funding Eligibility: 90%

Systemic Opportunity: Medium – Very High

Transit Amenities



Transit amenities could include benches, shelters, trash receptacles, and other features that would provide shelter, shade, and safety to pedestrians and bicyclists using transit. Providing and/or upgrading transit stops/stations highlights the destination for pedestrians and bicyclists more visible to motorists. Pedestrians and bicyclists often cross the roadway to access transit and visibility of the stops/stations allows vehicles to anticipate non-motorized users of the roadway more easily.

CRF: N/A

Crash Type: Pedestrian & Bicycle

Expected Life (Years): N/A

HSIP Funding Eligibility: N/A

Systemic Opportunity: High



Non-Engineering Countermeasures

SAFE ROADS

- Placemaking in Traffic Safety Initiatives
- Regular Regional Traffic Safety Coordination Meetings

SAFE ROAD USERS

- Education & Public Awareness Campaigns Targeted at Specific Behaviors
- Pair Education with Engineering Countermeasures
- Safe Routes to School
- Safe Ride Home
- DUI Prevention
- High-Visibility Enforcement for DUI
- Pedestrian/Bicycle Safety and Homeless Services

SAFE SPEEDS

- Safe Speeds Education Campaign
- Speed Limit Modification
- Automated Enforcement

SAFE VEHICLES

- Emerging Technology

POST-CRASH CARE

- Rapid Response Safety Communication Protocol & Multi-Disciplinary Team

Countermeasures That Work – Effectiveness Rating

★★★★★

Demonstrated to be effective by several high-quality evaluations with consistent results.

★★★★

Demonstrated to be effective in certain situations.

★★★

Likely to be effective based on balance of evidence from high-quality evaluations or other sources.

★★

Effectiveness still undetermined; different methods of implementing this countermeasure produce different results.

★

Limited or no high-quality evaluation evidence.

Source: *Countermeasures That Work*, National Highway Traffic Safety Administration, 2017



Example of placemaking in traffic safety initiatives.

Source: City of Richmond Hill, Georgia

SAFE ROADS

Placemaking in Traffic Safety Initiatives

Launch a city-wide initiative to treat streets as places by incorporating permanent placemaking efforts (public art, green infrastructure, and neighborhood amenities) into traffic safety initiatives. Such amenities can activate streetscapes and encourage lower speeds and better awareness of non-vehicle users. Prioritize areas with high numbers of vulnerable users.

Lead Agency:

- City of Lake Elsinore Public Works

Partner Agencies:

- Community-Based Organizations
- Riverside Transit Agency
- Western Riverside Council of Governments
- Caltrans

Funding Sources:

- City Funds
- Public/Private Partnerships
- SCAG Sustainable Communities Program
- SCAG Go Human Mini-Grant Program
- California Natural Resources Agency Urban Greening Program

Effectiveness:

N/A - Initial studies indicate art-based placemaking efforts have a strong positive correlation with improve safety benefits, but further studies are recommended to cover a wider variety of roadway and land use contexts to inform development of a crash modification factor.

Context:

Areas throughout the City with high volumes of vulnerable users

Regular Regional Traffic Safety Coordination Meetings

Given that residents and visitors often pass back and forth between the different jurisdictions with regularity, coordination and updates on roadway safety best practices and observations across the region can create a unified approach to traffic safety. Information sharing could improve efficiencies in traffic safety management, including policies that are working and those that require improvement. The meetings could be held monthly or semi-annually.

In August 2019, SCAG hosted a series of traffic safety workshops entitled Go Human with representatives from each of the counties and many jurisdictions within the SCAG region. Presenters from the region spoke on a number of projects within their region including multi-lingual pedestrian safety campaigns, open streets projects, safe routes to school, and others. This allowed members from cities within the SCAG region to hear about best practices, successes, and challenges from their counterparts and enhance their understanding of roadway safety.

Lead Agency:

- Western Riverside Council of Governments

Partner Agencies:

- City of Lake Elsinore Public Works
- Neighboring Cities Public Works

Funding Sources:

- Regional Funds

Effectiveness:

N/A

Context:

Regional



SAFE ROADS USERS

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Education & Public Awareness Campaigns Targeted at Specific Behaviors

Coordinate the City's and Regional communication efforts to use existing social media accounts to establish an ongoing public education campaign on safe and responsible driving, discouraging drinking and driving, along with encouraging increased awareness of pedestrians and bicyclists. Another application of this countermeasure would be collaborating with local radio stations to disseminate safety messages.

The SCAG Go Human campaign and the California Office of Traffic Safety (OTS) Go Safely California campaign both have free resources for local agencies to use in implementing public awareness campaigns.

Lead Agency:

- City of Lake Elsinore Public Works & Communications Team

Partner Agencies:

- Riverside County Fire Department
- Riverside County Sheriff's Department
- Riverside Transit Agency
- Western Riverside Council of Governments
- Caltrans
- City or Regional Public Health Department

Funding Sources:

- SCAG Go Human Mini-Grant Program
- OTS Grant Programs

Effectiveness:

★★★ Mass Media Campaigns on DUI

Context:

City or Regional

Pair Education with Key Engineering Countermeasures

Educational materials can be used to teach people how to use new and unfamiliar safety countermeasures, such as pedestrian hybrid beacons (PHB), roundabouts, or protected bikeways. These materials can consist of informational signs or demonstration videos, and should be presented in multiple languages, including English and Spanish.

Lead Agency:

- City of Lake Elsinore Public Works & Communications Team

Partner Agencies:

- Community-Based Organizations
- Riverside County Sheriff's Department
- Western Riverside Council of Governments

Funding Sources:

- OTS Grant Programs
- City & Regional Funds

Effectiveness:

N/A

Context:

City or Regional, focused on areas with new infrastructure projects



Source: Ohio Department of Transportation

SAFE ROAD USERS

Safe Routes to School

Safe Routes to School programs aim to make it safer for students to walk and bike to school and encourage more walking and biking where safety is not a barrier. Transportation, public health and planning professionals, school communities, law enforcement officers, community groups and families all have roles to play using education, encouragement, engineering, and enforcement to meet a local community's needs.

Lead Agency:

- City of Lake Elsinore Public Works

Partner Agencies:

- School District(s)
- Community-Based Organizations
- Riverside County Sheriff's Department

Funding Sources:

- Active Transportation Program (ATP)
- Safe Streets and Roads for All Grant

Effectiveness:

★★★ Safe Routes to School

Context:

Areas adjacent to schools

Safe Ride Home

Develop partnerships between the Transportation Network Company (TNC) operators, Riverside County Sheriff's Department, the regional transit agency, WRCOG, and local businesses to offer promotional codes for free or discounted rides home from establishments or events in the County to reduce the potential for DUI, drowsy driving, or distracted driving. This program may be focused on particular holidays or event days or applied more broadly to weekend nights.

Lead Agency:

- City of Lake Elsinore Public Works

Partner Agencies:

- TNC Operators (Lyft, Uver, Taxis, etc.)
- Riverside County Sheriff's Department
- Riverside Transit Agency
- Western Riverside Council of Governments
- Local Businesses

Funding Sources:

- User Fees (e.g., taxi and TNC fee)
- City & Regional Funds

Effectiveness:

★★★ Alternative Transportation

Context:

City or Regional



DUI Prevention

Prevention and education policies focus on mobilizing and educating the community and intervening before driving under the influence takes place. According to NHTSA research, alcohol problem assessment and treatment programs, as well as alcohol intervention in settings such as a doctor's office, are highly effective strategies for improving safety outcomes.

Lead Agency:

- Riverside County Sheriff's Department

Partner Agencies:

- School District(s)
- City or Regional Public Health Department

Funding Sources:

- OTS Grant Programs

Effectiveness:

★★★★★ Alcohol Screening & Brief Intervention

Context:

City or Regional

High Visibility Enforcement for DUIs

The County Sheriff's Department should continue their use of high visibility enforcement for DUIs. Deterrence policies focus on raising the actual and perceived risk of detection of driving under the influence. These policies should be highly visible to increase awareness of the risks of driving under the influence. Publicized sobriety checkpoints, saturation patrol, and other forms of high visibility enforcement are effective for safety outcomes.

Integrated enforcement would include coordination with Public Awareness Campaigns. Deterrence policies focus on raising the actual and perceived risk of detection of driving under the influence. These policies should be highly visible to increase awareness of the risks of driving under the influence. For example, widespread dissemination of multi-lingual educational messaging and promotion of safe rides home programs in advance of major enforcement efforts will help to mitigate equity concerns about disproportionate impacts of fines/fees on lower income residents.

Lead Agency:

- Riverside County Sheriff's Department

Partner Agencies:

- City of Lake Elsinore Public Works

Funding Sources:

- OTS Grant Programs

Effectiveness:

- ★★★★★ Publicized Sobriety Checkpoints
- ★★★★★ High-Visibility Saturation Patrols
- ★★★ Integrated Enforcement

Context:

Citywide

SAFE ROAD USERS

Pedestrian/Bicycle Safety and Homeless Services

Homeless services provide temporary residence for homeless individuals and families. In jurisdictions with a large unsheltered population, unsheltered people are often disproportionately represented in pedestrian collisions. Unsheltered people have a relatively high level of traffic exposure as they may stand in medians, cross roadways outside of designated pedestrian crossings, and/or spend time in parking lots.

Lead Agency:

- Community-Based Organizations (i.e., The Anchor)

Partner Agencies:

- City of Lake Elsinore Public Works
- Western Riverside Council of Governments
- City or Regional Public Health Department

Funding Sources:

- City & Regional Funds
- Public/Private Partnerships

Effectiveness:

N/A

Context:

City or Regional, focused on areas with high homeless populations

SAFE SPEEDS

Safe Speeds Education Campaign

Continue existing safety education campaign targeting safe speeds. This could include yard signs, wall boards/posters along high-injury corridors and neighborhoods, ads on bus exteriors, radio ads, etc. To maximize effectiveness, this should be an ongoing program.

The SCAG Go Human campaign and the OTS Go Safely California campaign both have free resources for local agencies to use in implementing public awareness campaigns.

Lead Agency:

- City of Lake Elsinore Public Works & Communications Team

Partner Agencies:

- School District(s)
- Riverside County Sheriff's Department
- Western Riverside Council of Governments
- Caltrans

Funding Sources:

- SCAG Go Human Mini-Grant Program
- OTS Grant Programs

Effectiveness:

★★★ Communications and Outreach on Speeding

Context:

City or Regional



Speed Limit Modification

Utilize California Assembly Bill (AB) 43 methodology to lower speed limits on additional corridors. AB 43 provides local jurisdictions with more flexibility in setting speed limits, especially regarding vulnerable road users.

AB 43 sets speed limits on roads without posted signs in residential and business districts to 25 miles per hour. AB 43 also allows local authorities to forgo engineering and traffic surveys to lower the speed limit on portions of highway near to schools and school grounds. The legislation also provides for flexibility in lowering speed limits in senior zones and business districts.

Lead Agency:

- City of Lake Elsinore Public Works

Partner Agencies:

- School District(s)
- Riverside County Sheriff's Department
- Local Businesses

Funding Sources:

- City Funds

Effectiveness:

★★★★★ Speed Limits

Context:

Citywide, focused on "safety corridors", business activity districts, and school zones

Automated Enforcement

Automated enforcement, such as red-light cameras or speed cameras, target the specific drivers who are behaving dangerously. Automated speed detection devices can identify speeding violations and provide citations. This treatment is currently not supported in California..

A strictly data-driven approach to automated enforcement might place red-light or speed cameras in locations with the highest number of collisions. However, given that many low-income neighborhoods have historically received fewer infrastructure investments, which often results in a higher rate of collisions, a strictly data-driven approach could lead to a disproportionate burden of enforcement. Therefore, automated enforcement should be implemented evenly across a jurisdiction at problem locations. In addition, jurisdictions should pair automated enforcement with updated fine structures so that low-income communities don't bear a disproportionate burden of traffic fines.

Lead Agency:

- City of Lake Elsinore Public Works

Partner Agencies:

- School District(s)
- Riverside County Sheriff's Department

Funding Sources:

- City Funds
- Citations

Effectiveness:

★★★★★ Automated Enforcement

Context:

Citywide, focused on areas with speeding and school zones

SAFE VEHICLES

Emerging Technology

Recent advancements in transportation technology have not only introduced new transportation modes and travel patterns but have also presented opportunities to better understand travel behavior and encourage safe behavior. The following represents a summary of emerging technology trends related to safety.

Intelligent Transportation Systems

Some existing and emerging on-board vehicle technologies require investments in public infrastructure in order to function properly. For example, lane departure warning technology common on newer vehicles requires regular maintenance of roadway striping and the use of highly retroreflective materials to maximize effectiveness. Emerging Vehicle-to-Infrastructure (V2I) technologies will likely require integration with existing infrastructure. The City's Capital Improvement Plan can facilitate the effectiveness of safe vehicle technology with traffic signal and detection upgrades and systematic resurfacing projects to ensure roadway striping is easily visible.

Near Miss Data

Near miss collisions have historically been difficult to study in practical safety applications due to an overall lack of reported information. In the absence of sufficient crash data, near miss data is an important indicator for guiding crash prevention. Video data and incident data from connected vehicles are emerging data sources that can provide key safety insights regarding near misses.

Autonomous Vehicle Readiness Planning

Having strategies prepared to meet and address the oncoming challenges posed by autonomous vehicle (AV) technology will be crucial in advancing road safety. Fully automated vehicles have the potential to transform travel behavior and safety outcomes given that AVs are ultimately designed to operate without any human intervention. Some strategies for preparation include educating the public on current and future safety features and limitations,

developing signing and striping standards, and conducting reviews of equity implications. Without appropriate research and guidance, AVs could widen accessibility and safety gaps for vulnerable communities.

Lead Agency:

- City of Lake Elsinore Public Works

Partner Agencies:

- Riverside County Fire Department
- Riverside County Sheriff's Department
- Vehicle Manufacturers
- Data Vendors

Funding Sources:

- Caltrans Highway Safety Improvement Program
- OTS Grant Programs
- City Funds

Effectiveness:

N/A

Context:

Citywide



POST-CRASH CARE

Rapid Response Safety Communication Protocol & Multi-Disciplinary Team

Employ an internal, multi-departmental communication strategy in response to severe and fatal collisions. The protocol should outline a path forward for Public Works staff to be a part of the immediate on-the ground-response to an investigation of severe and fatal collisions, ensuring a multi-disciplinary response team focused both on the behavioral and engineering elements of a collision. Development of this multi-disciplinary team can also support timely data sharing among City departments.

The development of an integrated database with law enforcement collision data and injury surveillance provides can also improve communication protocol. Data integration can help practitioners estimate actual injury costs and costs of treatments for future planning efforts.

Lead Agencies:

- Riverside County Fire Department
- Riverside County Sheriff's Department

Partner Agencies:

- City of Lake Elsinore Public Works & Communication Team
- Western Riverside Council of Governments
- Caltrans
- City or Regional Public Health Department

Funding Sources:

- City & Regional Funds
- OTS Grant Programs

Effectiveness:

N/A

Context:

City or Regional

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7

Chapter 7 – Systemic Trends and Countermeasures

This chapter outlines the six collision profiles selected for project development. Each collision profile represents a systemic trend, or combinations of factors that contributed to the highest quantity of severe injury or fatal collisions. Countermeasures proposed to address systemic trends are also presented.

Systemic Analysis and Project Prioritization

Systemic analysis is a proactive safety approach that focuses on evaluating an entire roadway network using a defined set of criteria. It looks at collision history on an aggregate basis to identify high-risk roadway characteristics, in addition to looking at high-collision locations. By merging roadway and intersection features with collision data, relationships can be uncovered between contextual factors and the risk of frequent and severe collisions.

Collision data (2018-2022) in the City of Lake Elsinore was paired with geographic roadway and other contextual data to develop collision profiles. Outputs from this analysis were used to populate a set of matrices that allow us to look at crosstabs between collision data and geographic data.

The matrices allowed for identification of the combinations of factors that contributed to the highest quantity of collisions resulting in severe injury or fatalities, and combinations that led to the highest Weighted Collision Score. The Weighted Collision Score represents the equivalent numbers of property-damage-only collisions that occur for relative comparison between collision profiles. Injury collisions involving vulnerable victims, including pedestrians, bicycles, and people under the age of 18 or over the age of 65, receive additional weight.

Collision Profiles

Each collision profile is representative of a systemic trend observed in the City of Lake Elsinore. The collision profiles are presented with key statistics, including a list of key locations based on collision data and a set of recommended countermeasures aimed at reducing the number and severity of collisions. Collision Reduction Factor (CRF) are provided for countermeasures, if available; these countermeasures are best suited for competitive HSIP grant applications, which require a benefit-cost analysis.

Collision Profiles – Representative of a Systemic Trend

- 1. Broadside Collisions at Unsignalized Intersections along High-Speed Roads (40+ mph)**
- 2. Broadside Collisions at Signalized Intersections with Permissive Left-Turn Phasing**
- 3. Hit Object Collisions at Night at Unsignalized Locations**
- 4. Collisions with Pedestrians Crossing the Road at Night**
- 5. Collisions with Pedestrians at Intersections near Parks and Schools**
- 6. Collisions Involving Driving Under the Influence at Locations with Speeding**



COLLISION PROFILE 1

Broadside Collisions at Unsignalized Intersections along High-Speed Roads (40+ mph)

KEY STATISTICS

- Representative of **12 percent** of injury collisions and **9 percent** of KSI collisions in Lake Elsinore.
- The primary collision factor for **65 percent** of injury collisions and **80 percent** of KSI collisions within Collision Profile 1 was roadway users not yielding to opposing vehicles at unsignalized intersections (Vehicle Right-of-Way Violation).
- Within Collision Profile 1, **64 percent** of injury collisions involved left-turn conflicts, common for broadside collisions (i.e., T-bone).

KEY LOCATIONS	COUNTERMEASURES			
Unsignalized Intersections	Install Left-Turn Lane (CRF = 30-35%)	Improve Sight Distance (CRF = 20%)	Install Signal (CRF = 30%)	Prohibit Left-Turns from Minor Road (CRF=50%)
Along Grand Ave (SR-74) ²				
At Tempe St		X		
Between Riverside Dr and Ortega Hwy ³	Two-Way Left-Turn Lane			
At Morro Way ³		X		
At Scales Way ³		X		
Dexter Ave & Lake Elsinore Market Place Dwy ²	Left-Turn Receiving Lane		X	
Lakeshore Dr & Fraser Dr ^{1,2}				X
Lakeshore Dr & Lawrence Way ^{1,2}	Left-Turn Pocket and Receiving Lane			
Canyon Hills Rd & Whispering Willow Dr			X	X
Auto Center Dr & San Jacinto River Rd ²				X (Or stripe "Keep Clear")

1. Located in a State Designated Disadvantaged Community.

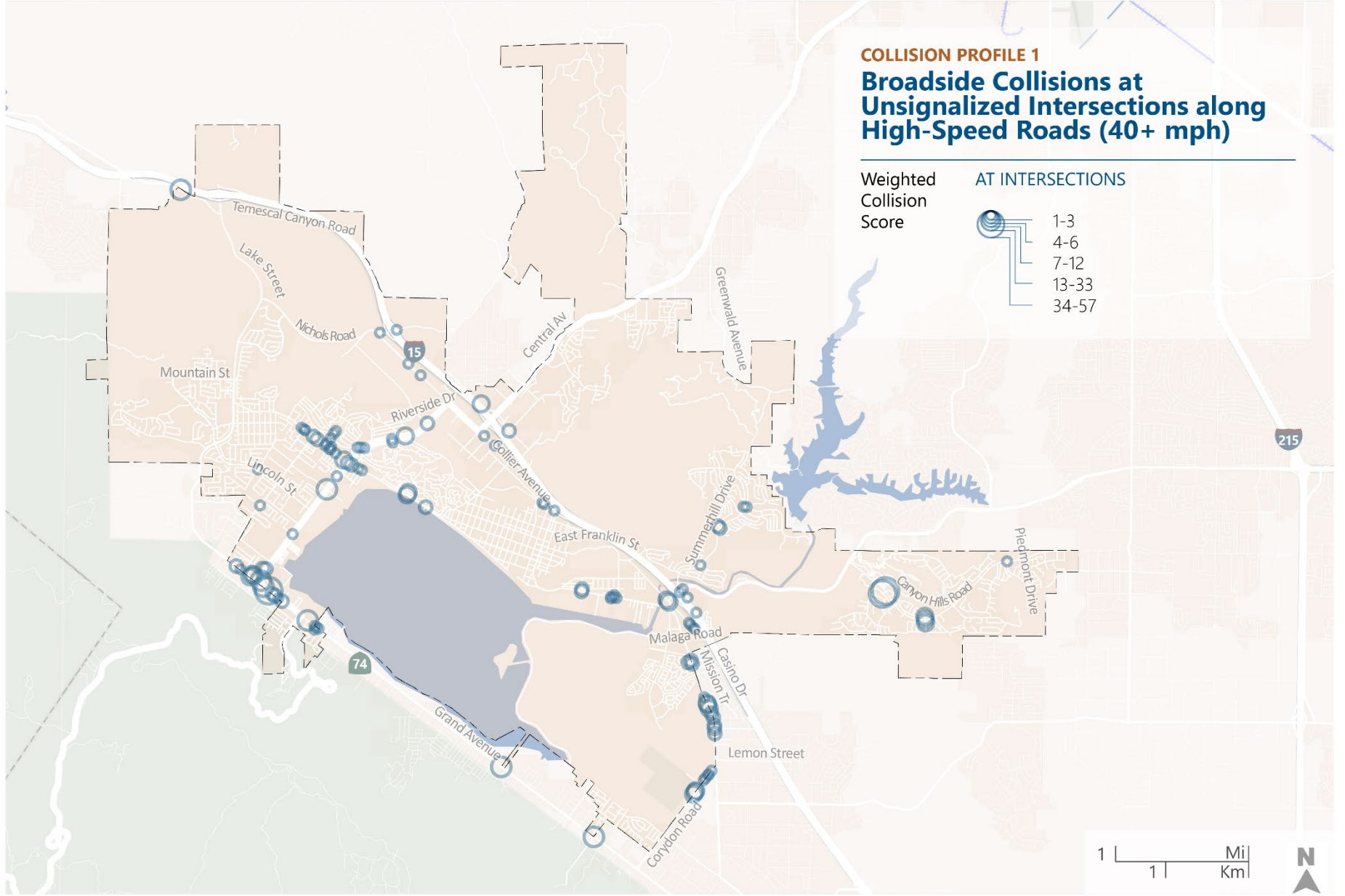
2. Located in a Federal Designated Disadvantaged Community.

3. Owned and Maintained by Caltrans. The City of Lake Elsinore is unable to make improvements at this location without concurrence from Caltrans.

Recent safety countermeasures were installed by the City of Lake Elsinore at 1) Canyon Hills Rd & Sprucewood Way, 2) Riverside Dr (SR-74) & Gunnerson St, 3) Riverside Dr (SR-74) & Joy St, and 4) Riverside Dr (SR-74) & Grand Ave. These key locations are not included in the table above.

GENERAL COUNTERMEASURES

- Install intersection warning signs (CRF = 15%)
- At locations where both the major and minor roadways are high-speed, installing flashing beacons (CRF = 15%) and traverse rumble stripes (CRF = 20%) on stop-controlled approaches are appropriate.
- On a case-by-case basis, investigating alternative control strategies, such as roundabouts, may reduce broadside collisions and provide traffic calming. Roundabouts are not recommended along congested corridors.





COLLISION PROFILE 2

Broadside Collisions at Signalized Intersections with Permissive Left-Turn Phasing

KEY STATISTICS

- Representative of **9 percent** of injury collisions and **7 percent** of KSI collisions in Lake Elsinore.
- The primary collision factor for **53 percent** of injury collisions and **57 percent** of KSI collisions within Collision Profile 2 was roadway users failing to obey signs or signals (i.e. Traffic Signals and Signs Violation).
- Within Collision Profiles 2, **62 percent** of injury collisions involved left-turn conflicts, common for broadside collisions (i.e., T-bone).

KEY LOCATIONS		COUNTERMEASURES		
Signalized Intersections	Install Left-Turn Lane and Provide Protected Left-Turn (CRF = 55%)	Provide Protected Left-Turn Phase (CRF = 30%)	Extend Yellow and All-Red Time (CRF = 15%)	Retroreflective Backplates on Signals (CRF=15%)
Along Central Avenue (SR-74) ²				
At Riverside St			X	X
At Trellis Ln (Private Street)			X	X
At Conard Ave	X		X	X
At Dexter Avenue		X	X	X
At I-15 Northbound Ramps			X	X
Diamond Dr & Auto Center Dr/Casino Dr ²		X	X	X
Mission Trail & Olive Street ²			X	X
Grand Ave & McVicker Canyon Park Rd ²			X	X
Summerhill Dr & Canyon Estates Dr		X	X	X
Canyon Hills Dr & Hillside Dr		X	X	X

1. Located in a State Designated Disadvantaged Community.

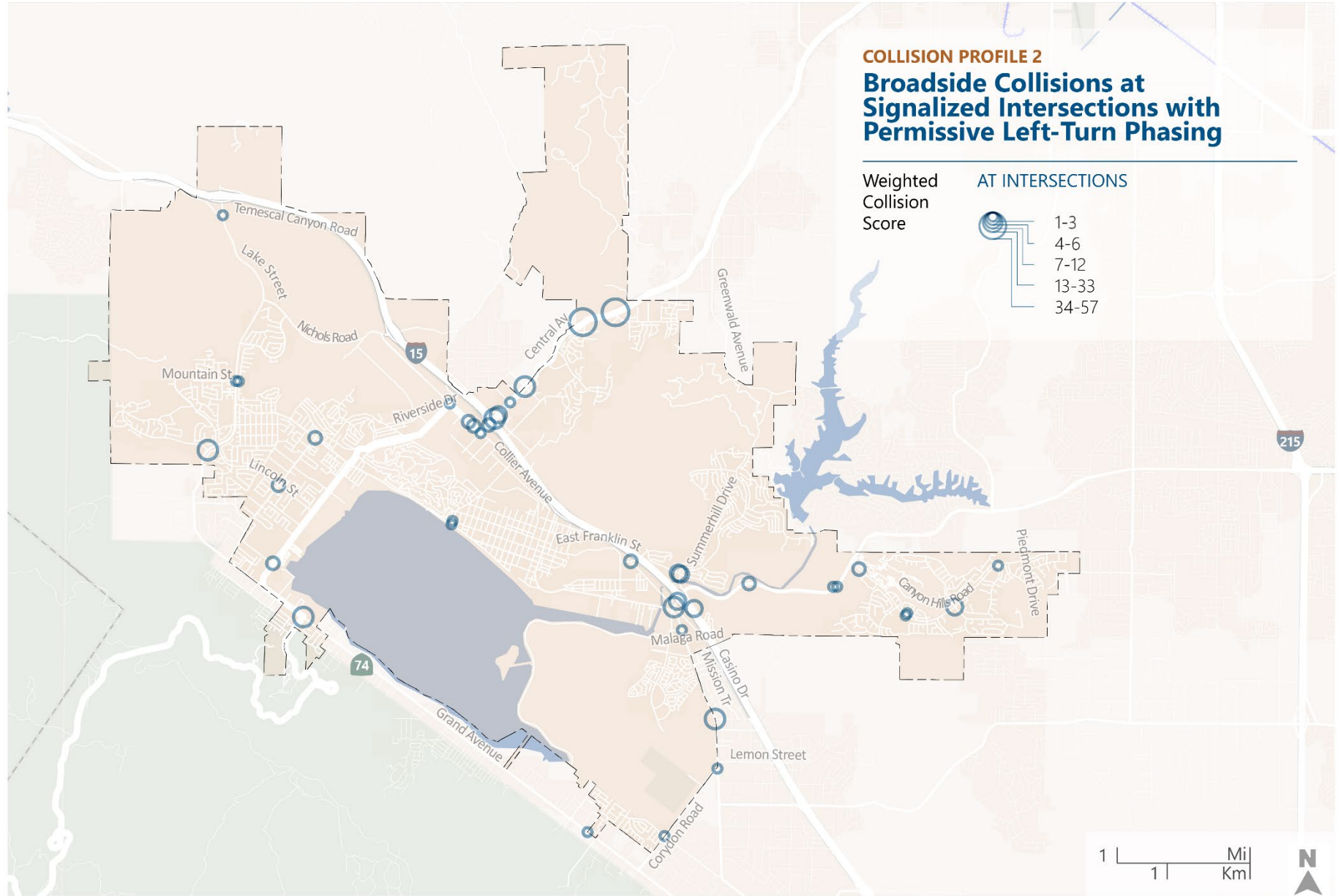
2. Located in a Federal Designated Disadvantaged Community.

3. Owned and Maintained by Caltrans. The City of Lake Elsinore is unable to make improvements at this location without concurrence from Caltrans.

Recent safety countermeasures were installed by the City of Lake Elsinore at 1) Railroad Canyon Rd/Diamond Dr & I-15 Southbound Ramps and Grape St & I-15 Northbound Ramps, which included revised yellow and all-red times and retroreflective backplates, and 2) Grand Avenue (SR-74) & Ortega Hwy, which included retroreflective backplates. These key locations are not included in the table above.

GENERAL COUNTERMEASURES

- Install Advanced Dilemma Zone detection and/or Red Light Cameras.
- Install 'Signal Ahead' warning signs with flashing beacons along roadway approaches with limited sight distance (i.e., curved roadway segments) and/or approaches with elevation changes (CRF = 30%).





COLLISION PROFILE 3

Hit Object Collisions at Night at Unsignalized Locations

KEY STATISTICS

- Representative of **6 percent** of injury collisions and **11 percent** of KSI collisions in Lake Elsinore.
- 73 percent** of injury collisions and **100 percent** of KSI collisions within Collision Profile 3 occurred on High-Speed Roads (40+ mph).
- 38 percent** of injury collisions and **67 percent** of KSI collisions within Collision Profile 3 involved driving under the influence.

KEY LOCATIONS		COUNTERMEASURES			
Unsignalized Intersections	Convert to All-Way Stop (CRF = 50%)	Install Flashing Beacon on 'Stop Ahead' Signs (CRF = 30%)			
Minthorn St & Spring St ^{1,2}	X				
Nichols Rd & Collier Ave ²		X			
Roadways - General	Retroreflective Paint on Edgelines, Lane Markings, and Centerlines (CRF = 25%)	Install Additional Edgelines and Centerlines to Maintain 12' Lanes (CRF = 25%)	Install Pavement Reflectors along Edgelines and/or Centerlines (CRF = 15%)	Install Edgeline and Centerline Rumble Stripes (CRF = 15-20%)	
Lakeshore Dr between Lake St and Machado St ²	X	X	X		
Mission Trail between Magala Rd and Corydon Rd ²	X		X		
Riverside Dr (SR-74) between Lakeshore Dr and Collier Ave ^{1,2,3}			X	X	
Nichols Rd between Pierce St and Collier Ave ²				X	
Roadways - Significant Changes in Elevation	Install Speed Feedback Sign	High Friction Surface Treatment (CRF = 55%)	Retroreflective Paint on Lane Markings and/or Median Curb (CRF = 15%)	Additional Pavement Reflectors along Curved Segments (CRF = 15%)	Install Chevron and/or Curve Ahead Signs (CRF = 25-40%)
Summerhill Dr between Canyon Estates Dr and Corte Seriui	X	X	X	X	X

1. Located in a State Designated Disadvantaged Community.

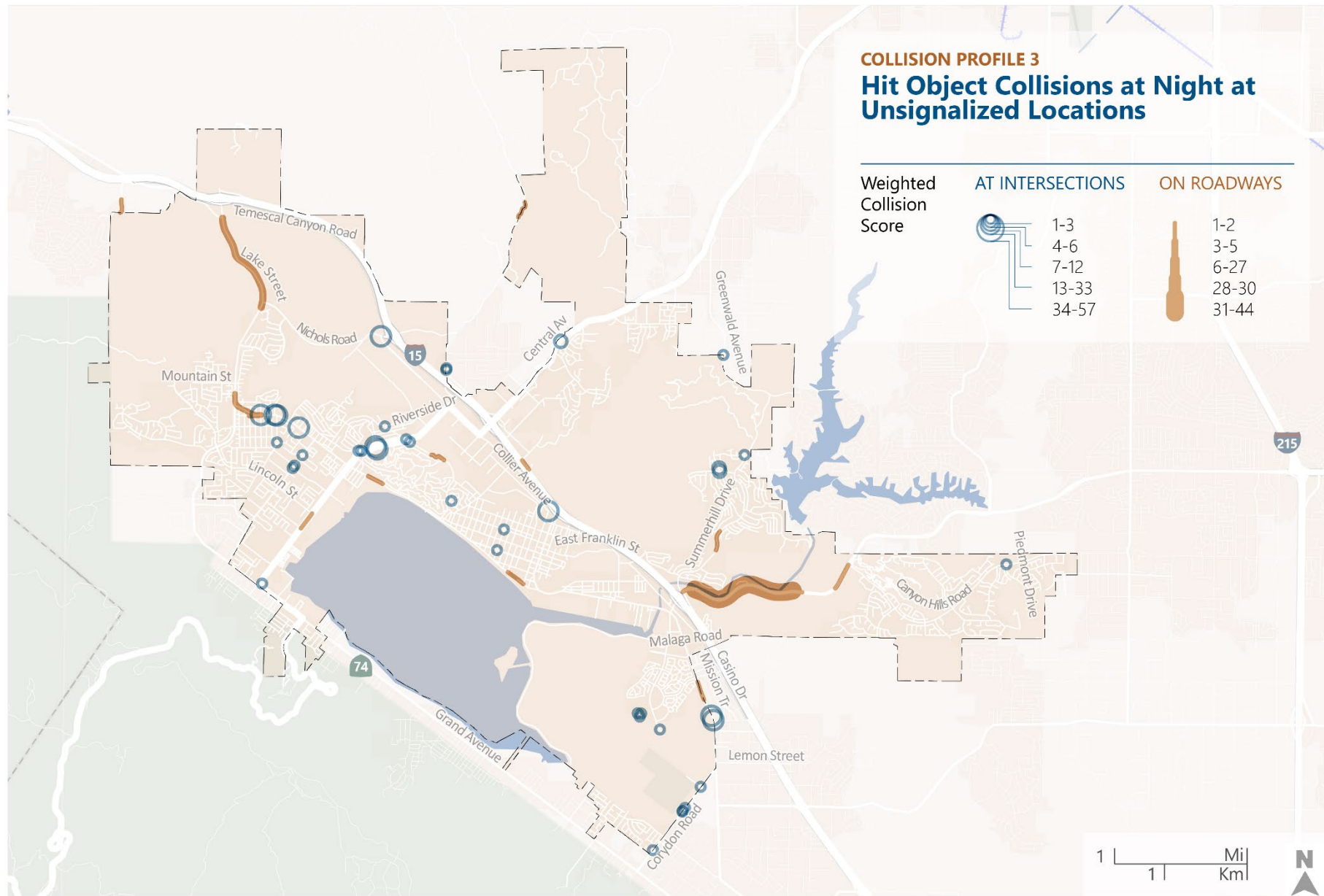
2. Located in a Federal Designated Disadvantaged Community.

3. Owned and Maintained by Caltrans. The City of Lake Elsinore is unable to make improvements at this location without concurrence from Caltrans.

Recent safety countermeasures were installed by the City of Lake Elsinore on Railroad Canyon Rd as a result of the *Railroad Canyon Road LRSP* (Fehr & Peers, 2022); this key location is not included in the table above.

GENERAL COUNTERMEASURES

- Install Object Markers and Roadside Delineators (CRF = 15%) and Upgrade Signs with Fluorescent Sheeting (CRF = 15%).
- Install or upgrade Edgelines and Centerlines with Retroreflective Paint (CRF = 25%) and/or Pavement Reflectors (CRF = 15%).
- In Non-Residential Areas, install Edgeline and Centerline Rumble Stripes (CRF = 15-20%).





COLLISION PROFILE 4

Collisions with Pedestrians Crossing the Road at Night

KEY STATISTICS

- Representative of **33 percent** of pedestrian injury collisions and **47 percent** of pedestrian KSI collisions in Lake Elsinore.
- Most injury collisions (**88 percent**) within Collision Profile 4 occurred at unsignalized intersections.
- Within Collision Profile 4, Half (**50 percent**) occurred near a park or school, and **31 percent** involved people under 17 or over 65 years of age.

KEY LOCATIONS

COUNTERMEASURES

Unsignalized Intersections	Upgrade Pedestrian Crossings with High Visibility Crosswalks, Raised Crosswalks and/or Curb Extensions (CRF = 35%)	Install Pedestrian Crossing with Beacons and/or Refuge Island (CRF= 35-55%)		
Sumner St & Langstaff St ^{1,2}	X			
Machado St & Parkview Dr ²	X	Across Machado St		
Graham Ave & Lindsay St ^{1,2}	X			
Mission Trail & Sylvester Rd ²		Across Mission Trail		
Signalized Intersections	Install Leading Pedestrian Interval (CRF= 60%)	Install Pedestrian Countdown Signal Heads (CRF = 25%)	Provide Protected Left-Turn Phase (CRF = 30%)	
Central Ave & I-15 Southbound Ramps ^{1,2,3}	X	X		
Diamond Dr & I-15 Southbound Ramps ^{2,3}	X	X		
Diamond Dr & Auto Center Dr/Casino Dr ²	X	X	X	
Roadways	Install Sidewalk/Pathway (CRF= 80%)	Install Pedestrian Crossing with Beacons (CRF= 35%)	Install Roadway Segment Lighting (CRF = 20%)	Install Bus Stop Amenities
Grand Ave (SR-74) ^{2,3}		Across Grand Ave (SR-74) at bus stops (i.e., Riverside Dr or Jaimeson St, and Macy St)	X	X
Between Jamieson St and Lime St	South Side			
Between Macy St and Ortega Hwy	South Side			
Between Intersections and Bus Stops	North Side			

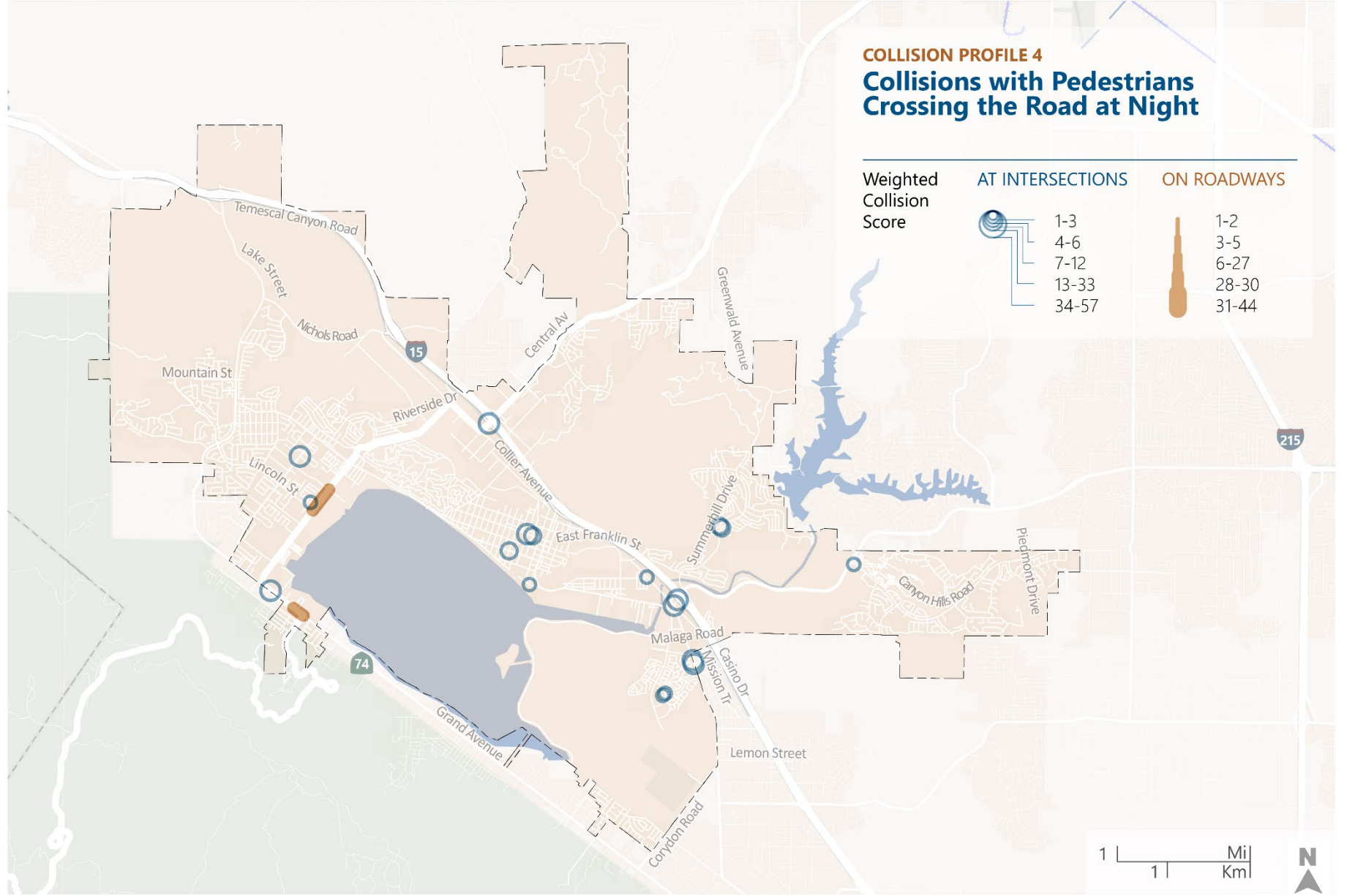
1. Located in a State Designated Disadvantaged Community.

2. Located in a Federal Designated Disadvantaged Community.

3. Owned and Maintained by Caltrans. The City of Lake Elsinore is unable to make improvements at this location without concurrence from Caltrans.

GENERAL COUNTERMEASURES

- Install sidewalks/pathways (CRF = 80%) and roadway segment lighting (CRF = 20%).





COLLISION PROFILE 5

Collisions with Pedestrians at Intersections near Parks and Schools

KEY STATISTICS

- Representative of **41 percent** of all pedestrian injury collisions and **29 percent** of pedestrian KSI collisions in Lake Elsinore.
- Most injury collisions (**70 percent**) within Collision Profile 5 occurred at unsignalized intersections.
- Within Collision Profile 5, **41 percent** of injury collisions and **100 percent** of KSI collisions involved driving under the influence.

KEY LOCATIONS

COUNTERMEASURES

Unsignalized Intersections	Upgrade Pedestrian Crossings with High Visibility Crosswalks (CRF = 35%)	Upgrade Pedestrian Crossings with High Visibility Crosswalks, Raised Crosswalks and/or Curb Extensions (CRF = 35%)	Install Pedestrian Crossing with Beacons and/or Refuge Island (CRF= 35-55%)	Install Bus Stop Amenities
Sumner St & Langstaff St ^{1,2}		X		
Sumner St & Riley St ¹		X	Across Sumner Ave ⁴	
Machado St & Parkview Dr ²		X	Across Machado St	
Graham Ave & Lindsay St ^{1,2}		X		
Lakeshore Dr & Avenue 6 ²			Across Lakeshore Dr	X
Lincoln St & Broadway Ave ²	X		Across Lincoln St	
Lincoln St & Sunswept Dr ²	X			
Signalized Intersections	Upgrade Pedestrian Crossings with High Visibility Crosswalks	Install Leading Pedestrian Interval (CRF= 60%)	Install Pedestrian Countdown Signal Heads (CRF = 25%)	Provide Protected Left Turn Phase (CRF = 30%)
Grand Ave & Broadway Ave	X	X	X	X
Riverside Dr (SR-74) & Le Harve Street ^{2,3}	X	X	X	

1. Located in a State Designated Disadvantaged Community.

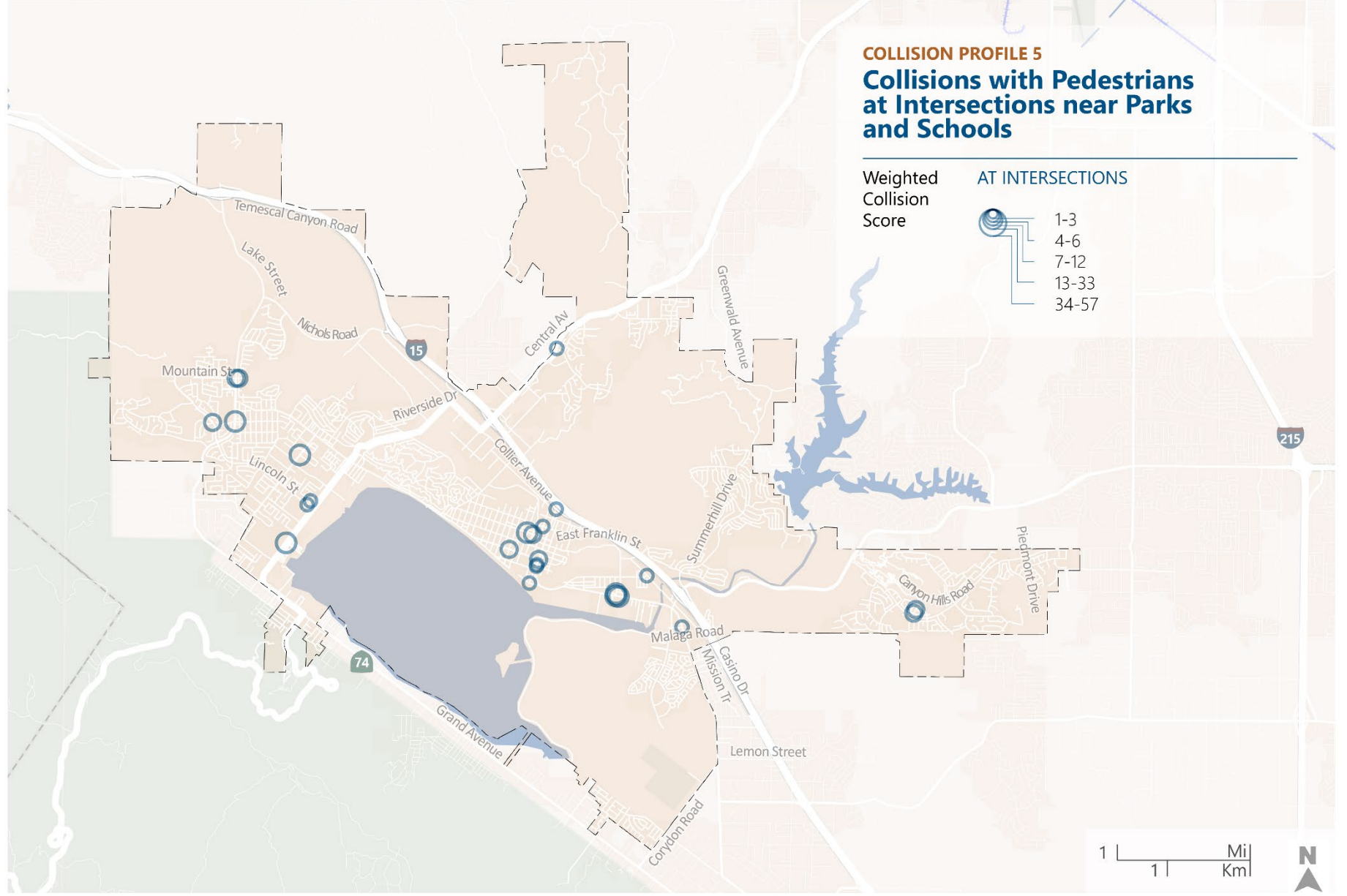
2. Located in a Federal Designated Disadvantaged Community.

3. Owned and Maintained by Caltrans. The City of Lake Elsinore is unable to make improvements at this location without concurrence from Caltrans.

4. Consider relocating the mid-block crossing 50 feet east to the bike path crossing.

GENERAL COUNTERMEASURES

- Install or upgrade pedestrian crossings with High Visibility Crosswalks (CRF = 35%).
- At unsignalized intersections on low-speed (less than 40 mph) roadways, install mini-roundabouts (CRF = 30%).
- At uncontrolled pedestrian crossings, install Beacons and/or Refuge Islands (CRF = 35-55%).
- At signalized pedestrian crossings, install Leading Pedestrian Intervals (CRF = 60%), Pedestrian Countdown Signal Heads (CRF = 25%), and/or a Pedestrian Scramble (CRF = 40%) near/at entrances to schools and parks.





COLLISION PROFILE 6

Collisions involving Driving Under the Influence at Locations with Speeding

KEY STATISTICS

- Representative of **5 percent** of all injury collisions **15 percent** of KSI collisions in Lake Elsinore.
- 82 percent** of injury collisions and **81 percent** of KSI collisions within Collision Profile 6 occurred at night between 6 PM and 6 AM.
- Within Collision Profile 6, the most common KSI collision types are Hit Object (**38 percent**), Vehicle/Pedestrian (**25 percent**), and Head-On (**19 percent**).

KEY LOCATIONS

COUNTERMEASURES

Roadways	Retroreflective Paint on Edgelines, Lane Markings, and Centerlines (CRF = 25%)	Install Additional Edgelines and Centerlines to Maintain 12' Lanes (CRF = 25%)	Install Pavement Reflectors along Edgelines and/or Centerline (CRF = 15%)	Install Edgeline and Centerline Rumble Stripes (CRF = 15-20%)
Lake St between I-15 and Nichols Rd ²	X		X	X
Lakeshore Dr between Lake St and Machado St ²	X	X	X	
Lakeshore Dr between Riverside Dr (SR-74) and Graham Ave ^{1,2}	X		X	X
Machado St between Grand Ave and Lakeshore Dr ²	X	X	X	
Riverside Dr (SR-74) between Lakeshore Dr and Collier Ave ^{1,2,3}			X	X
Mission Trail between Malaga Rd and Corydon Rd ²	X		X	
Corydon Rd between Mission Trail and Palomar St ²	X	X	X	
Palomar St between Silverwood Dr & Cape Cod Dr ²			X	

1. Located in a State Designated Disadvantaged Community.

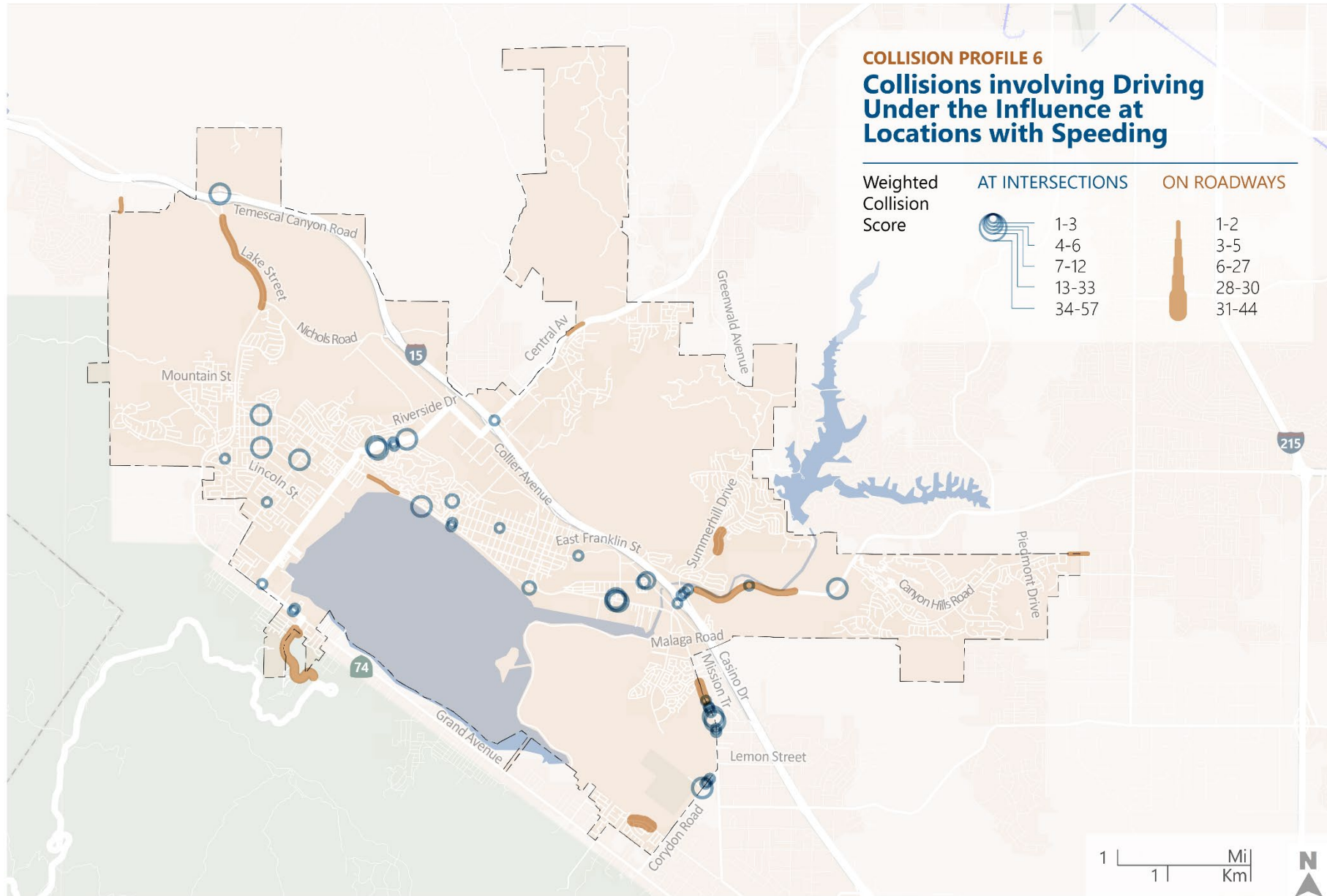
2. Located in a Federal Designated Disadvantaged Community.

3. Owned and Maintained by Caltrans. The City of Lake Elsinore is unable to make improvements at this location without concurrence from Caltrans.

Recent safety countermeasures were installed by the City of Lake Elsinore on Railroad Canyon Rd as a result of the *Railroad Canyon Road LRSP* (Fehr & Peers, 2022); this key location is not included in the table above. Countermeasures for Summerhill Drive between Canyon Estates Dr and Corte Seriui are provided in Collision Profile 3.

GENERAL COUNTERMEASURES

- Install Speed Feedback Signs and evaluate the potential for Automated Speed Enforcement (Assembly Bill 645).
- Install or upgrade Edgelines and Centerlines with Retroreflective Paint (CRF = 25%) and/or Pavement Reflectors (CRF = 15%).
- In Non-Residential Areas, install Edgeline and Centerline Rumble Stripes (CRF = 15-20%).



8

Chapter 8 – Implementation and Evaluation

This chapter describes the process that can be used by the City to ensure implementation of projects, identify funding sources for projects, and evaluate the success of the plan.

Implementation

Implementation of the LRSP is a vital step in the process where identified strategies and projects are executed. To successfully implement programs and projects, partnerships, trust, funding, and coordination need to be proactively managed. Successful implementation requires sustained and coordinated support from key stakeholders, elected officials, and City staff.

Funding Opportunities

This LRSP positions the City of Lake Elsinore for funding at the regional, state, and federal levels. At the state level, Highway Safety Improvement Program (HSIP) funds are largely awarded based on a benefit/cost analysis using a set of Caltrans-approved countermeasures with documented collision reduction factors and historic collision data. While many safety projects will perform well in the HSIP process, others may be successfully funded through sources that consider additional factors, such as the Active Transportation Program (ATP) and Safe Streets and Roads for All (SS4A) Grant Program. The sources in this chapter may be used to fund a broad scope of projects targeting air quality and sustainability, affordable housing, and transportation. Successful projects often entail creative solutions that address impact areas beyond transportation safety alone.

Evaluation

Evaluation of the plan allows the City to understand how it is doing against the goal of reducing collisions and collision severity in each of its emphasis areas. Recommendations include how and when to update this plan, and guidance on presenting these findings to local stakeholders. Specific performance metrics that can be used to quantify safety are included.



Implementation

Implementation Action	Description	Agencies or Partners	Example(s)
Garnering Support			
Public Engagement	Develop a one-page fact sheet about the LRSP, how it was developed, and what it will be used for.	Lake Elsinore Public Works Riverside County Sheriff's Department Community-Based Organizations	Reporting options in the Alert LE mobile app could include locations where residents encounter speeding, stop sign violations, or near miss collisions. Regional resources include the SCAG Go Human Campaign, which offers free County co-branded materials and lends demonstration kits for pop-up events.
	Address citizen concerns about recently-implemented LRSP projects.		
	Include a safety data reporting option in the "Alert LE" mobile app.		
	Continue to incorporate community leaders into engagement event planning and outreach.		
	Leverage regional resources to receive free materials and borrow demonstration kits.		
Engage Elected Officials	Maintain ongoing touch points with elected officials on roadway safety updates. Annually, in conjunction with CIP planning, is a good minimum.	Lake Elsinore City Council	Brief newly-appointed officials on LRSP goals and benefits.
Identify Roadway Safety Champions	A champion is the plan's main advocate and point-person for its development and implementation.	Lake Elsinore Public Works	Many safety stewards can fit the role, including public works officials, law enforcement officers, or elected officials.
	A champion represents the City's safety efforts to other City agencies, the public, and surrounding jurisdictions.	Riverside County Fire Department	
Establish a Roadway Safety Task Force	Supports the roadway safety champion(s) and is the team responsible for implementing the multi-agency nature of the safety plan.	Riverside County Sheriff's Department Riverside Transit Agency Mayor's Office	Continuation of the stakeholder group established for the LRSP or a smaller group consisting primarily of City with a greater implementation and decision-making responsibility.
Engage Other Agencies	Facilitate support for roadway safety goals with colleagues at neighboring cities and regional agencies.	Lake Elsinore City Council Western Riverside Council of Governments Caltrans	Coordinate improvements on multi-jurisdictional roadways. Host quarterly meetings with counterparts to facilitate regional coordination and check-in on progress.

Implementation Action	Description	Agencies or Partners	Example(s)
Project Delivery Methods			
Project Bundling	This can reduce soft costs such as project administration, data collection, and conceptual and final design and increase the efficiency of public outreach and engagement compared to delivering multiple separate projects.	Lake Elsinore Public Works	Citywide signal improvements or pavement marking upgrades.
	More cost-intensive LRSP projects that serve multiple communities can be bundled across multiple jurisdictions to minimize cost and pool resources.		Partnerships with other agencies can serve as a bridge for improving multi-jurisdictional roadways that are often more-difficult to improve.
Reallocate Funding or Modify Scope for CIP Projects	Reevaluate currently-funded general road projects and potentially reallocate some of this money to prioritize high priority locations identified in the LRSP, adding safety improvements to project scopes.	Lake Elsinore City Council	Resurfacing projects can allow for integration of bike lanes or striping and pavement marking upgrades.
	The City Council and Public Works Department can also strategically develop future capital improvement plans to create opportunities for safety improvements with typical CIP projects.		Traffic signal modifications can be an opportunity for integration of pedestrian signal heads, leading pedestrian intervals, or protected left-turn phasing. Focus future Intelligent Transportation System (ITS) investments on safety elements.
Integrate Safety Projects into Public Works Department Regular Maintenance	Create new standards for typical maintenance that reflect LRSP project goals.	Lake Elsinore Public Works	Striping standards, lighting standards, or crosswalk design guidelines. Routine re-painting of crosswalks can introduce an ongoing opportunity to upgrade to high-visibility crosswalk.
Incorporate LRSP Goals into All Roadway Projects	Consider prioritization of roadway projects based on locational or attribute collision history and potential to address safety risk factors.		Prioritization of projects with a safety benefit over those with other operational benefits, such as congestion relief.



Implementation Action	Description	Agencies or Partners	Example(s)
Project Delivery Methods (Continued)			
Implement Pilot Projects to Gather Feedback	Rolling out safety projects as pilots presents the opportunity for the City to gather valuable public and stakeholder feedback to make improvements and adjustments before moving on with similar projects.	Lake Elsinore Public Works	Installing protected bicycle lanes on a pilot roadway corridor.
	A pilot typically consists of one or a few rollouts of a replicable safety improvement, where the engagement, construction, and impact of the improvement is evaluated for scalability.		A less capital-intensive strategy is pop-up demonstrations, which can be funded and supported through the SCAG Go Human campaign.
Implement Interim Strategies	Not all of the LRSP recommended projects need to be implemented at once; some lower cost projects can be introduced first to get the safety benefits moving and gather public and elected official recognition or support.		Implementation of striping until funding for more capital-intensive concrete medians or curb extensions is secured.
Incorporate LRSP Goals into Citywide Traffic Impact Study	Include collision review and roadway safety issues identification during development review and non-CEQA traffic impact analysis.		Create City of Lake Elsinore roadway safety guidelines for development review. Example: Caltrans Interim Land Development and Intergovernmental Review, Safety Review Practitioners Guide

Funding Opportunities

Local and Regional Sources

RCTC TDA Article 3 Program

The Transportation Development Act (TDA) provides that two percent of the Local Transportation Funds (LTF) be made available to counties and cities for facilities for the exclusive use of pedestrians and bicyclists, known as TDA Article 3 Program. Call for projects occur on a biennial basis, with a release date in the Spring of every other year.

NEXT FUNDING OPPORTUNITY: SPRING 2025

SCAG Sustainable Communities Program

Provides direct technical assistance to SCAG member jurisdictions to complete planning and policy efforts that enable implementation of the regional SCS. Grants are available in four categories: 1) Civic Engagement, Equity & Environmental Justice; 2) Smart Cities & Mobility Innovations; 3) Housing & Sustainable Development; and 4) Active Transportation & Safety.

NEXT FUNDING OPPORTUNITY: TBD

SCAG Go Human Mini-Grant Programs

Competitive community grant program that funds safety projects. The program aims to build street-level community resiliency and increase the safety of people most harmed by traffic injuries and fatalities. The 2023 funding cycle closed in April and applicants could apply for up to \$40,000 in grant funding to support projects that leveraged new or existing community gatherings and resources site to implement traffic safety strategies including but not limited to messaging,

education, engagement activities, leadership development, community assessment, or resource distribution.

NEXT FUNDING OPPORTUNITY: TBD

State Sources

Highway Safety Improvement Program (HSIP)

HSIP is a core federal-aid program to states for the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. California's local HSIP focuses on infrastructure projects with nationally recognized crash reduction factors (CRFs). This is the primary grant funding source to support roadway projects identified through the LRSP. Call for projects occur on a biennial basis, with a release date in the Spring/Summer of every other year.

NEXT FUNDING OPPORTUNITY: SPRING/SUMMER 2024

California Strategic Growth Council (SGC) Transformative Climate Communities (TCC) Program

The Transformative Climate Communities (TCC) Program empowers the communities most impacted by pollution to choose their own goals, strategies, and projects to reduce greenhouse gas emissions and local air pollution. Round 5 applications concluded in August 2023.

NEXT FUNDING OPPORTUNITY: TBD

SGC Affordable Housing and Sustainable Communities (AHSC) Program

The Affordable Housing and Sustainable Communities (AHSC) Program makes it easier for Californians to drive less by



making sure housing, jobs, and key destinations are accessible by walking, biking, and transit.

NEXT FUNDING OPPORTUNITY: DUE MARCH 2024

Active Transportation Program (ATP)

ATP is a statewide competitive grant application process with the goal of encouraging increased use of active modes of transportation. The ATP consolidates existing federal and state transportation programs, including the Transportation Alternatives Program (TAP), Bicycle Transportation Account (BTA), and State Safe Routes to School (SRTS), into a single program with a focus to make California a national leader in active transportation. The ATP is administered by the Division of Local Assistance, Office of State Programs.

NEXT FUNDING OPPORTUNITY: DUE JUNE 2024

90

SB 1 Local Streets and Roads Program (LSRP)

SB 1 dedicated approximately \$1.5 billion per year in new formula revenues apportioned by the State Controller to cities and counties for basic road maintenance, rehabilitation, and critical safety projects on the local streets and roads system.

NEXT FUNDING OPPORTUNITY: 2024

Caltrans Sustainable Communities Grants

To encourage local and regional planning that furthers state goals, including, but not limited to, the goals and best practices cited in the Regional Transportation Plan Guidelines adopted by the California Transportation Commission. Fiscal Year 2024-25 applications were due in January 2024.

NEXT FUNDING OPPORTUNITY: 2025

California Office of Traffic Safety (OTS) Grant Programs

OTS administers traffic safety grants in the following areas: Alcohol Impaired Driving, Distracted Driving, Drug- Impaired Driving, Emergency Medical Services, Motorcycle Safety, Occupant Protection, Pedestrian and Bicycle Safety, Police Traffic Services, Public Relations, Advertising, and Roadway Safety and Traffic Records. Fiscal Year 2025 applications were due December 2023.

NEXT FUNDING OPPORTUNITY: 2024

SB1 Local Partnership Program (LPP)

The purpose of this program is to provide local and regional transportation agencies that have passed sales tax measures, developer fees, or other imposed transportation fees with a continuous appropriation of \$200 million annually from the Road Maintenance and Rehabilitation Account to fund road maintenance and rehabilitation, sound walls, and active transportation projects. There is also a competitive grant portion of this program that occurs on a biennial basis.

NEXT FUNDING OPPORTUNITY: 2024

California Natural Resources Agency Urban Greening Program

This competitive grant program intends to solicit project proposals for urban greening projects that reduce greenhouse gas emissions, mitigate the effects of extreme heat, and provide additional multiple benefits. This program will give priority consideration to projects located within and benefiting disadvantaged communities. The prior grant cycle concluded in November 2023.

NEXT FUNDING OPPORTUNITY: 2024

Federal Sources

RAISE Grants (formerly BUILD and TIGER)

Under the Bipartisan Infrastructure Law (BIL), the Rebuilding American Infrastructure with Sustainability and Equity (or RAISE) program provides funding for capital investments in surface transportation that will have a significant local or regional impact. A Benefit-Cost Analysis (BCA) is required for this grant program.

NEXT FUNDING OPPORTUNITY: 2024

Safe Streets and Roads for All Grant

In November 2021, the Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), was passed into law. The passage of IIJA included funding for the Safe Streets and Roads for All (SS4A) grant program. The SS4A program provides funding to local agency initiatives that prevent transit related deaths and serious injuries on roads and streets.

NEXT FUNDING OPPORTUNITY: FEBURARY 2024



Evaluation

Evaluation Action	Description	Agencies or Partners	Example(s)
Update Plan Regularly	Scheduling an update every two years could assist with organizing and directing evaluation efforts. As conditions within the County change, it will be necessary to update the LRSP in the future. Caltrans requires the LRSP to be updated every 3-5 years.	Lake Elsinore Public Works	This LRSP is an example of a regularly updated safety plan. The predecessor, the City's Systemic Safety Analysis Report was published in 2019.
	Completion of bi-annual plan updates should correspond with Caltrans HSIP calls-for-projects. Calls-for-projects are typically released in spring or early summer of even years (i.e., 2024, 2026, etc.) and are due in the fall of the same year.		
Presentation of Evaluation	Annual presentations to local leaders on LRSP performance.	Lake Elsinore Public Works	Summarizing collision trends annually is a way to demonstrate and/or market the benefits of improving safety.
	Create online dashboard showcasing safety metrics and recent projects.		
	Release an annual publicly available "safety report card".	Lake Elsinore City Council	Online collision dashboards have been used by cities to share safety trends and priorities with the public.
	Train County employees on a standard approach to addressing the public and the media about LRSP performance.		
	Market benefits of safety investments – how is funding being used and what are resulting safety outcomes?		

Evaluation Performance Metrics

Performance Metric	Sub-Metrics
Safety Funding Secured	<ul style="list-style-type: none"> Dollars received from infrastructure and programmatic grants.
Number of Countermeasures Implemented	<ul style="list-style-type: none"> Engineering countermeasures Education, engagement, and enforcement campaigns or programs
Collisions	<p>KSI Collisions:</p> <ul style="list-style-type: none"> Annual KSI collisions Percentage of total collisions resulting in KSI <p>Vulnerable Users:</p> <ul style="list-style-type: none"> Annual collisions by mode (e.g., pedestrian, bicycle, and motorcycle collisions) Percentage of collisions resulting in KSI by mode <p>Collision Trends:</p> <ul style="list-style-type: none"> Annual collisions within each collision trends Percentage of collisions within each collision trend resulting in KSI <p>Demographic Data of Collision Victims</p> <ul style="list-style-type: none"> Percentage of collisions involve victims aged under 19 or over 65 Percentage of victims who identify as a person of color Percentage of collisions within or near a Disadvantaged Community
Before/After Studies	<ul style="list-style-type: none"> Number of collisions in the project influence area Percentage of collisions resulting in KSI in the project influence area
Speed and Speed Limit Compliance	<ul style="list-style-type: none"> 85th percentile speeds Number of roadways where posted speed has been lowered, based on California Assembly Bill 43 Annual collisions with unsafe speed violations
Perception of Safety and Community Feedback	<ul style="list-style-type: none"> Pedestrian and bicycle volumes in areas where safety projects have been implemented Community surveys in areas where safety projects have been implemented

