County of Lake
Local Road Safety Plan (LRSP)

August 15, 2022

Prepared for:

Lake County
255 N. Forbes Street
Lakeport, CA 95453

Prepared by:

HEADWAY TRANSPORTATION

2240 St. George Lane, Suite 1
Chico, CA 95926

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Statutory Notice

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Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway- highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds 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 a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

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This section is included per California Government Code - GOV § 7550 which states that:

"(a) Any document or written report prepared for or under the direction of a state or local agency, that is prepared in whole or in part by nonemployees of the agency, shall contain the numbers and dollar amounts of all contracts and subcontracts relating to the preparation of the document or written report; if the total cost for the work performed by nonemployees of the agency exceeds five thousand dollars ($5,000). The contract and subcontract numbers and dollar amounts shall be contained in a separate section of the document or written report.

(b) When multiple documents or written reports are the subject or product of the contract, the disclosure section may also contain a statement indicating that the total contract amount represents compensation for multiple documents or written reports."

The contract amount for this Lake County LRSP is $49,837.

Acknowledgements

The Lake County Public Works staff and project stakeholders were instrumental in the creation of this Local Road Safety Plan. The local knowledge and collaborative attitude of all stakeholders involved helped create a holistic LRSP. Headway Transportation would like to express appreciation to the staff and project stakeholders who contributed to this plan.

Stakeholders

Scott DeLeon, Lake County Public Works
John Everett, Lake County Public Works
Leah Sautelet, Emergency Services / Lake County Sheriff's Office
Mark Mueller, Caltrans

Headway Transportation

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Executive Summary

This *Local Road Safety Plan* (LRSP) is for unincorporated areas of Lake County, California. The purpose of an LRSP is to establish the framework and processes for identifying, evaluating, and prioritizing transportation safety improvements on local streets, primarily to reduce the risk of serious injury and fatal crashes.

The LRSP process accomplishes the following objectives documented in this report:

- Engages stakeholders and the public to identify and prioritize needs and initiatives across the identified focus areas:
  - Distracted Driving
  - Impaired Driving
  - Speeding
  - Intersection Safety
  - Pedestrian Safety
  - Bicycle Safety
  - Roadway/Intersection Lighting
  - Lane Departures (Roadway Segments)
  - Senior/Elderly Driving
  - Motorcycle Safety
- Identifies the transportation safety issues unique to Lake County and provides recommendations and priorities across the 4 Es of traffic safety:
  - Engineering
  - Enforcement
  - Education
  - Emergency Services
- Meets the Federal Highway Administration's requirement for an LRSP or equivalent document to apply for the next round of Highway Safety Improvement Program (HSIP) funding.

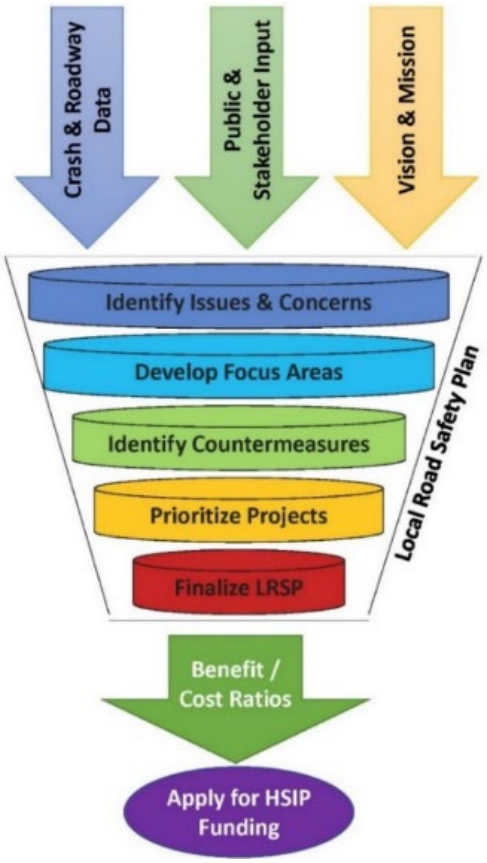

Exhibit 1. A Local Road Safety Plan is developed in partnership with stakeholders to establish a framework for safety improvements on local streets.

The key findings in the LRSP are:

- Study draws from previous studies and efforts indicate that significant strides have been made in improving transportation safety and several other efforts are planned or underway.
- Public priorities on Lake County Roadways are distracted driving, impaired driving, speeding, and roadway/pavement conditions.
- A total of 3,136 crashes occurred between 2016 and 2020. Of those crashes, 304 (or 10 percent) resulted in a severe injury or a fatality.

- Most crashes have occurred along roadway segments (as opposed to at intersections), and the most common crash type involved a vehicle leaving the roadway and colliding with a fixed object.
- Impaired driving accounted for 18 percent of total crashes and 30 percent of serious injury and fatal crashes.
- Pedestrian and bicycle involved crashes accounted for 10 percent of serious injury and fatal crashes.
- Dark conditions (without roadway lighting) crashes accounted for 25 percent of the total crashes and 28 percent of serious injury and fatal crashes.
- Motorcycle involved crashes accounted for 21 percent of serious injury and fatal crashes.
- The top priority for developing systemic countermeasure applications projects focuses on lane departures on roadway, pedestrian and bicycle, and speeding projects.
- Projects for potential HSIP applications include:
    - Site Specific for Point Lakeview Road
    - Systemic Roadway Lane Departures
    - Systemic Pedestrian/Bicycle Improvements
    - Systemic Speed Control Improvements

The LRSP is intended to be a living document, which should be updated at least every five years using the most up-to-date crash data to evaluate the performance of implemented countermeasures and re-evaluate and re-prioritize focus areas.

Introduction

Each year 1.35 million people are killed on roadways world-wide and traffic crashes are a leading cause of death in the United States[1]. Lake County has undertaken this Local Road Safety Plan with the goal of reducing crashes, specifically fatal and serious injury crashes as local roads are less traveled, but tend to have a higher rate of serious injury and fatal crashes.

The LRSP provides a framework for developing safety improvements on local roads with a goal of reducing fatalities and serious injuries on the local road network. The development of this Local Road Safety plan is achieved through a process of analyzing data, engaging stakeholders and the public, creating focus areas, developing countermeasures and an implementation plan, and identifying funding sources. The main thrust of accident prevention and control across the world has been on 4 E's i.e. (i) Education; (ii) Engineering; (iii) Enforcement; and (iv) and Emergency Services. Engineering safety projects may be systemic or location specific.

Exhibit 2. LRSP Development Process
Source: FWHA

Countermeasures are identified based on the types, frequency, and contributing elements of crashes. Identified countermeasures are included in the applicable focus areas (i.e., intersection safety, impaired driving, speeding, etc.) and further categorized based on the "E" of traffic safety in which they address. Education and Enforcement strategies are often best implemented with input from community partners and stakeholders. Developing countermeasures across these four areas of traffic safety ensures a plan that improves traffic safety through a variety of approaches. "Emerging Technologies" is considered a new fifth category and was considered in the countermeasure process.

Implementation of identified countermeasures typically requires additional grant funding for many agencies. As of 2020, the LRSP will be a required document for any agencies applying for HSIP funding. The HSIP is a federal aid program which requires states to develop comprehensive Statewide Highway Safety Plans (SHSPs) focused on reducing fatal and serious injury crashes. HSIP is one of the primary funding mechanisms for roadway safety enhancements across the United States. Each state department of transportation can allocate HSIP funding to local entities for traffic safety projects focused on reducing fatal and serious injury crashes. The California Department of Transportation (Caltrans) will require any agency applying for HSIP funding (Cycle 11 and beyond) to first complete a LRSP.

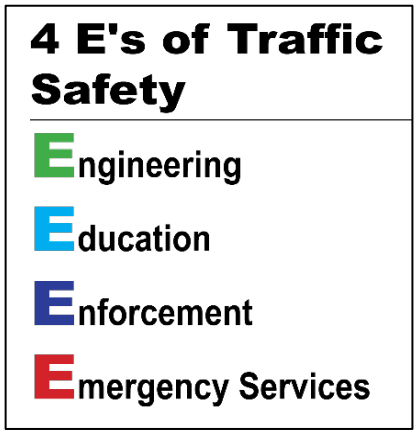

Exhibit 3. Countermeasures are developed across four areas of traffic safety.

[1] https://www.cdc.gov/injury/features/global-road-safety/index.html

Vision and Targets

The LRSP aligns with state and national goals of improving roadway safety, particularly by reducing fatal and serious injury crashes. This LRSP shares the vision of federal and national efforts such as the Road to Zero, Toward Zero Deaths, Vision Zero, and ITE's Vision Zero, in developing a systematic approach towards traffic safety tailored to Lake County's needs. Vision Zero sets a target of zero roadway fatalities and serious injuries and embraces a safe systems approach by ensuring tools such as speed management, traffic calming, enhanced visibility, etc. are integrated into roadway design The LRSP also aligns with the California Office of Traffic Safety (CalOTS) goals of improving roadway safety through grants geared toward innovative and proven technologies as well as education and enforcement programs.

Exhibit 4. A six-step process is used to develop the LRSP, starting with stakeholder engagement.

Source: FWHA

Stakeholder Engagement

LRSP Focus Areas

- ✓ Distracted Driving
- ✓ Impaired Driving
- ✓ Speeding
- ✓ Intersection Safety
- ✓ Pedestrian Safety
- ✓ Bicycle Safety
- ✓ Roadway/Intersection Lighting
- ✓ Lane Departures (Roadway Segments)
- ✓ Motorcycle Safety
- ✓ Senior/Elderly Driving

The stakeholder engagement group was instrumental in establishing the mission and vision statements, and prioritizing the transportation safety needs, potential solutions, and projects. The stakeholders group included members from agencies such as the Lake County Public Works Department, Caltrans, tribal communities, law enforcement, Calfire, education, social services, and transit. A list of the stakeholders in the engagement group is provided in **Appendix A**.

The stakeholder group will also be key in implementing countermeasures, measuring outcomes, and updating the plan in the future. The LRSP is intended to be a living document, which should be updated at least every five years using the most up to date crash data to evaluate the performance of implemented countermeasures and re-evaluate focus areas.

Related Lake County Studies, Planning Documents, and Future Projects

- *Lakeport and Clearlake LRSPs (2021)*
- *2022 Lake County Regional Transportation Plan/Active Transportation Plan*
- *Lake Walks Study/Lake County Pedestrian Facility Needs Inventory and Engineered Feasibility Study (2019)*
- *Highway 20 Northshore Communities Traffic Calming Plan and Engineered Feasibility Study (2020)* – The study presented concepts to redesign Highway 20 within Nice, Lucerne, Glenhaven, and Clear Oaks to improve access and multimodal safety. Recommended improvements focused on enhanced pedestrian crossings, improved multimodal facilities, and implementing traffic calming measures.
- *Konocti Road Safe Routes to Schools Project (2016)*
- *2016 Lake County Active Transportation Plan*
- *2011 Lake County Regional Transportation Bikeway Plan*

Public Outreach

Public Outreach Methodology

Public outreach was conducted via an online survey conducted from March 10, 2022 to April 22, 2022, and included questions pertaining to demographics, travel patterns, and transportation safety concerns and priorities. Approximately 75 surveys were completed, and other comments were received via email.

Input provided through the public outreach survey helped to identify general transportation safety and roadway network concerns and priorities. Survey responses are included in **Appendix B** (no personal information is included), and the results are summarized below.

Public Outreach Key Takeaways

- ✓ Distracted Driving, Impaired Driving, and Speeding were the highest ranked concerns.
- ✓ Open-ended responses included pavement conditions, unsafe driving, speeding and specific roadway segments and intersections.

Question 1 – What is your primary mode of transportation?

The choices were personal vehicle, bicycle, walking, public transit, carpool/rideshare, or other. Most respondents (94.7 percent) indicated that their primary mode of transportation is a personal vehicle with bicycle (1.3 percent), walking (1.3 percent), and other (2.7 percent) selected as the other modes of transportation.

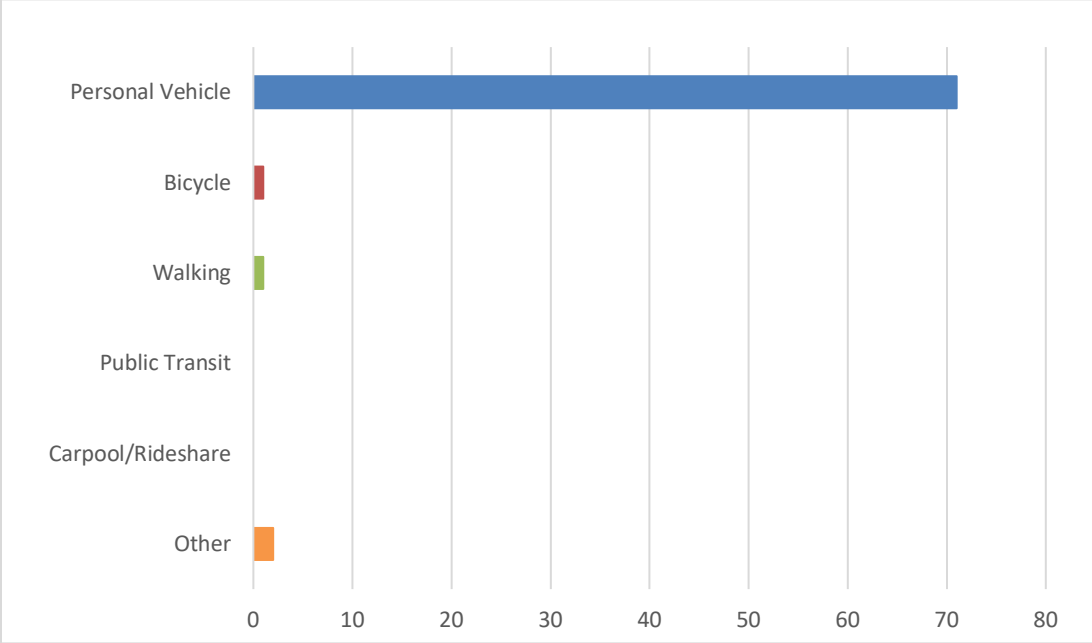

Figure 1. Primary Transportation Mode

Question 2 – What is your age?

Survey responses were received from all age ranges, except for the "Under 20" age group. The majority of respondents were over 40-years-old (84 percent), while 16 percent of respondents were 40 and below.

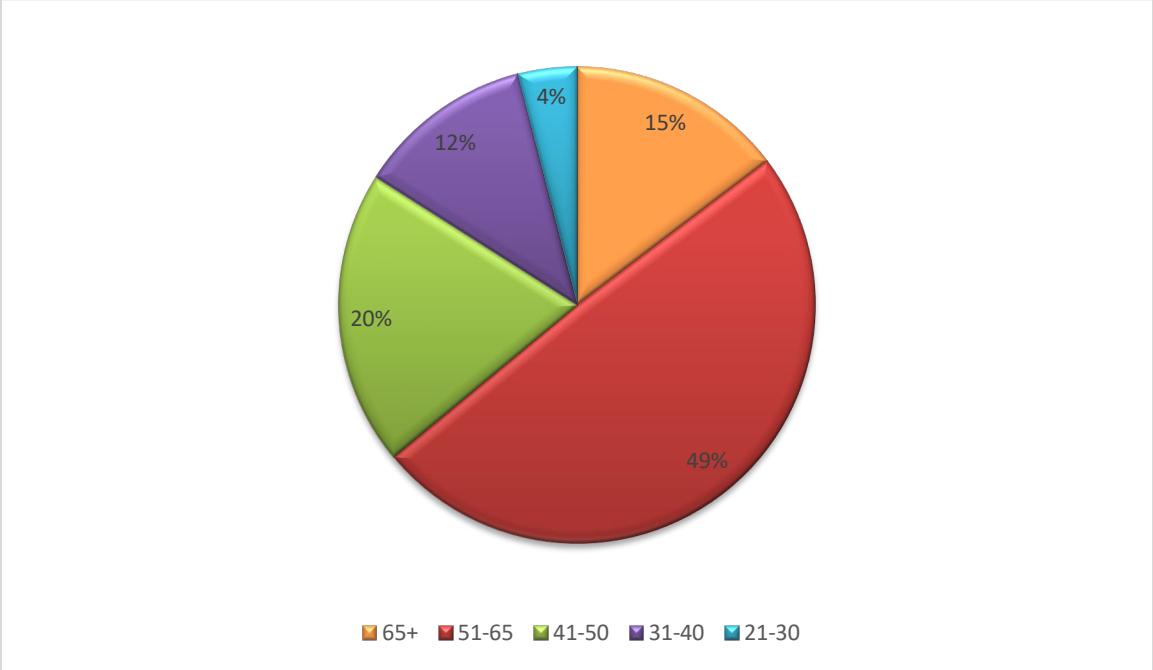

Figure 2. Respondents by Age Range

Question 3 – Did your travel habits change during COVID restrictions?

This question was included to gauge the impacts of COVID-19 on the transportation network from approximately 2020-2022 when restrictions were in place. Based on the survey results, the majority of respondents traveled less (58.7 percent).

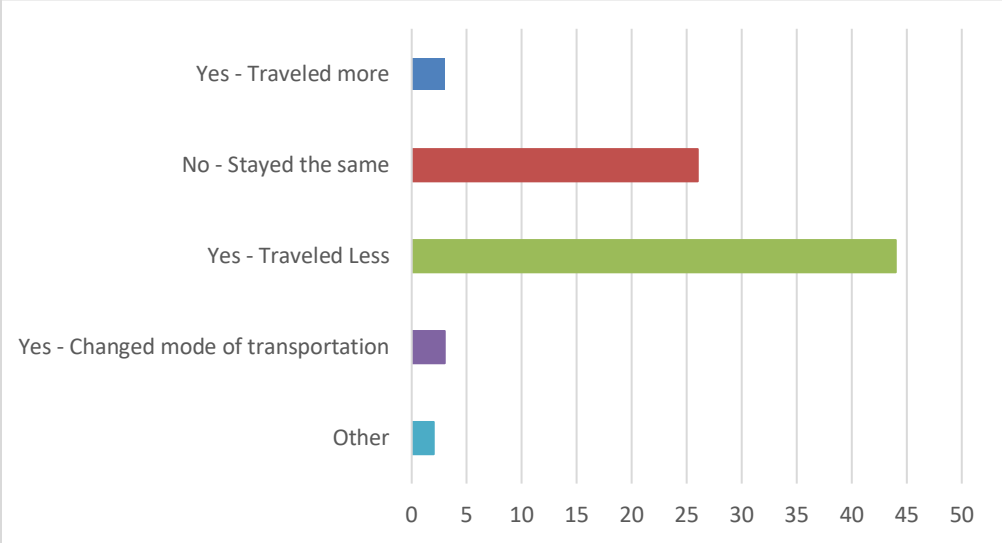

Figure 3. Travel Habits during COVID

Question 4 – Please rank the following categories based on your personal level of concern regarding each category, with "1" representing the highest level of concern.

The responses to this question indicated the highest priority transportation safety focus areas for survey respondents. Respondents were asked to place focus areas in a ranked list based on which area they were most concerned about. **Figure 4** lists the focus areas in order based on their average weighted scores with the higher scores indicating more priority/level of concern.[2]

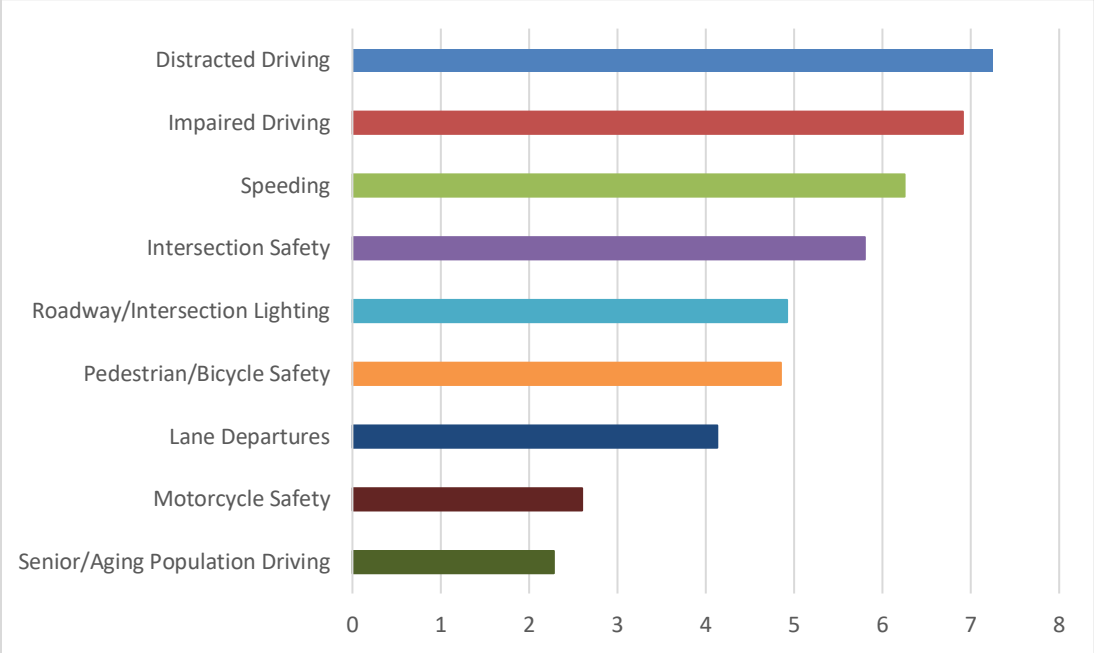

Figure 4. Survey Respondent Priorities

Question 5 – Please enter any comments relation to transportation safety in Lake Country below.

Response to this question was reviewed by the project team and grouped by common categories for general comments and location specific. **Tables 1** and **2** on the following page show a summary of the responses.

[2] *An inverse weighting system was applied to the survey responses. For example, a focus area ranked as number one was assigned eight points and a focus area ranked number eight was assigned one point.*

Table 1. Open Response – Site Specific Responses

Comment Summary - Site Specific	Number of Comments	Applicable Crash Data	State Hwy or Local Roadway
Highway 29 / C Street	4	2 Total Crashes	State Hwy / Local
Twin Lakes / SR 29	3	No Reported Crashes	Local / State Hwy
Lakeshore Boulevard	2	Top Crash Roadway (66 Total Crashes)	Local
Morgan Valley Road	1	Top Crash Roadway (19 Total Crashes)	Local
Country Club Drive	1	14 Total Crashes	Local
Highway 20 (Traffic Calming and Lighting)	1	State Hwy - 805 Total Crashes (Full Length)	State Hwy
Mendenhall Avenue (Speeding and Stop Signs)	1	3 Total Crashes	Local
Elk Road Speed Limits	1	13 Total Crashes	Local
Highway 29 from Putah Lane to Butts Canyon Road	1	State Hwy - 648 Total Crashes (Full Length)	State Hwy
Soda Bay (Bicycle Lanes)	1	Top Crash Roadway (118 Total Crashes), No Bicycle Crashes	Local
Big Valley Road	1	18 Total Crashes	Local
Bottle Rock Road	1	Top Crash Roadway (29 Total Crashes)	Local
Hill Road (Pedestrian Safety and Speeding)	1	9 Total Crashes	Local
Pitney Lane (Speeding)	1	No reported crashes	Local
New Long Valley Road	1	Top Crash Roadway (24 Total Crashes)	Local
Kelseyville Riviera Neighborhood – Fairway Drive and Chippewa Trail	1	Speeding (11 Total Crashes)	Local
Gaddy Lane Curve – West of State Street	*	4 Total Crashes	Local

**Submitted via social media/email*

Table 2. Open Response – General Responses

Comment Summary - General	Number of Comments
Pavement Conditions	11
Unsafe Driving	5
Speeding	2
Pedestrian Safety	2
Intersection Sight Distance/Clear Zones	2
Safety Campaign	2
Bicycle Safety	1
Safe Routes to School for Pedestrians and Bicyclists	1
Lane Widths	1
Lack of Deceleration Lanes/Turn Pockets	1

Crash Data Analysis

County, District, and Statewide Trends

Table 3 shows how crash trends for Lake County compare to district and statewide averages from the most recent Caltrans *Crash Data on California State Highways (road miles, travel, crashes, crash rates)* annual reports from 2016-2018.

Table 3. Caltrans Annual Report Trends

2016-2018 Crash Data on California State Highways (road miles, travel, crashes, crash rates)	Average Values (2016-2018)		
	ACC/MVM[1]	F+I/MVM[2]	FATALITIES/100 MVM[3]
Statewide Rural Outside the City	0.69	0.27	1.69
District 1 - Rural Areas	1.16	0.45	3.40
Lake County - Rural Areas	1.14	0.51	2.18

Notes: 1. Accidents per million vehicle miles
2. Fatal or Injury accidents per million vehicle miles
3. Fatalities per 100 million vehicle miles

The data for Lake County is countywide. Overall trends indicate that Lake County has higher than statewide rates for all categories presented. Lake County rates are similar to those for District 1; the Lake County fatality rates are lower. The Caltrans reports indicated the following statewide trends, consistent from 2016-2018:

- Most frequent crash type was 'rear end'
- Most frequent fatal crash type was 'hit object'
- Most frequent primary collision factor was 'speeding'

Crash Data Analysis Methodology

Crash data records contain detailed information for each crash including the type of crash, time of day, lighting conditions, alcohol involvement, and other contributing factors. Analyzing all crashes which occurred over several years helps to identify crash patterns and specific areas which may have safety issues.

Crash data for the most recent five years (2016-2020) for the unincorporated areas of Lake County (not including Lakeport and Clearlake) was obtained from two primary sources, the Statewide Integrated Traffic Records System (SWITRS) and the Transportation Injury Mapping System (TIMS). SWITRS is a web-based database that collects and processes crash data. It includes all crash severities with limited geospatial data. TIMS is a geo-referenced web-based database that includes only serious injury and fatal crashes. The SWITRS data was used to identify overall crash trends, while the TIMS data was primarily used to identify hot spots and location-specific safety concerns given the advanced geospatial information. Location-based data from SWITRS was used as available.

Exhibit 5. Crash data is analyzed for overall trends and to uncover key information for each focus area.
Source: FHWA

The crash data was utilized to identify crash trends and high frequency areas, overall and by focus area. Crash data was analyzed for overall trends and to uncover key information for each focus area. It is important to note that the focus of this report is to identify countermeasures for local roads. The data analysis included state highways for overall trends since it is important to identify these patterns and some countermeasures, such as education campaigns, when applicable county-wide. Some deep-dive analyses for specific areas focus on local roads and exclude state highways as noted.

Overall Crash Data Trends

Figure 5 shows all crashes (2016-2020) in unincorporated Lake County by severity (i.e., fatal, injury, etc.).

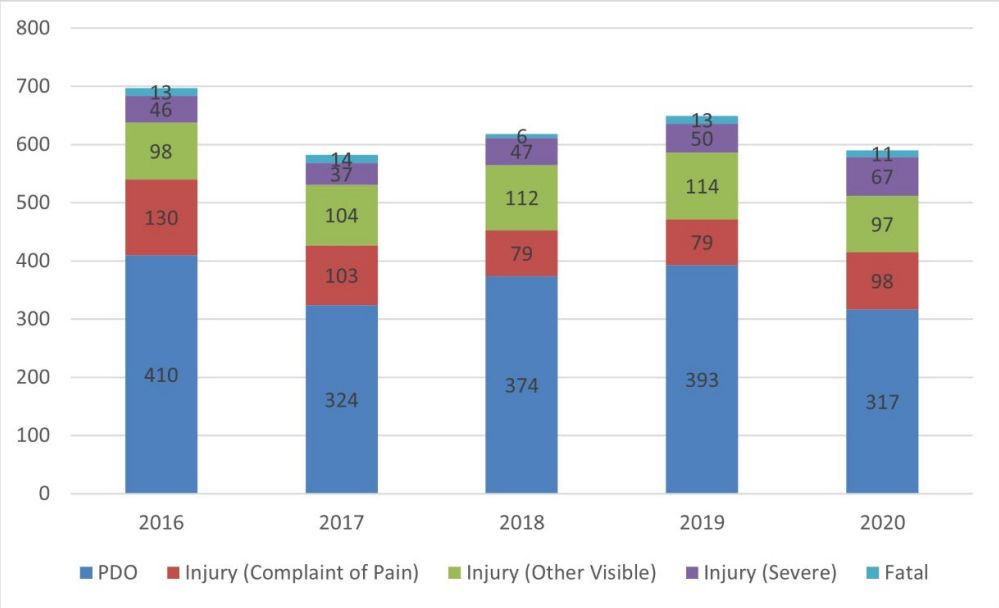

Figure 5. Total Crashes by Year and Severity

A total of 3,136 crashes occurred in unincorporated Lake County between 2016 and 2020. The totals were consistent year to year with the year 2020 showing a slight decrease, potentially attributed to closures and restrictions during Covid-19. Approximately 10 percent (304 crashes) resulted in a severe injury or fatality.

Figures 6 through 8 show the crash data graphically by location of the total crashes by severity, a heatmap, severe injury and fatal crashes. Two-thirds of traffic accidents across Lake County occurred along State Highways, which leads to difficulty identifying safety concerns along County roadways.

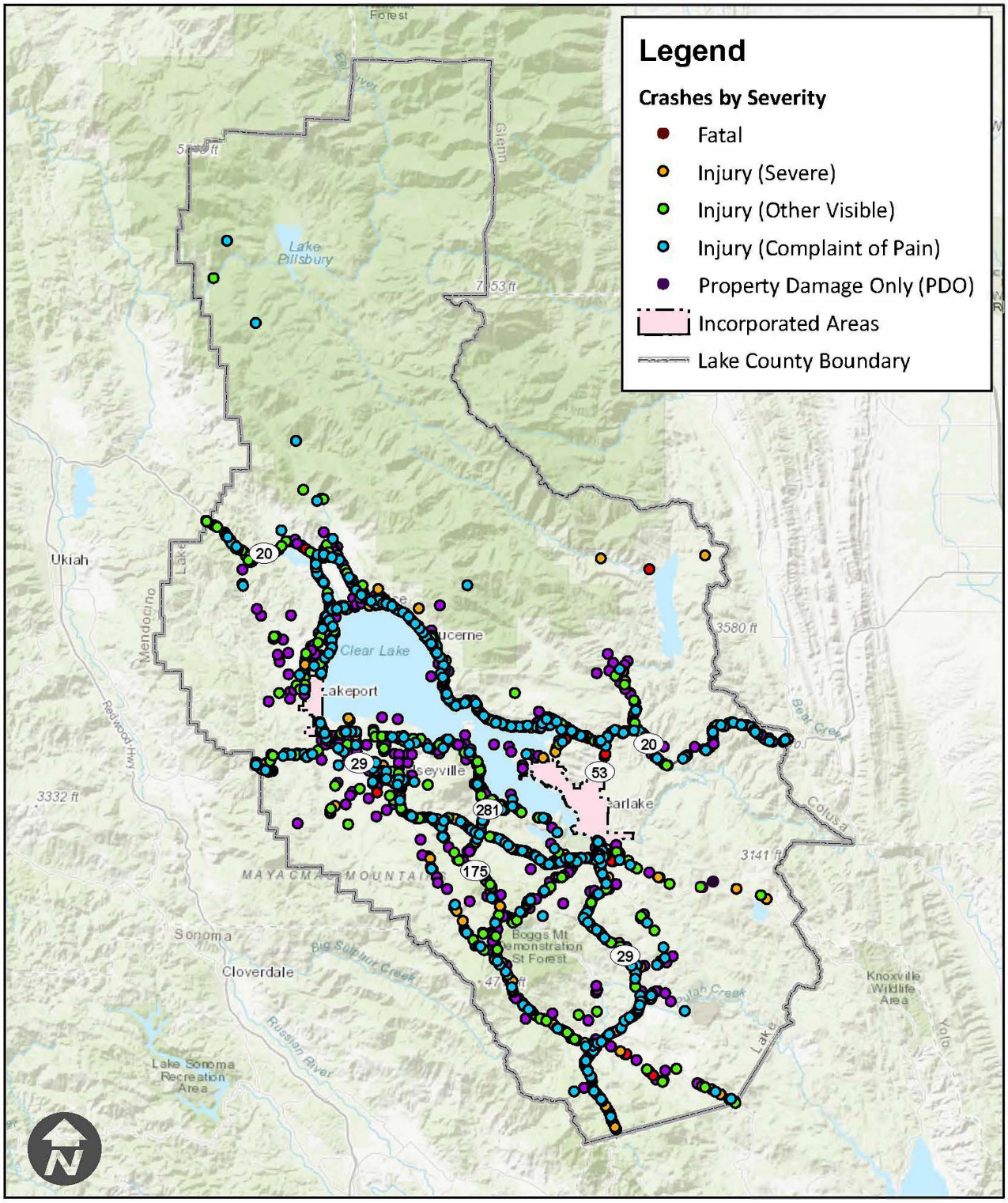

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Figure 6
Lake County
Local Road Safety Plan
Crash Locations by Severity

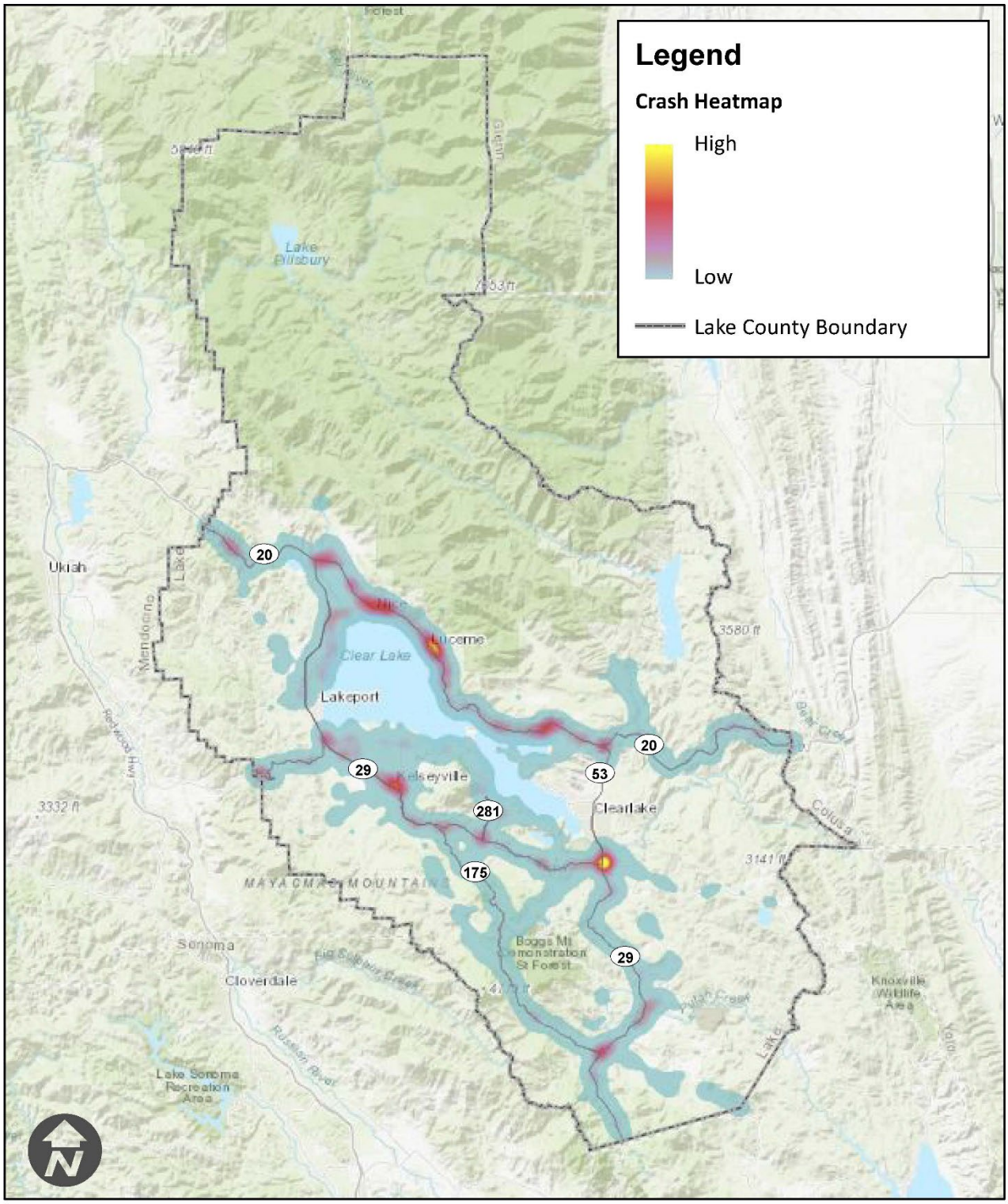

Figure 7
Lake County
Local Road Safety Plan
Crash Heatmap

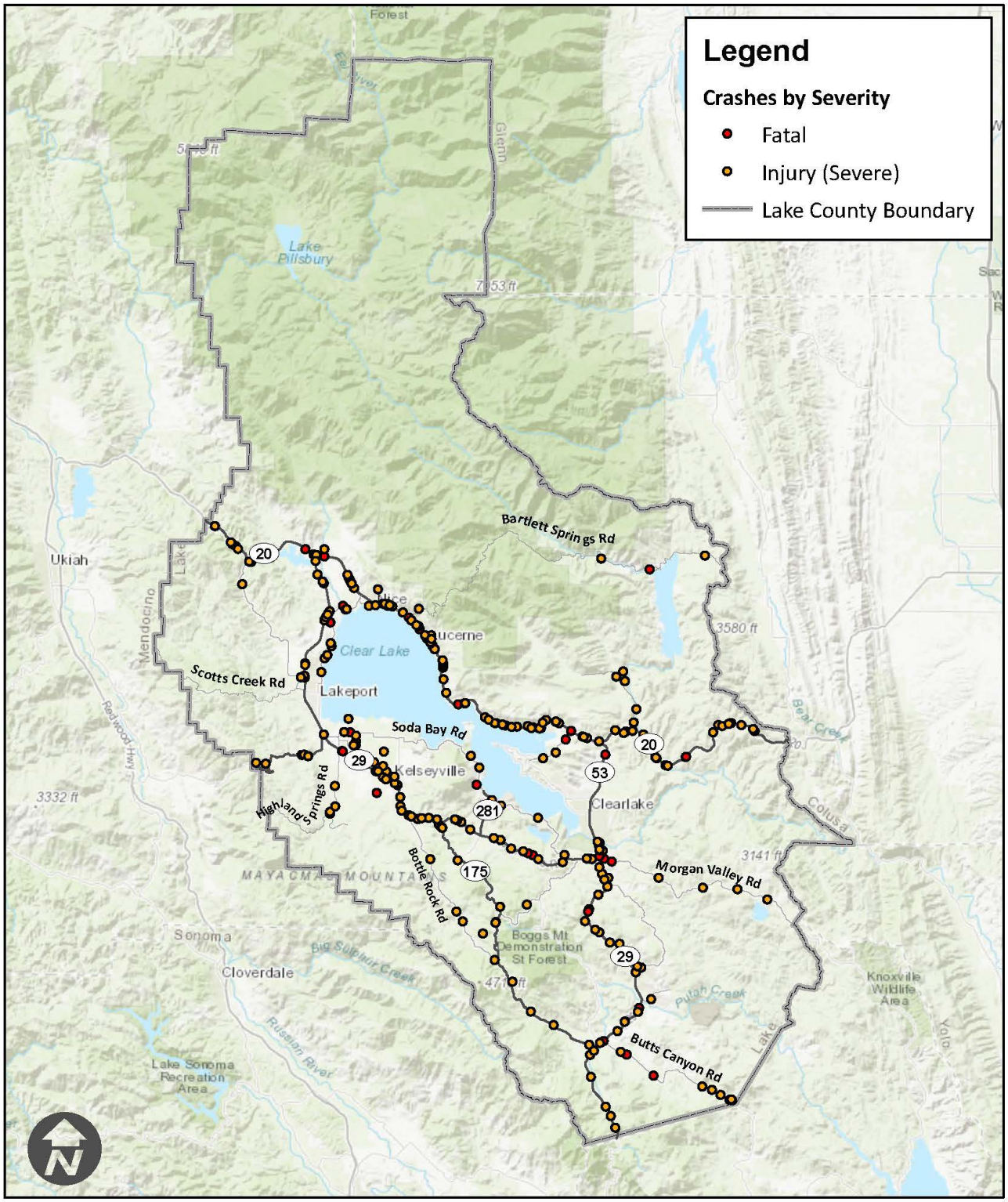

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Figure 8
Lake County
Local Road Safety Plan
Severe Injury and Fatal Crash Locations

The top Primary Collision Factors, or the leading reported factor that contributed to the crash for all crashes are shown in **Figure 9** for all crashes, and **Figure 10** for severe injury and fatal crashes.

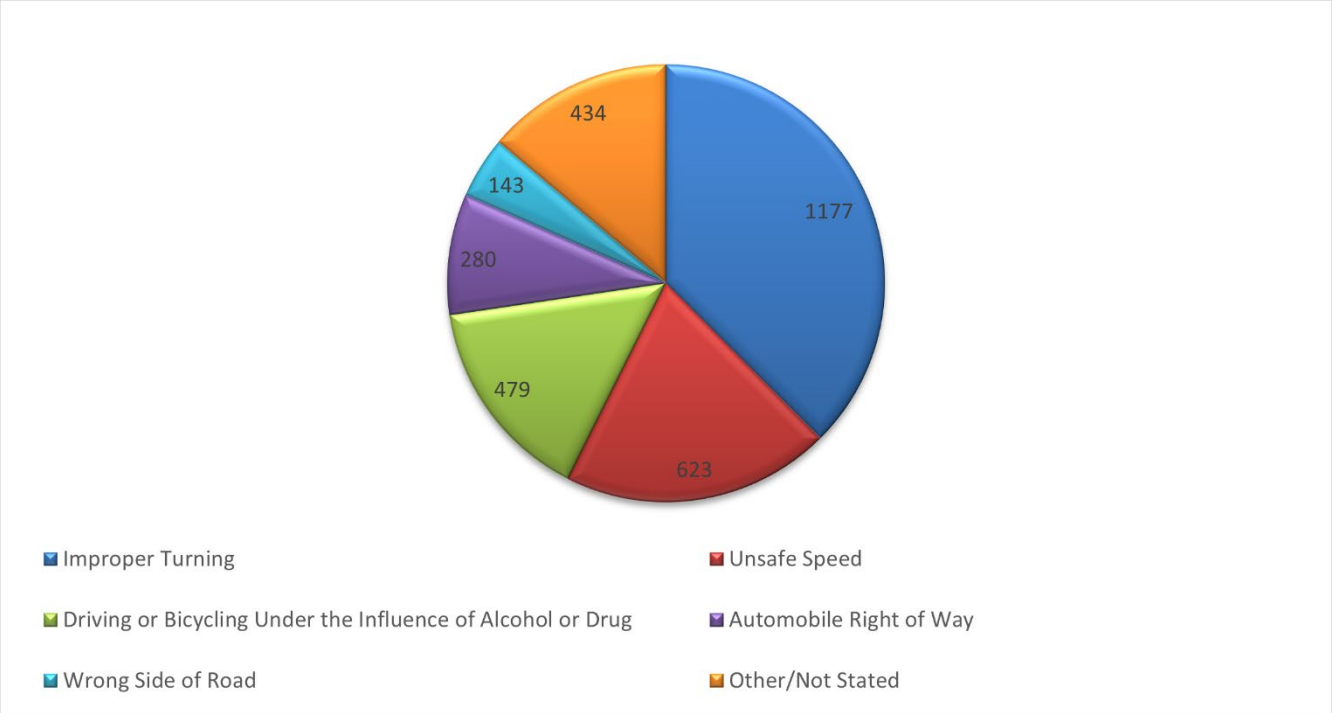


Figure 9. Primary Collision Factors – All Crashes

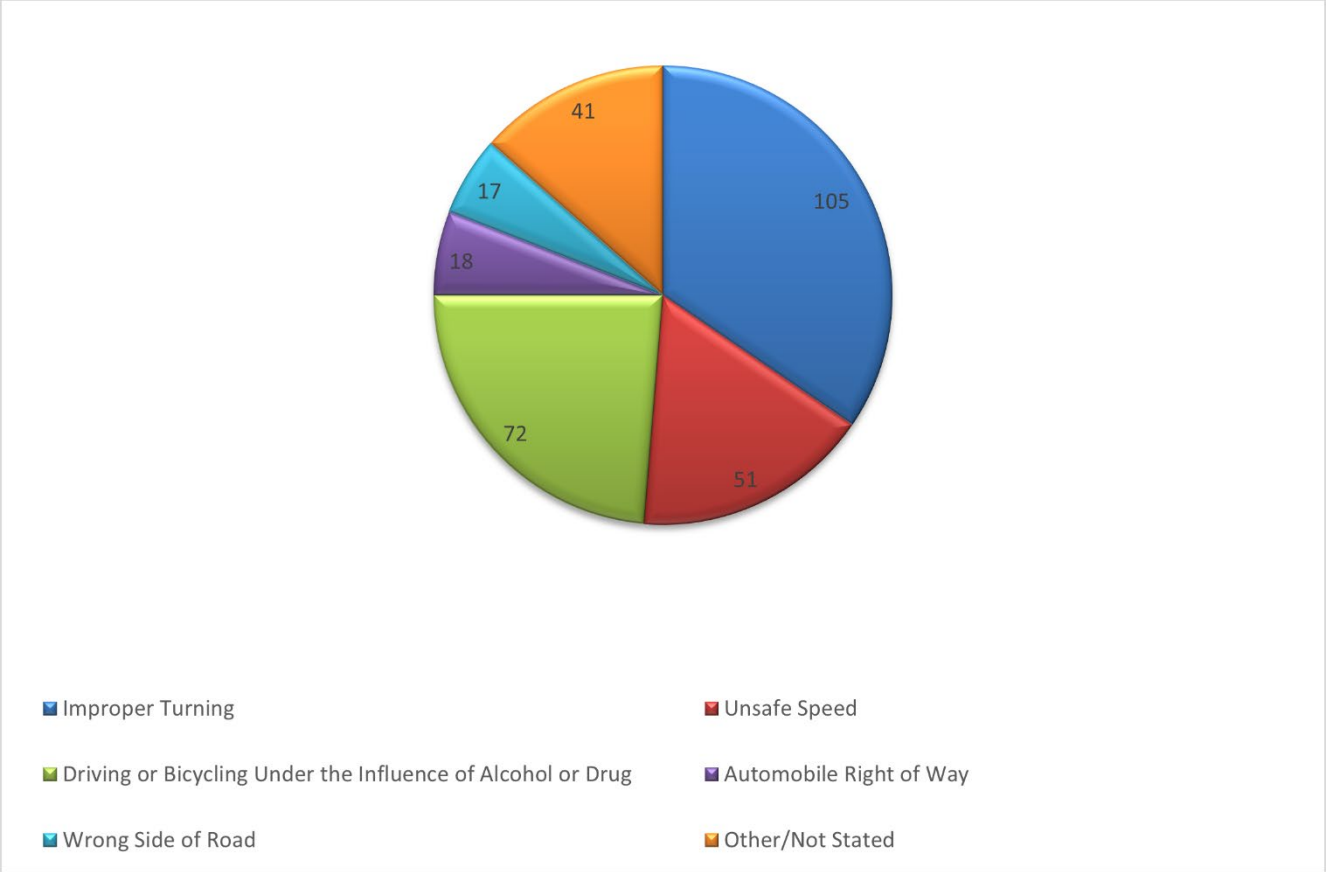


Figure 10. Primary Collision Factors – Severe Injury and Fatal Crashes

As shown in **Figures 9** and **Figure 10**, *improper turning* and *unsafe speed* were top factors for all crashes, whereas *unsafe speed* and *driving under the influence* of alcohol or drugs were top factors for severe injuries and fatal crashes. The Primary Collision Factors were key in developing focus areas.

The crash types are shown in **Figure 11** for all crashes, and **Figure 12** for severe injury and fatal crashes.

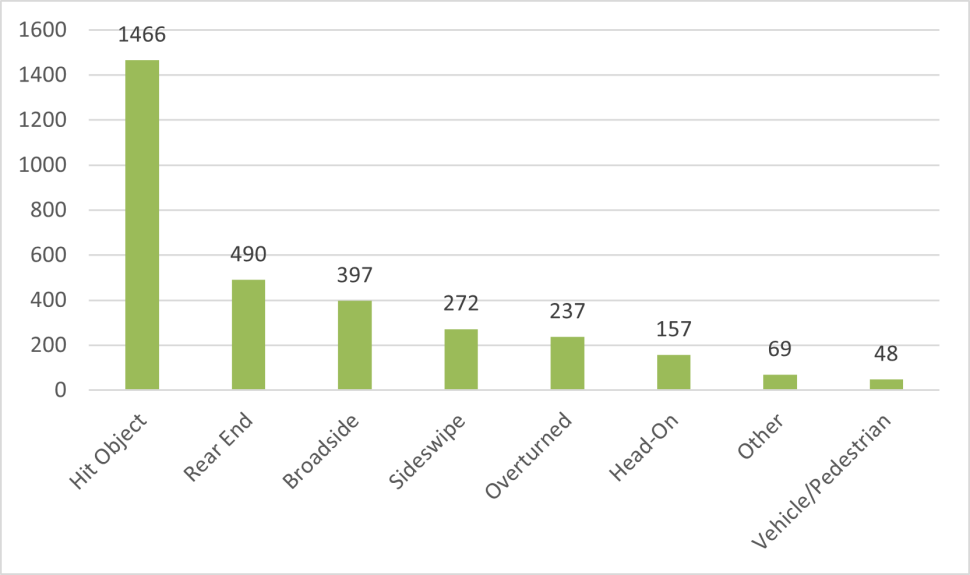


Figure 11. Crash Types – All Crashes

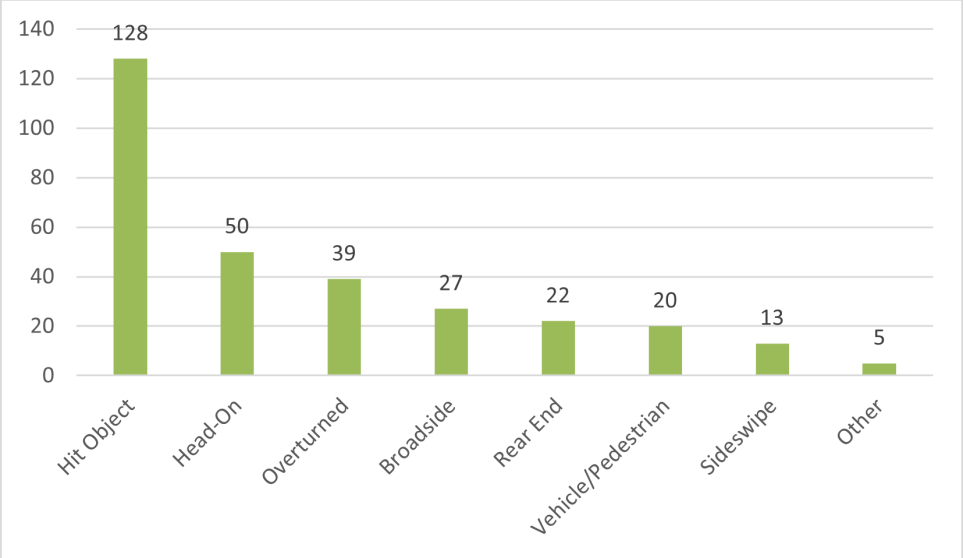


Figure 12. Crash Types – Severe Injury and Fatal

As shown in **Figures 11** through **12**, *hit object* was the most common crash type. *Hit object*, *head-on*, and *overturned* had the most occurrences of severe injury or fatal crashes.

Table 4 shows the breakdown for intersection and roadway crashes, as indicated in the database as intersections 'yes/no'.

Table 4. Intersection and Roadway Crashes

	Intersections	Roadways	Total
Total Crashes	391	2745	3136
Percent of Total Crashes	12%	88%	100%
Total Intersection Severe Injury and Fatal Crashes	18	286	304
Percent of Severe Injury and Fatal	6%	94%	100%

As indicated in **Table 4**, the most crashes were identified as roadway (not intersection) related. This may still include crashes that happened near an intersection.

Focus Area and Countermeasure Development

Focus (or emphasis) areas were identified through the crash data analysis, stakeholder input, and aligned with challenge areas identified in the *California Strategic Highway Safety Plan Report 2020-2024*. Each focus area was analyzed to determine patterns, identify needs, and pinpoint hot spots. Potential countermeasures are provided indicating which "E" of traffic safety the proposed measures fall under – *Engineering, Education, Enforcement, or Emergency Services.*

Exhibit 6. Countermeasures are provided under the emphasis areas.

Source: FWHA

Countermeasures are an action or device designed to negate or offset a crash risk. Developing a program of countermeasures and strategies across the four E's of safety planning (Engineering, Education, Enforcement, and Emergency Services) is critical to ensure that the complex issue of local road safety is being addressed in a holistic manner.

Site evaluations should be conducted to determine engineering countermeasures based on risk factors – elements that the location lacks or could be enhanced to improve safety. Risk factors identify common roadway or intersection characteristics which may contribute to past crashes or increase the risk of future crashes. *The Federal Highway Administration (FHWA) Systemic Safety Project Selection Tool*[3] includes a list of common risk factors for intersections and roadway segments. Site evaluations were conducted to identify specific risk factors in the roadway network that may be contributing to crash trends noted in the data analysis.

Exhibit 7. Countermeasures and Implementation are based on the SMART model.

[3] Source: https://safety.fhwa.dot.gov/systemic/fhwasa13019/element1.cfm#el12

Engineering countermeasures can be applied at site-specific locations or systemically across Lake County. HSIP eligible countermeasures are provided in the *Local Roadway Safety: A Manual for California's Local Road Owners (April 2020)* and as part of the *HSIP Analyzer Manual for Benefit Cost Ratio (BCR) Applications*. A table of the countermeasures is included in **Appendix C**. The HSIP number is represented by "S" for signalized intersections, "NS" for unsignalized intersections, or "R" for roadway followed by corresponding number and description.

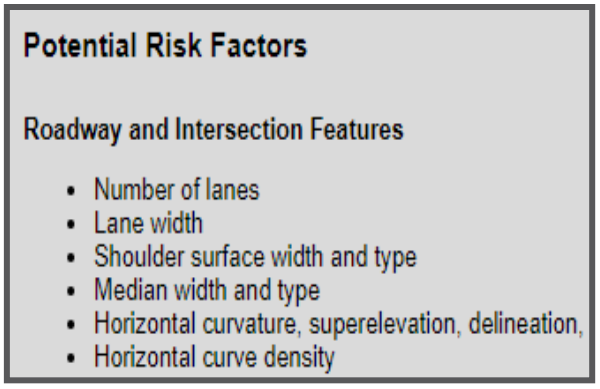


Exhibit 8. Subset of Roadway and Intersection Risk Factors
Source: FHWA Systemic Safety Project Selection Tool

The tables shown in **Appendix C** the countermeasure name, type, applicable crash type(s), crash reduction factors (CRFs), federal funding eligibility, and opportunity for systemic implementation, divided into three groups: signalized intersections, non-signalized intersections, and roadway segments. This data was used as a guide to develop improvements that will provide potential for funding opportunity. The table is not an exhaustive list of safety improvements. Other non-HSIP eligible improvements are also considered and recommended as applicable. Countermeasures may be applied systemically or at specific sites.

Systemic Applications

Systemic countermeasures are applied to multiple locations based on crash data and similar geometric features. This approach can also be used proactively to apply countermeasures at locations without a significant crash history, but high-risk factors. Risk factors identify common roadway or intersection characteristics that may contribute to past crashes or increase the risk of future crashes. The HSIP countermeasure table in **Appendix C** indicates if the countermeasure is a "Low" to "Very High" opportunity for systemic implementation. Systemic improvements may be incorporated into regular maintenance activities as budgets allow or implemented through HSIP grant funds.

Site Specific Applications

Potential projects can be developed for high crash frequency site-specific locations if the risk factors and recommended improvements do not fit into a systemic application.

Focus Areas

Each focus area listed below is detailed to show the associated crash patterns and potential countermeasures.

- Distracted Driving
- Impaired Driving
- Speeding
- Intersection Safety
- Roadway/ Intersection Lighting
- Pedestrian/ Bicycle Safety
- Lane Departures
- Motorcycle Safety
- Senior/Aging Population Driving

Exhibit 9. Addressing focus areas can involve the implementation of numerous strategies.
Source: FHWA

Distracted Driving

Analysis

Distracted driving was ranked as the highest priority in the public outreach**.** Crash data typically does not show "distracted driving" as a PCF; however, many crashes are at least partially a result of distracted driving. Over the past decade, the number of potential distractions for drivers has increased dramatically from cellphone usage to on-board touch screen displays within vehicles. This is the most common type of distraction and has resulted in an increase in distracted driving across the nation. The newest crash records include an attribute for cellphone usage and this data attribute should be utilized to evaluate distracted driving in future versions of this LRSP.

Potential Countermeasures

- Engineering
  - Any countermeasures that increase visibility and generally reduce crashes overall will have a positive benefit for distracted driving; these are detailed in subsequent focus areas.
- Education
  - Distracted Driving Public Outreach Campaign: Local distracted driving messaging campaign using a variety of media outlets.
- Enforcement
  - High-Visibility Cell Phone/Text Messaging Enforcement Campaign: Conduct high visibility enforcement program, contingent on staff resources, and issue citations as appropriate. High visibility programs incorporate several strategies designed to increase enforcement and create public awareness.

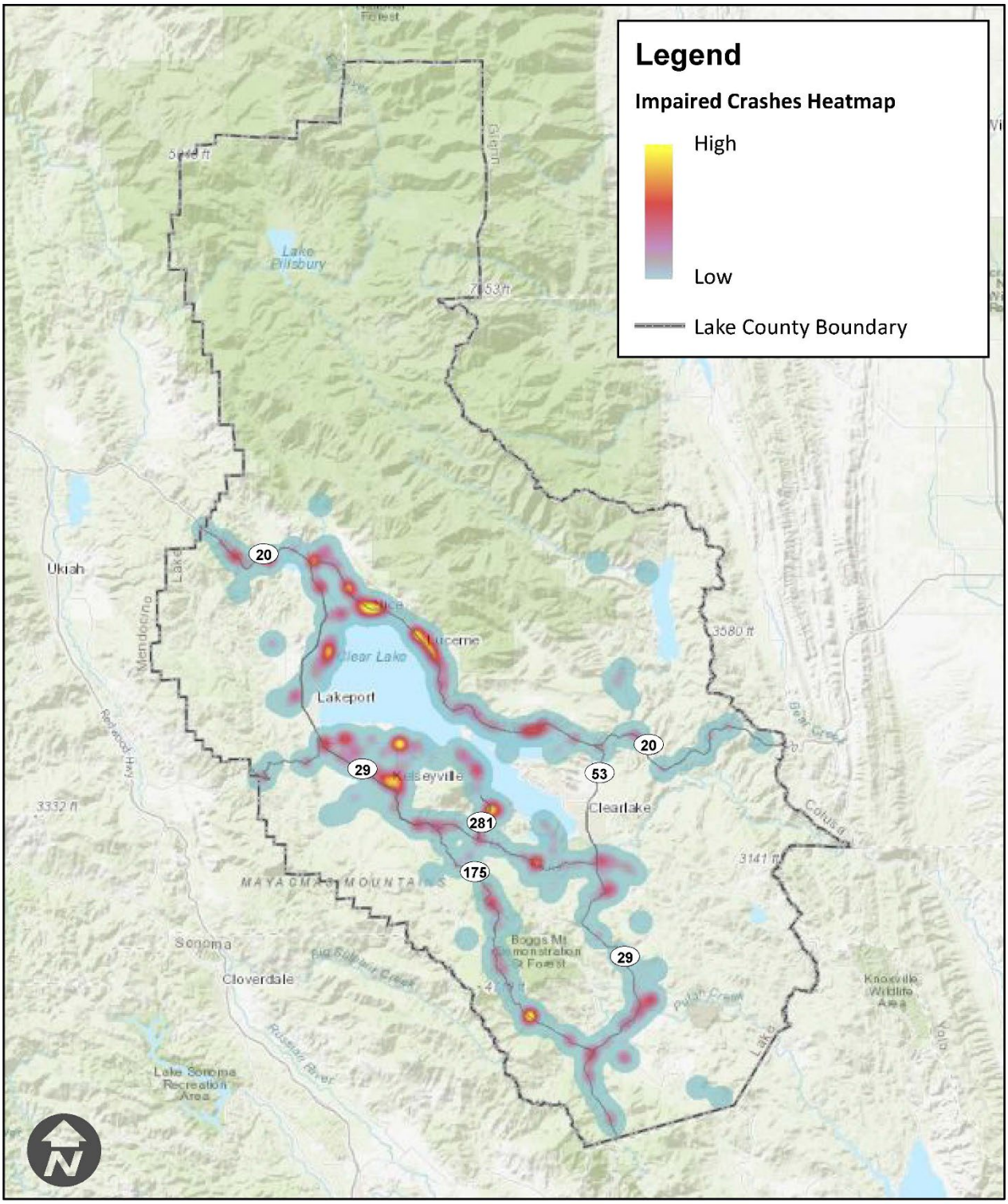
Impaired Driving

Analysis

Impaired driving was ranked as the second highest priority in the public outreach. The data analysis indicated that:

- Impairment was the second highest Primary Collision Factor in severe injury and fatal crashes, and the third highest Primary Collision Factor in all crashes.
- Eighteen (18) percent of all crashes and 30 percent of severe injury and fatal crashes involved impairment.
- Crashes involving impairment were three times more likely than non-impaired crashes to result in a severe injury and fatality.
- Most impaired crashes happen on Friday and Saturday (approximately 20 percent each day) compared to 12 percent (on average) for other days.

Figure 13 shows a heatmap of impaired crashes.



HEADWAY TRANSPORTATION

Figure 13
Lake County
Local Road Safety Plan
Impaired Crashes Heatmap

As shown in the **Figure 13**, concentrated areas of impaired crashes are highest along State Highways 29, 20, and 175. County maintained roads with concentrated areas of impaired crashes include Soda Bay Road, the Nice-Lucerne Cutoff, Lakeshore Boulevard in North Lakeport, and Butts Canyon Road near Middletown.

Potential Countermeasures

- Enforcement
  - Sober Ride Home: Transportation Network Companies such as Uber and Lyft, as well as traditional taxi companies, may work with the county to provide discounted or free rides home to intoxicated individuals to avoid driving while under the influence of drugs or alcohol. This program may first be focused on specific time periods/dates such as Saint Patrick's Day, New Year's Eve, or Halloween and expanded based on funding and need in the future.
  - Responsible Beverage Service: Following the passage of Assembly Bill 82, any alcohol server and their manager will be required to have a valid Responsible Beverage Service (RBS) certification from an Alcoholic Beverage Control (ABC) accredited RBS training provider and pass an online ABC administered RBS exam within 60 calendar days from the first date of employment as of July 1, 2022[4]. The county may work with the local chamber of commerce and local alcohol server training providers to promote face-to-face training programs as the standard for local businesses, as these programs have been shown to be effective.

RBS
Responsible
Beverage
Service

Exhibit 10. RBS certification programs have been shown to be effective.

  - Passive Alcohol Sensors: Equip law enforcement officers with Passive Alcohol Sensors to increase efficiency of Alcohol Checkpoints and normal traffic stops.
  - Publicized Sobriety Checkpoints: Highly publicized sobriety checkpoints conducted regularly to increase perceived risk of arrest for impaired driving.
  - High-Visibility Saturation Patrols: Focused patrols around specific areas where impaired-driving crashes are common as part of an on-going saturation program.
  - Enforcement efforts should be focused on weekends.
- Education
  - Drunk & Impaired Driving Awareness Campaign: Local impaired driving messaging campaign using a variety of media outlets.

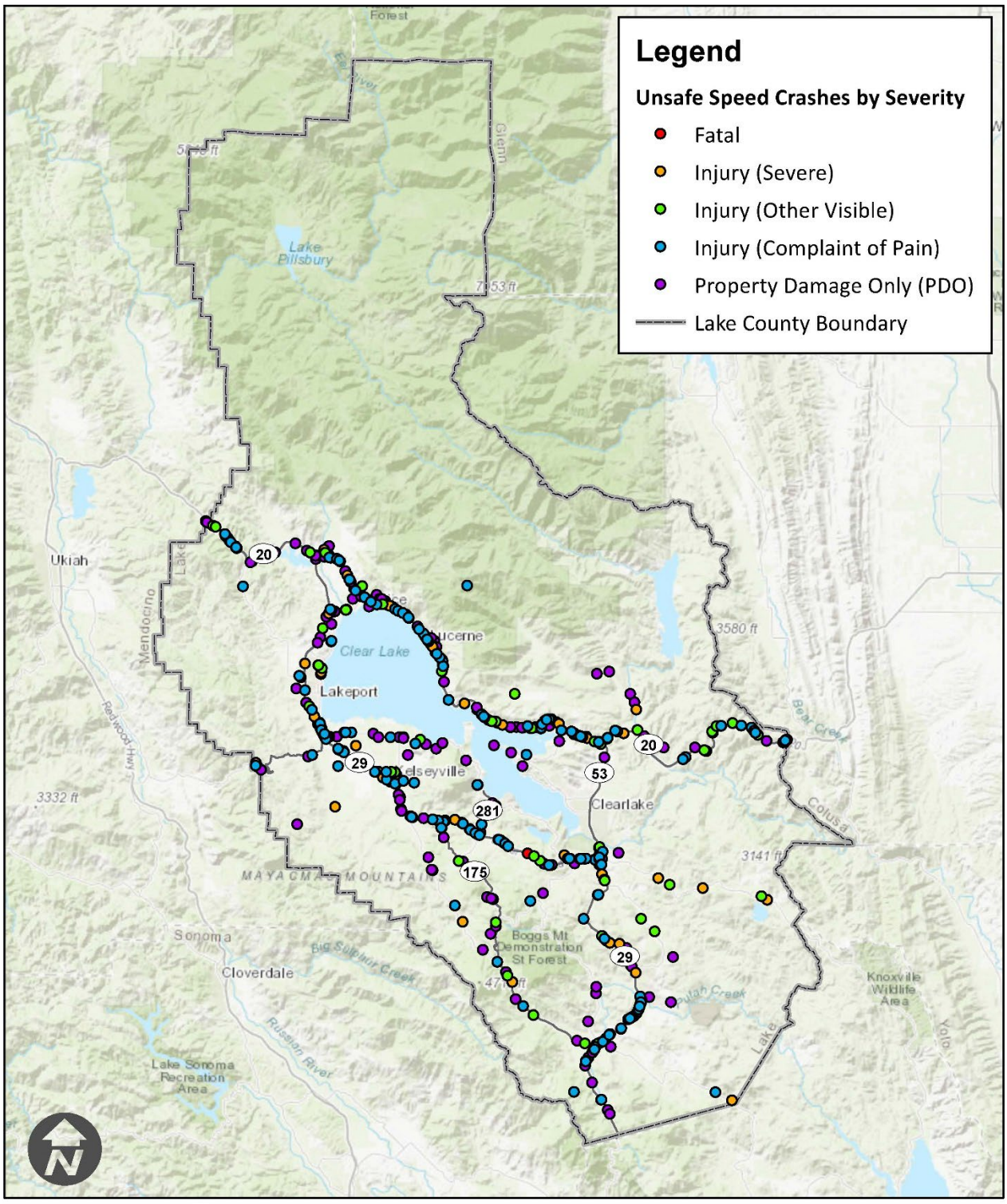
[4] https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa09028/resources/countermeasures.pdf

Speeding

Analysis

Speeding was ranked as the third highest priority in the public outreach and was noted in several open response questions in the survey. Furthermore, input from various stakeholders has indicated that speeding is a high priority area of concern throughout the county, particularly neighborhood streets, near schools, and low speed streets serving commercial areas with high volumes of pedestrians. The data analysis indicated that 20 percent of the crashes had 'unsafe speed' listed as the Primary Collision Factor; the locations by severity are shown in **Figure 14**.

Exhibit 11. Speed Limit sign in Kelseyville Riviera Community



HEADWAY TRANSPORTATION

Figure 14
Lake County
Local Road Safety Plan
Unsafe Speed Crash Locations by Severity

As shown in **Figure 14**, concentrated areas of speeding-related crashes are noted along all State Highways, Soda Bay Road, Morgan Valley Road, and Bottle Rock Road in Lake County.

Potential Countermeasures

- Engineering
  - Speed evaluations should be conducted to determine areas affected by speeding, and speed limits should be posted.
  - Several traffic calming measures can be applied to reduce speeds including (but not limited to) portable speed trailers, radar/dynamic speed feedback signs, later shifts, chicanes, speed humps, speed tables, median islands, and curb extensions. Each measure has advantages, disadvantages, and recommended applications. The Federal Highway Administration (FHWA) provides thorough documentation of traffic calming measures, applications, effects, and other useful information through the traffic calming ePrimer[5]. In addition, many municipalities and agencies have developed guidelines for traffic calming.
  - Speed humps and speed tables are recommended on residential and local roadways as identified through traffic calming evaluations. Per County policy, speed humps and tables are limited to roadways posted at 25 mph.
  - Road diets and roundabouts can be potential solutions if an engineering study justifies the need.
  - **Table 5** shows the HSIP countermeasures recommended to address speeding in Lake County.

Table 5. Potential Speeding Engineering Countermeasures

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
R26	Operation/ Warning	Install dynamic/variable speed warning signs	All	30%	10	90%	High

Source: *HSIP Analyzer Manual for BCR Applications*

- Enforcement
  - Speed Enforcement: Reduce speeding issues along select corridors through regular and targeted and/or automated enforcement methods.
- Education
  - Speed Kills Campaign: Conduct public outreach campaign about the importance of driving the speed limit and the impact just 5 mph can have on the severity of a crash.

[5] Source: https://safety.fhwa.dot.gov/speedmgt/traffic_calm.cfm#eprimer

Intersection Safety

Analysis

Intersection safety was ranked as the fourth highest priority in the public outreach. Intersection crashes account for 12 percent of the total crashes, and 6 percent of the severe injury and fatal crashes. **Figure 15** shows the intersection crashes type.

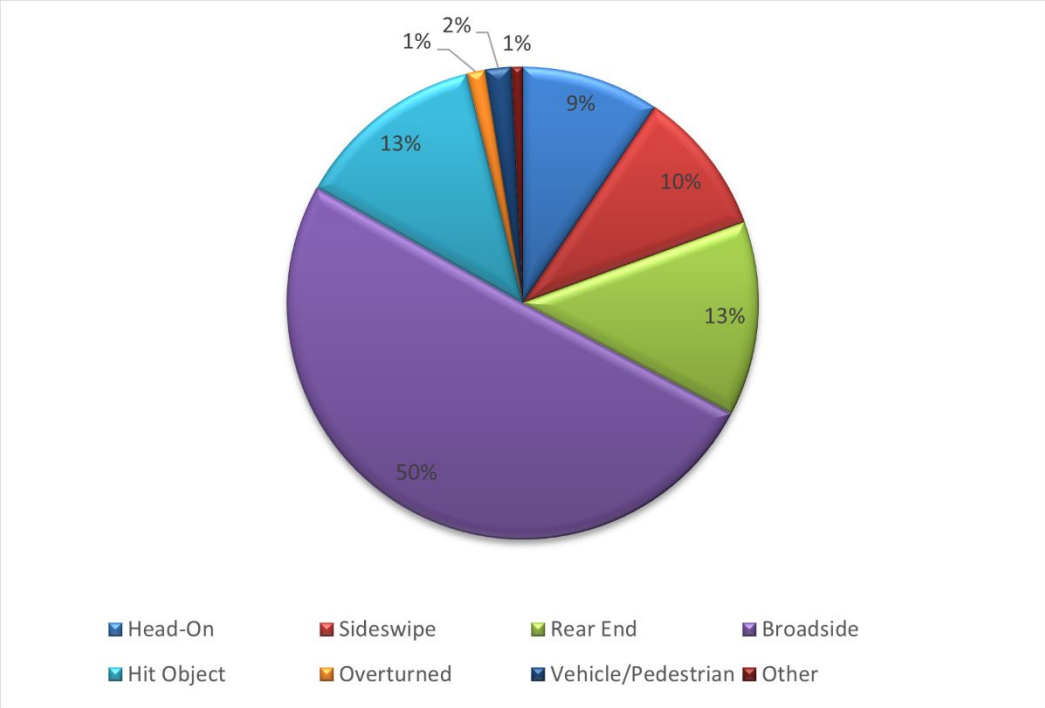
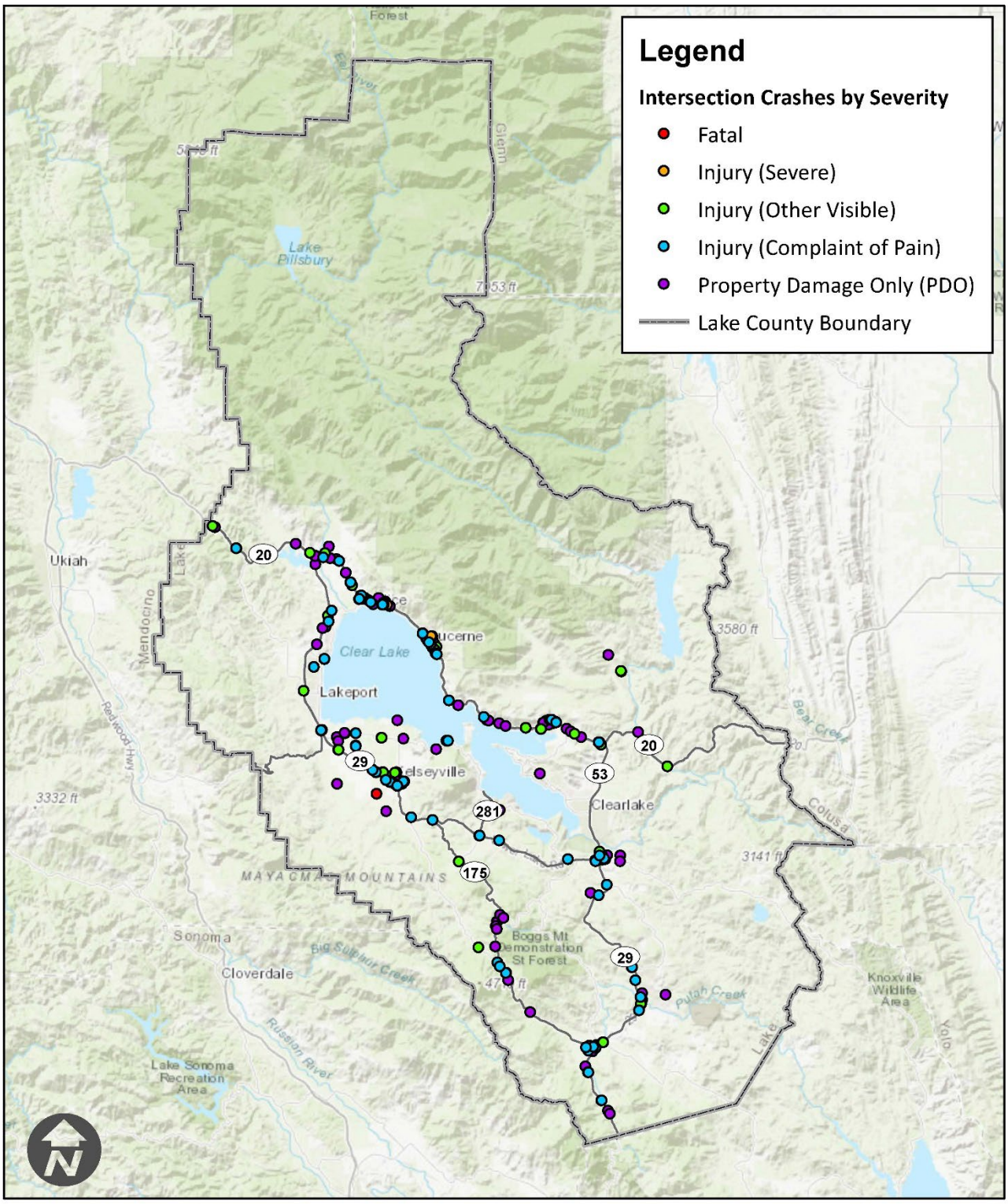


Figure 15. Intersection Crashes by Type

As shown in **Figure 15**, the most common crash type at intersections is *broadside*. **Figures 16 and 17** show the location of intersection crashes by severity and a heatmap.



HEADWAY TRANSPORTATION

Figure 16
Lake County
Local Road Safety Plan
Intersection Crash Locations by Severity

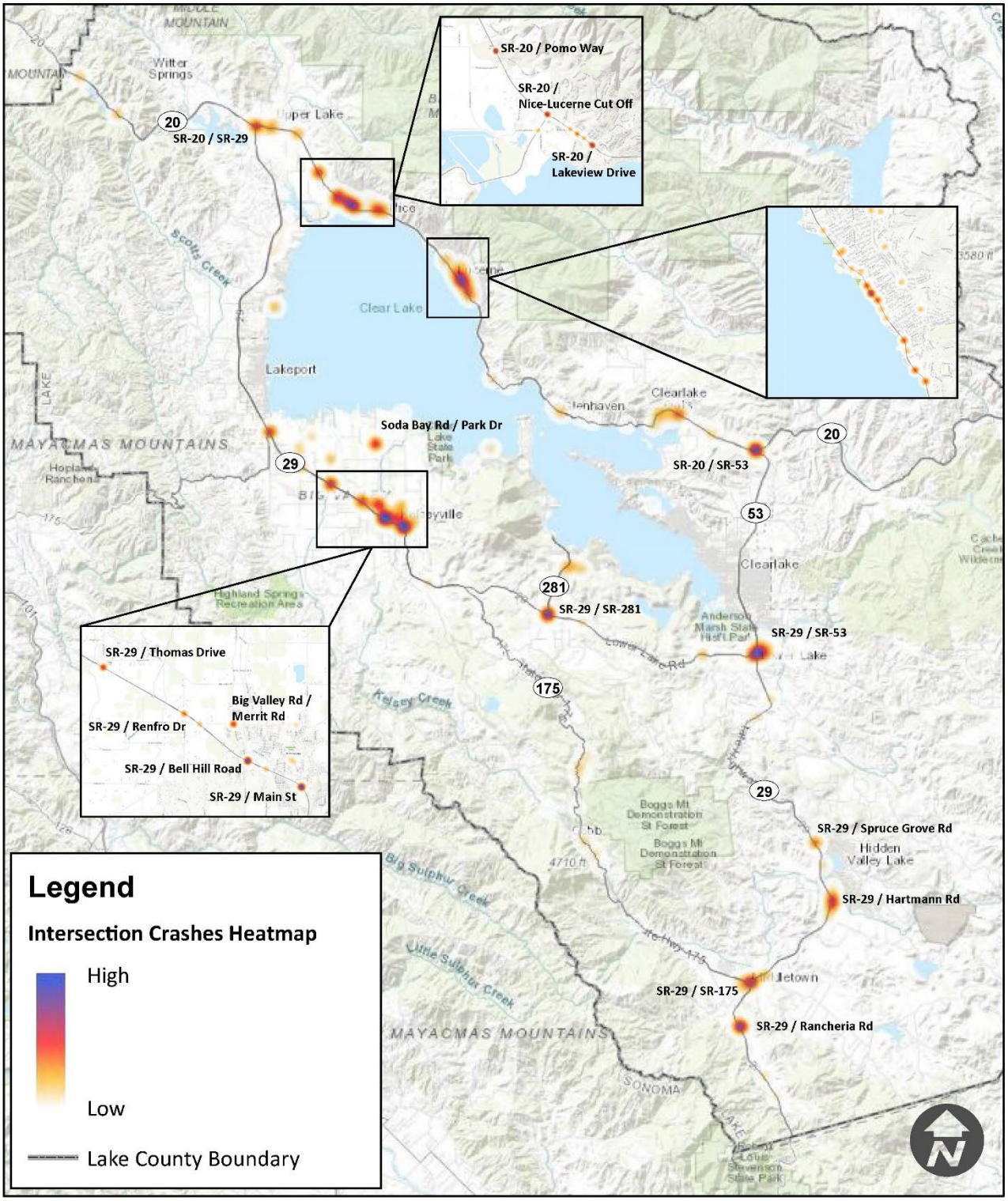


Figure 17
Lake County
Local Road Safety Plan
Intersection Crash Heatmap

Table 6 details intersections with at least one local roadway with the highest crash impacts (considering the severity and number of crashes). It is noted that the intersections of the major state highways had higher instances of crashes as expected, given the higher vehicular use.

Table 6. Top Crash Intersections

Intersection	Fatal	Injury (Severe)	Injury (Other Visible)	Injury (Complaint of Pain)	PDO
SR-29/MAIN STREET	1	1	3	2	4
SR-20/POMO WAY	1			2	3
GOLD DUST DRIVE/WILSON ROAD	1				
SR-29/BELL HILL RD		2	4	3	2
SR-20/HOWARD AVE		2			1
SR-29/ THOMAS DRIVE		1	1	2	4
SODA BAY ROAD/PARK DRIVE/CALIFORNIA PACKING ROAD			5		2
LAKESHORE BLVD/PARK WAY		1	1	1	
SR-29/RANCHERIA ROAD, 2 DUI			3	2	4
SR-20/ISLAND DRIVE		1	1		
SR-29/MERRIT ROAD		1		1	2
SR-20/9TH ST		1		1	
COUNTRY CLUB DR/ROBIN HOOD WAY		1			
SR-175/PARK AVENUE		1			
SR-20/SARATOGA SPRINGS		1			
SR-29/LIVE OAK DRIVE.		1			
SR-20/LAKEVIEW DRIVE/Collier Ave			3	1	2
SR-20/MENDENHALL AVE			2	1	1

Note: Highlighted locations indicate that a pedestrian-related crash occurred at this location.

Other intersections identified by stakeholders as potentials for improvements include:

- Bottle Rock Road/ SH-175/ SH-29
- Merritt Road/ N. Main Street/ Big Valley Road
- Gunn Street/ Gaddy Lane/ Loasa Road
- Nice-Lucerne Cuttoff / Lakeshore Blvd.
- Keyes Road/ SH 20
- Bell Avenue/ SH 29
- Ellis Ranch Driveway/ SH-29
- Soda Bay Road/ Fairway Drive
- SH 175/ SH 29/ Soda Bay Road
- Rainbow Road/ Lakeshore Boulevard
- SH 29/ SH 281/ Red Hill Road

Potential Countermeasures

- Engineering
  - **Table 7** shows potential HSIP countermeasures for intersections in Lake County.

Table 7. Potential Intersection Engineering Countermeasures

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
NS06	Operation / Warning	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	All	15%	10	90%	Very High
NS07	Operation / Warning	Upgrade intersection pavement markings	All	25%	10	90%	Very High
NS08	Operation / Warning	Install Flashing Beacons at Stop-Controlled Intersections	All	15%	10	90%	High
NS09	Operation / Warning	Install flashing beacons as advance warning	All	30%	10	90%	High
NS10	Operation / Warning	Install transverse rumble strips on approaches	All	20%	10	90%	High
NS11	Operation/ Warning	Improve sight distance to intersection (Clear Sight Triangles)	All	20%	10	90%	High

Source: HSIP Analyzer Manual for BCR Applications

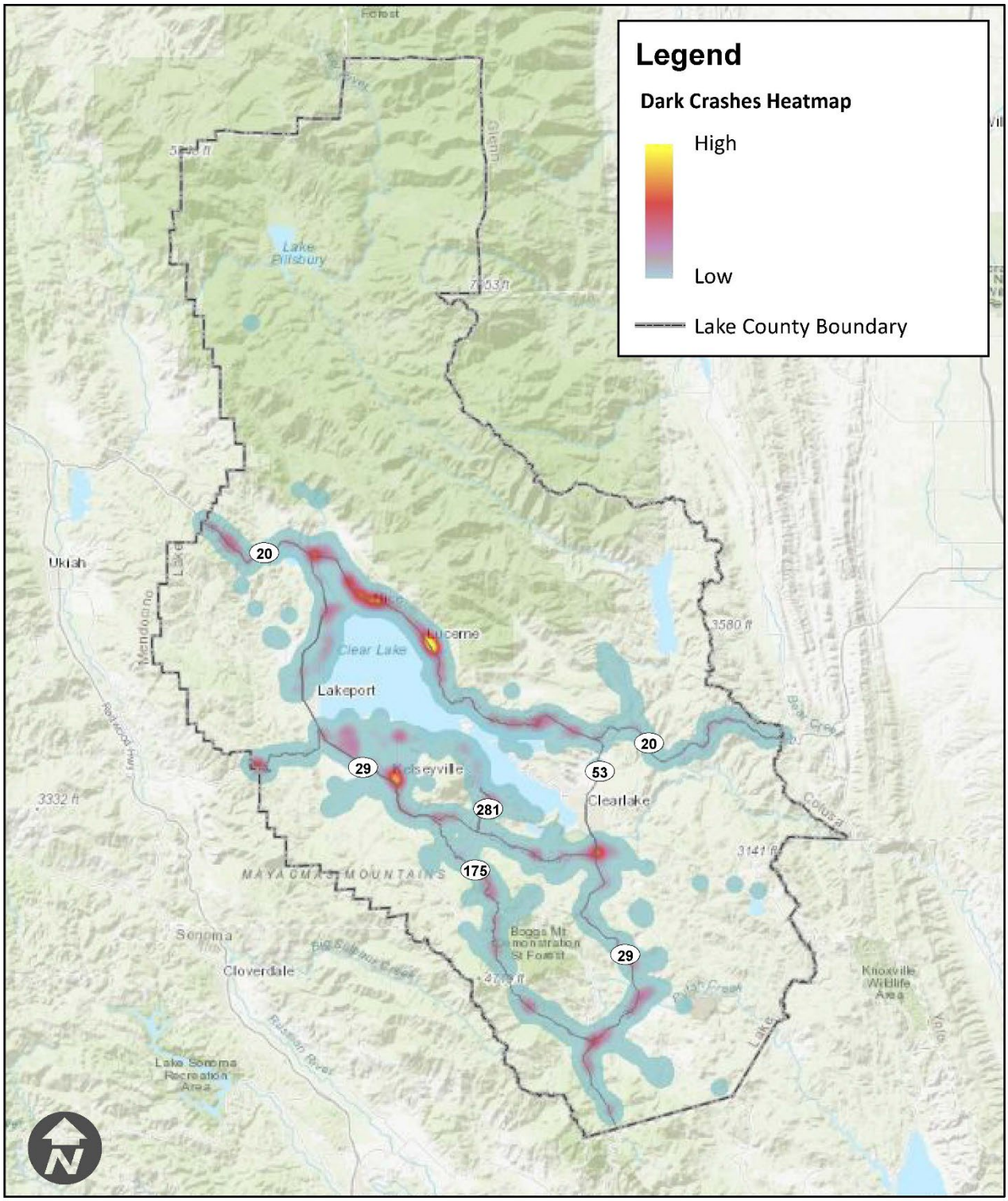
Roadway/Intersection Lighting

Analysis

Lighting was ranked as the fifth highest priority in the public outreach. The data analysis indicated that:

- 'Dark Conditions – No Streetlight' crashes account for 25 percent of the total crashes, and 28 percent of the severe injury and fatal crashes.
- The most common crash type associated with dark conditions was 'hit object' (65 percent), and the majority were on roadways as opposed to intersections (95 percent).

Figure 18 shows a heatmap of the Dark Conditions crashes.



HEADWAY TRANSPORTATION

Figure 18
Lake County
Local Road Safety Plan
Dark Conditions Crash Heatmap

Potential Countermeasures

- Engineering
  - Accident data alone does not indicate the needed for a lighting project. An analysis should be conducted countywide to determine areas of insufficient lighting. Notation of 'Dark Conditions' on the crash report does not confirm that lighting conditions contributed to the crash. **Table 8** shows potential HSIP countermeasures related to dark conditions crashes.

Table 8. Potential Lighting Engineering Countermeasures

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
S01	Lighting	Add intersection lighting	Night	40%	20	90%	Medium
NS01	Lighting	Add intersection lighting	Night	40%	20	90%	Medium
R01	Lighting	Add segment lighting	Night	35%	20	90%	Medium
R27	Operation/ Warning	Install delineators, reflectors and/or object markers	All	15%	10	90%	Very High
R28	Operation / Warning	Install edge-lines and centerlines	All	25%	10	90%	Very High

Source: HSIP Analyzer Manual for BCR Applications

Pedestrian and Bicycle Safety

Analysis

Pedestrian and bicycle safety was ranked as the sixth highest priority in the public outreach and was referenced in several open-ended survey responses. It is noted that complete street efforts are underway in Lake County. Complete streets are designed to support safe mobility for all roadway users and often include accommodations for bicyclists and pedestrians. Complete streets projects are being considered on Rainbow Road, Howard Avenue, and Lakeshore Drive.

Exhibit 12. Pedestrian crosswalk near Acorn Street

The crash data analysis indicated that:

- A total of 79 pedestrian and bicyclist crashes occurred. Eleven (11) were fatal and 18 were severe injury, as shown in **Figure 19.**

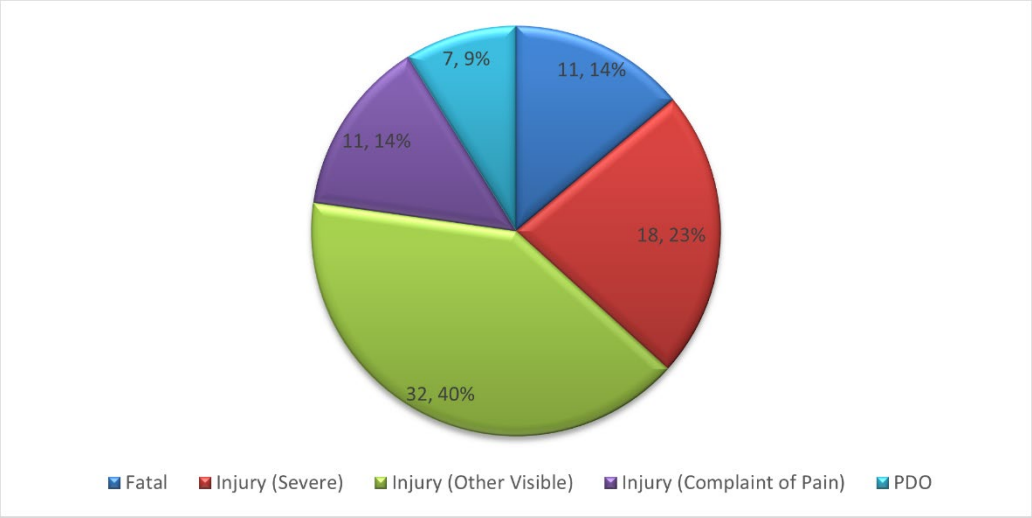


Figure 19. Pedestrian/Bicycle Crashes by Severity

- Crashes involving a bicyclist or pedestrian account for three percent of the overall crashes, and 10 percent of the severe injury and fatal crashes.
- 86 percent occurred on roadways; 14 percent at intersections
- Pedestrian and Bicycle involved crashes are three times more likely to be serious or fatal compared to overall crash trends; 37 percent of pedestrian and bicycle crashes resulted in a severe injury or fatality.
- Pedestrian crashes were more common in roadways, as shown in **Figure 20**.

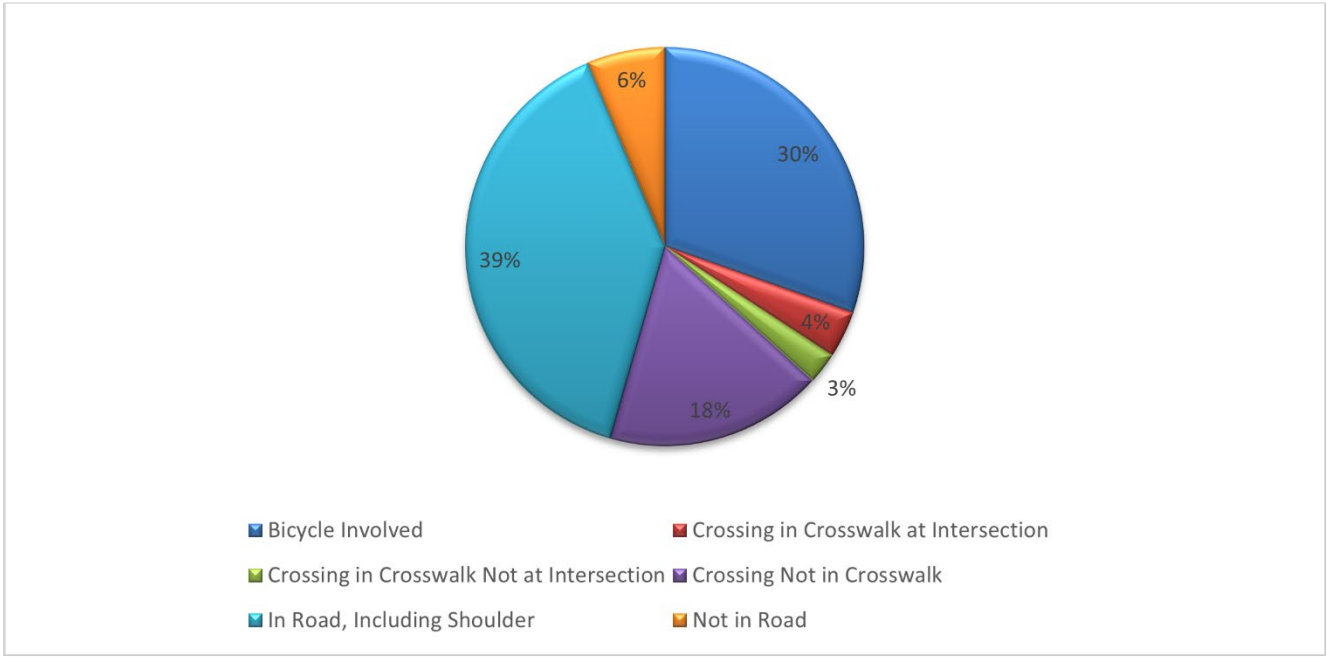


Figure 20. Pedestrian/Bicycle Crashes by Action

- Pedestrian crashes with injuries (fatal, severe, or visible injury) on roadways are shown in **Table 9**.

Table 9. Pedestrian Injury Crashes on Roadways

Primary Road	Secondary Road	Severity	Pedestrian Action	Pedestrian/ Bicycle Facilities
Acorn St	SR-20	Injury (Other Visible)	In Road, Including Shoulder	Near a marked crosswalk
Adobe Creek Rd	Wight Way	Injury (Other Visible)	In Road, Including Shoulder	None
California St	Clark Dr	Injury (Severe)	In Road, Including Shoulder	None
Fairway Dr	Bannock Ct	Injury (Other Visible)	In Road, Including Shoulder	None
Keys Blvd	Marina Village	Injury (Severe)	In Road, Including Shoulder	Near a marked crosswalk
Lake St	Jesse St	Injury (Other Visible)	Crossing not in Crosswalk	In a school zone near a crosswalk
Main St	Adams St	Fatal	In Road, Including Shoulder	Near a marked crosswalk
Soda Bay Rd	Mission Rancheria Rd	Fatal	In Road, Including Shoulder	None
SR-20	Levy Ave	Fatal	Crossing not in Crosswalk	Near a marked crosswalk
SR-20	Main St	Fatal	Crossing in Crosswalk not at intersection	In a marked crosswalk
SR-20	Pomo Way	Fatal	In Road, Including Shoulder	None
SR-20	Hudson Ave	Fatal	Crossing not in Crosswalk	Near a marked crosswalk
SR-20	Second Ave	Injury (Severe)	Crossing not in Crosswalk	Near marked crosswalks both sides
SR-20	Keys Blvd	Injury (Severe)	In Road, Including Shoulder	No adjacent crosswalks; sidewalks one side

Table 9. Pedestrian Crashes on Roadways (continued)

Primary Road	Secondary Road	Severity	Pedestrian Action	Pedestrian/ Bicycle Facilities
SR-20	Keeling Ave	Injury (Severe)	Crossing in Crosswalk at Intersection	In a marked crosswalk
SR-20	Foothill Blvd	Injury (Severe)	In Road, Including Shoulder	Near a marked crosswalk
SR-20	Grove St	Injury (Other Visible)	Crossing not in Crosswalk	None
SR-20	Government St	Injury (Other Visible)	Crossing not in Crosswalk	Near a marked crosswalk (~350')
SR-20	Carson St	Injury (Other Visible)	Crossing not in Crosswalk	None
SR-20	Colusa St	Injury (Other Visible)	In Road, Including Shoulder	None
SR-20	7th Ave	Injury (Other Visible)	In Road, Including Shoulder	Near a marked crosswalk (~350')
SR-20	Mendenhall Ave	Injury (Other Visible)	Crossing not in Crosswalk	Near a marked crosswalk (~350')
SR-29	Highland Springs Rd	Fatal	In Road, Including Shoulder	None
SR-29	SR-175	Injury (Severe)	In Road, Including Shoulder	None
SR-29	West Rd	Injury (Other Visible)	In Road, Including Shoulder	None
SR-29	A Street	Injury (Other Visible)	In Road, Including Shoulder	None
SR-29 N/B to Nice-Lucerne Cutoff	Nice-Lucerne Cutoff	Injury (Severe)	In Road, Including Shoulder	None

Table 9. Pedestrian Crashes on Roadways (continued)

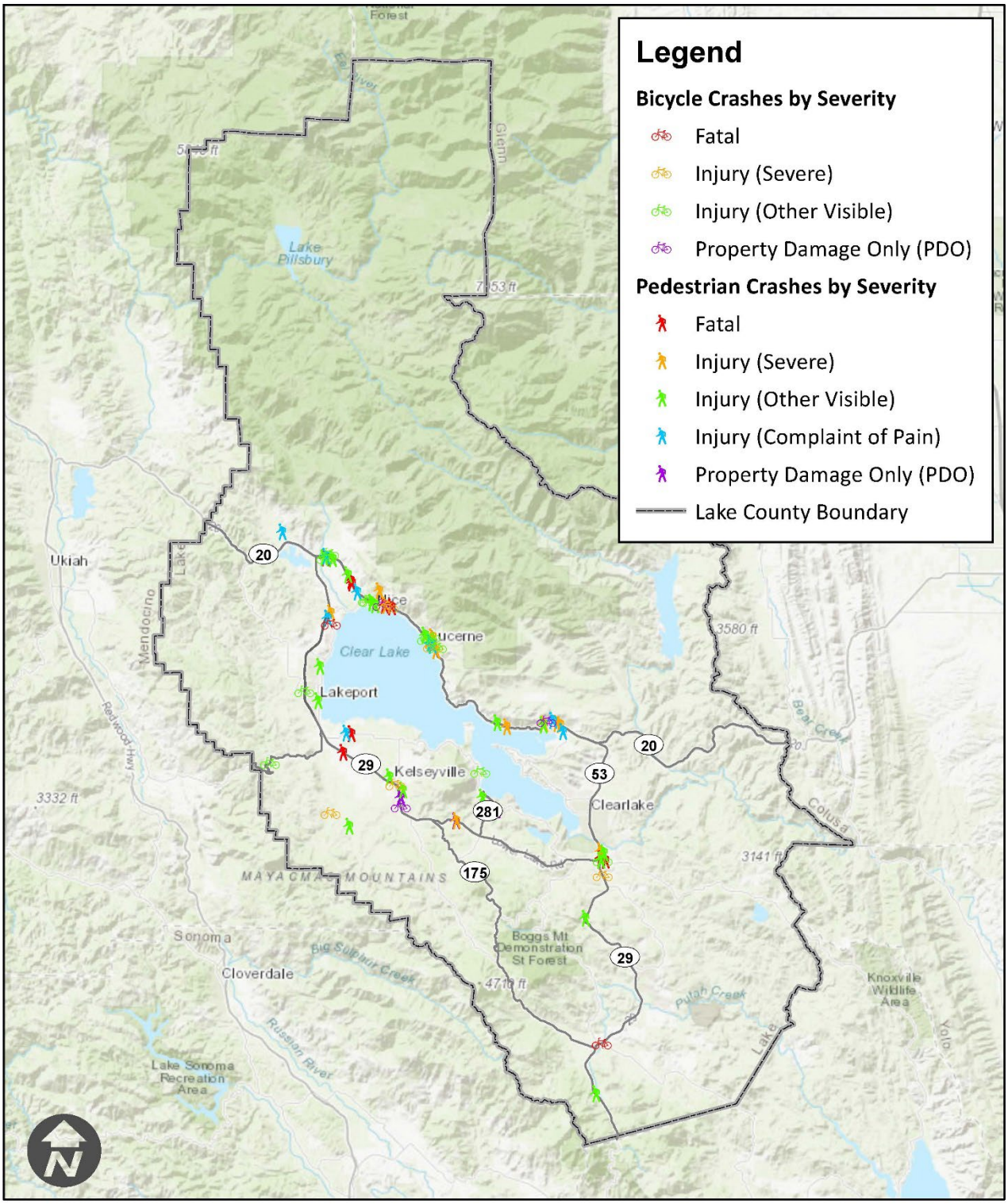
Primary Road	Secondary Road	Severity	Pedestrian Action	Pedestrian/ Bicycle Facilities
SR-53	Orchard Street	Fatal	Crossing not in Crosswalk	No adjacent crosswalks; sidewalks one side
SR-53	Anderson Ranch Pkwy	Injury (Severe)	In Road, Including Shoulder	None
SR-53	SR-29	Injury (Other Visible)	Crossing not in Crosswalk	Near a signalized intersection with crosswalks all approaches

Pedestrian crashes at intersections are shown in **Table 10**.

Table 10. Pedestrian Crashes at Intersections

Intersection	Control	Bike/Ped	Crosswalk/ Bicycle Lanes	Pedestrian Action
SR-29 / Live Oak Drive	Signalized	Bicycle	Crosswalks	No Pedestrian Involved
Country Club Drive / 14th Avenue	Unsignalized	Bicycle	None	No Pedestrian Involved
11th Street / S/B SR-29 On-Ramp	Unsignalized	Bicycle	Bicycle Lanes	No Pedestrian Involved
SR-20 / Lake Street	Unsignalized	Bicycle	Bicycle Lanes	No Pedestrian Involved
SR-20 / Butler Street	Unsignalized	Pedestrian	Crosswalks	Crossing in Crosswalk at Intersection
SR-20 / 9th Street	Unsignalized	Pedestrian	Crosswalks	Crossing in Crosswalk Not at Intersection
SR-20 / 6th Street	Unsignalized	Pedestrian	No Crosswalks	Crossing Not in Crosswalk
1st Street / Saderlund Street	Unsignalized	Pedestrian	No Crosswalks	In Road, Including Shoulder
Country Club Drive / Robin Hood Way	Unsignalized	Pedestrian	None	Crossing Not in Crosswalk
SR-20 / Pomo Way	Unsignalized	Pedestrian	No Crosswalks	Crossing Not in Crosswalk
SR-20 / Lakeview Drive	Unsignalized	Pedestrian	No Crosswalks	In Road, Including Shoulder

As shown in **Tables 9** and **10**, the majority of pedestrian crashes occurred along state highways. It is noted that the *Highway 20 Northshore Communities Traffic Calming Plan and Engineered Feasibility Study* included multimodal improvements, including pedestrian crossings. **Figure 21** shows the pedestrian and bicycle crashes by action and severity.



HEADWAY TRANSPORTATION

Figure 21
Lake County
Local Road Safety Plan
Bicycle and Pedestrian Crash Locations by Action and Severity

Potential Countermeasures

Lake County appears to have a high number of pedestrian/bicycle crashes relative to the population. Hotspots for pedestrian fatalities include Upper Lake, Nice, and Lower Lake. Pedestrian fatalities in Nice (2) and Upper Lake (2) are associated with crossing SR 20 at, or near, unlit crosswalks. The SR 20 corridor from Upper Lake through Clearlake Oaks should implement the *2006 Highway 20 Traffic Calming and Beautification Plan*.

- Engineering
  - Potential HSIP countermeasures for roadways and non-signalized intersections are shown in **Table 11** on the following page.
  - SR 20 crosswalks in Upper Lake, Nice, Lucerne, and Clearlake Oaks should be upgraded as deemed necessary by evaluation. This may include evaluating streetlighting and the potential need for speed tables and crosswalks along Main Street in Lower Lake.

Table 11. Potential Pedestrian/Bicycle Engineering Countermeasures

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
NS20PB	Ped and Bike	Install pedestrian crossing at uncontrolled locations (new signs and markings only)	Ped and Bike	25%	10	90%	High
NS21PB	Ped and Bike	Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)	Ped and Bike	35%	10	90%	Medium
NS22PB	Ped and Bike	Install Rectangular Rapid Flashing Beacon (RRFB)	Ped and Bike	35%	10	90%	Medium
NS23PB	Ped and Bike	Install Pedestrian Signal (including Pedestrian Hybrid Beacon (HAWK)	Ped and Bike	55%	10	90%	Low
HSIP No.	**Type**	**Countermeasure Name**	**Crash Type**	**Crash Reduction Factor (CRF)**	**Expected Life (Years)**	**HSIP Eligibility**	**Systemic Approach Opportunity?**
R32PB	Ped and Bike	Install bike lanes	Ped and Bike	35%	20	90%	High
R33PB	Ped and Bike	Install Separated Bike Lanes	Ped and Bike	45%	20	90%	High
R34PB	Ped and Bike	Install sidewalk / pathway (to avoid walking along roadway)	Ped and Bike	80%	20	90%	Medium
R35PB	Ped and Bike	Install/upgrade pedestrian crossing (with enhanced safety features)	Ped and Bike	35%	20	90%	Medium

Source: *HSIP Analyzer Manual for BCR Applications*

- Education

  - Incorporating pedestrian and bicycle training into the physical education curriculum for elementary school students will require close collaboration between the county, school district, parents, teachers, and students.
  - Work collaboratively to support and enhance existing bicycle safety courses offered by various entities. This may include providing course materials, sponsoring American League of Bicyclists Certified Instructors to train the course, or providing bicycle safety materials to support these on-going trainings. The county should collaborate with these organizations to identify the greatest need.

Exhibit 13. Enhance pedestrian and bicycle training/safety.
Source: https://lakecounty.com/experience/cycling-in-lake-county/

  - Work with the Department of Motor Vehicles and other driver instruction providers to include information about bicyclist safety and bicyclists' rights into driver training materials. Changing existing driver training materials is anticipated to be a long process, which may require convening driver instruction providers to address the issue holistically at a local level.
  - Safe Routes to School: Safe Routes to School plan created for local elementary and middle schools with identified projects and recommended improvements.
  - Bike Safety Education for Children: Bike safety instruction for children through school or county program(s).
  - Active Lighting/Conspicuity Enhancement: Make pedestrians and bicyclists more visible at night to avoid collisions by providing free lighting equipment and retroreflective clothing.
  - Share the Road & Pedestrian Safety Awareness Messaging: Increase driver awareness of pedestrian and bicyclist rights and needs on the roadway.

Lane Departures/Roadway Segments

Analysis

Lane departures focuses on crash types associated with vehicles veering out the lane, typically associated with roadway segments. Lane departure crashes can include head-on, sideswipe, hit object, and overturned type crashes, including when a vehicle runs off the road or crosses into the opposing lane prior to the crash. Lane departures was ranked as the seventh highest priority in the public outreach. The data analysis indicated that:

Exhibit 14. Nice-Lucerne Cutoff Road

- Collision types often associated with lane departures (head-on, sideswipe, hit object, and overturned type crashes) account for 68 percent of the total crashes, and 76 percent of the severe injury and fatal crashes.
- Of the lane departure crashes, 64 percent occurred on a state highway.
- Overall, roadway crashes (all types) account for 88 percent of the total crashes and 94 percent of the severe injury and fatal crashes, with the majority being 'hit object' as shown in **Figure 22**.

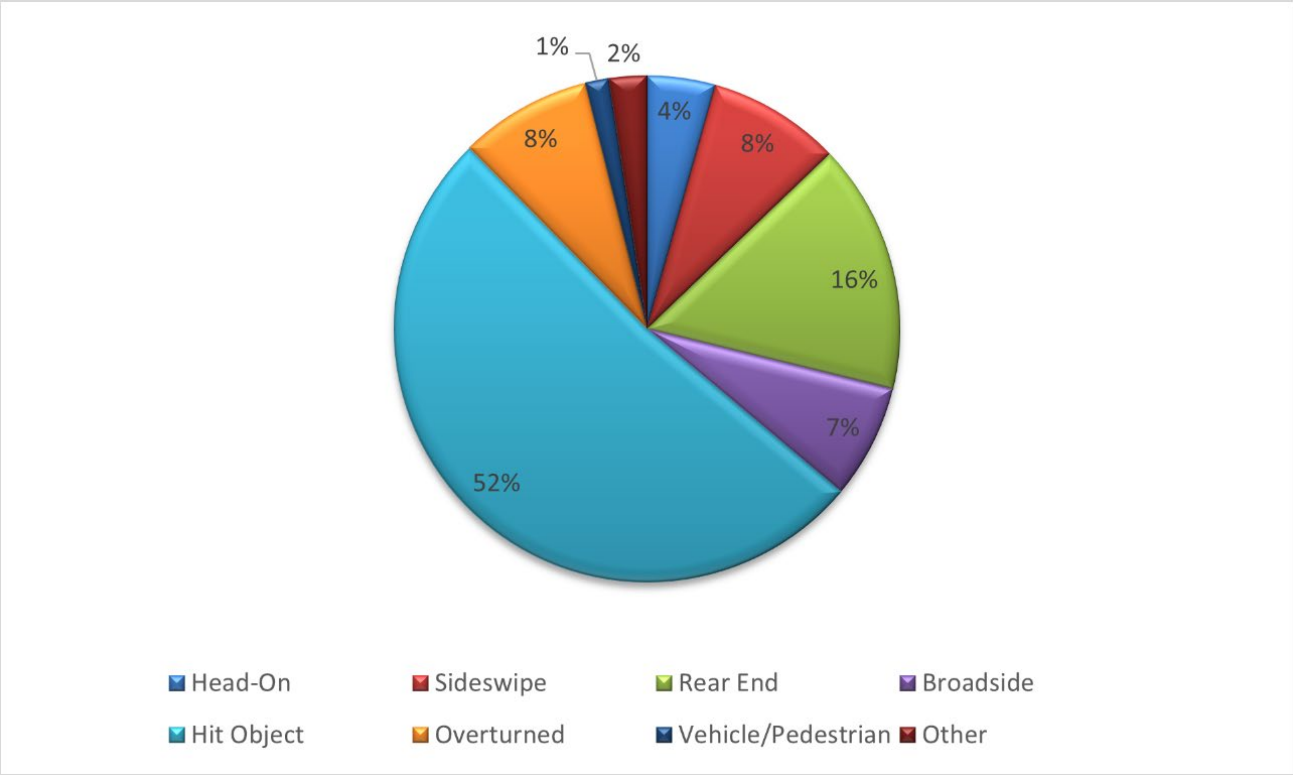
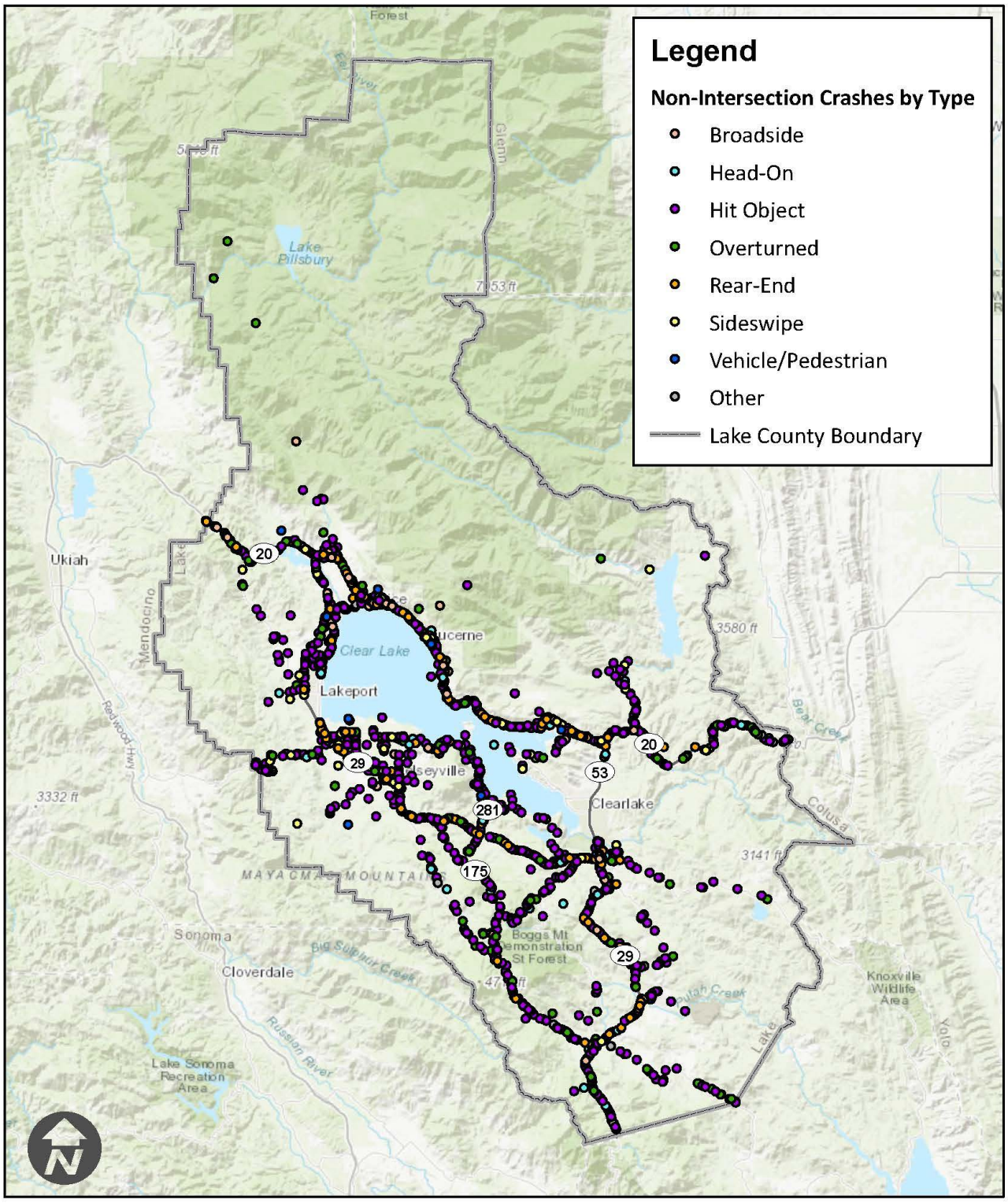


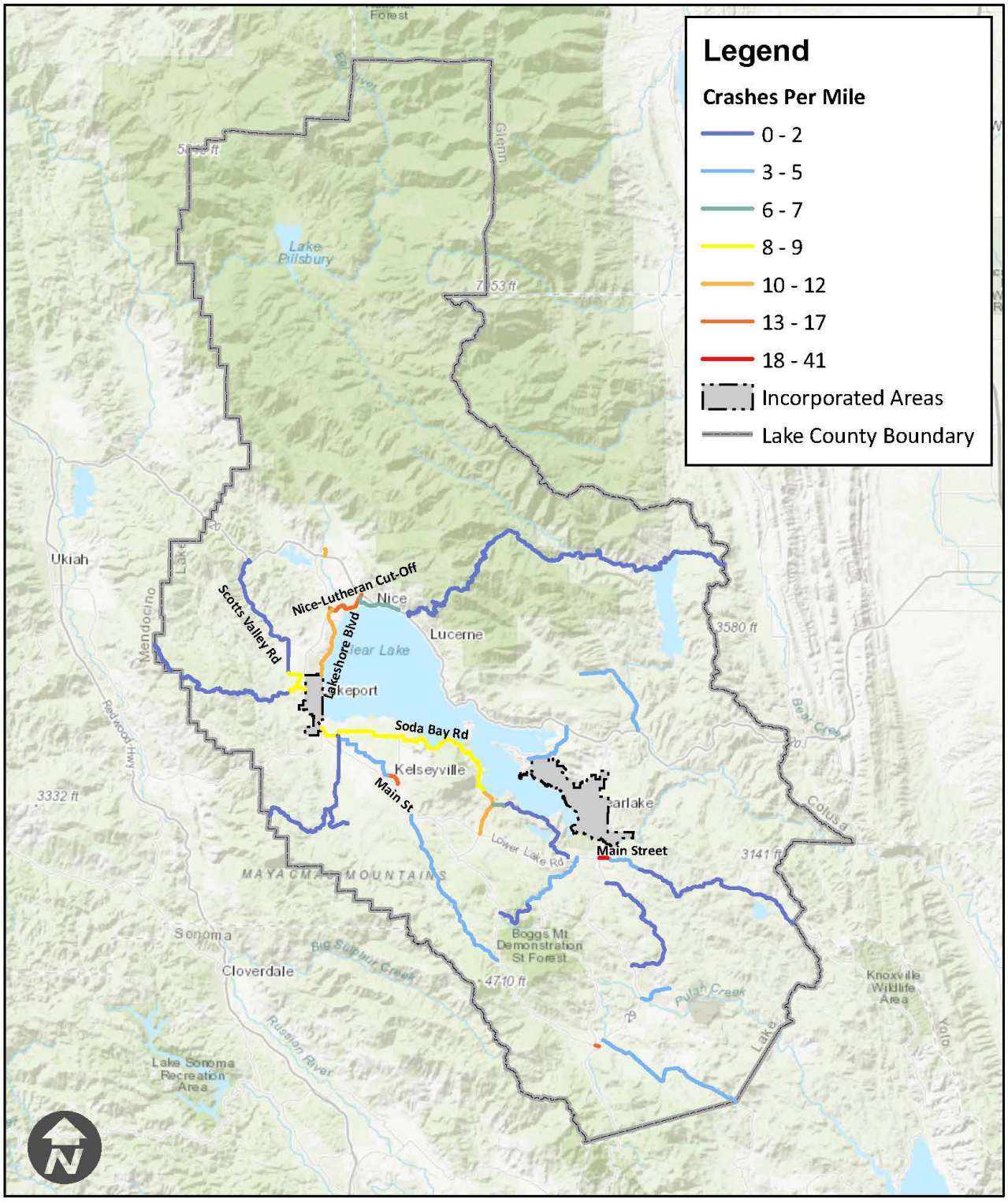
Figure 22. Roadway Crashes by Type

Figures 23-24 show the locations of roadway crashes and roadway segments with the highest crashes per mile.



HEADWAY TRANSPORTATION

Figure 23
Lake County
Local Road Safety Plan
Roadway Crash Locations by Type



HEADWAY TRANSPORTATION

Figure 24
Lake County
Local Road Safety Plan
Roadway Crashes Per Mile

Figures 25-28 show the roadways (separated by state highways and local roadways) with the highest number of crashes, which may be most appropriate for systemic countermeasures. It is noted that the length of roadway and average daily traffic would impact the crash rates on these roadways.

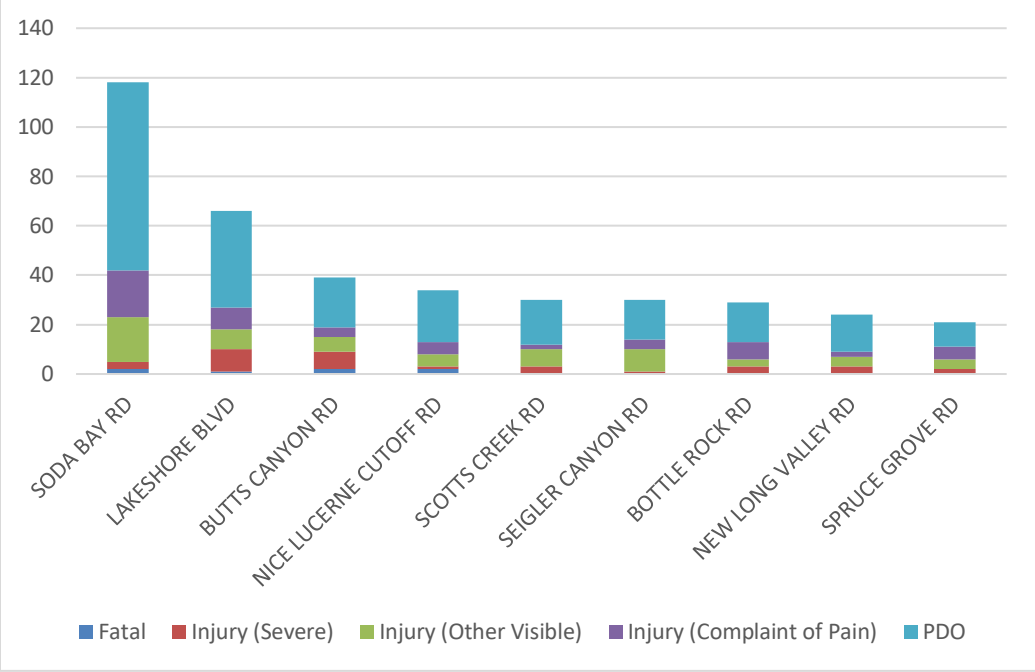


Figure 25. Non-State Highway Crashes by Severity

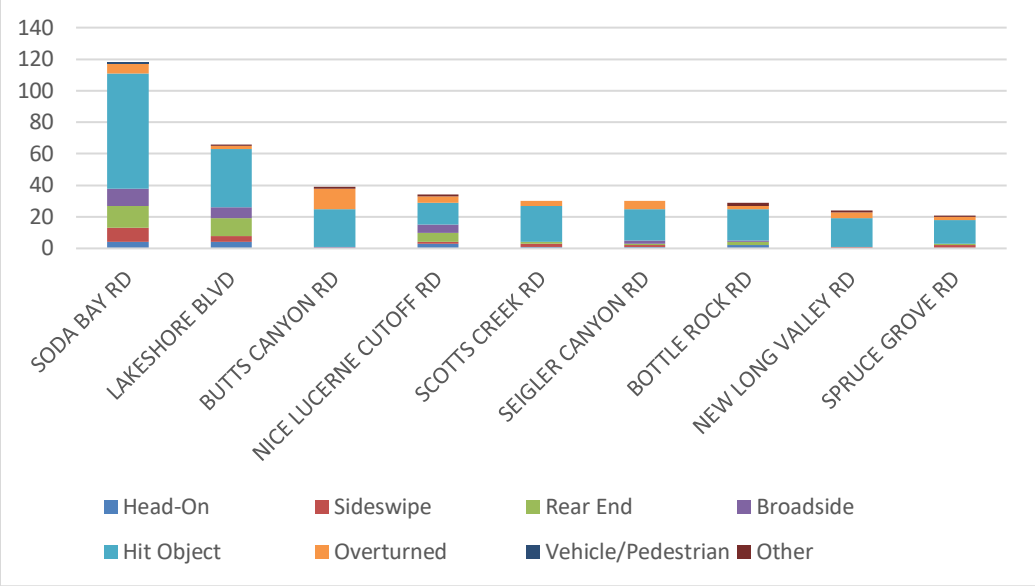


Figure 26. Non-State Highway Crashes by Collison Type

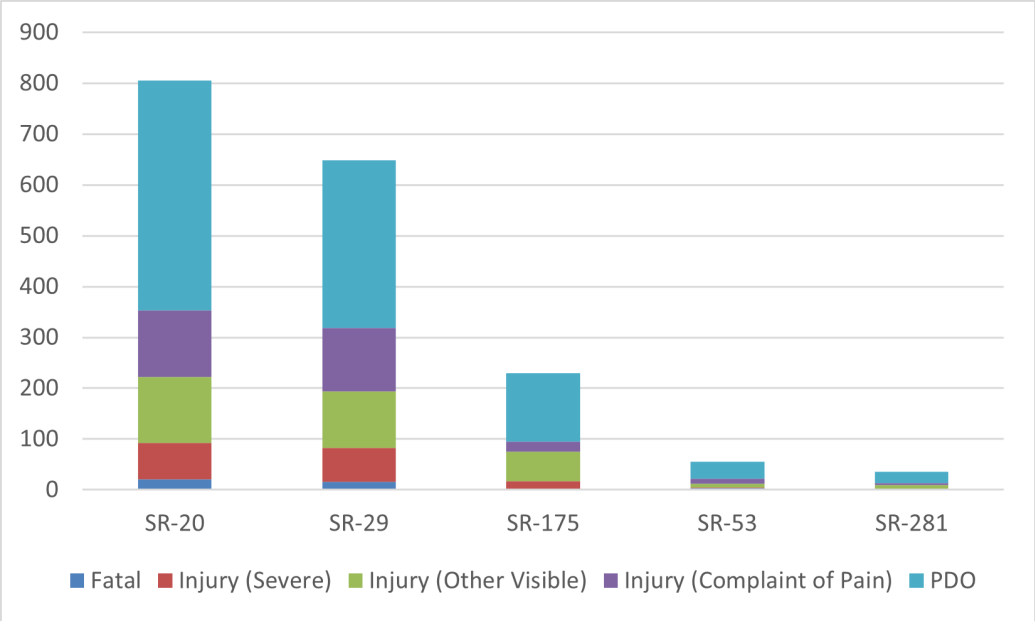


Figure 27. State Highway Crashes by Severity

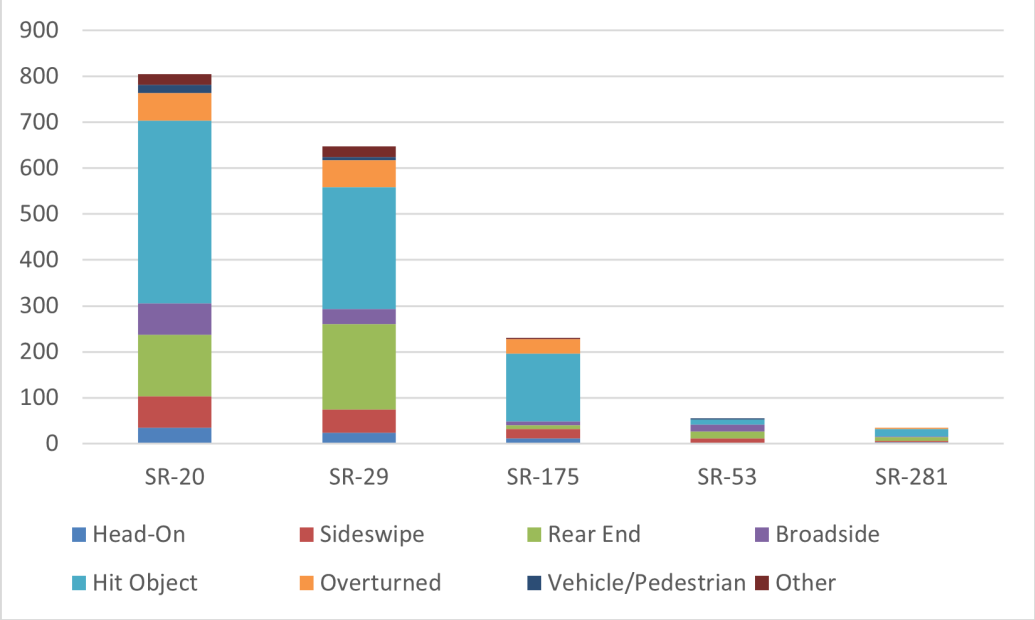


Figure 28. State Highway Crashes by Type

Potential Countermeasures

- Engineering

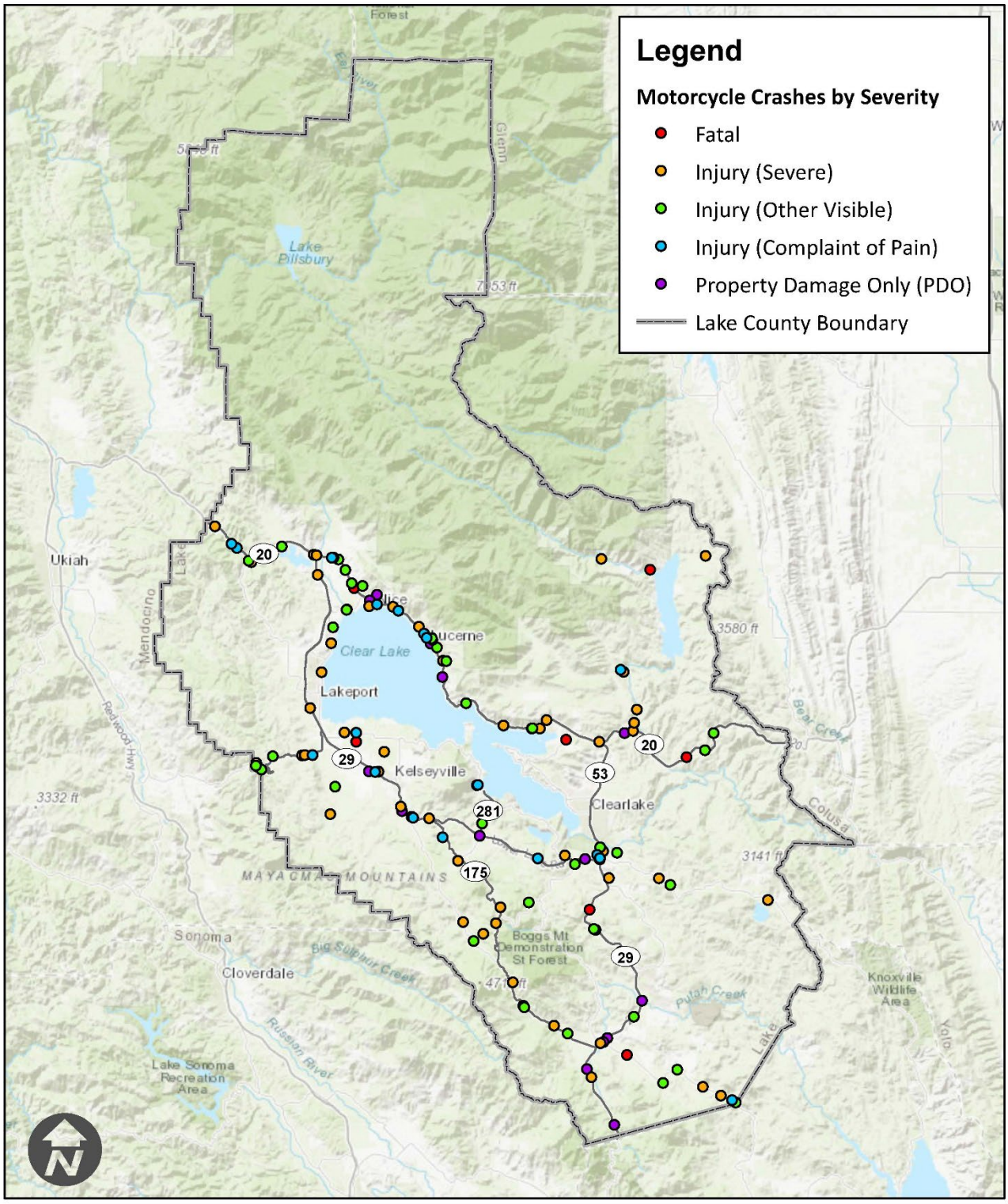
Table 12. Potential Roadway Engineering Countermeasures

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
R02	Remove / Shield Obstacles	Remove or relocate fixed objects outside of Clear Recovery Zone	All	35%	20	90%	High
R04	Remove / Shield Obstacles	Install Guardrail	All	25%	20	90%	High
R06	Remove/ Shield Obstacles	Flatten side slopes	All	30%	20	90%	Medium
R12	Geometric Modification	Widen lane (initially less than 10 ft)	All	25%	20	90%	Medium
R15	Geometric Modification	Widen shoulder	All	30%	20	90%	High
R21	Geometric Modification	Improve pavement friction (High Friction Surface Treatments)	All	55%	10	90%	Medium
R22	Operation/ Warning	Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	All	15%	10	90%	Very High
R23	Operation/ Warning	Install chevron signs on horizontal curves	All	40%	10	90%	Very High
R24	Operation/ Warning	Install curve advance warning signs	All	25%	10	90%	Very High
R25	Operation/ Warning	Install curve advance warning signs (flashing beacon)	All	30%	10	90%	High
R27	Operation/ Warning	Install delineators, reflectors and/or object markers	All	15%	10	90%	Very High
R28	Operation / Warning	Install edge-lines and centerlines	All	25%	10	90%	Very High
R30	Operation / Warning	Install centerline rumble strips/stripes	All	20%	10	90%	High
R31	Operation / Warning	Install edge line rumble strips/stripes	All	15%	10	90%	High

Motorcycle Safety

Analysis

Motorcycle safety was ranked as the eighth highest priority in the public outreach. Data analysis indicated that motorcycle-involved crashes account for 5 percent of the total crashes, but 21 percent of the severe injury and fatal crashes. **Figure 29** shows the location and severity of motorcycle crashes.



HEADWAY TRANSPORTATION

Figure 29
Lake County
Local Road Safety Plan
Motorcycle Crash Locations by Severity

Potential Countermeasures

- Education – Motorcycle Safety awareness messaging campaigns through advertisements, social media, and other mediums to increase driver awareness of motorcyclists and reduce motorcycle-involved crashes.
  - MAC (Motorcycle Awareness Campaign): a non-profit motorcycle safety organization
  - Get Educated and Ride Safe (GEARS) program, funded by a grant from OTS through NHTSA

Exhibit 15. Increase driver awareness of motorcyclists and reduce motorcycle-involved crashes through messaging campaigns.
Source: https://lakecounty.com/explore/driving-directions

Senior Population/Aging Drivers

Analysis

Senior Population/Aging Drivers was ranked as the ninth highest priority in the public outreach. Demographic data indicated that approximately 23 percent of the population are over 65 years old.

Potential Countermeasures

- Any countermeasures that increase visibility and generally reduce crashes overall will have a positive benefit for senior drivers.

Potential Engineering Projects

Potential engineering projects were identified based on crash trends and locations with high crash frequencies. These potential projects may be used to pursue HSIP or other funding. It is recommended that the priority for developing systemic countermeasure applications projects focus on lane departures on roadways, pedestrian and bicycle, and speeding projects. Potential projects are detailed in **Appendix D**. The detail includes reason for inclusion, locations, key risk factors, proposed countermeasures, and potential benefit-cost ratios.

Implementation Plan

Key Components of Non-Engineering Implementation

Non-engineering components primarily comprise the Education and Enforcement "E's". The most critical steps for implementation of the non-engineering LRSP countermeasures are building strong public outreach messaging, expanding, and leveraging partnerships and collaborations with stakeholders and local agencies, and obtaining grant funding for expanded initiatives and outreach. While all countermeasures identified in the plan are important for improving safety in the county, the following countermeasures and general strategies are most feasible for early implementation and provide the greatest safety benefit from non-engineering countermeasures.

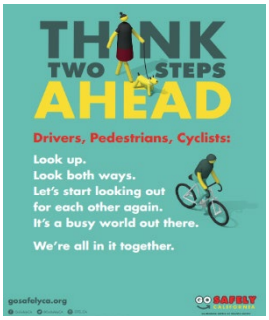
Exhibit 16. Develop implementation plan for countermeasures.
Source: FHWA

Social Media Campaign and Continued Outreach

Providing the public with important safety information and messaging through a variety of platforms including social media, online advertisements, TV, and radio is an important strategy for increasing awareness around safety and reducing crashes. The specific type of media used for each campaign depends on the audience, the message, and available resources. Some outreach campaigns may focus exclusively on social media, and some may require more holistic approaches including more traditional media like TV, newspaper, and radio. However, these larger outreach campaigns may require longer time frames for implementation and higher budget considerations. A targeted social media campaign can be implemented quickly with very little budget by utilizing existing messaging, such as those provided by the Caltrans Office of Traffic Safety through the "Go Safely, California" program, highlighted below.

Exhibit 17. Distracted Driving Campaign

"Go Safely, California" – Public outreach and education materials covering a variety of safety topics including impaired driving, distracted driving, and bicycle and pedestrian safety are available through the **"Go Safely, California"** website. These resources provide local agencies with free and compelling materials to educate the public on the dangers of distracted driving, impaired driving, pedestrian & bicyclist safety, and speeding. Pre-made toolkits are available to supplement existing outreach efforts.



Source: www.gosafelyca.org

Targeted social media messaging campaigns can focus outreach efforts to a particular demographic, such as young drivers between 15 and 23 years of age regarding the potential risks of distracted driving and impaired driving. Targeted messaging campaigns through social media will help to ensure their message is received by those in the

target group with minimal budget impacts. Additionally, the reach of social media messages and campaigns may be amplified many times if stakeholders share the safety campaign messages through their own social media accounts. This strategy was utilized during the public outreach process, which resulted in a significantly higher rate of responses than anticipated by the project team.

Partnerships & Collaborations

Roadway safety is a shared responsibility and so too is the implementation of roadway safety plans. The county must work collaboratively with numerous stakeholders and form interdepartmental and interagency partnerships to successfully implement many of the identified strategies. The identified strategies will require direct partnerships and close collaboration to be successful.

Crash Data Records

To ensure that local data represents the most accurate information, the County Public Works department should update the crash data received with the most up-to-date local data. A lag in reporting periods may result in a crash victim passing away from their injuries, which requires the crash data record to be updated to a fatality. To reduce inaccuracies, the County Public Works department and police departments should evaluate how data is collected and reported to best support future safety analysis and include outside agencies (Caltrans, CHP, etc.) in the overall discussion about improving local crash data records and the record keeping process, as appropriate.

Potential Funding Sources

Lake County Public Works and local stakeholders will likely pursue grant opportunities to implement many of the identified countermeasures and strategies. Additionally, the timeframes for implementation will be contingent on obtaining grant funding as well as maintaining existing maintenance and construction funding levels. The following section highlights key considerations for each potential grant funding opportunity.

Highway Safety Improvement Program (HSIP)

This federal program is managed by Caltrans and focuses on infrastructure projects with nationally recognized crash reduction factors. This is one of the major funding mechanisms for safety projects across California and is closely tied to the LRSP. Agencies must have completed LRSP plans prior to submitting future HSIP applications. Calls for projects under this funding program are typically announced every other year. HSIP Cycle 11 opened in May 2022 with an application deadline in September 2022.

Active Transportation Program (ATP)

This competitive statewide program, managed by Caltrans, consolidates federal and state funding from several sources including the State Senate Bill 1 (SB1), Transportation Alternatives Program (TAP), Bicycle Transportation Account (BTA), and State Safe Routes to School (SRTS). This program is focused on increasing the use of walking and biking by increasing safety and mobility for non-motorized users, advancing regional active transportation efforts, and providing a broad

Exhibit 18. Increase safety and mobility for non-motorized users.

spectrum of projects to benefit many types of active transportation users. Eligible grant applicants include public schools and school districts as well as local, regional, or state agencies. For a project to qualify as a Safe Routes to School project, it must be within two miles of a public school or within the vicinity of a public-school bus stop with the students intended as the primary beneficiaries of the project.

Congestion Mitigation and Air-Quality Improvement Program (CMAQ)

This flexible federal funding program managed by Caltrans may be used for a variety of projects which further the goals of the Clean Air Act and its amendments on a reimbursable basis. Projects must be included in the *Transportation Improvement Program (TIP)* to be eligible for this funding stream. This funding may be used for bicycle & pedestrian outreach programs, constructing bicycle and pedestrian facilities which are not exclusively recreational and reduce vehicle trips, and public education and outreach activities.

National Highway & Traffic Safety Administration (NHTSA)

The NHTSA provides traffic safety grants through the California Office of Traffic Safety. Based on the most recent guidance, Caltrans Office of Traffic Safety (OTS) accepts applications for this funding program on a regular annual basis. The following grant opportunities were identified as the most applicable:

- *Section 402: State & Community Highway Safety Grant Program* – This versatile funding program can be used for a variety of initiatives focused on reducing deaths and serious injuries on our roadways including enhancing pedestrian and bicycle safety, increasing enforcement of traffic safety laws, improving traffic records, or reducing speeding.
- *Section 405: National Priority Safety Program* – This program authorizes funding to address high priority safety issues across the nation including impaired driving, distracted driving, and non-motorized safety. Funding for each issue is authorized as a separate tier under the Section 405 program.
    - Section 405(d): Impaired Driving Countermeasures – This tier represents 52.5 percent of the total annual funding for the full Section 405 program. These funds are intended for programs which reduce the risk of driving under the influence of alcohol or drugs. A matching share of 20 percent must be provided by the local agency.
    - Section 405(e): Distracted Driving – A total of 8.5 percent of Section 405 funds are allocated for distracted driving incentive grants. Funds are intended for programs which reduce the risk of distracted driving.
    - Section 405(h): Non-motorized Safety – Five (5) percent of Section 405 funds are available under this tier for states where the combined bicycle and pedestrian fatalities represent more than 15 percent of all roadway fatalities in that state based on the most recent Fatality Analysis Reporting System (FARS) data from National Highway Traffic Safety Administration (NHTSA). Funding under this tier requires a 20 percent match and is only eligible for training law enforcement on state laws applicable to pedestrian and bicycle safety, enforcement mobilizations and campaigns designed to enforce those state laws, or public education and awareness programs designed to inform motorists, pedestrians, and bicyclists.

FHWA Local and Tribal Road Safety MATCH Program

The Federal Highway Administration's (FHWA) Mentoring, Assistance, Training, and Communication Help (MATCH) Program provides free assistance to local and tribal agencies to address roadway safety in their community. The program connects agencies requesting assistance with volunteers that have specific expertise to help successfully address the identified challenges. The program connects agencies requesting assistance with volunteers that have specific expertise to help successfully address the identified challenges.

Safe Streets and Roads for All (SS4A) Grant Program

This program through the US Department of Transportation (USDOT) will provide several billions of dollars in grants over the next 5 years supporting regional, local, and Tribal initiatives. The goal of the grants is to prevent roadway deaths and serious injuries.

California Highway Patrol (CHP) Cannabis Tax Fund Grant Program (CTFGP)

Funding for this program comes from the passage of Proposition 64, The Control, Regulate, and Tax Adult Use Marijuana Act (AUMA) in 2016. The intent of this program is to reduce the number of crashes by impaired drivers, increase public awareness related to the dangers of impaired driving, and improve highway safety. The purpose of the funds is to supplement and not supplant funding for current activities and programs.

Key Steps for Successful LRSP Implementation

In July 2020, the FHWA released guidance (*Implementing a Local Road Safety Plan*) based on best practices and lessons learned by agencies around the country for implementing LRSPs. This guidance identified six key steps:

1. **Maintain buy-in and support:** Maintaining and expanding the stakeholder and public support fostered during the development of this LRSP will require on-going communication and coordination through educational materials, news releases, and meetings. Implementation of many non-engineering countermeasures will require partnerships with stakeholders to achieve a successful outcome. The county should identify the specific outreach methods and level of detail that is achievable for continued communications with stakeholders, the public, and decision makers. Education and Enforcement strategies are often best implemented following buy-in from community partners and stakeholders. It will be critical to work closely with stakeholders and community partners to ensure that resources and efforts are shared whenever possible.

2. **Identify funding mechanisms:** LRSPs are required for future HSIP funding, however, other funding mechanisms can also be used to improve local safety.

3. **Identify and prioritize projects:** Projects, programs, and initiatives should be prioritized based on the potential safety improvement and ease of obtaining funding and implementation.

4. **Determine project delivery methods:** Projects identified through this LRSP will be primarily pursued through grant funded programs and initiatives due to existing funding constraints. When possible, countermeasures should be included in on-going maintenance programs and incorporated into other projects.

5. **Evaluate effectiveness:** This living document is intended to be updated at least every five years. However, Lake County would benefit from tracking safety metrics annually in order to gauge implementation outcomes on a more frequent basis.

Exhibit 19. The LRSP is a living document that should be monitored and updated.
Source: FHWA

6. **Continue communication and coordination:** Similar to step 1, it is important to maintain close communication with stakeholders to coordinate efforts whenever possible and provide the public with updates regarding implementation progress and outcomes.

Key Findings

The development of this Local Road Safety Plan (LRSP) used a methodical process and input from stakeholders and the public to identify focus areas, analyze crash trends, and develop countermeasures across the four E's of safety planning (Engineering, Education, Enforcement, and Emergency Services). Key findings are recommendations for the LRSP are:

Exhibit 20. Clear Lake

- Study draws from previous studies and efforts indicate that significant strides have been made in improving transportation safety and several other efforts are planned or underway.
- Public priorities are distracted driving, impaired driving, speeding, and roadway/pavement conditions.
- A total of 3,136 crashes occurred between 2016 and 2020. Of those crashes, 304 (or 10 percent) resulted in severe injury or fatality.
- Most crashes have occurred along roadway segments (as opposed to at intersections), and the most common crash type involved a vehicle colliding with a fixed object.
- Impaired driving accounts for 18 percent of total crashes and 30 percent of serious injury and fatal crashes.
- Pedestrian and bicycle involved crashes account for 10 percent of serious injury and fatal crashes.
- Dark conditions (without roadway lighting) crashes account for 25 percent of the total crashes and 28 percent of serious injury and fatal crashes.
- Motorcycle involved crashes account for 21 percent of serious injury and fatal crashes.

- The top priority for developing systemic countermeasure applications projects focus on lane departures on roadways, pedestrian and bicycle, and speeding projects.
- Projects for potential HSIP applications include:
  - Site Specific for Point Lakeview Road – Lane and Shoulder Widening
  - Systemic Roadway Lane Departures – Systemic projects include new guardrail, shoulder widening, lane widening, and fixed object removal (trees, power poles).
  - Systemic Pedestrian/Bicycle Improvements – Systemic projects include street lighting, crossing enhancements, push button activated crosswalk signing.
  - Systemic Speed Control Improvements – Systemic projects include traffic calming measures, speed tables/humps, and speed zone signing.

Appendix A

Stakeholder Working Group

Lake County LRSP - Countywide
Stakeholder Working Group Agency List*

Agency
Lake County Office of Education
Habematolel Rancheria in Upper Lake
Northshore Fire Protection District
Lake County Public Works
Robinson Rancheria
Calfire
Lake County Public Works
California Highway Patrol
Elem Indian Colony
Big Valley Band of Pomo Indians
Scotts Valley Band of Pomo Indians
Kelseyville Fire Protection District
Scotts Valley Band of Pomo Indians
Lake Links
Lake County Social Services
Lake County Sheriff
Caltrans
Middletown Rancheria
Lake County Fire Protection District
Lake County Office of Emergency Services
Lake Transit Authority/Lake APC
Lakeport Fire
Upper Lake - Habematoel
Calfire

**Stakeholders contacted; not all participated in meetings.*

Appendix B

Public Outreach

Lake County LRSP - Countywide
Public Survey Open Response

Please enter any comments relating to transportation safety in Lake County below.

Speed on State Highways and County Roads has got completely out of hand in Lake County
Would be nice to see a safety campaign (road signs/billboards/psa) for the danger of dragging trailer chains & sparks that start fires. With the large uptick in trailers coming into the county (especially St. Helena, Cow Mountain BLM, Upper Lake forest & Indian Valley BLM), I've witnessed many occasions (especially on Hwy 20 from Williams) of trailers being towed with chains dragging & throwing sparks into dry brush. There is no cell service to call authorities & drivers usually don't stop. The passing area on E Hwy 20, near the call box at roughly mile marker 35, should have never been repainted as a passing area. It's a very dangerous area & people try to pass going into semi-blind turn. The broken line is a very short length & many see the broken line coming, move over to pass, only to realize the passing area's ending. They end up slamming on their brakes to get back behind the other vehicle or push the gas & move over while navigating a turn, long after the broken line has ended.
I live on Eureka Ave in the city of Clearlake. When I bought my home it was on a 'paved' road. I have since been told by the city that it is not a city maintained road even though well within the city limits. I had no idea that I needed to worry about my road going away, and the city would not maintain a paved road in the city. The county will not help because we are in the city. And everyone north of Davis avenue is in this situation. This is an ongoing situation that became so bad, that a couple years ago some could not get vehicles in or out. After alot of crying the city did a quick drive by with a grader, but said we are on our own from here on out. We have nowhere to turn, cannot afford to pave the road. I am now in my seventies and need to have safe access in and out of my home.
Lakeshore Boulevard between Nice-Lucerne cutoff & Lakeshore Boulevard Extension to Highway 20!!!!
Pothole repair, severe drop-off from pavement/eroded shoulder, prompt abandon vehicle removal. Morgan Valley Road at various locations and times.
I notice some intersections have trees or brush blocking my view. I have to inch forward to see if it safe to pull out.
Country Club Dr, Lucerne. Speeding along here is a daily occurrence with some vehicles and motorcycles reaching speeds of at least 60 mph. We desperately need traffic calming measures along this residential street. Sidewalks would be an added benefit the whole length, presently they are only partway. I live on the corner of Sherwood Ct and Country Club, we frequently have the equivalent of drag racing late at night.
I would ride my bicycle more and further if there were safe bike lands. Really wish the Bridge Arbor Trail had been completed to ride from Lakeport to UL. Hwy 29 is too narrow in parts for that to be safe.
This county needs significant improvements to the roadways and increased signage in neighborhoods. The current roads are a threat to our vehicles shocks, tires, and alignment.

The list above doesn't include people who drive 15 to 20 miles under the speed limit with several cars behind them, causing congestion. It also does not include the conditions of the roads which cause hazardous conditions causing people to swerve to miss potholes. Also all of the debri in the road that constantly causes broken windshields.
Traffic on 20 thru Northshore towns needs calming and the areas need much better lighting
Prioritized list is not working for me…
We need a turn pocket at the entrance to Twin Lakes. C st @ 29 has had many accidents and close calls. They widened the road but did not install a turn pocket like we assumed was going to happen.
The Mendenhall end of Main St. between the Jehovah Witness building and the stop sign on Mendenhall has SEVERE speeding and failing road surface. Yellos dots need to be installed and the road surface needs to be repaired and the lines on the street repainted - they have disappeared.
Speed limit should be 35 mph on Pitney Lane from intersection with Elk MT Rd, entire length. Speed limit should be 35 on the entire length of Elk Mt Rd. CHP should enforce speed limit on Elk Mt. Rd
We have an alarmingly high amount of traffic collisions on Highway 29 from Putah Lane to Butts Canyon Road. These traffic collisions are occurring at freeway speeds, and result in major injuries and fatalities. The section is only a couple miles long, but, is one of the most hazardous in the county. A solid barrier between the lanes for that stretch would be a lives-saver.
#1: Pull Over to allow passing. There seems to be little knowledge amongst drivers that it is important and necessary to pull over--especially when driving under the speed limit--if traffic is backing up behindyou. This situation leads to road rage, passing at unsafe locations, etc.
All vegetation along all roadways on the easement should be removed for increase site distance and fire spread reduction. 5 feet or 100 feet on each side is a start. On the State Hwys for sure.
We need safe routes for children to get to school- bikes lanes and sidewalks
I would like to thank the roads department for their attention to the rural roads.
Road surfaces are horrible... chip sealing is only a band aid, fix it right & then maintain it for longer life & lower costs.
Pave all the roads in Lake County. Poor road conditions prevent safe transportation and emergency exit. Crosswalks on lakeshore dr Clearlake need to have flashing lights. Aspen ct Kelseyville needs maintenance. Loose rocks are a hazardous.
My biggest concern is road maintenance. Why isn't it on your list? I've been in the Kelseyville Riviera for over 20 years. The county used to help maintain our streets. We are county and need roads that are well maintained instead of allowed to degrade back to dirt roads with massive potholes.
Pedestrian safety is an afterthought.
Worst drivers and driving here is not pleasurable nor safe. I have driven in Central and South America, Europe, and in American cities rated as worst places to drive but area covered by survey beats them all for poor drivers
Lane width and road/pavement condition are really poor or substandard throughout Lake County.
Not enough turn pockets and merge lanes on highway entering and exiting side roads
Looking forward to the county's 5 year plan to repair county roads.
Would really love to see a bike lane on Soda Bay/Main Street Lakeport. I used to ride my bicycle to work but my office moved to Lakeport during Covid. Do not feel safe riding on Soda Bay Road from the transfer station to Jack in the Box. Would also be really nice to Big Valley Road get some TLC. The section from Finley to Kelseyville is in

pretty bad shape. I feel like my Wrangler is going to bounce out of the lane. Sometimes it is difficult to find a smooth stretch for my motorcycle.
It would be nice if the police, local, county and state, would follow traffic laws -- using signals, not speeding, etc. They should not be exploiting their power.
Lakeshore Boulevard in Nice between Nice-Lucerne cutoff & Hwy. 20 is used as a short cut & cars haul ass! Lots of folks use this street to walk or bicycle. This includes locals & the many visitors to the resorts. Access to Hwy. 20 should be closed & speed humps should be installed.
We need a turn pocket on Hwy 29 into Twin Lakes, just south of Lower Lake. Several fatalities and multiple near misses . Thank you.
Would not let me do the survey completely.
Please clean storm drains, ditches and remove trash debris more often to prevent localized flooding, muddy roads and trash all over. Thank you
There needs to be a left turn lane on HWY north bound at C st in Lower Lake
Slow drivers unwilling to turn out, causing anxiety for vehicles behind and often resulting in risky passing. Enforce 5 car rule with tickets to drive awareness that leading a carsvan is unsafe to all and illegal as any other moving violation.
Something needs to be done about bottle rock rd There are sections on that road that are becoming dangerous to drive on Especially for motorcycles and vehicles towing
Turning from Hwy 29, onto C Street is very dangerous. There is a passing lane, blind corners going into and coming out of the straight stretch. People speed up to pass when I'm trying to slow down and turn into the Twin Lakes neighborhood. We need turn lanes for safe turning.
Turn lane at 29 and c st
The side streets in Lucerne, particularly 1st -5th, Highland, and Country Club, but to a fair degree most others as well, are in abysmal shape and have not, to my memory, been paved since the late 70s or early 80s when the sewers went in. I'm hoping some consideration will be placed on paving.
Hwy29 turn to C street needs turn line
No posted speed sign on Hill Road Loop outside of Lakeport. This road is used as a pedestrian walking trail with no pedestrian signage. Cars drive at unsafe freeway speed on this side road, putting pedestrian safety in jeopardy. Lake County needs more walking friendly areas to help promote better health for its residents. Please consider widening and/or clearing the sides of Hill Road/Hill Road East and posting speed limits and pedestrian safety signs. Thank you
Hwy 29 entering or exiting into Twin Lakes subdivision is hard, especially at.evening. Street lights are desperately needed because speeding folks don't seem to pay attn to neither blinkers nor flashers!
Poor pavement causing swerving and damage.
Biggest concern is pedestrian safety. There have been far too many preventable deaths. We have far too many extremely dangerous walking areas with blind corners and no sidewalk or bike lane. Far too long of stretches without a safe lighted cross walks. Road markings are often faint or gone increasing the chance a driver crosses into what little space a pedestrian does have.
The quality of the roads need to be improved. Too many pot holes and unfinished work
Deer, hog and turkeys cause roadeay hazardous. Speeders are aggressive flipping off and those traveling speed limit.
Almost every time I travel Hwy 29 from hidden valley lake to Clearlake I have a car drift into my lane ahead of me or see the drift start and the driver catches it. I ride the white line always.

New Long Valley Road needs a complete do-over. Primarily from Hwy 20 to Spring Valley Road. There are so many lumps, humps, slumps, bumps, dips and eroded shoulders. Places where there wasn't enough asphalt to paint the white line. Not so bad in my car but pulling a 5000 pound boat and trailer, I'm limited to 35 MPH for fear of breaking something and in just three miles cars get stacked up behind me and not happy. Not asking for a freeway, only to be able to drive 45. NLV is the roughest paved road I've ever driven. Thank you.

Appendix C

HSIP Countermeasures

Table 1. Countermeasures for Signalized Intersections

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	HSIP Funding Eligibility	Systemic Approach Opportunity?
S01	Lighting	Add intersection lighting (S.I.)	Night	40%	20	90%	Medium
S02	Signal Mod.	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	All	15%	10	90%	Very High
S03	Signal Mod.	Improve signal timing (coordination, phases, red, yellow, or operation)	All	15%	10	50%	Very High
~~S04*~~	~~Signal Mod.~~	~~Provide Advanced Dilemma Zone Detection for high speed approaches~~	~~All~~	~~40%~~	~~10~~	~~90%~~	~~High~~
S05	Signal Mod.	Install emergency vehicle pre-emption systems	Emergency Vehicle	70%	10	90%	High
S06	Signal Mod.	Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)	All	55%	20	90%	Low
S07	Signal Mod.	Provide protected left turn phase (left turn lane already exists)	All	30%	20	90%	High
S08	Signal Mod.	Convert signal to mast arm (from pedestal-mounted)	All	30%	20	90%	Medium
S09	Operation/ Warning	Install raised pavement markers and striping (Through Intersection)	All	10%	10	90%	Very High
S10	Operation/ Warning	Install flashing beacons as advance warning (S.I.)	All	30%	10	90%	Medium
S11	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	55%	10	90%	Medium
S12	Geometric Mod.	Install raised median on approaches (S.I.)	All	25%	20	90%	Medium
S13PB	Geometric Mod.	Install pedestrian median fencing on approaches	P & B	35%	20	90%	Low
S14	Geometric Mod.	Create directional median openings to allow (and restrict) left-turns and u-turns (S.I.)	All	50%	20	90%	Medium
S15	Geometric Mod.	Reduced Left-Turn Conflict Intersections (S.I.)	All	50%	20	90%	Medium
S16	Geometric Mod.	Convert intersection to roundabout (from signal)	All	Varies	20	90%	Low
S17PB	Ped and Bike	Install pedestrian countdown signal heads	P & B	25%	20	90%	Very High
S18PB	Ped and Bike	Install pedestrian crossing (S.I.)	P & B	25%	20	90%	High
S19PB	Ped and Bike	Pedestrian Scramble	P & B	40%	20	90%	High
S20PB	Ped and Bike	Install advance stop bar before crosswalk (Bicycle Box)	P & B	15%	10	90%	Very High
S21PB	Ped and Bike	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	P & B	60%	10	90%	Very High

* CM S04 has been deleted in HSIP Cycle 11 Call-for-projects.

Table 2. Countermeasures for Non-Signalized Intersections

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	HSIP Funding Eligibility	Systemic Approach Opportunity?
NS01	Lighting	Add intersection lighting (NS.I.)	Night	40%	20	90%	Medium
NS02	Control	Convert to all-way STOP control (from 2-way or Yield control)	All	50%	10	90%	High
NS03	Control	Install signals	All	30%	20	90%	Low
NS04	Control	Convert intersection to roundabout (from all way stop)	All	Varies	20	90%	Low
NS05	Control	Convert intersection to roundabout (from stop or yield control on minor road)	All	Varies	20	90%	Low
NS05mr*	Control	**Convert intersection to mini-roundabout**	All	30%	20	90%	Medium
NS06	Operation/ Warning	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	All	15%	10	90%	Very High
NS07	Operation/ Warning	Upgrade intersection pavement markings (NS.I.)	All	25%	10	90%	Very High
NS08	Operation/ Warning	Install Flashing Beacons at Stop-Controlled Intersections	All	15%	10	90%	High
NS09	Operation/ Warning	Install flashing beacons as advance warning (NS.I.)	All	30%	10	90%	High
NS10	Operation/ Warning	Install transverse rumble strips on approaches	All	20%	10	90%	High
NS11	Operation/ Warning	Improve sight distance to intersection (Clear Sight Triangles)	All	20%	10	90%	High
NS12	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	55%	10	90%	Medium
NS13	Geometric Mod.	Install splitter-islands on the minor road approaches	All	40%	20	90%	Medium
NS14	Geometric Mod.	Install raised median on approaches (NS.I.)	All	25%	20	90%	Medium
NS15	Geometric Mod.	Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.)	All	50%	20	90%	Medium
NS16	Geometric Mod.	Reduced Left-Turn Conflict Intersections (NS.I.)	All	50%	20	90%	Medium
NS17	Geometric Mod.	Install right-turn lane (NS.I.)	All	20%	20	90%	Low
NS18	Geometric Mod.	Install left-turn lane (where no left-turn lane exists)	All	35%	20	90%	Low
NS19PB	Ped and Bike	Install raised medians / refuge islands (NS.I.)	Ped and Bike	45%	20	90%	Medium
NS20PB	Ped and Bike	Install pedestrian crossing at uncontrolled locations (new signs and markings only)	Ped and Bike	25%	10	90%	High
NS21PB	Ped and Bike	Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)	Ped and Bike	35%	20	90%	Medium
NS22PB	Ped and Bike	Install Rectangular Rapid Flashing Beacon (RRFB)	Ped and Bike	35%	20	90%	Medium
NS23PB	Ped and Bike	Install Pedestrian Signal (including Pedestrian Hybrid Beacon (HAWK))	Ped and Bike	55%	20	90%	Low

* CM NS05mr is a new countermeasure added for HSIP Cycle 11 Call-for-projects.

Table 3. Countermeasures for Roadways

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	HSIP Funding Eligibility	Systemic Approach Opportunity?
R01	Lighting	Add segment lighting	Night	35%	20	90%	Medium
R02	Remove/ Shield Obstacles	Remove or relocate fixed objects outside of Clear Recovery Zone	All	35%	20	90%	High
R03	Remove/ Shield Obstacles	Install Median Barrier	All	25%	20	90%	Medium
R04	Remove/ Shield Obstacles	Install Guardrail	All	25%	20	90%	High
R05	Remove/ Shield Obstacles	Install impact attenuators	All	25%	10	90%	High
R06	Remove/ Shield Obstacles	Flatten side slopes	All	30%	20	90%	Medium
R07	Remove/ Shield Obstacles	Flatten side slopes and remove guardrail	All	40%	20	90%	Medium
R08	Geometric Mod.	Install raised median	All	25%	20	90%	Medium
R09	Geometric Mod.	Install median (flush)	All	15%	20	90%	Medium
R10PB	Geometric Mod.	Install pedestrian median fencing on approaches	P & B	35%	20	90%	Low
R11	Geometric Mod.	Install acceleration/ deceleration lanes	All	25%	20	90%	Low
R12	Geometric Mod.	Widen lane (initially less than 10 ft)	All	25%	20	90%	Medium
R13	Geometric Mod.	Add two-way left-turn lane	All	30%	20	90%	Medium
R14	Geometric Mod.	Road Diet (Reduce travel lanes and add a two way left-turn and bike lanes)	All	35%	20	90%	Medium
R15	Geometric Mod.	Widen shoulder	All	30%	20	90%	Medium
R16	Geometric Mod.	Curve Shoulder widening (Outside Only)	All	45%	20	90%	Medium
R17	Geometric Mod.	Improve horizontal alignment (flatten curves)	All	50%	20	90%	Low
R18	Geometric Mod.	Flatten crest vertical curve	All	25%	20	90%	Low
R19	Geometric Mod.	Improve curve superelevation	All	45%	20	90%	Medium
R20	Geometric Mod.	Convert from two-way to one-way traffic	All	35%	20	90%	Medium
R21	Geometric Mod.	Improve pavement friction (High Friction Surface Treatments)	All	55%	10	90%	High

Table 3. Countermeasures for Roadways (Continued)

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	HSIP Funding Eligibility	Systemic Approach Opportunity?
R22	Operation/ Warning	Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	All	15%	10	90%	Very High
R23	Operation/ Warning	Install chevron signs on horizontal curves	All	40%	10	90%	Very High
R24	Operation/ Warning	Install curve advance warning signs	All	25%	10	90%	Very High
R25	Operation/ Warning	Install curve advance warning signs (flashing beacon)	All	30%	10	90%	High
R26	Operation/ Warning	Install dynamic/variable speed warning signs	All	30%	10	90%	High
R27	Operation/ Warning	Install delineators, reflectors and/or object markers	All	15%	10	90%	Very High
R28	Operation/ Warning	Install edge-lines and centerlines	All	25%	10	90%	Very High
R29	Operation/ Warning	Install no-passing line	All	45%	10	90%	Very High
R30	Operation/ Warning	Install centerline rumble strips/stripes	All	20%	10	90%	High
R31	Operation/ Warning	Install edgeline rumble strips/stripes	All	15%	10	90%	High
R32PB	Ped and Bike	Install bike lanes	P & B	35%	20	90%	High
R33PB	Ped and Bike	Install Separated Bike Lanes	P & B	45%	20	90%	High
R34PB	Ped and Bike	Install sidewalk/pathway (to avoid walking along roadway)	P & B	80%	20	90%	Medium
R35PB	Ped & Bike	Install/upgrade pedestrian crossing (with enhanced safety features)	P & B	35%	20	90%	Medium
R36PB	Ped and Bike	Install raised pedestrian crossing	P & B	35%	20	90%	Medium
R37PB	Ped and Bike	Install Rectangular Rapid Flashing Beacon (RRFB)	P & B	35%	20	90%	Medium
R38	Animal	Install animal fencing	Animal	80%	20	90%	Medium

Appendix D

Potential Projects

Potential Project: Point Lakeview Road

Project Need

This project was identified by the Lake County Public Works Department to address substandard lane widths (8-9 feet) and missing or narrow shoulders. Previous efforts to improve safety on this roadway have included signing and striping projects. Two project limits along Point Lakeview Road are evaluated:

- Wheeler Drive to SR 29 (approximately 5.7 miles)
- Wheeler Drive to Anderson Road (approximately 1.9 miles)

Point Lakeview Road near SR 29

Project Description (*Source: Lake County HSIP Cycle 10 application*)

- Increase lane width to permissible dimensions.
- Increase shoulders to 4 feet. Install safety edges and shoulder backing.
- Reestablish drainage and edge line striping.
- Relocate telephone poles and other fixed objects adjacent to the roadway.

Potential Countermeasures

The countermeasure information is provided by the *HSIP Analyzer Manual*. Recommended countermeasures are provided in **Table D-1**.

Table D-1: HSIP Countermeasures for Point Lakeview Road

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
R02	Remove/Shield Obstacles	Remove or relocate fixed objects outside of Clear Recovery Zone	All	35%	20	90%	High
R04	Remove/Shield Obstacles	Install guardrail	All	25%	20	90%	High
R12	Geometric Modification	Widen lane (initially less than 10 ft)	All	25%	20	90%	Medium
R15	Geometric Modification	Widen shoulder	All	30%	20	90%	High
R31	Operation/Warning	Install edgeline rumble strips/stripes	All	15%	10	90%	High

It is noted further engineering evaluation is needed to determine which countermeasures are feasible for which limits considering right-of-way, costs, and roadway risk factors. The applicable crash data should be modified if the project limits are changed.

BCR: Wheeler Drive to SR 29

Crash Data (2016-2020)

- 16 Total Crashes
- 0 Fatal
- 2 Severe Injury
- 4 Injury (Other Visible)
- 3 Injury (Complaint of Pain)
- 7 Property Damage Only

Project Cost

The project was estimated by Lake County Public Works in November 2020 at approximately $2.1 million, with $1.9 million in requested HSIP funds.

Benefit Cost Ratio (BCR)

The BCR is estimated at **4-8** based on the crash data, costs, and three countermeasures. The BCR will vary depending on the project limits, associated crash data, countermeasures selected and project costs.

BCR: Wheeler Drive to Anderson Road

Crash Data (2016-2020)

- 9 Total Crashes
- 0 Fatal
- 1 Severe Injury
- 3 Injury (Other Visible)
- 1 Injury (Complaint of Pain)
- 4 Property Damage Only

Project Cost

The project is preliminarily estimated to cost approximately half of the full limits amount estimated by the Lake County Public Works Department, or $1 million.

Benefit Cost Ratio (BCR)

The BCR is estimated at **4-8** based on the crash data, costs, and three countermeasures. The BCR will vary depending on the project limits, associated crash data, countermeasures selected and project costs.

Potential Project: Systemic Roadway Project

Project Need

This project addresses a key need as lane departure crashes accounted for 68 percent of the total crashes and 76 percent of the severe injury and fatal crashes in the county. Road departure is a common type of lane departure crash, and the most common type was hit object; indicating that vehicles are leaving the roadway at a high rate. Previous projects have included signing and striping/pavement markers to improve roadway visibility. While these efforts are an improvement, additional countermeasures are needed to reduce the occurrence of lane departure crashes, particularly fatal and severe injury types.

Project Description

This project aims to widen roadway shoulders and create clear zones, as possible. A clear zone is an open, traversable area adjacent to the roadway. By maintaining a clear zone, vehicles that leave the roadway have a better chance of stopping safely or regaining control of the vehicles. The recommended width of a clear zone along roadways is determined based on speed, traffic volume, roadside slope, and curvature.

These efforts can reduce the occurrences of roadway departures resulting in a crash and reduce the severity of crashes that still occur. Widening shoulders and providing a safety edge can also decrease the likelihood and severity of crashes for vehicles that inadvertently exit the roadway. SafetyEdge℠ slopes the edge of the pavement, reducing vehicle damage from drop off and provides a smoother transition to allow safe return to the roadway.

Where these measures are not feasible, installing guard rail and edgeline rumble strips is a low-cost improvement that can reduce occurrences and severity of lane departures.

Potential Countermeasures

The countermeasure information is provided by the *HSIP Analyzer Manual*. Potential countermeasures were selected based on the crash data and general site evaluations although all countermeasures will not be applicable for all roadways. Potential countermeasures are provided in **Table D-2**.

Candidate Systemic Roadway Projects (county-wide) could include:

1. Safety edge (usually combined with should widening)
2. Tree/telephone pole removal/relocation (or other fixed object removal; within clear zone)
3. Street Lighting – both safety and continuous
4. Guardrail (county-wide)

Table D-2: HSIP Countermeasures for Systemic Roadway Projects

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
R02	Remove / Shield Obstacles	Remove or relocate fixed objects outside of Clear Recovery Zone	All	35%	20	90%	High
R04	Remove / Shield Obstacles	Install Guardrail	All	25%	20	90%	High
R06	Remove / Shield Obstacles	Flatten Side Slopes	All	30%	20	90%	High
R15	Geometric Modification	Widen shoulder	All	30%	20	90%	High
R31	Operation/Warning	Install edgeline rumble strips/stripes	All	15%	10	90%	High

Other potential countermeasures for roadways that have not been improved could include High Friction Road Treatments, striping, or signing improvements. Systemic projects can have up to three countermeasures which should be the same for all locations; however, exceptions can be made if a few locations have different needs.

Siegler Canyon Road

Potential Roadways

The potential roadways were selected based on the crash history (considering the number and severity of crashes), and general roadway risk factors consistent with the proposed project. Risk factors are elements that the location lacks or could be enhanced to improve safety. Risk factors identify common roadway characteristics which may contribute to past crashes or increase the risk of future crashes.

Not all roadways will need all project elements for the entire length, and it will not be feasible to implement countermeasures for all roadway portions. Sections of roadway proposed for countermeasures should be prioritized based on feasibility, crash history, and segments most in need.

Stone Drive

Additionally, other roadways can be added to this systemic project if the risk factors are consistent to proactively improve safety even if a significant crash history is not noted. The roadways are shown in **Table D-3,** including the crash history for the length of the roadway**.**

Table D-3: Potential Roadways for Systemic Roadway Project

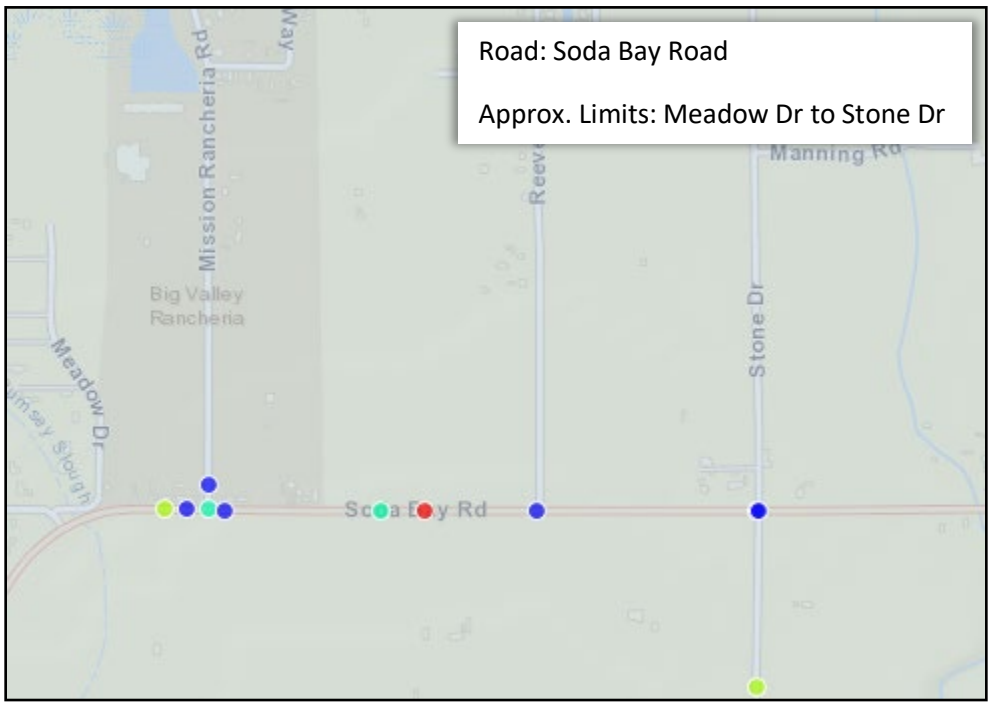
Roadway	Crash History (2016-2020)				
	Fatal	Injury (Severe)	Injury (Other Visible)	Injury (Complaint of Pain)	PDO
SODA BAY RD	2	3	18	19	76
BUTTS CANYON RD	2	7	6	4	20
NICE LUCERNE CUTOFF RD	2	1	5	5	21
LAKESHORE BLVD	1	9	8	9	39
MORGAN VALLEY RD	1	4	5	2	7
SULPHUR BANK DR	1	2	3	2	9
STONE DR.	1	1	0	0	4
BOTTLE ROCK RD	0	3	3	7	16
SCOTTS VALLEY RD	0	3	6	2	17
POINT LAKE VIEW RD	0	3	5	4	7
BIG VALLEY RD	0	4	2	3	9
NEW LONG VALLEY RD	0	3	4	2	15
SEIGLER CANYON RD	0	1	9	4	16
SPRUCE GROVE RD	0	2	4	5	10

Potential Limits

This high-level assessment identifies approximate roadway limits for potential projects based on crash data the with high potential for countermeasures given the severity and number of injury crashes. The roadways and limits may be modified, lengthened, or reduced through project refinement based on feasibility, right-of-way, and other associated costs/criteria. Potential Roadway limits, crash data (source: Transportation Injury Mapping System (TIMS) 2016-2020 data*),* and site evaluation notes are shown below.

Crash Data

Legend:

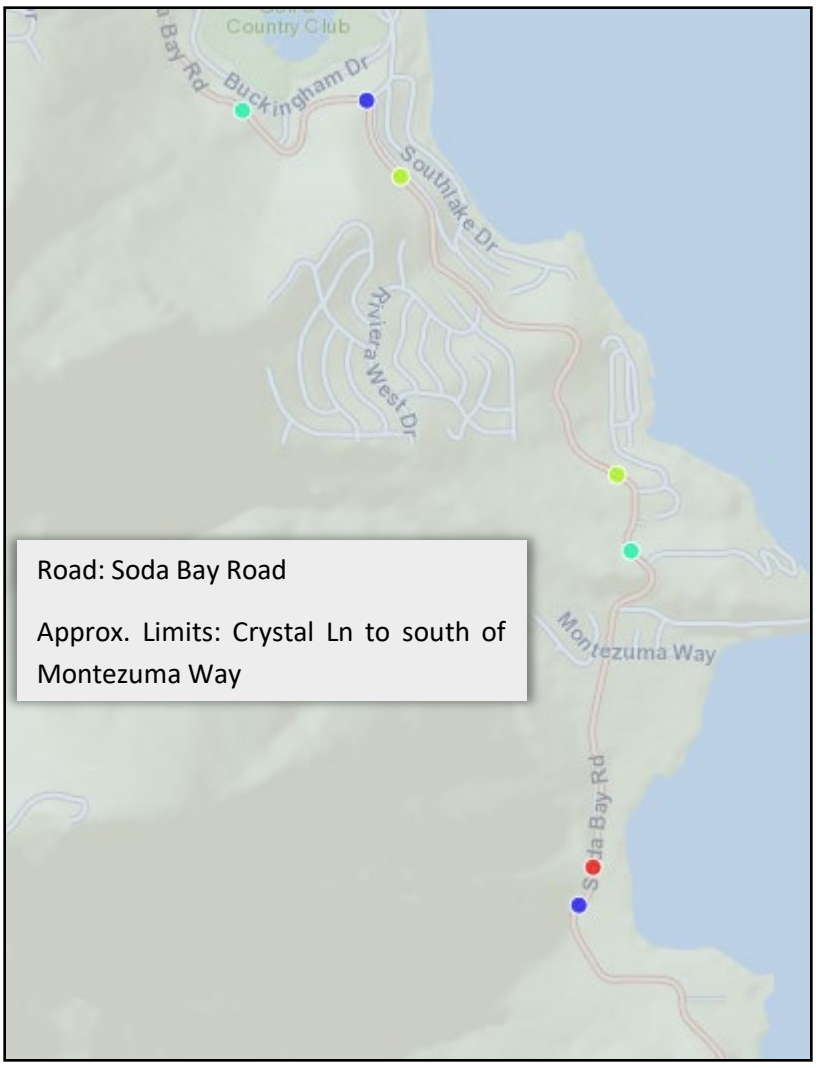


Soda Bay Road (Meadow Dr to Stone Dr) Site Evaluation Notes:

- Narrow shoulders, paved and gravel
- Residential Area
- Utility poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

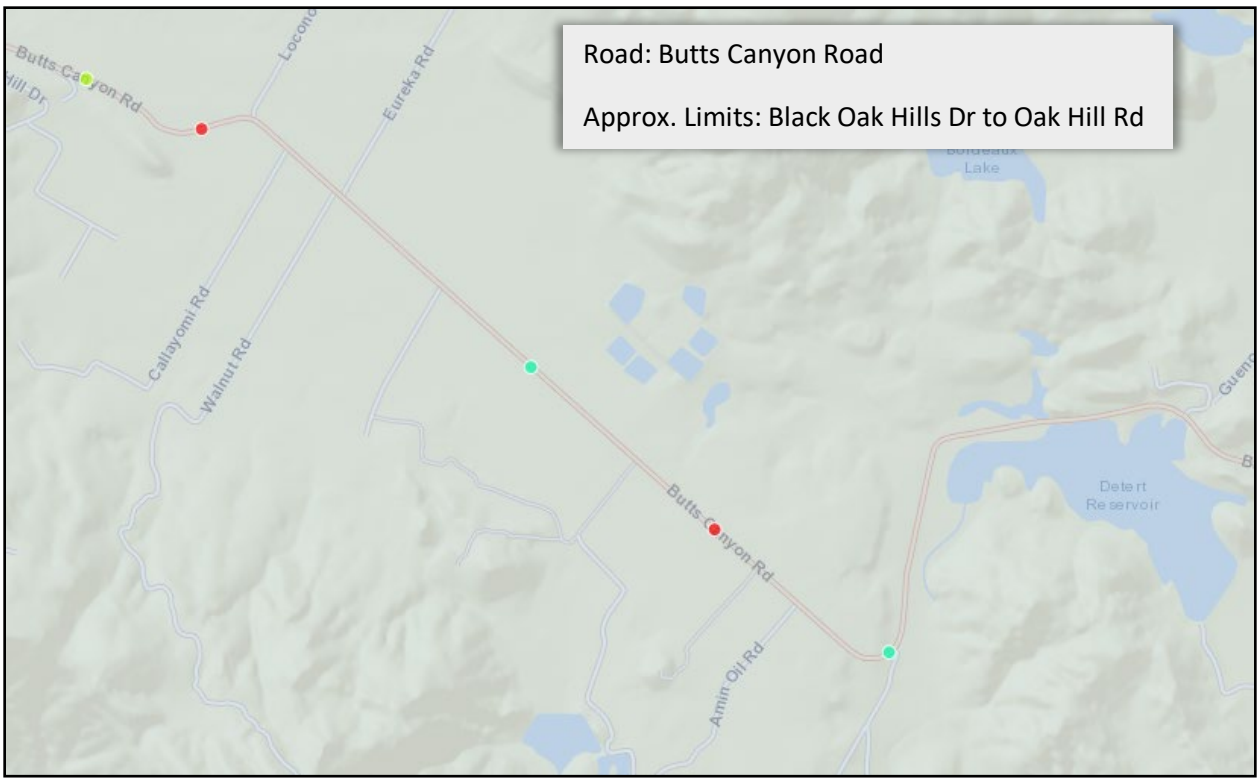
Soda Bay Road (Waldo Ln to Glebe Rd) Site Evaluation Notes:

- Majority no or narrow shoulders
- Residential Area
- Utility poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



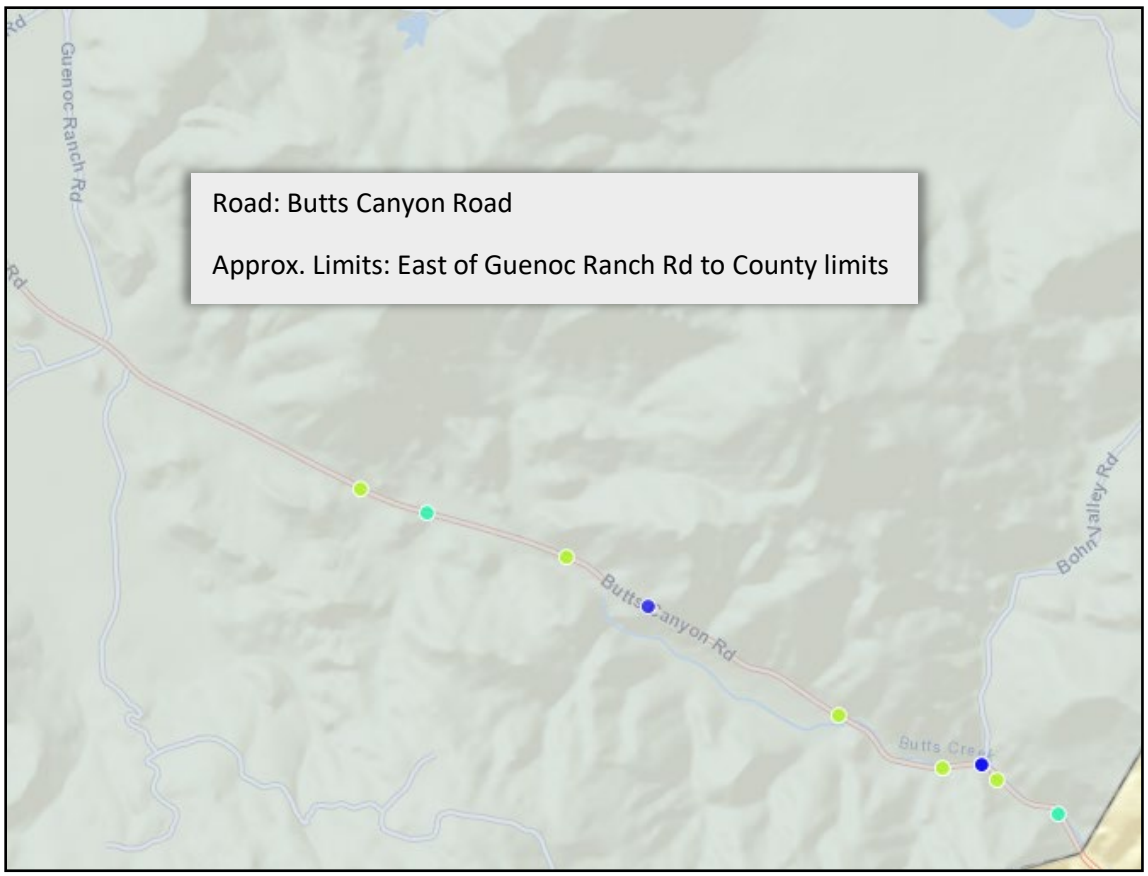
Soda Bay Road (Crystal Ln to south of Montezuma Way) Site Evaluation Notes:

- Roadway has sections of curves (with warning signs) with heavy vegetation adjacent to roadway, no or narrow shoulders
- Traverses residential Areas
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R06: Flatten Side Slopes (spot locations)
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



Butts Canyon Road (Black Oak Hills Dr to Oak Hill Rd) Site Evaluation Notes:

- Majority no shoulders
- Utility poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



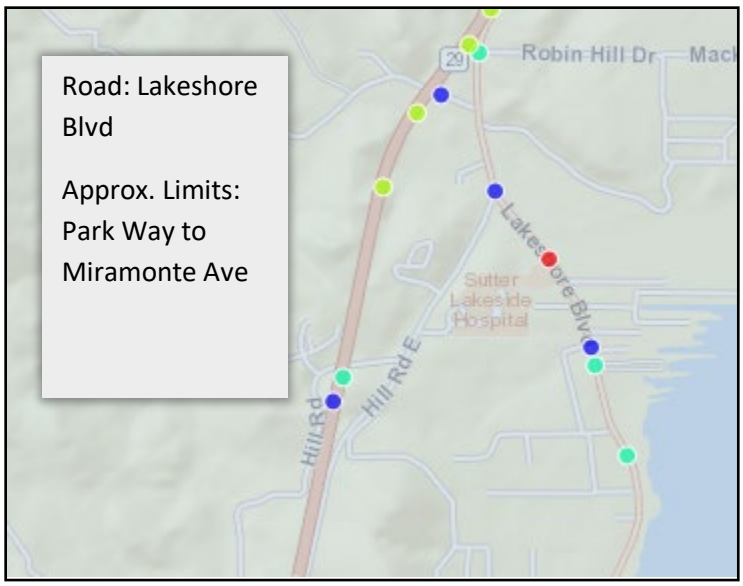
Butts Canyon Road (East of Guenoc Ranch Rd to County limits) Site Evaluation Notes:

- Majority no or narrow shoulders; terrain may prevent roadway widening in sections
- Vegetation and mountain terrain adjacent to the roadway; guardrail in areas
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R06: Flatten Side Slopes (spot locations)
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

Nice Lucerne Cutoff Road (East of Lakeshore Blvd to Bridge) Site Evaluation Notes:

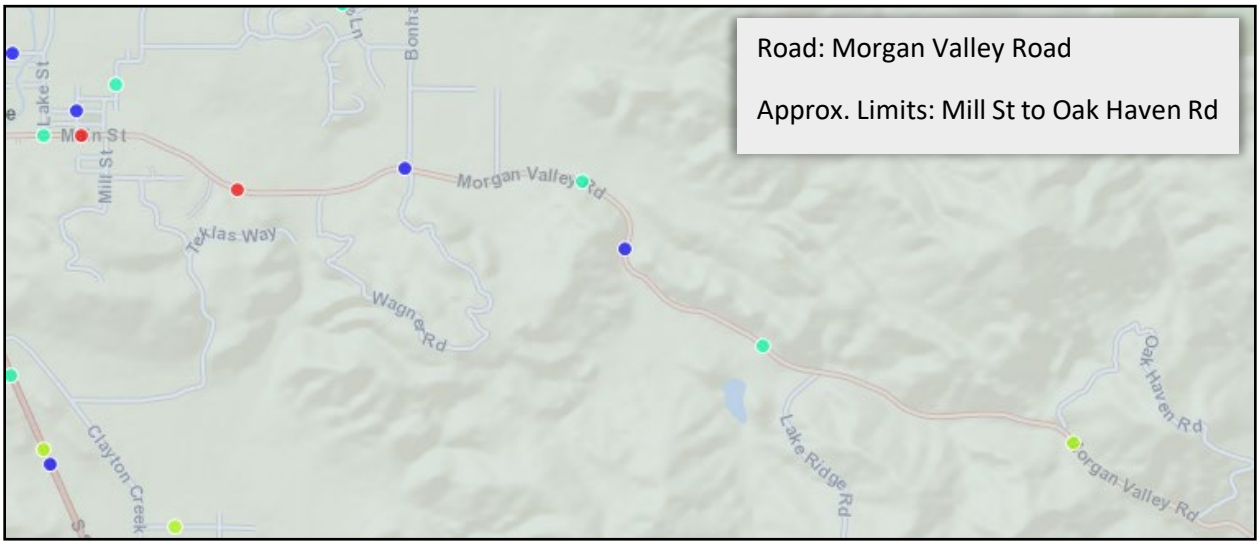
- Roadway has curves, narrow and/or gravel shoulders
- Vegetation and mountain terrain adjacent to the roadway; guardrail in areas
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

In addition to the HSIP countermeasures, add a safety edge and left-turn pocket at Rodman Slough Park entrance.



Lakeshore Blvd (Park Way to Miramonte Ave) Site Evaluation Notes:

- Heavy residential area, homes and fences adjacent to roadway.
- No shoulders on west side; gravel shoulders most of length.
- Utility poles and vegetation adjacent to the roadway
- South of Miramonte Avenue crashes shoulders are wider and bicycle lanes exist.
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

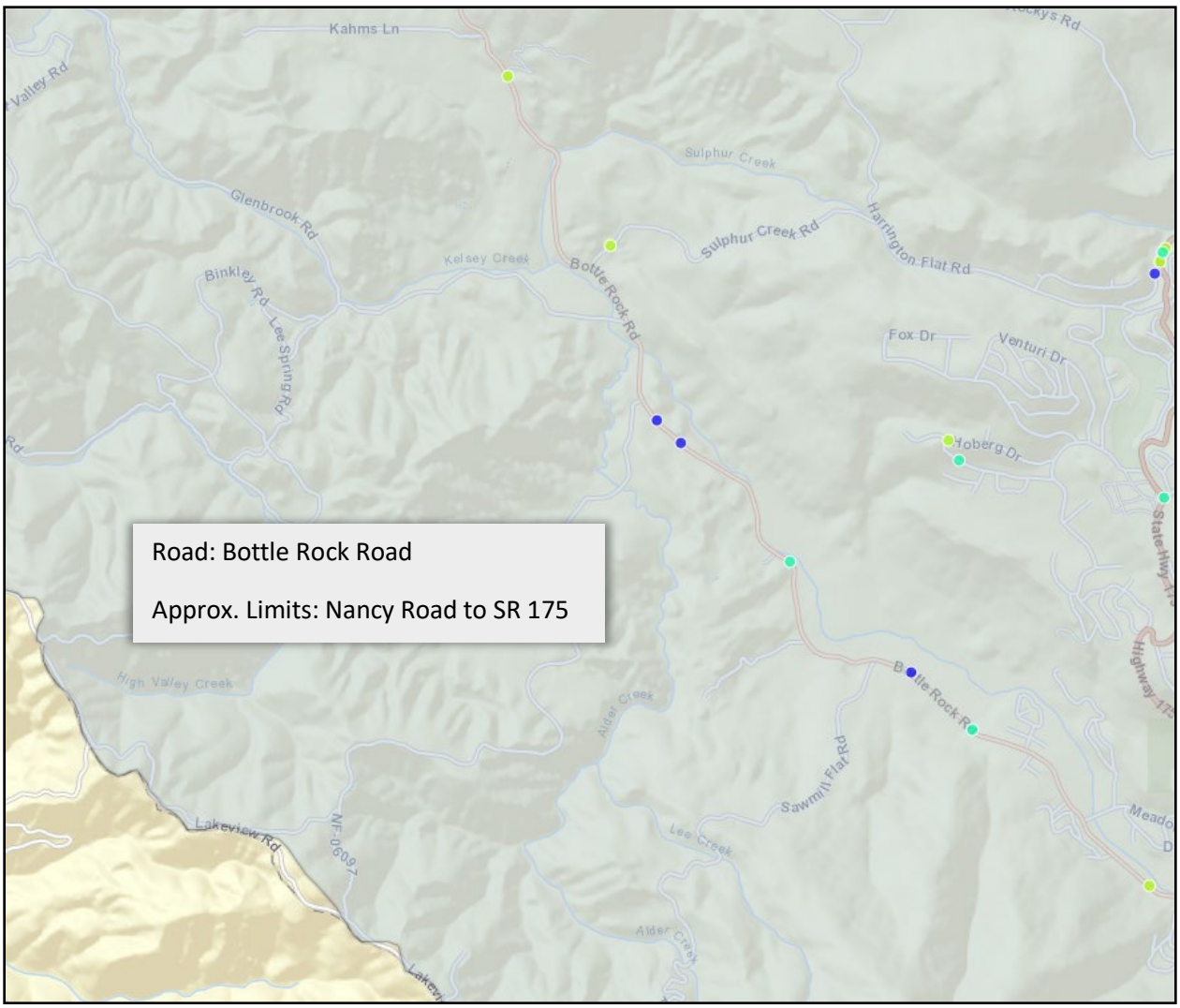


Morgan Valley Road (Mill St to Oak Haven Rd) Site Evaluation Notes:

- Mixture of no, narrow and gravel shoulders
- Guardrail in areas
- Steep terrain in areas may prevent shoulder widening
- Utility poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R06: Flatten Side Slopes
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

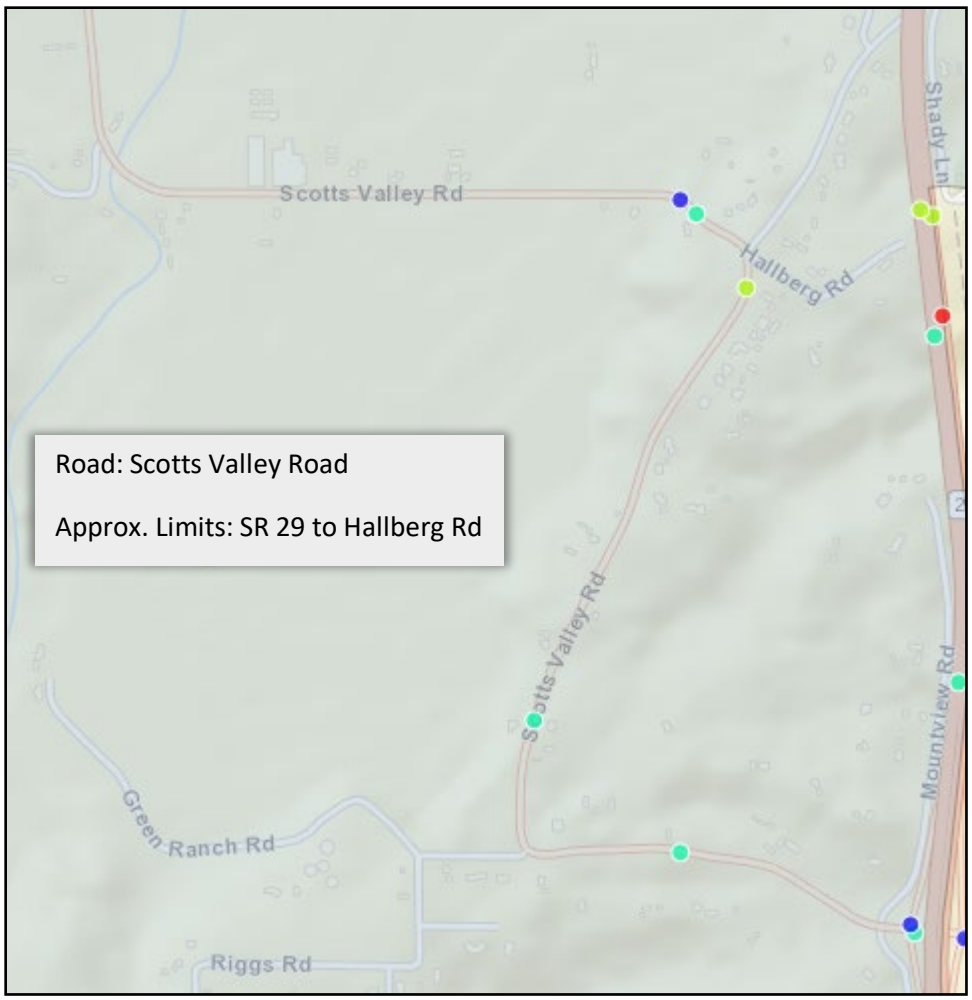
Sulphur Bank Drive (SR 20 to Sulphur Bank Mine Rd) Site Evaluation Notes:

- Majority no or gravel shoulders
- Vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R06: Flatten side slopes
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



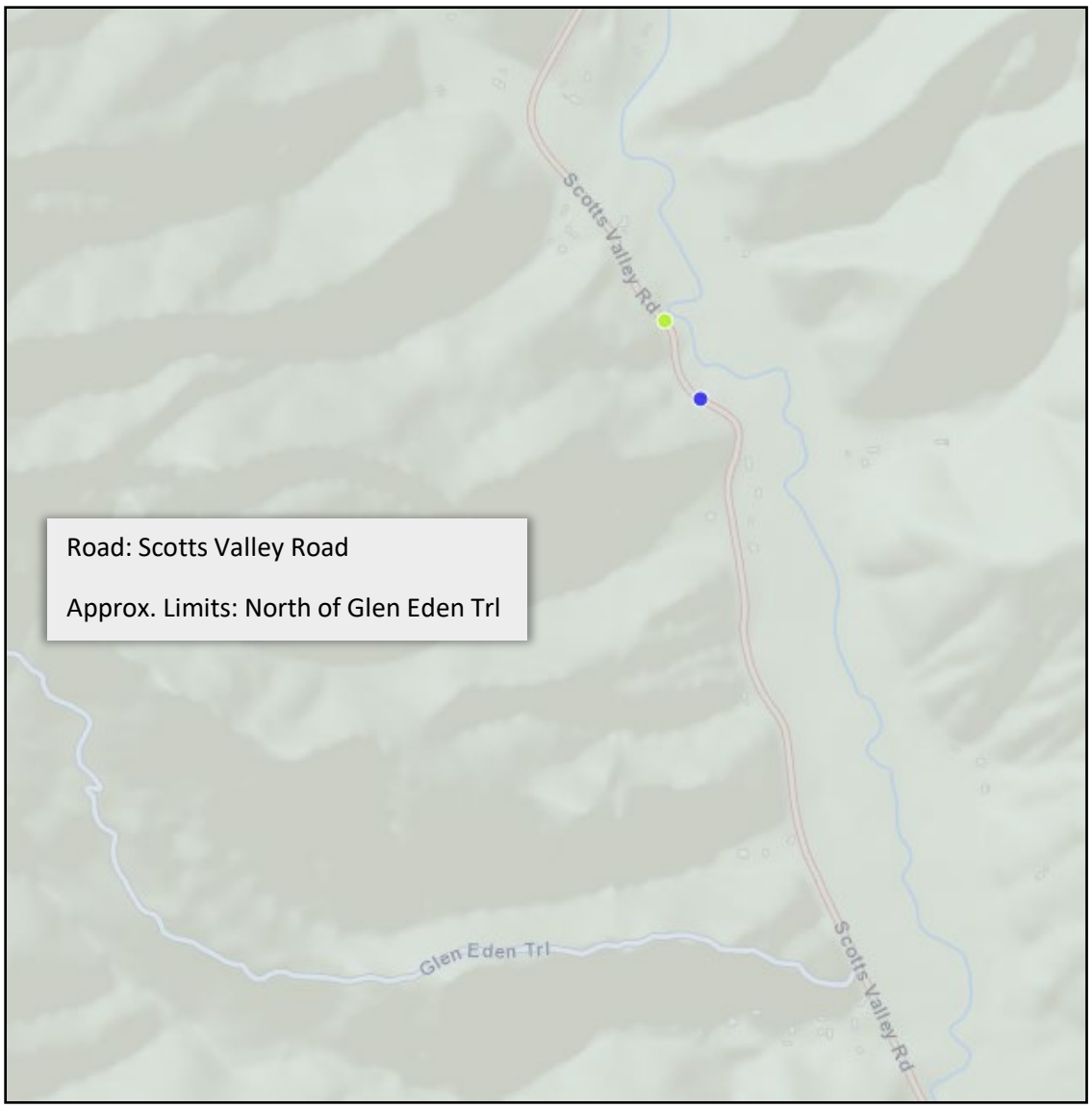
Bottle Rock Road (Nancy Rd to SR 175) Site Evaluation Notes:

- No or narrow shoulders
- Utility Poles and vegetation adjacent to the roadway
- Terrain may restrict shoulder widening on portions
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



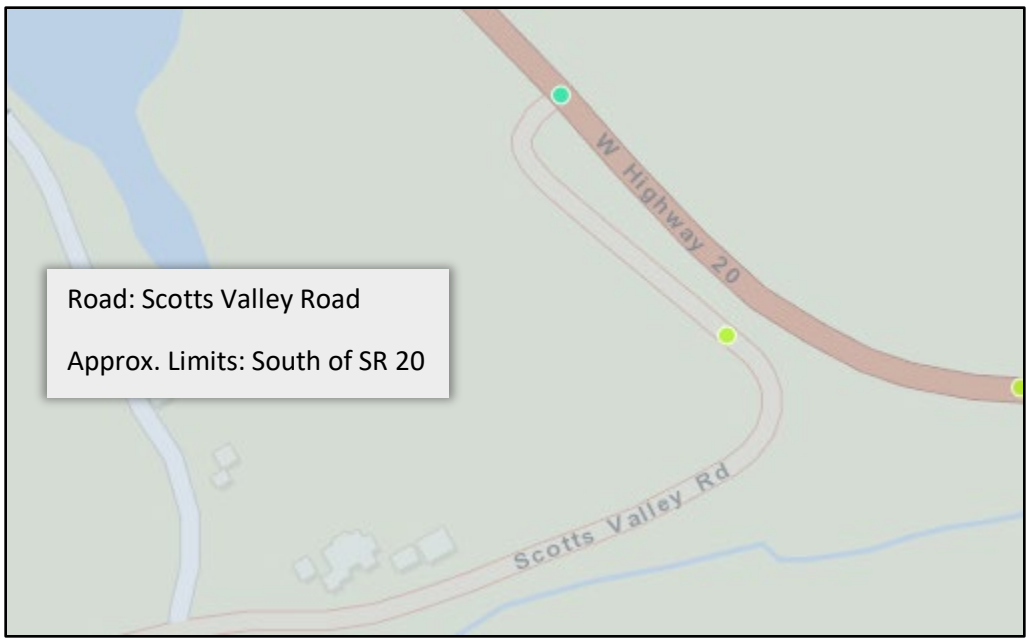
Scotts Valley Road (SR 29 to Hallberg Rd) Site Evaluation Notes:

- No or narrow shoulders
- Residential areas
- Utility Poles and vegetation adjacent to the roadway
- Terrain may restrict shoulder widening on portions
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



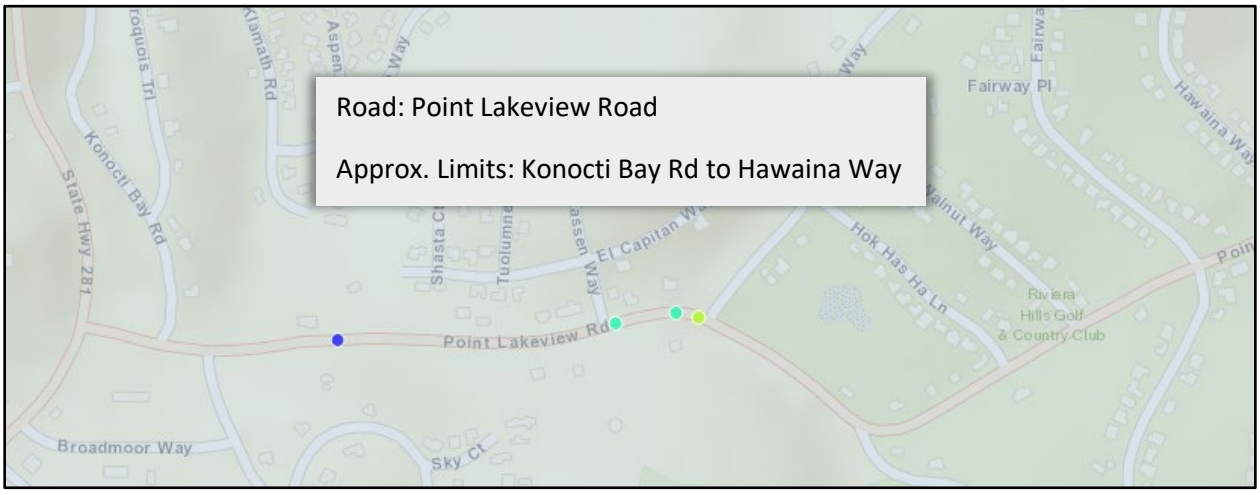
Scotts Valley Road (North of Glen Eden Trl) Site Evaluation Notes:

- No or narrow shoulders; terrain may prevent widening on west; steep drop off on east
- Vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R06: Flatten Side Slopes (spot locations)
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



Scotts Valley Road (South of SR 20) Site Evaluation Notes:

- Shoulders exists
- Vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R31: Install edgeline rumble strips/stripes

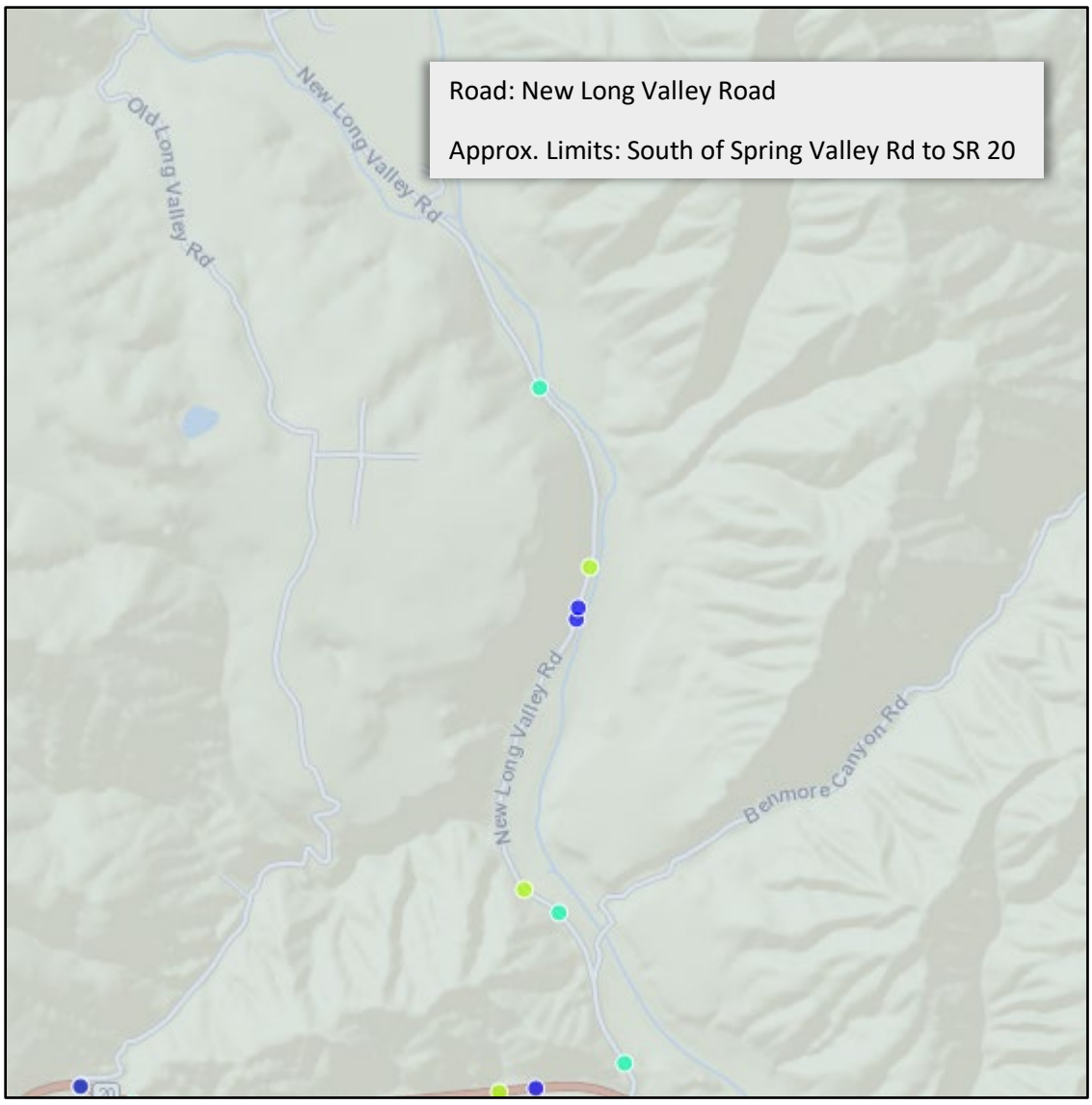


Point Lakeview Road (Konocti Bay Rd to Hawaina Way) Site Evaluation Notes:

- Narrow roadway with no shoulders, steep drop offs
- Terrain may prevent widening shoulders
- Utility Poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R06: Flatten Side Slopes (spot locations)
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

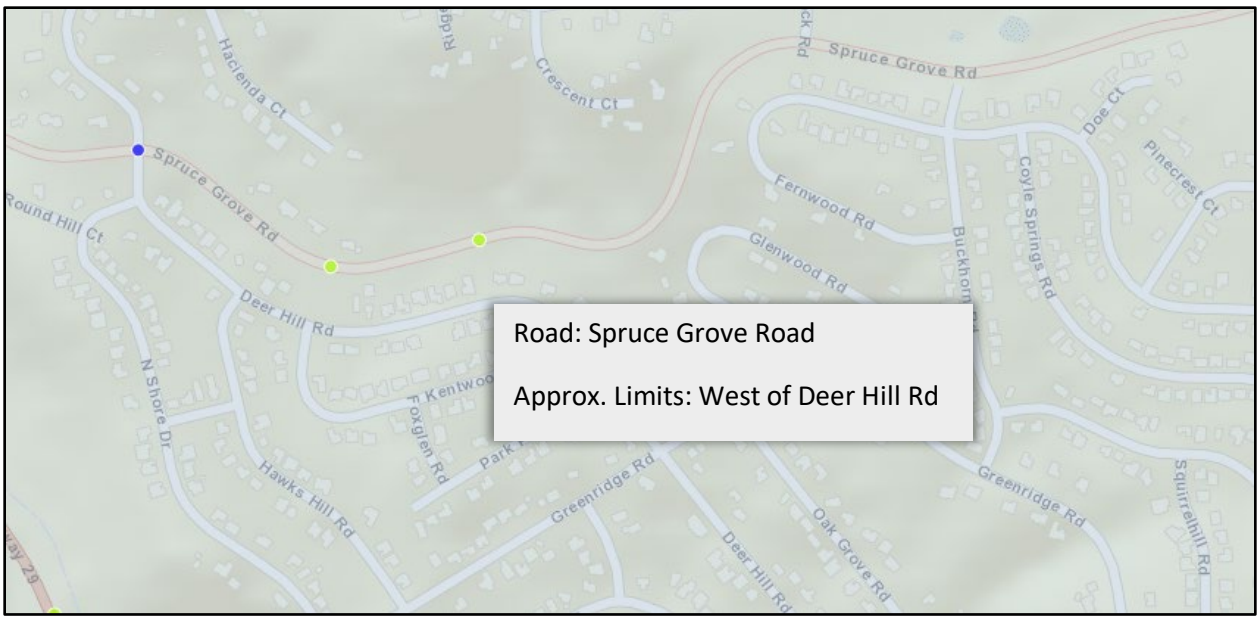
Point Lakeview Road (Near Miller Rd) Site Evaluation Notes:

- Narrow roadway with no shoulders, steep drop offs
- Terrain may prevent widening shoulders
- Utility Poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R06: Flatten Side Slopes (spot locations)
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes



New Long Valley Road (South of Spring Valley Rd to SR 20) Site Evaluation Notes:

- No, narrow and/or gravel shoulders, steep drop offs
- Terrain may prevent widening shoulders
- Utility Poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R04: Install Guardrail (spot locations)
  - R06: Flatten Side Slopes (spot locations)
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

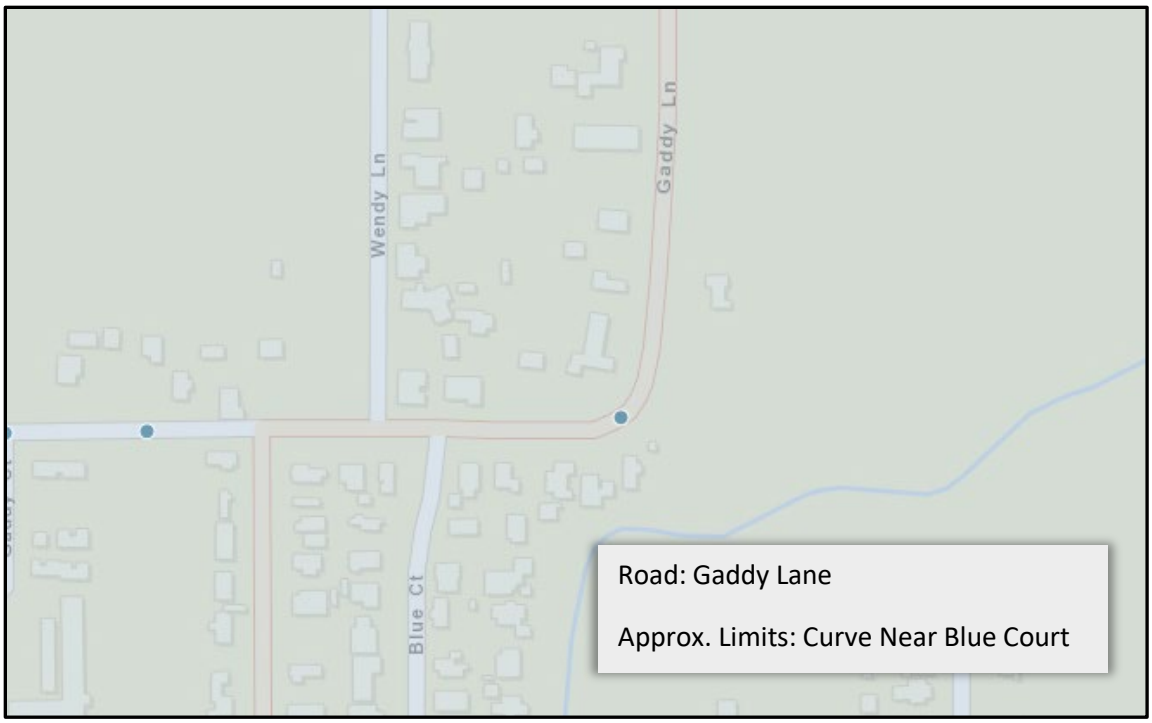


Spruce Grove Road (West of Deer Hill Rd) Site Evaluation Notes:

- Shoulders exist; narrow in some sections
- Utility Poles and vegetation adjacent to the roadway
- Potential Countermeasures:
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R31: Install edgeline rumble strips/stripes

Project Cost and BCR

The project cost will vary greatly depending on the roadways included, segment lengths, available right-of-way, etc. but would likely exceed $1,000,000. The roadways with the highest crashes and those that are most feasible/cost effective should be prioritized. The maximum that can be applied for in HSIP funds is $10 million. Similarly, the BCR will vary greatly given the project parameters and associated countermeasures but is expected to be higher given the high number of crashes on the potential roadway segments.



Gaddy Lane Site Evaluation Notes:

- Vegetation limits curve sight distance
- Utility poles and vegetation adjacent to the roadway
- Roadway tangents allow motorists to build speed which may lead to speeding through the curve
- Narrow shoulders
- Limited signage warning of curve
- Potential Countermeasures
  - R02: Remove or relocate fixed objects outside of Clear Recovery Zone
  - R15: Widen shoulders
  - R17: Improve horizontal alignment (flatten curves)
  - R21: Improve pavement friction (High Friction Surface Treatments)
  - R22: Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)
  - R23: Install chevron signs on horizontal curves
  - R24: Install curve advance warning signs
  - R25: Install curve advance warning signs (flashing beacon)
  - R26: Install dynamic/variable speed warning signs
  - R31: Install centerline rumble strips/stripes

Potential Project: Systemic Pedestrian Crossings

Project Need

This project addresses a key need as pedestrians are vulnerable roadway network users, and crashes involving a pedestrian are more likely to result in injuries. In Lake County, crashes involving a pedestrian accounted for 10 percent of the severe injury and fatal crashes. The majority (86 percent) occurred on roadways as opposed to intersections, and most occurred outside of a crosswalk.

Crosswalk on Keys Blvd

Project Description

This project improves pedestrian safety by providing enhanced crosswalks at key locations.

Potential Countermeasures

The countermeasure information is provided by the *HSIP Analyzer Manual*. Recommended Countermeasures are provided in **Table D-4**.

Table D-4: HSIP Countermeasures for Systemic Pedestrian Crossings

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
R35PB	Ped and Bike	Install/upgrade pedestrian crossing (with enhanced safety features)	Ped and Bike	35%	20	90%	Medium
R37PB	Ped and Bike	Install Rectangular Rapid Flashing Beacon (RRFB)	Ped and Bike	35%	20	100%	Medium

Potential Locations

Locations were selected where pedestrian-related crashes have occurred, considering the crash factors and location of adjacent pedestrian generators and facilities such as sidewalks, walking paths, and enhanced or unenhanced crosswalks. Additional sites may be added for a systemic application of a crosswalk if needed, regardless of the presence of crash history. The locations are shown in **Table D-5**.

Table D-5: Potential Roadways for Systemic Pedestrian Crossing Project

Primary Roadway	Secondary Roadway	Crash Severity	Recommendations
ACORN ST	SR-20	Injury (Other Visible)	The crash occurred adjacent to a marked continental crosswalk at Acorn St/SR 20. This crosswalk should be enhanced to encourage use; however, the location is on SR 20, a state highway which would require coordination with Caltrans.
KEYS BLVD	MARINA VILLAGE	Injury (Severe)	The crash occurred adjacent to a marked continental crosswalk at Keys Blvd/SR 20. This crosswalk should be enhanced to encourage use.
LAKE ST	JESSE ST	Injury (Other Visible)	The crash occurred in a school zone for Lower Lake High School and Elementary School, less than 100' from an existing crosswalk. This crosswalk should be enhanced to encourage use.
MAIN STREET	ADAMS ST	Fatal	The crash occurred adjacent to a marked crosswalk at Main Street/Adams Street. This crosswalk should be enhanced to encourage use.

Other Potential Locations for a Systemic Approach:

- Irvine Avenue at SH 20
- Main Street, Upper Lake at SH 20
- Government Street at SH 20
- Pomo Way at SH 20
- Levy Avenue at SH 20
- Keeling Avenue at SH 20
- Howard Avenue at SH 20
- Hudson Avenue at SH 20
- Lucerne: Push button activated ped crossing signs (crosswalk enhancements)
  - SH-20 at 1st, 2nd, 3rd, 4th, 5th, 9th, 10th, 13th and 16th Avenues.
- Clear Oaks:
  - Pine Street at SH 20
  - Acorn Street at SH 20
  - Foothill Blvd. at SH 20
  - Lakeland St./Oakgrove Ave. at SH 20
  - High Valley Rd at SH 20
  - Butler Street at SH 20
  - Hoover Street at SH 20
  - Keys Blvd. at SH 20

- Lower Lake, enhancements to crosswalks:
  - Lake Street at Lower Lake Elementary School
  - Main Street at Mill Street
  - Main Street at Adams Street
  - Main Street at Lake Street
  - Main Street at Post Office
- In Middletown:
  - Hartmann Road at Golf Course
  - Young St. at SH 29
  - Young St. at Washington St.
  - Armstrong St. at SH 29
  - Douglas St. at SH 29
  - Callayomi St. At SH 29
- In Kelseyville:
  - Main Street at Gunn
  - Main Street at 1st Street
  - Main Street at 2nd Street
  - Main Street at 3rd Street
  - Main Street at 4th Street
  - Main Street at Konocti Road
  - Main Street at Forrest's Road
  - Konocti Road at Kelseyville H.S.

Project Cost and BCR

An enhanced crosswalk with an RRFB is estimated to be $50,000 per location. The BCR is expected to be very high (over 25) given the crash history and relatively low project costs. Therefore, it would be beneficial to add in other sites with high risk factors, in need of enhanced pedestrian crosswalks for a systemic application or provide additional safety features at the selected sites such as sidewalks.

Crosswalk near Acorn Dr

Potential Project: Systemic Dynamic/Variable Speed Warning Signs

Project Need

Speeding was ranked as the third highest priority in the public outreach and was noted in several open response questions in the survey. Furthermore, input for various stakeholders has indicated that speeding is a high priority area of concern throughout the county, particularly neighborhood streets, near schools, and low speed streets serving commercial areas with high volumes of pedestrians. The data analysis indicated that 20 percent of the crashes had 'unsafe speed' listed as the Primary Collision Factor.

Subdivision Speed Limit Sign
Chippewa Trails Dr

Project Description

This project installs dynamic/variable speed warning signs throughout the unincorporated Lake County to encourage drivers to adhere to appropriate speed limits and increase safety through awareness.

Potential Countermeasures

The countermeasure information is provided by the *HSIP Analyzer Manual*. Recommended countermeasures are provided in **Table D-6**.

Table D-6: HSIP Countermeasures for Speed Warning Project

HSIP No.	Type	Countermeasure Name	Crash Type	Crash Reduction Factor (CRF)	Expected Life (Years)	HSIP Eligibility	Systemic Approach Opportunity?
R26	Operation/ Warning	Install dynamic/variable speed warning signs	All	30%	10	100%	High

Potential Locations

Locations were selected based on the crash history along roadways with high occurrences of crashes with 'unsafe speed' as the primary collision factor and other locations identified as a speeding concern by public outreach and stakeholders to proactively address speeding. The locations are shown in **Table D-7**.

Table D-7: Potential Roadways for Systemic Dynamic Variable Speed Warning Signs

Roadway Included per Crash Data	Crash History (2016-2020)				
	Fatal	Injury (Severe)	Injury (Other Visible)	Injury (Complaint of Pain)	PDO
SODA BAY RD	2	3	18	19	76
BUTTS CANYON RD	2	7	6	4	20
NICE LUCERNE CUTOFF RD	2	1	5	5	21
LAKESHORE BLVD	1	9	8	9	39
MORGAN VALLEY RD	1	4	5	2	7
SULPHUR BANK DR	1	2	3	2	9
STONE DR.	1	1	0	0	4
BOTTLE ROCK RD	0	3	3	7	16
SCOTTS VALLEY RD	0	3	6	2	17
POINT LAKE VIEW RD	0	3	5	4	7
BIG VALLEY RD	0	4	2	3	9
NEW LONG VALLEY RD	0	3	4	2	15
SEIGLER CANYON RD	0	1	9	4	16
SPRUCE GROVE RD	0	2	4	5	10
Roadways Included per Stakeholder or Public Input for Proactive Systemic Application					
Roadways in the Kelseyville Riviera Subdivision including (but not limited to) Fairway Drive and Chippewa Trails Drive					

Project Cost and BCR

At approximately $5,000 per sign, this project could include a system of at least 20 signs for the HSIP application minimum of $100,000. The BCR would vary significantly depending on the roadways and limits but is expected to be extremely high (over 100) given the relative very low cost to cover a significant portion of roadway.

Additional Considerations

This project to install speed feedback signs could be part of a multifaceted traffic calming project. The Federal Highway Administration (FHWA) provides thorough documentation of traffic calming measures, applications, effects, and other useful information through the traffic calming ePrimer at:

https://safety.fhwa.dot.gov/speedmgt/traffic_calm.cfm#eprimer

In addition, many municipalities and agencies have developed guidelines for traffic calming. A summary of potential traffic calming measures is shown in **Table D-8**.

Table D-8: Traffic Calming Measures

Traffic Calming Measure	Potential Safety Benefits	Advantages	Disadvantages/ Potential Issues	Estimated Costs[1]
Non-Physical				
Speed Enforcement by Police	Slows traffic	City-wide, can easily be moved to different locations	Temporary impacts, dependent on police availability	Low
Portable Speed Radar Trailers	Increases driver awareness, slows traffic	City-wide, can easily be moved to different locations	Temporary benefits	Medium (per trailer)
Radar Speed Feedback Signs – *signs displaying the speed limit and speed of motorists*	Increases driver awareness, slows traffic	Easy to implement, does not require design, somewhat portable	May not significantly reduce speeds over time, requires power source or solar panels	Medium
Media/Social Media Campaigns	Brings awareness, slows traffic	Easy to deploy City-wide	May not significantly reduce speeds over time	Low
Signage or Pavement Markings	Increases driver awareness, slows traffic	Easy to implement and does not require design	May not significantly reduce speeds over time	Low
Horizontal Deflection				
Lateral Shift – *island to create curvature in the roadway*	Slows traffic	Can accommodate higher traffic volumes and provides aesthetic/ landscaping opportunities	Several in series needed to maintain reduced speeds and volumes, may impact on-street parking, may be struck by motorist	Medium - High
Chicane – *curb bulb-outs placed to create an "S" shaped roadway*	Slows traffic	Can accommodate higher traffic volumes and provides aesthetic/ landscaping opportunities	Several in series needed to maintain reduced speeds and volumes, may impact on-street parking, may be struck by motorist	Medium - High
Traffic Circle or roundabout – *raised island at an intersection to circulate traffic*	Slows traffic	Can improve intersection safety, provides aesthetic/landscaping opportunities	Use at intersections only, landscaping maintenance	High

Table D-8 continued: Traffic Calming Measures

Traffic Calming Measure	Potential Safety Benefits	Advantages	Disadvantages/ Potential Issues	Estimated Costs[1]
Vertical Deflection				
Speed Hump – *raised device constructed across roadway*	Slows traffic and can reduce cut-through traffic	Effective at reducing speeds	Several in series needed to retain reduced speeds and volumes, driver discomfort, noise	Low
Speed Lump – *speed hump with openings for large vehicles or bicyclists*	Slows traffic and can reduce cut-through traffic	Effective at reducing speeds, while accommodating large/emergency vehicles and bicycles	Several in series needed to retain reduced speeds and volumes, driver discomfort, noise	Low
Speed Table – *speed hump with flat top and gentler transition*	Slows traffic and can reduce cut-through traffic	Slows traffic with less discomfort to the vehicle than a speed hump	Several in series needed to retain reduced speeds and volumes	Low - Medium
Raised Intersection – *speed table extending through intersection*	Slows traffic, can reduce cut-through traffic, can provide pedestrian safety benefits	Slows traffic for two streets and adds safety benefits for pedestrians	Use only at intersections, does not reduce speeds mid-block	High
Raised crosswalk- *speed table combined with a pedestrian crossing*	Slows traffic, can reduce cut-through traffic, pedestrian safety benefits	Enhances a pedestrian crossing	Single application will not reduce speeds corridor-wide	Low - Medium
Street Width Reduction				
Corner Extension/Bulb Out/Neckdown – *bulb outs at intersections*	Slows traffic, can provide pedestrian safety benefits	Provides traffic calming for two streets and safety benefits for pedestrians	Use at intersections only, may impact on-street parking, may be struck by motorists	High
Mid-Block Choker – *bulb outs placed in the middle of the roadway*	Slows traffic and can reduce cut-through traffic	Provides landscaping opportunities, can include a pedestrian crosswalk	Landscaping maintenance, may impact on-street parking, may be struck by motorists	Medium - High
Median Island – *raised island mid-block*	Slows traffic and can reduce cut-through traffic	Provides landscaping opportunities, can include a pedestrian crosswalk	Landscaping maintenance, may impact on-street parking, may be struck by motorists	Medium

Table D-8 continued: Traffic Calming Measures

Traffic Calming Measure	Potential Safety Benefits	Advantages	Disadvantages/ Potential Issues	Estimated Costs[1]
Routing Restrictions				
Diagonal Divider/Full Closure/Half Closure/Median Barrier – *blocks movements at an intersection*	Reduces traffic volume and cut-through traffic	Lower traffic volumes and speeds	Restrictive, may cause indirect routes and restrict business access, can move the traffic to another residential street	Medium - High

Notes: 1. Cost estimates are preliminary provided by FHWA and other sources. Costs can vary significantly given the project specifics. Low costs are <$6k, Medium costs are $6k-$15k, High costs are >$15k per installation.