Statement of Protection of Data from Discovery and Admissions

SECTION 148 OF TITLE 23, UNITED STATES CODE
REPORTS DISCOVERY AND ADMISSION INTO EVIDENCE OF CERTAIN REPORTS, SURVEYS, AND INFORMATION —
Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for any purpose relating to this section, shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at the location identified or addressed in the reports, surveys, schedules, lists, or other data.

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

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A Traffic Safety Vision for Concord

The City of Concord’s Local Roadway Safety Plan (LRSP) Vision Statement highlights the central importance of improving health, safety and equitable access to multimodal transportation facilities for all roadway users. Complementary goals for the LRSP, developed through stakeholder outreach and data analysis, represent specific facets of the transportation system set alongside higher-level holistic objectives for communitywide health and safety improvements. Together, the vision statement and goals establish a concise yet comprehensive focus for investments in infrastructure, education, emergency services, and enforcement.

Vision Statement

Roadway safety impacts the health and comfort of all those who live and travel in the City of Concord, and it is imperative to make the transportation system safer and more equitable for users of all transportation modes.

The City of Concord is committed to eliminate traffic deaths and severe injuries by 2033. As part of this commitment, the City will prioritize safety when trade-off decisions are necessary between competing demands and visions for the roadway network.

The City of Concord will form a standing Local Roadway Safety Working Group that will meet regularly to implement this Local Roadway Safety Plan, monitor progress towards the City’s goal of eliminating traffic deaths and severe injuries, and communicate outcomes to the public regularly.
Safety Goals

Equity
Commit to equity in all aspects of Vision Zero, including data analysis that acknowledges and addresses reporting biases, project prioritization efforts that promote projects in historically under-invested communities rather than providing unequal opportunities to those with the historically “loudest” voices or most resources for civic participation, and enforcement strategies that follow data-driven approaches.

Eliminating Collisions
Eliminate fatal and serious injury collisions, particularly those involving people walking and biking.

Crossings
Enhance roadway crossings, especially near commercial areas, schools, and other high pedestrian activity areas, to promote and support safe travel for people walking and biking.

Nighttime Visibility
Improve the visibility of roadway users traveling at night, especially for people walking.

Safe Speeds and Safer Streets
Encourage safe driving practices (such as driving at lower speeds, obeying signal controls at intersections, and avoiding driving under the influence) through roadway design, outreach, and enhanced enforcement, including considerations of automated enforcement methods.

Post-Crash Care
Improve post-crash care through increased multi-jurisdictional collaboration, appropriate emergency vehicle access, and support for victims and their family members.
Introduction, Background, and Existing Efforts

Each day, people are killed and seriously injured on our roads. Collisions can irreversibly change the course of human lives, touching victims, their families and loved ones. The City of Concord is committed to prioritizing safety and eliminating transportation-related deaths and serious injuries on City streets. This Local Road Safety Plan (LRSP) proactively evaluates hot spots throughout the City to identify the proven countermeasures that can be implemented through the current and future Capital Improvement Plan (CIP).

Through collective action on the part of all roadway system stakeholders, from system operators and vehicle manufacturers, to law enforcement and everyday users, we can move to a Safe Systems approach that anticipates human mistakes with the goal of eliminating fatal and serious injuries for all road users.

A Safe System acknowledges the vulnerability of the human body – in terms of the amount of kinetic energy transfer a body can withstand – when designing and operating a transportation network to minimize serious consequences of collisions. According to the World Health Organization, the goal of a Safe System is to ensure that if collisions occur, they “do not result in serious human injury.”

The Safe System approach to road safety started internationally as part of the Vision Zero proclamation that no one should be killed or seriously injured on the road system.

It is founded on the principle that people make mistakes, and that the road system should be adapted to anticipate and accommodate human mistakes and human physiological and psychological limitations. Countries that have adopted the Safe System approach have had significant success reducing highway fatalities, with reductions between 50 and 70%. The Safe System approach addresses the five elements of a safe transportation system – Safe Road Users, Safe Vehicles, Safe Speeds, Safe Roads, and Post-Crash Care – in an integrated manner, through a wide range of interventions, as shown in Figure 1.

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

- Separate users in a physical space, such as sidewalks and dedicated bicycle facilities
- Separate users in time using such measures as pedestrian scrambles and dedicated turn phases at signalized intersections.
- Alert users to potential hazards
- Accommodate human injury tolerance through interventions that reduce speed or impact force

Figure 1
The Safe System Approach


Creating a Safe System means shifting a major share of the responsibility from road users to those who design the road transport system. Individual road users are responsible for abiding by all laws and regulations, and do so by exhibiting due care and proper behavior on the transportation system. However, while road users are responsible for their own behavior, this is a shared responsibility with those who design, operate, and maintain the transportation network: including the automotive industry, law enforcement, elected officials, and government bodies. In a Safe System, roadway system designers and operators take on the highest level of ethical responsibility.

The recommendations in this report have been organized to follow the Safe System approach elements and to reflect the shared responsibility of system planners, designers, and users in support of Concord's safety goals.

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**ITE Safe System Framework: Focus on Safe Speeds**

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

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

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

This Plan will assist the City when it applies for safety infrastructure funding sources. For example, the Cycle 11 Highway Safety Improvement Program (HSIP) funding cycle in 2022 requires a comprehensive safety action plan, such as an LRSP, for an agency to be eligible to apply for funding.

In addition, this Plan also meets the required characteristics of a comprehensive safety Action Plan set forth by the Safe Streets for All (SS4A) grant, a new Federal grant program established by the Bipartisan Infrastructure Law centered around the Department of Transportation’s National Roadway Safety Strategy and its goal of zero deaths and serious injuries on America’s roadways. This enables Concord to apply for Implementation Grants offered by the program, which can help to fund the delivery of this Plan.

The City of Concord is the largest city in Contra Costa County, home to approximately 130,000 people. Of those, 47% identify as white, 29% as Hispanic or Latino, 13% as Asian, 3% as Black or African American, 1% as Pacific Islanders, and 7% as two or more races. Approximately 36% of residents speak a language other than English at home.

The citywide median household income is $92,706, lower than the regional average of $110,837. Several census tracts within Concord are identified as Equity Priority Communities by the Metropolitan Transportation Commission (MTC). Concord also contains several census tracts designated SB 535 Disadvantaged Communities based on the State of California’s CalEnviroScreen dataset, which measures health, economic and environmental factors. Furthermore, one of Concord’s census tracts is also in the lowest quartile for healthcare access according to the California Healthy Places Index.
Concord Local Roadway Safety Plan

The City has a number of pre-existing plans and efforts that advance roadway safety in Concord, which this LRSP will complement and augment.

**Concord General Plan (2007)**

The Transportation Element of the General Plan, amended in 2015, is intended to provide guidance and specific actions to ensure that people and goods can safely and efficiently move within Concord and connect to the regional transportation system. The Element defines several general trade-offs within the transportation system that prioritize bicyclists and pedestrians:

- Pedestrian facilities prioritized above dedicated bicycle facilities
- Bicycle and pedestrian facilities prioritized above street trees
- Bicycle and pedestrian facilities over street parking except on residential streets
- Travel lanes over street parking, except on Downtown streets

**Downtown Corridors Plan (2016)**

The Plan focuses on revitalizing and enhancing Concord’s downtown, where pedestrian, bicycle, and traffic safety is an important issue. Downtown Concord contains many high-volume streets with 30-35 mph speed limits, such as Galindo Street, Clayton Road, Concord Boulevard, Willow Pass Road, and Port Chicago Highway, which result in an elevated risk of collisions and injuries.

**Iron Horse Trail Active Transportation Study (2020)**

This study seeks to improve the 32-mile-long Iron Horse Trail corridor, encouraging a shift from people making personal vehicle trips to more active transportation trips. The study proposes recommendations for the segments passing through Concord:

- Improve trail connections, including additional pedestrian bridges across Walnut Creek
- Retrofitting undercrossings at Concord Avenue, Diamond Boulevard, and Willow Pass Road
- Improve connections to collector bike facilities and intersections

**Monument Corridor Community-Based Transportation Plan (2019)**

This plan is intended to address mobility and accessibility issues for the Monument Corridor in the City of Concord. Several mobility goals were identified, including roadway safety. The community concerns regarding safety focus on the use of bicycles and walking: users of active transportation are disproportionately affected by collisions in the study area. Based on public feedback, the plan recommends the following actions, among others, to upgrade transportation safety:

- Safe Routes to School Improvements: Improve walkways, bicycle school bus, low-stress bikeways, transit youth passes, and mobility education
- Infrastructure Improvements: Enhanced crossings at specific distances and traffic signal coordination, closure of sidewalk gaps and consolidation of commercial driveways, separated bikeways, “bike kitchens”, wayfinding signage, volunteer driver programs
Bicycle, Pedestrian & Safe Routes to Transit Plan (2016)

The purpose of the Plan is to establish a 20-year vision for improving the walking and bicycling environment. To achieve the goal of a safe and efficient multi-modal transportation system, the City recognizes new streets will need to be developed and existing streets selectively retrofitted by means of road diets, lane narrowing, traffic calming, or other safety improvements. The Plan places safety as its highest priority, developing project recommendations and seeks to address known safety challenges based on available collision data. Where there is existing safe space, the Plan recommends immediate bicycle and pedestrian improvements.

• Seek to prioritize travel safety for all modes of transportation, design active transportation projects that are accessible and comfortable for people of all ages and abilities, identify and develop a complete and convenient active transportation network, and increase awareness and support of walking and bicycling through education, encouragement, and evaluation programs.

• Annually review most recent available collision data, including causes, to implement ongoing improvements throughout the transportation network

• Identify viable funding for an enforcement campaign targeting violations associated with severe and fatal injuries, high injury areas and corridors, schools and housing for senior people with disabilities

• Prioritize suggested roadway improvements at intersections and corridors with significant numbers of injuries and fatalities

• Identify viable funding for an education campaign focusing on road safety for all users and the City’s objective to reduce traffic fatalities

• Utilize designs that emphasize safety and comfort for the most vulnerable road users

• Identify and develop a complete and convenient active transportation network
Citywide Climate Action Plan (2013)

This Climate Action Plan serves as a community document that measures and monitors the trend of locally-generated greenhouse gas emissions. The strategies included in this plan work in several ways, including Transportation Systems and Land Use strategies that make incremental, long-term improvements to increase the variety of viable transportation options within Concord and to make motor vehicle infrastructure more energy-efficient. Some of these strategies include:

- Develop a pedestrian master plan consistent with the Citywide Complete Streets Standards to minimize barriers to pedestrian access and maximize pedestrian interconnectivity.

- Work with the Police Department to prioritize traffic enforcement efforts in strategic locations to protect the safety and rights of cyclists and pedestrians. Develop and implement a training program to inform drivers of the need to respect cyclists and pedestrians.

- Implement pedestrian and bicycle-friendly traffic calming measures. Require such measures as a condition of development approvals where appropriate, including measures to slow traffic and encourage walking and bicycling. Typical features could include curb bulb-outs, additional street trees, raised crosswalks, roundabouts, smaller corner radii, pavement treatments, and lane narrowing.

- Develop a bicycle master plan to make it more convenient and safe to ride bicycles throughout the City. Identify and address barriers and dangers to people riding bicycles throughout the City, and maximize connectivity to key destinations like transit stations, schools, medical services, and grocery stores. Leverage the off-road trails network and increase connections to the on-street network. A bicycle master plan could be developed as part of an update to the existing Concord Trails Master Plan.

- Create a comprehensive Safe Routes to Schools program within Concord using the "five 'E's" to frame a comprehensive approach: engineering, enforcement, encouragement, education, evaluation.

- Implement the Complete Streets project prioritizing the safety and comfort of active transportation users, among others.
Relevant stakeholders were identified to ensure the LRSP included the perspective of various departments and organizations. The stakeholder group included representatives from Concord Police, County Connection, and Mt. Diablo Unified School District, as well as staff from the City of Concord’s Transportation Division. The group met in February to review initial findings from collision analysis, and again in April to review the collision profiles and associated countermeasures. Following these stakeholder meetings, a draft version of this Plan was also presented to the City of Concord’s Bicycle and Pedestrian Advisory Committee (BPAC) in August.

The invaluable information and input received from stakeholders and at these meetings through the course of the development of this Plan have been incorporated accordingly.

This group of stakeholders will also constitute the City of Concord’s Local Roadway Safety Working Group, which shall continue to have regular, standing meetings beyond this Plan’s development process.

The Working Group will also be in charge of this Plan’s implementation, and will be responsible for monitoring safety outcomes in Concord in the coming years to evaluate the effectiveness of the Plan. The composition of the Working Group will ensure that inter- and intra-governmental cooperation and collaboration continues to occur as this Plan is implemented.

Safety Partners
Collision records on local roadways from 2015-2019 were investigated to describe historic collision trends and identify high-risk locations. This information acts as a primary resource for the Concord LRSP, providing the underlying data to support key analyses.

The data-driven process included:

- **Examination of Collision Trends**
  Review of collision statistics to evaluate when, where, and why collisions occur and who is involved.

- **Development of Collision Profiles of Emphasis**
  Combination of collision factors to identify 9 prevalent collision types.

- **Development of a Countermeasure Toolbox**
  Identification of effective, nationally proven countermeasures applicable to different collision profiles.

- **Identification of Priority Project Locations**
  Identification of priority project locations based on collision density and community verification.

The following section will present results and findings from the first stage of the data analysis to identify patterns and trends. Chapter 2 of Caltrans’ Local Roadway Safety Manual (LRSM) instructs safety practitioners to “consider a wide range of data sources to get an overall picture of the safety needs.” Collision data and contextual data were collected and analyzed as part of this LRSP, as well as anecdotal input from City staff and community stakeholders.
This analysis utilizes data on injury collisions from 2015 through 2019 available through the Transportation Injury Mapping System (TIMS) as of April 2021. TIMS reports injury collisions from the Statewide Integrated Traffic Records System (SWITRS), but excludes collisions that cause property damage only (PDO) and no injuries.

Note on Data Source
While collision databases like TIMS remain the best source of collision data, they have been found to have certain reporting biases, including:
- Collisions involving people walking, on bicycles, or on motorcycles are less likely to be reported than collisions with people driving
- Property damage only collisions are less likely to be reported compared to more severe collisions
- Younger victims are less likely to report collisions
- Alcohol-involved collisions may be underreported

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

Collisions by Year and by Mode

The table below provides a summary of the number of collisions by mode and severity within the 5-year dataset. From 2015 to 2019, there were 2,145 injury collisions in total, of which 165 were KSI collisions, which denote those collisions where someone was killed or severely injured.

<table>
<thead>
<tr>
<th>Collision Summary</th>
<th>Total</th>
<th>KSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2,145</td>
<td>165</td>
</tr>
<tr>
<td>Bicycle</td>
<td>161</td>
<td>17</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>210</td>
<td>59</td>
</tr>
<tr>
<td>Vehicles Only</td>
<td>1,774</td>
<td>89</td>
</tr>
</tbody>
</table>

Figures 2 and 3 shows the temporal trends of collisions in Concord. As shown, year over year, the number of overall collisions in Concord has remained steadily high with small fluctuations. The number of KSI collisions per year, however, has increased dramatically over the study period: there were 25 KSI collisions in Concord in 2015, but 42 in 2019, just five years later. This increase also coincided with a 5% increase in traffic. On average, 42 collisions per year translates to one KSI every nine days.
Comparison with Peer Cities
The California Office of Traffic Safety (OTS) publishes statewide data that ranks cities’ safety outcomes with those of their peers of similar population sizes (100,000 to 250,000). The chart to the right shows Concord’s rankings in the 2019 OTS data among the 59 cities with similarly-sized populations (a ranking of 1 out of 59 is worst). Concord ranked 32nd on total fatalities and injuries, and 15th on OTS’s composite safety score. The City also ranked poorly on several other indicators, including speed-related collisions, pedestrian collisions, and alcohol-involved collisions for people aged 21-34.

<table>
<thead>
<tr>
<th>Category</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fatalities and Injuries</td>
<td>32/59</td>
</tr>
<tr>
<td>Bicyclists</td>
<td>24/59</td>
</tr>
<tr>
<td>Pedestrians</td>
<td>14/59</td>
</tr>
<tr>
<td>Alcohol-Involved</td>
<td>23/59</td>
</tr>
<tr>
<td>Alcohol-Involved, ages 21-34</td>
<td>10/59</td>
</tr>
<tr>
<td>Speed Related</td>
<td>11/59</td>
</tr>
<tr>
<td>Nighttime (9pm-3am)</td>
<td>28/59</td>
</tr>
<tr>
<td>Hit-and-Run</td>
<td>20/59</td>
</tr>
<tr>
<td>Composite Score</td>
<td>15/59</td>
</tr>
</tbody>
</table>

People walking or biking are particularly vulnerable in the event of a collision, as they lack the protection afforded to them by being inside a motor vehicle. As a result, collisions involving people walking or biking are more likely to result in injury and fatality. As shown in Figure 4, in Concord, people walking and biking are involved in 18% of all injury collisions, but 46% of KSI collisions. People walking are especially over-represented in KSI collisions, as they are involved in only 10% of all injury collisions, but 36% of KSI collisions.

Figure 4
Collision Mode Share by Severity

- **Vehicle-Only Collisions**
  - All Collisions: 83%
  - KSI Collisions: 54%
  - Fatal Collisions: 50%
- **Bicycle Collisions**
  - All Collisions: 10%
  - KSI Collisions: 10%
  - Fatal Collisions: 10%
- **Pedestrian Collisions**
  - All Collisions: 8%
Collisions by Collision Type

Figure 5 illustrates the share of collisions in the study period that fall into each collision type. As shown, the most common collision types across all collisions in Concord are Broadsides, at 36%, Rear Ends, at 29%, and Vehicle/Pedestrian, Sideswipe, and Head-On collisions, at 8% each.

However, the percentage breakdowns are very different for KSI collisions. Vehicle/Pedestrian collisions and Broadsides are most common, each making up 28% of all collisions, followed by Head-On collisions at 16%. This further illustrates the disproportionate impact in severity that collision type and mode can play. For example, while they do not make up a large share of collisions overall, Vehicle/Pedestrian collisions are one of the leading collision types when it comes to KSI collisions.
Collisions by Primary Collision Factor (PCF)

Figure 6 illustrates the share of collisions in the study period that are classified under each Primary Collision Factor (PCF). PCFs are the one element or driving action which, in the investigating officer's opinion, best describes the primary or main cause of a collision. It is important to note that PCFs do not include contextual information about the design aspects of the collision location that could have been primary or secondary contributors to a collision. In Concord, the most common PCFs are Unsafe Speed, at 28%, followed by Vehicle Right of Way Violation, at 16%, and Traffic Signals and Signs, at 14%. For KSI collisions, the most common PCFs are Pedestrian Violation, at 22%, followed by Driving or Bicycling Under the Influence, at 16%, and Traffic Signals and Signs, at 10%.

Note on Pedestrian PCFs
The Pedestrian Violation PCF indicates that the pedestrian violated a rule of the road, such as crossing outside of a crosswalk, as opposed to the Pedestrian Right of Way Violation PCF where the driver of a vehicle violates the pedestrian’s right of way. The Pedestrian Violation category may be overrepresented due to a lack of clear information related to collision circumstances, and the increased likelihood that the pedestrian party may be unable to provide their side of the incident at the time of the collision.
Driving Under the Influence

Figure 7 illustrates the share of collisions of various types in the study period that involved at least one party driving under the influence (DUI). Drugs or alcohol increase the likelihood that a collision will be more severe, and as shown, the number of DUI collisions are overrepresented amongst KSI collisions. While just 8% of all injury collisions involve drugs or alcohol, 26% of KSI collisions do.

Furthermore, as with KSI collisions in general, DUI collisions disproportionately affect pedestrians. For example, 29% of KSI pedestrian-involved collisions involve drugs or alcohol.

These percentages reflect the portion of collisions involving one or more parties determined to be under the influence of drugs or alcohol. Driving under the influence may not always be listed as the primary collision factor even if a driver is found to be under the influence.

Figure 7
Share of DUI Collisions by Mode and Severity

<table>
<thead>
<tr>
<th></th>
<th>DUI Collisions</th>
<th>All Other Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Collisions</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>Bicycle-Involved</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Pedestrian-</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>KSI Collisions</td>
<td>26%</td>
<td>6%</td>
</tr>
<tr>
<td>Bicycle-Involved</td>
<td>6%</td>
<td>29%</td>
</tr>
<tr>
<td>KSI Collisions</td>
<td>26%</td>
<td>6%</td>
</tr>
<tr>
<td>Pedestrian-</td>
<td>29%</td>
<td>6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Collisions</th>
<th>All Other Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>5%</td>
<td>5%</td>
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<td>10%</td>
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<tr>
<td>40%</td>
<td>40%</td>
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</tbody>
</table>
Collisions by Lighting Conditions

**Figure 8** illustrates the share of collisions in the study period that occur at night. As shown, collisions tend to be more severe at night. KSI collisions constitute a disproportionate number of collisions at night due to a variety of factors, including reduced visibility, and over half of the KSI collisions from the study period occur at night.

Collisions that occur during nighttime also disproportionately affect people walking, with almost half of pedestrian injury collisions and almost two-thirds of pedestrian KSI collisions occurring at night. While most nighttime collisions occurred where streetlights were present, the quality of the lighting can vary widely. Streetlights can be insufficiently bright, or placed too widely apart, and the quality of lighting may be especially poor for people walking or in the sidewalk, as streetlights are often designed primarily with vehicles in travel lanes in mind.

**Figure 8**
**Share of Nighttime Collisions by Mode and Severity**

<table>
<thead>
<tr>
<th>Collisions</th>
<th>All Collisions</th>
<th>Bicycle-Involved Collisions</th>
<th>Pedestrian-Involved Collisions</th>
<th>KSI Collisions</th>
<th>Bicycle-Involved KSI Collisions</th>
<th>Pedestrian-Involved KSI Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime Collisions</td>
<td>29%</td>
<td>26%</td>
<td>45%</td>
<td>52%</td>
<td>41%</td>
<td>64%</td>
</tr>
<tr>
<td>Nighttime Collisions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>
Chapter 3

Collision Profiles of Emphasis

Nine collision profiles were identified through a systemic analysis of collisions in the City of Concord. These profiles were identified through historical collision data, contextual data, and stakeholder feedback. Combined, they account for 68% of injury collisions and 75% of KSI collisions in Concord during the study period.

The nine profiles are as follows:

1. Downtown area collisions involving speeding and intersection right-of-way violations
2. Hill passes (Kirker Pass Road, Willow Pass Road, Bailey Road, Treat Boulevard, and Ygnacio Valley Road)
3. Driving Under the Influence
4. Intersections with side-street stop control
5. Red Light Violation
6. Speeding Vehicles and excessive speed along major arterials, especially pertaining to arterial traffic in the evenings
7. Pedestrian collisions along arterials near activity centers
8. Pedestrian collisions occurring in the dark
9. Wrong-way riding, focusing on large arterials and roadways with one-way operations

The following pages contain cutsheets that present each collision profile, along with the following information:

- Description and associated information about each profile
- Number of collisions associated, including number of KSI collisions among those
- A map of collision locations
- Engineering countermeasures that can potentially address these collisions, arranged by level of implementation effort for consideration in generating short-, medium-, and long-term plans

*Profiles are not mutually exclusive; collisions can fall under multiple profiles, and totals will exceed 100%.
Profile 1

Downtown Area Collisions involving speeding and intersection right-of-way violations

- **266** collisions / **17** KSIs
  - 12% of all collisions
  - 10% of all KSIs

- **10** bike collisions / **2** KSIs
  - 6% of all bike collisions
  - 12% of all bike KSIs

- **38** ped collisions / **11** KSIs
  - 18% of all ped collisions
  - 19% of all ped KSIs

Concord's Downtown is characterized by, on the one hand, vibrant and high-density developments, but on the other, multi-lane one-way streets designed to carry large volumes of traffic at high speeds resulting in a high number of KSI collisions across all modes.

This profile highlights collisions caused by vehicles speeding or ignoring intersection right-of-way controls or regulations. The goal is to make vehicular traffic flow more compatible to what is appropriate for dense, walkable downtown environment.

Potential Engineering Countermeasures

- **Low Cost**
  - Bike Box
  - Extend Green Time For Bikes
  - Upgrade Signs with Fluorescent Sheetings
  - Delineators, Reflectors, and/or Object Markers
  - High-Visibility Crosswalk
  - Leading Pedestrian Interval
  - Rectangular Rapid Flashing Beacon
  - Retroreflective Tape on Signals
  - Upgrade Signal Head
  - Prohibit Left Turn
  - Yield To Pedestrians Sign
  - Extend Yellow and All Red Time

- **Medium Cost**
  - Refuge Island
  - Directional Median Openings to Restrict Lefts
  - Pedestrian Countdown Timer
  - Raised Crosswalk
  - Road Diet
  - Advanced Dilemma Zone Detection
  - Speed Sensitive Rest in Red Signal
  - Bike Lane
  - Red Light Camera
  - Median Barrier
  - Curb Extensions
  - Intersection Lighting

- **High Cost**
  - Segment Lighting
  - Separated Bikeway
  - Roundabout
  - Pedestrian Hybrid Beacon
  - Signal Interconnectivity & Coordination/Green Wave
  - Signal
  - Close Slip Lane
Collisions Near Hill Passes
Kirker Pass Rd, Willow Pass Rd, Bailey Rd, Treat Blvd, and Ygnacio Valley Rd

188 collisions / 23 KSIs
8% of all collisions
14% of all KSIs

2 bike collisions / 0 KSIs
1% of all bike collisions

4 ped collisions / 3 KSIs
2% of all ped collisions
5% of all ped KSIs

Potential Engineering Countermeasures

Low Cost
- Extend Green Time For Bikes
- Rumble Strips
- High-Visibility Crosswalk
- Signs and Markings at Uncontrolled Ped Crossings
- Leading Pedestrian Interval
- Retroreflective Tape on Signals
- Extend Yellow and All Red Time
- Curve Advance Warning Sign
- Upgrade Signs with Fluorescent Sheetings
- Yield To Pedestrians Sign
- Delineators, Reflectors, and/or Object Markers

Medium Cost
- Advanced Dilemma Zone Detection
- Speed Sensitive Rest in Red Signal
- Bike Lane
- Flashing Beacon as Advance Warning
- Refuge Island
- Protected Left Turns

High Cost
- Signal
- Separated Bikeway
- Roundabout
- Segment Lighting
- Signal Interconnectivity & Coordination/ Green Wave

There are several stretches of roadway within the City of Concord where the roadway characteristic shifts rapidly between rural hilly thoroughfare with high speeds and little cross traffic to the more typical arterial through dense suburban development. These interface areas are of particular concern when it comes to speeding, as vehicles travelling at high speeds need to decelerate rapidly in the face of conflicting movements from vehicles, bikes, and pedestrians. The aim of countermeasures would be to slow vehicle traffic to ensure safety at these interface areas.
Driving Under the Influence (DUI) collisions remain a serious concern citywide. Non-engineering interventions will be needed as the primary means to address challenges associated with this collision profile, but they may be supplemented with the engineering countermeasures listed, which can make roadway designs more forgiving in general.
Side-Street Stop Control Intersections

Collisions involving speeding, vehicle right-of-way violation, or improper turning

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
<th>KSIs</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>352</td>
<td>16</td>
<td>16% of all collisions, 10% of all KSIs</td>
</tr>
<tr>
<td>Bike</td>
<td>17</td>
<td>4</td>
<td>11% of all bike collisions, 24% of all bike KSIs</td>
</tr>
<tr>
<td>Ped</td>
<td>3</td>
<td>1</td>
<td>1% of all ped collisions, 2% of all ped KSIs</td>
</tr>
</tbody>
</table>

This profile highlights collisions at intersections of large arterials with minor streets with side-street stop-control. There are a variety of risk factors involving these intersections, including low visibility both from and of the side streets (especially of bicyclists), confusion over right-of-way, and high speeds along the major street. To alleviate these risk factors, the countermeasures aim to improve visibility, reduce speeding, and add additional controls where necessary, especially in conjunction with pedestrian improvements.

Potential Engineering Countermeasures

<table>
<thead>
<tr>
<th>Cost Level</th>
<th>Countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Cost</td>
<td>All-Way Stop Control, Rumble Strips, High-Visibility Crosswalk</td>
</tr>
<tr>
<td></td>
<td>Delineators, Reflectors, and/or Object Markers, Leading Pedestrian Interval, Retroreflective Tape on Signals</td>
</tr>
<tr>
<td></td>
<td>Upgrade Intersection Pavement Markings, Upgrade Signs with Fluorescent Sheeting</td>
</tr>
<tr>
<td></td>
<td>Yield To Pedestrians Sign</td>
</tr>
<tr>
<td>Medium Cost</td>
<td>Directional Median Openings to Restrict Lefts, Refuge Island, Bike Lane</td>
</tr>
<tr>
<td></td>
<td>Raised Crosswalk, Pedestrian Scramble</td>
</tr>
<tr>
<td>High Cost</td>
<td>Signal, Pedestrian Hybrid Beacon, Roundabout</td>
</tr>
</tbody>
</table>
Key
- KSI collisions
- other injury collisions
Profile 5

Red Light Violations

collisions where vehicles failed to obey a red signal and stop at the line*

- **317** collisions / **15** KSI
  - 15% of all collisions
  - 9% of all KSI
- **13** bike collisions / **2** KSI
  - 8% of all bike collisions
  - 12% of all bike KSI
- **8** ped collisions / **1** KSI
  - 4% of all ped collisions
  - 2% of all ped KSI

Red light violations occur in Concord citywide, and pose a serious challenge to roadway safety and the efficacy of safety features. Non-engineering interventions, such as targeted enforcement and automated enforcement, will be needed as the primary means to address challenges associated with this collision profile, but they may be supplemented with the engineering countermeasures listed, which are general ways to enhance safety at signalized intersection.

* This profile does not include most pedestrian collisions involving vehicles violating pedestrian right of way, which is classified under a separate violation category. For more information, see page 21.

Potential Engineering Countermeasures

<table>
<thead>
<tr>
<th>Cost Level</th>
<th>Countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Upgrade Signal Head</td>
</tr>
<tr>
<td>Medium</td>
<td>Advanced Dilemma Zone Detection</td>
</tr>
<tr>
<td>High</td>
<td>Signal Interconnectivity &amp; Coordination/ Green Wave</td>
</tr>
</tbody>
</table>
This profile focuses on collisions resulting from excessive speeds along major arterials. Vehicular speeds are particularly high during the evening commute periods, when Concord’s arterials serve both local traffic as well as cut-through commute traffic. As part of the analysis for this profile, observed speed data from WeJo was also used to identify hotspots where travel speeds frequently exceed posted speed limits. The results from that analysis are shown on the next pages.

The aim of countermeasures is to slow traffic in areas with pervasive speeding, as well as to calm traffic in areas where speed limits need to be lowered in light of the surrounding land use context, especially in conjunction with new AB 43 allowances.

*This profile does not include most pedestrian collisions involving vehicles violating pedestrian right of way, which is classified under a separate violation category. For more information, see page 21.
Observed Speeds Data
Overall Median Speeds

Source: Wejo, March 2022

As shown, many roadways in Concord - especially large arterials in the east of the City - have prevailing speeds that are significantly higher than posted speed limits, which are often already high.

Key
- orange: median speeds up to 5MPH over posted speed limit
- black: median speeds more than 5MPH over posted speed limit
Observed Speeds Data
Evening Peak Hour Median Speeds

Source: Wejo, March 2022

As shown, instances of observed speeds exceeding posted limits is even more pronounced during the evening peak hours, as Concord's roadway network experiences even higher stress due to increased traffic volumes, especially high-speed cut-through traffic.

Key
- Orange line: median speeds up to 5MPH over posted speed limit
- Black line: median speeds more than 5MPH over posted speed limit
**Pedestrian Collisions at Activity Centers**

**75** ped collisions / **21** KSIs

36% of all ped collisions

36% of all ped KSIs

There are large clusters of pedestrian collisions around shopping centers in Concord. These are almost universally shopping plazas with street-fronting parking lots along wide arterials. A common issue is that pedestrian desire lines are often not served by existing crossings, as the actual store buildings are often set back a ways from the pedestrian crossings located at the nearest major intersection, and these large intersections also tend to feature design features unfriendly to pedestrians, such as slip lanes, long crossing distances, and missing crosswalk legs. The aim of countermeasures is to create roadway environments more friendly for people walking and better match facilities to serve the needs and desire lines of pedestrians.

---

**Potential Engineering Countermeasures**

**Low Cost**
- Bike Box
- Extend Green Time For Bikes
- Upgrade Signs with Fluorescent Sheetning
- Delineators, Reflectors, and/or Object Markers
- Retroreflective Tape on Signals
- High-Visibility Crosswalk
- Leading Pedestrian Interval
- Advance Stop Bar
- Extend Yellow and All Red Time
- Upgrade Signal Head
- Extend Pedestrian Crossing Time
- Yield To Pedestrians Sign
- Extend Pedestrian Crossing Time

**Medium Cost**
- Refuge Island
- Directional Median Openings to Restrict Lefts
- Pedestrian Countdown Timer
- Raised Crosswalk
- Road Diet
- Advanced Dilemma Zone Detection
- Speed Sensitive Rest in Red Signal
- Bike Lane
- Pedestrian Scramble
- Flashing Beacon as Advance Warning
- Curb Extensions
- Intersection Lighting
- Median Barrier
- Refuge Island
- Supplemental Signal Heads

**High Cost**
- Pedestrian Hybrid Beacon
- Separated Bikeway
- Roundabout
- Close Slip Lane
Pedestrian Collisions in the Dark Citywide

**Profile 8**

96 ped collisions / 39 KSI

46% of all ped collisions

66% of all ped KSI

While most collisions during evening hours occur in areas with streetlights, the quality of the lighting can vary widely. Street lighting is often designed primarily to illuminate the roadway for vehicles, and the luminosity and spacing of lighting may be too sparse to make pedestrians fully visible. More than two-thirds of the collisions that meet this profile, including 72% of the KSI, are farther than 50 feet from a streetlight pole. The aim of countermeasures is to increase lighting and general visibility of pedestrians on sidewalks and at crossings, especially in areas with high pedestrian activity.

**Potential Engineering Countermeasures**

- **Low Cost**
  - Bike Box
  - Extend Green Time For Bikes
  - Remove Obstructions For Sightlines
  - Delineators, Reflectors, and/or Object Markers
  - Retroreflective Tape on Signals
- **Medium Cost**
  - High-Visibility Crosswalk
  - Leading Pedestrian Interval
  - Advance Stop Bar
  - Curve Advance Warning Sign
  - Remove Obstructions For Sightlines
  - Advance Bar
  - Yield To Pedestrians Sign
  - Curve Advance Warning Sign
  - Road Diet
  - Advanced Dilemma Zone Detection
  - Speed Sensitive Rest in Red Signal
  - Bike Lane
  - Rectangular Rapid Flashing Beacon
  - Improved Pavement Friction
  - Curb Extensions
  - Intersection Lighting
  - Median Barrier
  - Flashing Beacon as Advance Warning
  - Advanced Stop Bar
  - Roundabout
  - Signal
  - Separated Bikeway
  - Supplemental Signal Heads
  - Close Slip Lane
Profile 9

Wrong-Way Bicycle Riding
collisions centered around large arterials and roadways with one-way operations

![Bike collisions / KSIs](image)

<table>
<thead>
<tr>
<th>Bike collisions</th>
<th>KSIs</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>2</td>
<td>24%</td>
</tr>
<tr>
<td>12%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This profile encompasses collisions where bicyclists are travelling opposing the direction of traffic, either travelling on the wrong side of the street or travelling against the direction of traffic on a one-way street. This creates dangerous conflicts with vehicular traffic, especially turning traffic that might not be expecting the bicyclist. This is often caused by a lack of high-quality bike infrastructure, resulting in bicyclists simply using the shortest path available absent better options, as well as by the lack of ways for bicyclists to safely cross the street.

In response, the aim should be to create more high-quality bikeways, provide for more safe crossings that match bicyclists’ desire lines, and reconsider one-way operations along roadways when they are detrimental to safety.

Potential Engineering Countermeasures

**Low Cost**
- Extend Green Time For Bikes
- Upgrade Intersection Pavement Markings
- Bike Box
- Delineators, Reflectors, and/or Object Markers
- High-Visibility Crosswalk

**Medium Cost**
- Widen/Pave Shoulder
- Protected Left Turns
- Bike Lane

**High Cost**
- Separated Bikeway
To address the safety concerns present within Concord, this Plan pairs data-driven collision analyses with proven countermeasures. Countermeasures can be engineering-based physical improvements, many of which have low-cost or quick-build versions, but they can also be non-engineering strategies in areas such as education, enforcement, and outreach.

The safety strategies in this chapter cover the five elements of a Safe System: Safe Roads, Safe Road Users, Safe Speeds, Post-Crash Care, and Safe Vehicles. Of these categories, Safe Roads consists of engineering countermeasures, while the remaining categories consist of non-engineering countermeasures.

The engineering countermeasures include a Crash reduction factor (CRF), if applicable, to indicate their relative effectiveness. In contrast to the infrastructure-focused engineering countermeasures, non-engineering countermeasures do not have an associated CRF. However, the National Highway Traffic Safety Administration (NHTSA) published the 9th edition of Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices in 2017, and this document serves as a guide for practitioners in selecting effective,
evidence-based countermeasures for traffic safety problems such as alcohol and drug impaired driving, speeding and speed management, and pedestrian and bicycle safety. Non-engineering countermeasures are given effectiveness ratings based on these guidelines, if applicable and data is available; Figure 9 shows the scale for these ratings. However, it is important to note that the effectiveness of any countermeasure varies immensely depending on its implementation, broad reach to all communities, and satisfactory funding. The effectiveness data likely shows the maximum effect that can be achieved through comprehensive implementation.

California is in the process of adopting the Safe System approach and a focus on equity as part of its Strategic Highway Safety Plan. This plan’s focus on the Safe System approach helps to provide alignment with current LRSP guidelines, but also sets the City of Concord up for success in recognition of emerging safety best practices.

**Figure 9**
**Effectiveness of Non-Engineering Countermeasures**

- **Demonstrated to be effective** by several high-quality evaluations with consistent results
- **Demonstrated to be effective in certain situations**
- **Likely to be effective** based on balance of evidence from high-quality evaluations or other sources
- **Effectiveness still undetermined** as different methods of implementing this countermeasure produce different results
- **Limited or no high-quality evaluation evidence**
Education and Public Awareness Campaigns – Targeted at Specific Behaviors

The City can expand upon any existing social media and portable and City Hall message boards to establish an ongoing public education media campaign focused on safe and responsible driving, discouraging drinking and driving, along with encouraging increased awareness of pedestrians and bicyclists. An example of this campaign is collaboration with local radio stations to disseminate safety messages. Concord can also coordinate with Contra Costa County Public Health & Social Services or partner with school districts to host OTS Safety Programs or Campaigns at schools, libraries, parks or other high-volume pedestrian and bicycle areas that focus on raising awareness about traffic rules, rights, and responsibilities for all users.

The OTS Go Safety California campaign has free resources for local agencies to use in implementing public awareness campaigns.

Context
Citywide

Best Practice Resources
San Francisco Municipal Transportation Agency (SFMTA) conducted its “Be Nice, Look Twice” pedestrian safety campaign and "Safety - It's Your Turn" campaign through social media, billboards, and bus posters in multiple languages.

Effectiveness

(Mass media campaign on DUls)

Source: SFMTA

SAFE
ITS YOUR TURN

Source: SFMTA

KNOW YOUR RESPONSIBILITIES

Source: SFMTA

DRIVE LIKE:
Your Friend is in the Crosswalk.

Yielding saves lives.
sfmta.com/benicelooktwice

Source: SFMTA

BE NICE
LOOK TWICE
**Partner with Local Businesses and Organizations on Hot Spot Corridors**

Local partners serve as community liaisons between the City and the public. Conducting targeted education with community partners and public institutions (such as local businesses, libraries, churches, and cultural organizations) along the hot spot corridors strengthens the engagement process by building trust and drawing on an established base of stakeholders. Educational materials can include pamphlets, stickers, window displays, or resources for liquor-serving establishments to ensure patrons do not drive while under the influence (e.g., safe ride home number, local taxi number, etc.).

**Context**

Hot Spot Corridors

**Best Practice Resources**

USDOT Traffic Safety Marketing provides images and GIFs discouraging DUI that can be displayed or posted on restaurants and nightlife establishments’ social media accounts.

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**Improve Infrastructure Connectivity for Vulnerable Users**

Concord can apply for grant funding that supports safe and connected infrastructure for all roadway users. This includes addressing gap closures in bicycle facilities and sidewalks and prioritizing low stress connections to key destinations. Contra Costa Transportation Authority (CCTA)’s 2018 Countywide Bicycle and Pedestrian Plan (CBPP) as well its extension Vision Zero Framework and forthcoming Pedestrian Needs Assessment can serve as a guide with previously identified projects.

**Context**

Citywide

**Best Practice Resources**

CCTA’s Vision Zero Framework and forthcoming Pedestrian Needs Assessment provides project recommendations for all jurisdictions within Contra Costa.
Expand Safe Routes to School
Expansion of school area traffic safety measures provides an opportunity to conduct further outreach on projects proposed in this LRSP, expand the toolkit to additional school areas, and pair engineering and non-engineering countermeasures citywide. These efforts would be funded through the Safe Routes to School grant awarded to the City in partnership with school districts.

**Context**
Schools citywide

**Best Practice Resources**
The Safe Routes Partnership's *Safety-based Prioritization of Schools for Safe Routes to School Infrastructure Projects* is a resource for identifying priority Safe Routes to School projects based on safety considerations.

**Effectiveness**

(Safe Routes to School)

High Visibility Enforcement
High-visibility enforcement is a multifaceted approach to enforcement that garners public attention to traffic safety laws through highly visible patrols, such as checkpoints, saturation patrols, or message boards. OTS provides three grant funding sources to supplement CHP in their high-visibility enforcement goals. The goal for Get Education and Ride Safe III (GEARS III) is to reduce the number of motorcycle-involved KSI collisions. The goal of the Safer Highways Statewide grant is to reduce the number of alcohol-involved KSI collisions. Lastly, the Regulate Aggressive Driving and Reduce Speed V (RADARS V) grant is aimed at reducing the number of victims killed or injured due to speed, improper turning, driving on the wrong side of the road, or reckless driving-related collisions.

The goal of high-visibility enforcement is to promote voluntary compliance with traffic laws and, according to NHTSA research, it is one of the most effective enforcement strategies for safety outcomes.6

**Context**
Citywide

**Effectiveness**

(Publicized Sobriety Checkpoints)

(High-Visibility Saturation Patrols)

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Pair Education with Key Engineering & Enforcement Countermeasures

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

Best Practice Resources
The City of Berkeley's "How to Use a Pedestrian Hybrid Beacon" informational flyer was paired with the installation of a new PHB and includes both driver and pedestrian instruction for properly using the new countermeasure.

The San Francisco Municipal Transportation Agency posted signs with a brief explanation next to a newly installed protected bike lane in multiple languages as part of their Vision Zero SF initiative. This approach was also applied to educate people about pedestrian scrambles and bus bulb outs.

The Los Angeles Department of Transportation (LADOT) used temporary pop-up installations to introduce safety improvements in specific neighborhoods. Hay bales and planters were used to test the roundabout design and educate drivers on how to use the countermeasure. In addition to introducing safety improvements, pop-up installations can bring out emergency vehicles to ensure the vehicles can navigate around roundabouts or curb extensions.

Source: Fehr & Peers for the City of Berkeley
Safe Ride Home Programs

Partnerships between the Police Department, CHP, TNC Operators (e.g., Lyft, Uber), and local businesses can be facilitated to offer promotional codes for free or discounted rides home from establishments or events to reduce the potential for DUI, drowsy driving, or distracted driving. This program may be focused on particular holidays or event days or applied more broadly to weekend nights.

Context

Citywide

Best Practice Resources

The Portland Bureau of Transportation (PBOT) Safe Ride Home Program was formed in partnership with the Portland Police Bureau, TriMet, Old Town Hospitality Group, and Portland cab companies Radio Cab, Broadway Cab, New Rose City Cab and United Independent Cab, as well as transportation network companies Lyft and Uber to provide promo codes for discounted rides. The program is funded by a 50-cent fee charged for every taxi and TNC ride in Portland.

Effectiveness

4/5

(Alternative transportation)
Speed Limit Modification

California Assembly Bill (AB) 43 was passed in 2021 to provide a means to lower speed limits on additional corridors. Cities will have increasing flexibility moving forward to consider context as they set speed limits.

AB 43 features the following five major components, focused on giving local jurisdictions more flexibility in setting speed limits, especially regarding vulnerable road users:

- **Engineering & Traffic Survey (E&TS)** an option to extend enforceable time period
- **Post E&TS** an agency can elect to retain current or immediately prior speed limit
- **Speed Limit Reduction** reduction of additional 5 mph based on several factors, including designation of local "Safety Corridors"
- **Prima Facie Speed Limits** options for 15 and 25 mph in certain zones
- **Business Activity Districts** option for 20 or 25 mph

Best Practice Resources

In supporting their commitment to Vision Zero, the City of Seattle completed their work of lowering speed limits to 25 mph on most major streets (totaling around 415 miles of arterial streets) and installed nearly 2,500 new speed limit signs. With funding from the voter-approved Levy to Move Seattle, the City created a policy of 25 mph on arterial streets with a speed limit of 20 mph on smaller streets and near schools when children are present. They already conducted a case study in five Seattle neighborhoods. The data showed that lowering speed limits and increasing sign density – without any marketing campaigns, additional enforcement, re-timed signals, or engineering changes to the roadway – resulted in a 20-40% drop in the number of collisions in the study locations.

The National Association of City Transportation Officials (NACTO) has produced *City Limits: Setting Safe Speed Limits on Urban Streets*, a set of guidelines providing a detailed, context-sensitive method of setting speed limits in urban environments.

Context

Citywide
Safe Speeds Education
This measure creates a safety education campaign targeting safe speeds. This can include yard signs, wall boards/posters in prime injury-corridor neighborhoods, ads on bus exteriors, radio ads, changeable message signs, etc. To maximize effectiveness, this should be an ongoing program for cities. The OTS Go Safety California campaign has free resources for local agencies to use in implementing public awareness campaigns.

Context
Citywide

Best Practice Resources
Jurisdictions such as the Minnesota Department of Transportation have also started to partner with technology companies to provide alerts to on-vehicle computer systems and phones when drivers pass through designated corridors that have been targeted for speed enforcement and education programs. These programs use geofencing technology and send push alerts urging drivers to travel at reasonable speeds.

Effectiveness

Automated Enforcement
Automated enforcement methods, such as red-light cameras or speed safety cameras, equitably target the specific drivers who are behaving dangerously. Red light cameras (RLC) detect motor vehicles that pass over sensors in the pavement after a traffic signal has turned red. According to a National Cooperative Highway Research Program study conducted over five states, a downwards trend in red light running collisions and violations because of RLCs was reported. City staff, including staff from the Police Department, should engage in in-depth discussions before implementation to ensure that there is agreement over the goals and aims of an automated red-light enforcement program, to conduct outreach to the public to communicate the goals of the program and build trust, and ensure that producing safety outcomes is prioritized over other aims, such as revenue generation.

Speed safety cameras (SSCs) use speed measurement devices to detect speeding and capture photographic or video evidence of vehicles that are violating a set speed threshold. SSCs can be deployed as fixed unit (single, stationary camera targeting one location), point-to-point (Multiple cameras capturing average speed over a certain distance) or mobile units (portable camera).

Safety cameras are not currently allowed in California. City staff can monitor potential changes to state legislation for future use of this critical tool, should it become available.

Context
Citywide

Best Practice Resources
FHWA’s resource on Speed Safety Cameras (FHWA-SA-21-070) contains guidance and suggestions for consideration for local agencies wishing to implement automated speed enforcement, and documents the efficacy of SSCs. It is available at https://safety.fhwa.dot.gov/provencountermeasures/speed-safety-cameras.cfm.

Effectiveness

4/5
(Communications and Outreach on Speeding)
Rapid Response Safety Communication Protocol & Multi-Disciplinary Team

City Public Works and Police Department staff work closely to address safety challenges at key collision locations. Concord can employ, or continue to employ, an internal, multi-department communication strategy in response to severe and fatal collisions. The protocol will outline a path forward for Public Works staff to be a part of the immediate on-the-ground response to an investigation of severe and fatal collisions, ensuring a multi-disciplinary response team focused both on the behavioral and engineering elements of a collision. This multi-disciplinary team also supports timely data sharing among City departments, ensures data accuracy, and develops near-term interventions.

Context
Citywide

Best Practice Resources
The San Francisco Vision Zero Traffic Fatality Protocol is an efficient and standardized procedure for reporting, investigating, and collecting data on traffic fatalities, with coordination across multiple city agencies.
Victim and Family Support

Post-collision care includes providing resources to both the victim, their friends, and their families. To ensure a collision survivor receives the care needed to recover and restore body and mind to an active life within society, they require medical rehabilitation with specialists that can range from orthopedics, neurosurgery, physical and occupational therapy, and prosthetics to psychology and neuropsychology.

Severe and fatal collisions not only affect the victim involved, but their family and friends as well. Across the nation, in Canada, and locally in the San Francisco Bay Area, there are chapters of Families for Safe Streets. This group advocates at the state capitol in Sacramento and works with lawmakers and non-profits like Mothers Against Drunk Driving to share their stories and testify before legislative committees. Supporting victims’ families comes in many forms. For example, World Day of Remembrance for Road Traffic Victims is an annual event held on the third Sunday in November in remembrance of those who have died or have been affected by motor vehicle collisions, and to draw attention to the goal of Vision Zero.

Context

Citywide

Best Practice Resources

The World Health Organization (WHO) produced a booklet entitled Post-Collision Response: Supporting Those Affected by Road Traffic Collisions that describes the consequences of collisions that may not only include physical injuries resulting in disability, but also psychological trauma. WHO recognizes that an effective post-collision response requires the integration of injury care, mental health services, legal support and legislation, and data on collisions and injuries.
Connected and Automated Vehicle (CAV) Readiness Planning

Having strategies prepared to meet and address the oncoming challenges posed by connected and automated vehicle (CAV) technology is crucial in advancing road safety. Fully automated vehicles have the potential to modify travel behavior and improve safety outcomes given that CAVs are ultimately intended to operate lawfully and eliminate or reduce human error. However, the need to integrate CAVs into the transportation system in the short term where there will be a mix of automated and non-automated vehicles also poses challenges. Some strategies for preparation include educating the public on current and future safety features and limitations, continuing to upgrade signal equipment, installing EV charging citywide, installing Intelligent Transportation Systems (ITS) to enable vehicle safety features, identifying the ability for future fleet purchases to include CAV technology, having policies around curbside management, having policies around truck routes to keep them off main arterials if feasible, and maintaining roadway surfaces, striping and signage.

Context

Citywide

Best Practice Resources

CAV technology remains a new and evolving topic. The NHTSA maintains a resource page entitled "Automated Vehicles for Safety" that summarizes the latest information and collects the latest resources on the subject, located at https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety.
Concord Local Roadway Safety Plan

Equitable and Culturally-Relevant Community Engagement

Community engagement is not a one-size-fits-all model. By developing culturally relevant engagement strategies, all participants are invited into conversations about safety. Culturally relevant engagement strategies can help education and programming around traffic safety reach a larger audience and be more impactful.

Culturally relevant community engagement may include dissemination of materials and presentation of information in multiple languages, including English, Spanish, and/or others. Hosting safety-related engagement events at local parks or businesses may provide better accessibility and comfort for residents to receive information and provide feedback. Additionally, the creation of a Street Safety Ambassador Program can also help to build awareness within specific communities around roadway safety issues. Culturally relevant community engagement could be considered during the implementation of all roadway safety projects.

A best practices example can be found in the Los Angeles Department of Transportation (LADOT) Vision Zero Division, which launched the Dignity-Infused Community Engagement (DICE) strategy in 2019. The effort centers community members in the Vision Zero planning process from the beginning and weaves all perspectives and lived experiences into the technical planning process. The DICE approach includes collaboration with local community-based organizations (CBOs); the provision of childcare, transportation, interpretation, and food at all engagement events; and the development of unique, culturally relevant engagement approaches that weave in community identity and markers. Beyond promoting the initiative, the dignity-infused planning process is an expansive approach to community engagement that seeks to heal and atone for the negative impacts of systems and practices within Los Angeles as well as the broader field of transportation planning.
When it comes time to make tradeoff decisions between vehicle roadway operations, parking, and safety, having policies in place guiding decision makers on prioritizing vulnerable users can streamline processes and provide consistency. Data inventory and management also play a role in the city’s overall non-infrastructure framework for safety. Using advanced technology to determine collision risks allows cities to be proactive and systemic when identifying projects for funding and implementation.

**Set Safety Policy that Outlines Tradeoff Decision Making and Prioritizes Vulnerable Users**

The City of Concord has committed to eliminating fatal and severe injury collisions as part of this LRSP, and the formation of a standing Working Group to implement this Plan and deliver on this goal. To ensure oversight and accountability throughout this process, there is a need for continued leadership.

This includes strategies such as identifying a champion to advocate for the LRSPs project development and implementation.

To prioritize achieving zero deaths and severe injuries through projects and policies, the City Council motion, directive, or ordinance that binds the City to this goal should also include an acknowledgement of the need for trade-offs on the roadway system, and a binding commitment to prioritize safety when those trade-offs arise.

**Construction Accessibility Policy**

Having a policy in place for accessibility to be maintained during construction and road maintenance projects is crucial for maintaining safety on City roads. These policies, including bicycle and pedestrian safety, can be included in a memorandum or report put out by a local jurisdiction.

**Collision Risk Indicators**

Surrogate safety measures, such as “near-miss” collisions, hard braking data, speed data, community-reported hazards, and high stress facilities provide an understanding of the safety landscape and enable proactive interventions. Near misses have historically been difficult to study in practical safety applications due to an overall lack of reported information. In the absence of sufficient collision data, near miss data is an important indicator for guiding collision prevention. There are several technologies that are closing the gap and providing key safety insights regarding near misses, including:

- **Video data**

  Video machine learning is an effective means of classifying collisions and collecting near miss data.
• **Public crowdsourcing**
  Online web crowdsourcing platforms, such as UC Berkeley’s SafeTREC Street Story tool (available in English and Spanish), allow anyone to anecdotally report incidents of near misses. It is located at [https://safetrec.berkeley.edu/tools/street-story-platform-community-engagement](https://safetrec.berkeley.edu/tools/street-story-platform-community-engagement). These data points are publicly available for analysis and contain important contextual information based on geographic location (e.g., road conditions, street lighting, and travel mode). Using a platform like Street Story in future projects also advances community education and engagement around road safety by providing an outlet and way for people to connect around each other’s stories. Social pinpoint is another platform that allows for online and geolocated public input on safety needs and perceptions.

**Contextual Data Inventory**
Up-to-date data on transportation infrastructure, including roadway characteristics, intersection characteristics, and signs, are valuable for planning and implementing future improvements. With an updated inventory, cities can identify project synergies, such as including a safety countermeasure with a repaving project. Finally, enhanced contextual data supports systemic safety analysis for future safety plans and evaluations.

**Collision Reporting**
Collision reporting practices, such as complete data collection and documentation of road user behavior and infrastructure, and sharing data across agencies or organizations (e.g., law enforcement, health officials, transportation officials, and hospitals) can lead to a greater understanding of the holistic safety landscape, and thus lead to improved investments in safety.
Chapter 5

Evaluation and Implementation Strategies

This chapter describes the processes that can be used by the City to ensure successful implementation of this Plan, evaluate its success and quantify its progress, and also identifies funding sources for safety improvements.

In terms of implementation, this chapter contains recommendations related to facilitating buy-in and support, and project delivery methods. The evaluation section contains recommendations relating to how and when to update this plan, establishing metrics and benchmarks, and public communications. All of these considerations are especially important given the City of Concord’s commitment to eliminating fatalities and severe injuries on its roadway network through the implementation of this Plan and ongoing, regular progress monitoring and reporting throughout the process.

Finally, this chapter identifies opportunities to fund the implementation of this Plan and delivery of safety improvements. While preparing the City of Concord to submit successful Highway Safety Improvement Program (HSIP) applications is a key goal of this Plan, safety projects can be funded through a wide range of additional sources at the regional, state, and federal levels. HSIP funds are largely awarded based on a benefit/cost analysis using a set of Caltrans-approved countermeasures with documented crash reduction factors and historic collision data. While many safety projects will perform well in the HSIP process, others may be successfully funded through other sources that consider additional factors, such as the Active Transportation Program (ATP). The sources in this chapter may be used to fund a broad scope of projects targeting air quality and sustainability, affordable housing, and transportation. Successful projects often entail creative solutions that address impact areas beyond transportation safety alone.
Implementation of the LRSP is a vital step in the process in which the identified strategies and projects are executed. To successfully implement programs and projects, partnerships, trust, funding, and coordination need to be proactively managed. Successful implementation of this Plan and especially meeting the City’s goal of eliminating fatal and severe injury collisions requires sustained and coordinated support from key stakeholders, elected officials, and City staff.

Oversight, Accountability, Coordination, and Partnership

To ensure effective delivery of safety projects and programs, the City of Concord will establish a Local Roadway Safety Working Group, as discussed earlier in this report. Having the leadership of this group will be a crucial part of maintaining buy-in and support for the LRSP from not only officials, but the community as well. Some duties of the working group could include conducting briefings and presentations at board and agency meetings, collecting and sharing information on a regular basis, and updating a public-facing webpage on the City of Concord website to inform LRSP goal progress, such as the number of projects funded or implemented and the number of collisions over time for comparison purposes.

Having continued communication and transparency with stakeholders and community members can allow for greater trust and support of the LRSP’s goals. Some other potential strategies include communication across diverse channels beyond the web (e.g. local news, mailers, and social media), actively soliciting and addressing community concerns, regularly publishing or updating more extensive factsheets on plan progress, and regular public meetings using effective community engagement techniques.

Much like the stakeholder input received throughout the creation of this Plan, coordination and partnership amongst diverse stakeholders will be essential for effective delivery of the LRSP throughout its lifetime. Some strategies that the Working Group should implement include regularly informing leaders and community groups and stakeholders on progress and key milestones, consulting partner agencies early on in the implementation process to gather suggestions and feedback, and ongoing monitoring and coordination of opportunities for partnership via project bundling (e.g. integrating LRSP projects with pavement resurfacing and maintenance).
**Policy Support**

Projects following the Safe System approach may often require tradeoffs to be made between on-street parking, vehicle level of service, and pedestrian and bicycle safety and accessibility, when funding and/or right of way are limited. The City Council’s Policy and Resolution in support of this Plan establishes that safety considerations should be prioritized in all projects citywide. However, the spirit of this overriding consideration must also be enshrined into the day-to-day operations and decision-making of the City of Concord. Thus, as a follow-on to this Plan, the City will review its policies, plans, guidelines, and standards, such as its Construction Details and Land Use Impact Assessment processes, and update them as necessary to ensure that they align with the overarching goal of prioritizing safety, and that they support a safe system practice. Other complementary policies to this Plan may include a citywide crosswalk policy and transition plan and a speed management policy and program, which will also be explored as part of this process. Implementation of these revised policies, plans, guidelines, and standards will be a crucial accompaniment to the implementation strategies within this Plan.

**Institutionalization**

In addition to pursuing funding for the priority and systemic projects identified in this LRSP via upcoming grant opportunities, the City should consider reactive and project safety project opportunities through:

- Rolling safety projects into existing Capital Improvement Projects, such as repaving efforts, to take advantage of cost efficiencies as well as accelerate project implementation and delivery.
- Development Impact Review and Mitigation: new guidance from the Institute of Transportation Engineers presents opportunities for bringing the Safe System approach into the development review process.

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The City of Concord has committed to eliminating traffic deaths and severe injuries, and to form a standing Working Group to monitor progress towards this goal and communicate outcomes to the public. This section identifies possible opportunities to evaluate progress towards this goal, inform future decision-making, and will allow the City to understand how it is doing with regards to meeting its safety goals. It will also provide the basis for determining future efforts to select priority areas, countermeasures, and locations to reduce collisions (and the harm resulting from them). The following section presents some recommendations to this effect.

**Update the Plan Regularly**

For example, scheduling an update at the halfway mark of the 10-year goal could assist with organizing and directing evaluation efforts. As conditions within the City could change, it will be necessary to update the LRSP in the future.

**Identify Metrics and Measure Performance in Priority Areas**

To understand progress and safety conditions, several metrics should be used in LRSP evaluation. Examples of measuring goal performance include:

- Monitoring collisions, specific to the goals outlined in this plan
- Monitoring the number of safety infrastructure improvements installed

Additional regular measurement of goal progress in priority areas can be performed every year (e.g. safety scorecard). Safety scorecards that are released annually can be a powerful tool for measuring effectiveness, highlighting areas that need further attention and resources, and identifying tasks and deadlines for responsible stakeholder parties.

**Continued Engagement**

Efforts around evaluation should include expanding partnership from diverse sources (e.g. officials, agencies, community advocacy groups). Input from identified partners and future partners, along with collected target metrics, could be used to adapt the plan based on community feedback and expert insight as projects and programs are rolled out.

Conducting pre- and post- surveys with community members can measure how their actions and views have shifted after engagement around traffic safety. Local partners can be tasked with disseminating the pre- and post-surveys to residents. Surveys should evaluate whether respondents express a shift in behavior after having participated in traffic safety programming. The metrics for evaluation can also be developed with local partners to ensure accessibility for the public.
Funding Considerations

The sources in this chapter may be used to fund a broad scope of projects targeting air quality and sustainability, affordable housing, and transportation. Successful projects often entail creative solutions that address impact areas beyond transportation safety alone, but that can include, and often benefit from, the countermeasures identified in this report.

Local, regional, state and federal funding opportunities relevant to LRSP projects are listed on the following pages. Where possible, details about upcoming funding application cycles are provided, however, many of these are in flux due to impacts from the ongoing Covid-19 pandemic. We recommend that the City periodically review this list and check for updates regarding funding availability until funding cycles stabilize.

Local and Regional Sources

Contra Costa County Measure J Funding
Administered through CCTA, Measure J provides funding for countywide and local transportation projects in Contra Costa County.

**Frequency:**
Apportioned annually by CCTA

One Bay Area Grant (OBAG) 3
OBAG is funding from the Federal Highway Administration, but is distributed by MTC in the Bay Area. This grant provides funding for projects and programs that improve safety, spur economic development, and help the Bay Area meet climate change and air quality improvement goals.

**Frequency:** Varies

**Next funding opportunity:**
OBAG application deadline for Contra Costa County has passed. The countywide project list will be submitted to MTC in September 2022

Developer Fees
California law allows local governments to establish and charge a fee on residential and non-residential developments to fund public facilities and to service population growth. Public facility fees can be charged to new development based on density and traffic impacts, and can go to a variety of public facilities, one being local roadways.

**Frequency:** Project-by-project basis

Lifeline Transportation Program
The Metropolitan Transportation Commission (MTC) has created the Lifeline Transportation Program to evaluate state and federal funds to provide grants for mobility and accessibility needs in low-income communities across the Bay Area. New guidelines are established for each cycle and the projects must address transportation gaps or barriers identified in community-based transportation plans or other local planning efforts in low-income neighborhoods.

**Frequency:** Biennial funding cycle
Program for Arterial System Synchronization (PASS)
PASS delivers financial and technical assistance to cities and counties to enhance signal coordination across jurisdictions. This includes engineering help for local governments seeking to re-time signals, adjustments to existing traffic-responsive timing systems, “flush” plans for managing traffic incidents, and more.

**Frequency:** Annual funding cycle

Transportation Development Act Article 3 (TDA3) Funding
Administered through the Metropolitan Transportation Committee (MTC), TDA3 provides funding annually for bicycle and pedestrian projects. Each county coordinates a consolidated annual request for projects to be funded in the county. Some counties competitively select projects, while other counties distribute the funds to jurisdictions based on population.

**Frequency:** Annual funding cycle

Next funding opportunity: Cycle 6 applications were due June 15, 2022. This cycle includes funding/programming for fiscal years 2023/2024, 2024/2025, 2025/2026, and 2026/2027. Cycle 6 will also receive a funding augmentation has been granted from the General Fund for this year.

Cycle 7 applications have yet to be announced but are anticipated in 2024.

State Sources

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

**Frequency:** Biennial funding cycle

Next funding opportunity: Cycle 6 applications were due June 15, 2022. This cycle includes funding/programming for fiscal years 2023/2024, 2024/2025, 2025/2026, and 2026/2027. Cycle 6 will also receive a funding augmentation has been granted from the General Fund for this year.

California Natural Resources Agency Environmental Enhancement and Mitigation (EEM) Program
This program supports projects that “contribute to mitigation of the environmental effects of transportation facilities.” According to the program guidelines, projects that fall under the following category can apply: “Mitigation Projects Beyond the Scope of the Lead Agency responsible for assessing the environmental impact of the proposed transportation improvement.”

**Frequency:** Annual funding cycle

Next funding opportunity: The 2022 EEM Program application deadline has passed for 2022. The California Natural Resources Agency has not announced when the application will open for 2023.
California Natural Resources Agency Urban Greening Program
This program supports projects that “use natural systems or systems that mimic natural systems to achieve multiple benefits.” Eligible projects include “Non-motorized urban trails that provide safe routes for travel between residences, workplaces, commercial centers, and schools.”

**Frequency:** Biennial funding cycle

**Next funding opportunity:**
Application deadline has passed for 2022. Next funding cycle is anticipated in 2024.

California Office of Traffic Safety (OTS) Grant Program
OTS administers traffic safety grants in the following areas: Alcohol Impaired Driving, Distracted Driving, Drug-Impaired Driving, Emergency Medical Services, Motorcycle Safety, Occupant Protection, Pedestrian and Bicycle Safety, Police Traffic Services, Public Relations, Advertising, and Roadway Safety and Traffic Records. This funding is primarily geared to enforcement and outreach efforts.

**Frequency:** Annual funding cycle

**Next funding opportunity:**
FY 2024 application materials and workshops will be announced December 2022; grant applications are due January 31, 2023.

California Strategic Growth Council (SGC) Transformative Climate Communities (TCC) Program
The Transformative Climate Communities (TCC) Program empowers the communities most impacted by pollution to choose their own goals, strategies, and projects to reduce greenhouse gas emissions and local air pollution.

**Frequency:** Annual funding cycle

**Next funding opportunity:**
Application deadline has passed for 2022. FY 2023/2024 NOFA Release for the next cycle is anticipated for March 2023.

Caltrans Strategic Partnerships Grants
These grants, a subset of Caltrans’ Sustainable Transportation Planning Grant Program, fund multi-modal planning studies, with a focus on transit, of regional, interregional, and statewide significance. Studies are conducted in partnership with Caltrans and must assist in achieving the Caltrans Mission and Grant Program Objectives.

**Frequency:** Annual funding cycle

**Next funding opportunity:**
FY 2023/2024 application period yet to be announced.

Clean California Grants
The Clean California Local Grant Program (CCLGP), operated by Caltrans, was created by AB 149 in 2021 to beautify and clean up local streets and roads, tribal lands, parks, pathways, transit centers, and other public spaces. The program will allocate $296 million in state funds, in grants not to exceed $5 million, to local and regional public agencies that install beautification measures and art in public spaces and remove litter and debris to enhance communities and improve spaces for walking and recreation. The goals of the CCLGP are to: reduce the amount of waste and debris within public rights-of-way, pathways, parks, transit centers, and other public spaces; enhance, rehabilitate, restore, or install measures to beautify and improve public spaces and mitigate the urban heat island effect; enhance public health, cultural connection, and community placemaking by improving public spaces for walking and recreation; and advance equity for underserved communities.

**Frequency:** three-year cycle

**Next funding opportunity:**
Cycle 2 timeline has yet to be announced, but anticipated for winter 2024.
Highway Safety Improvement Program (HSIP)
California’s Local HSIP focuses on infrastructure projects with nationally recognized crash reduction factors (CRFs). Local HSIP projects must be identified based on collision experience, collision potential, collision rate, or other data-supported means. There are opportunities to include systemic safety projects as well.

**Frequency:** Funding cycle varies between annual and biennial

**Next funding opportunity:**
HSIP Cycle 11 applications are due September 12, 2022.

SB 1 Local Partnership Program (LPP)
The purpose of this program is to provide local and regional transportation agencies that have passed sales tax measures, developer fees, or other imposed transportation fees with a continuous appropriation of $200 million annually from the Road Maintenance and Rehabilitation Account to fund road maintenance and rehabilitation, sound walls, and active transportation projects. There is also a competitive grant portion of this project.

**Frequency:** Biennial funding cycle

**Next funding opportunity:**
Call for Projects will open August 17-18, 2022, and the application deadline is November 29, 2022.

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

**Frequency:** Annual funding cycle

**Next Funding Opportunity:**
LSRP application deadline for 2022 has passed. Project Lists are due on July 1 of each year

SB 1 State Transportation Improvement Program (STIP)
The State Transportation Improvement Program (STIP) is the biennial five-year plan for future allocations of certain state transportation funds for state highway improvements, intercity rail, and regional highway and transit improvements.

**Frequency:** Biennial funding cycle

**Next funding opportunity:**
2024 cycle funding estimate and program details likely to be released Summer 2023.

SB 1 Solutions for Congested Corridors Program (SCCP)
The Solutions for Congested Corridors Program funds projects designed to reduce congestion in highly traveled and highly congested corridors. This statewide, competitive program makes $250 million available annually for projects that implement specific transportation performance improvements and are part of a comprehensive corridor plan by providing more transportation choices while preserving the character of local communities and creating opportunities for neighborhood enhancement.

**Frequency:** Biennial funding cycle

**Next funding opportunity:**
Call for Projects will open August 17-18, 2022, and the project nomination deadline is December 2, 2022.

SGC Affordable Housing and Sustainable Communities (AHSC) Program
The Affordable Housing and Sustainable Communities (AHSC) Program makes it easier for Californians to drive less by making sure housing, jobs, and key destinations are accessible by walking, biking, and transit.

**Frequency:** Annual funding cycle

**Next funding opportunity:**
Round 7 applications due February 2023.
Federal Sources

Community Development Block Grant (CDBG) Program
The Community Development Block Grant (CDBG) program is a flexible program that provides communities with resources to address a wide range of unique community development needs. Communities often use CDBG funds to construct and repair streets and sidewalks.

**Frequency:** Annual funding cycle

**Next funding opportunity:** Housing and Community Development program application cycle yet to be announced; likely January-February 2023.

Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Discretionary Grant Program
This program supports projects that are “road or bridge projects eligible under title 23, United States Code;” and “intermodal projects.” Previously the BUILD grant, this program replaces the TIGER program.

**Frequency:** Annual funding cycle

**Next funding opportunity:** FY 2023 applications due Spring 2023
Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program
The SMART program was established by the Bipartisan Infrastructure Law (BIL) for public sector agencies to conduct demonstration projects focused on advanced smart community technologies and systems to improve transportation efficiency and safety.

**Frequency:** Unknown

**Next funding opportunity:**
The Notice of Funding Opportunity (NOFO) will open in September 2022

Reconnecting Communities Pilot Program
This program was established under the BIL to support planning grants and capital construction grants, as well as technical assistance, to restore community connectivity through removal, retrofit, mitigation, or replacement of eligible transportation infrastructure facilities to underserved communities.

**Frequency:** Unknown

**Next funding opportunity:**
FY 2022 applications due October 13, 2022

Congestion Mitigation and Air Quality (CMAQ) Improvement Program
The FAST Act continued the CMAQ program to provide a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas).

**Frequency:** Annual funding cycle

**Next funding opportunity:**
Funding apportioned via metropolitan planning organizations (MPOs) based on a formula.

Safe Streets for All (SS4A) Grant Program
The Safe Streets for All (SS4A) grant program is a new Federal grant program established by the Bipartisan Infrastructure Law centered around the Department of Transportation’s National Roadway Safety Strategy and its goal of zero deaths and serious injuries on America’s roadways. It will provide $5 billion in grant funding over the next 5 years to develop and implement Vision Zero safety plans. Current legislation emphasizes funding of planning efforts, but the focus on implementation funding is expected to increase over the next few years.

**Frequency:** Annual funding cycle

**Next funding opportunity:**
2022 applications are due September 15, 2022
Chapter 6

Collision Hotspots and Focus Corridors

This chapter identifies collision hotspot locations and corridors in Concord.

Collisions were summarized by location to rank intersections based on the number of collisions. The table on page 77 presents the list of 25 highest-ranking intersections. The collision profiles associated with the location are also shown.

Several roadway corridors contain multiple locations featured on the top 25 list, as well as additional high-ranking locations that did not make the list. These corridors include Monument Boulevard, Clayton Road, Willow Pass Road, Concord Avenue, Ygnacio Valley Road / Kirker Pass Road, Port Chicago Highway, and Oak Grove Road. These corridors are also home to many of the contextual risk factors identified in the collision profiles of emphasis. Additionally, these corridors are all part of the Countywide high-injury networks created by CCTA as part of its Countywide Vision Zero effort.

As a result, these high-collision corridors can be a specific focal point for priority implementation efforts in line with the recommended strategies from this Plan, including the recommended engineering countermeasures from the collision profiles of emphasis as well as non-engineering countermeasures. These efforts should present interventions that address entire stretches of these corridors in a comprehensive way, rather than piecemeal improvements at single locations.

Over the next three years, the City plans to apply for additional grant funding to implement projects along these corridors in line with the recommended strategies from this Plan, and prepare any additional Complete Streets corridor studies necessary as part of these applications.
The table on the facing page presents the list of locations in Concord with the highest number of collisions associated. The locations are shown with the total number of injury collisions that have occurred during the study period, as well as the number of KSI collisions. The collision profiles associated with the location are also shown.
<table>
<thead>
<tr>
<th>Top Collision Hotspot Locations</th>
<th>Total Collisions</th>
<th>KSI Collisions</th>
<th>Profiles Represented</th>
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<tr>
<td>Concord Avenue and Market Street/SR 242 on-ramp</td>
<td>31</td>
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<td>Willow Pass Road, Pine Street, and Market Street</td>
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<td>Oak Grove Road and Treat Boulevard</td>
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<td>Port Chicago Highway and Bonifacio Street</td>
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<td>Port Chicago Highway and Salvio Street</td>
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</table>
Appendix

Engineering Countermeasures Toolbox
A curb extension is a traffic calming measure which widens the sidewalk for a short distance to enhance the pedestrian crossing. This reduces the crossing distance and allowing pedestrians and drivers to see each other when parked vehicles would otherwise block visibility. Paint and plastic curb extensions are a low-cost/quick build option.

Cost

$$
Low Cost / Quick Build alternative available

LRSM ID

NS21PB
List of Countermeasures

Low-Cost

- Advance Stop Bar
- All-Way Stop Control
- Bike Box
- Curve Advance Warning Sign
- Delineators, Reflectors, and/or Object Markers
- Extend Green Time For Bikes
- Extend Pedestrian Crossing Time
- Extend Yellow and All Red Time
- High-Visibility Crosswalk
- Install/Upgrade Pedestrian Crossing at Uncontrolled Locations (Signs and Markings Only)
- Leading Pedestrian Interval and Pedestrian Recall
- LED-Enhanced Sign
- Prohibit Left Turn
- Rectangular Rapid Flashing Beacon
- Remove Crossing Prohibition
- Remove Obstructions For Sightlines
- Retroreflective Tape on Signals
- Rumble Strips
- Upgrade Intersection Pavement Markings
- Upgrade Signal Head
- Upgrade Signs with Fluorescent Sheeting
- Yield To Pedestrians Sign

Medium-Cost

- Advanced Dilemma Zone Detection
- Bike Lane
- Curb Extensions
- Directional Median Openings to Restrict Left Turns
- Flashing Beacon Advance Warning
- Improved Pavement Friction
- Intersection Lighting
- Median Barrier
- Pedestrian Countdown Timer
- Pedestrian Scramble
- Protected Left Turns
- Raised Crosswalk
- Raised Median
- Red Light Camera
- Refuge Island
- Road Diet
- Speed Sensitive Rest in Red Signal
- Supplemental Signal Heads
- Widen/Pave Shoulder

High-Cost

- Close Slip Lane
- Pedestrian Hybrid Beacon
- Roundabout
- Segment Lighting
- Separated Bikeway
- Signal
- Signal Interconnectivity and Coordination / Green Wave

Local Roadway Safety Manual

Many of these countermeasures are recommended for the 9 collision profiles of emphasis included in this report. Most of the countermeasures are included in the 2020 Caltrans Local Roadway Safety Manual (LRSM) and can be advantageous for use in Caltrans Highway Safety Improvement Program (HSIP) grant funding applications. There are many effective safety countermeasures beyond those listed in the LRSM, and several are included in this toolbox.
**SIGNING & STRIPING**

**Advance Stop Bar**

An advanced stop bar is a horizontal stripe painted ahead of the crosswalk at stop signs and signals to indicate where drivers should stop. An advanced stop bar improves safety by reducing instances of vehicles encroaching on the crosswalk. Creating a wider stop bar or setting the stop bar further back may be appropriate for locations with known crosswalk encroachment issues.

**Cost**

$ Low Cost / Quick Build alternative available

**LRSM ID**

S20PB

**INTERSECTIONS & ROADWAYS**

**All-Way Stop Control**

An all-way stop-controlled intersection requires all vehicles to stop before crossing the intersection. An all-way stop controlled intersection improves safety by removing the need for motorists, bicyclists, and pedestrians on a side-street stop-controlled intersection to cross free-flowing lanes of traffic, which reduces the risk of collision. An “ALL WAY” sign should be placed under the octagonal stop sign at all-way stop-controlled intersections as required by the California Manual on Uniform Traffic Control Devices (MUTCD).

**Cost**

$

**LRSM ID**

NS02
BIKEWAYS

**Bike Box**

A designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.

**Cost** $  
*Low Cost / Quick Build alternative available*

**LRSM ID** S20PB

SIGNING & STRIPING

**Curve Advance Warning Sign**

A curve advance warning sign notifies drivers of an approaching curve and may include an advisory speed limit as drivers navigate around the curve. This warning sign is ideally combined with other infrastructure that alerts drivers of the curve, such as chevron signs, delineators, and flashing beacons. A curve advance warning sign improves safety by giving drivers additional time to slow down for the curve.

**Cost** $  
*Low Cost / Quick Build alternative available*

**LRSM ID** R24

**Other Reference Information**

FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads
### Delineators, Reflectors, and/or Object Markers

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

**Cost**

$\text{Low Cost / Quick Build alternative available}$

**LRSM ID**

R27

### Extend Green Time For Bikes

Prolongs the green phase when bicyclists are present to provide additional time for bicyclists to clear the intersection. Can occur automatically in the signal phasing or when prompted with bicycle detection. Topography should be considered in clearance time.

**Cost**

$

**LRSM ID**

S03
**Delineators, reflectors and/or object markers** are intended to warn drivers of an approaching curve or fixed object that cannot easily be removed. They are generally less costly than Chevron Signs as they don’t require posts to place along the roadside, avoiding an additional object with which an errant vehicle can crash into.

**Cost**

$ \quad \text{Low Cost / Quick Build alternative available}

**LRSM ID**

R27

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**SIGNALS**

**Extend Pedestrian Crossing Time**

Increases time for pedestrian walk phases, especially to accommodate vulnerable populations, such as children and the elderly.

**Cost**

$ \quad \text{Low Cost / Quick Build alternative available}

**LRSM ID**

S03

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**SIGNALS**

**Extend Yellow and All Red Time**

Extending yellow and all red time increases the time allotted for the yellow and red lights during a signal phase. Extending yellow and all red time improves safety by allowing drivers and bicyclists to safely cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection.

**Cost**

$ \quad \text{Low Cost / Quick Build alternative available}

**LRSM ID**

S03
A high-visibility crosswalk has a striped pattern with ladder markings made of high-visibility material, such as thermoplastic tape, instead of paint. A high-visibility crosswalk improves safety by increasing the visibility of marked crosswalks and provides motorists a cue to slow down and yield to pedestrians.

Cost: $  
Low Cost / Quick Build alternative available

LRSM ID: S18/NS20

A pedestrian crossing at an intersection or on a segment provides a formalized location for people to cross the street, reducing the risk of people crossing outside crosswalks where drivers are not expecting them. Crosswalk striping, signs, and other enhanced safety features alert drivers that there may be a pedestrian crossing.

Cost: $  
Low Cost / Quick Build alternative available

LRSM ID: R35PB
PEDESTRIAN FACILITIES

Leading Pedestrian Interval and Pedestrian Recall

At intersection locations that have a high volume of turning vehicle and have high pedestrian vs. vehicle crashes, a leading pedestrian interval gives pedestrians the opportunity to enter an intersection 3 - 7 seconds before vehicles are given a green indication. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left or right.

Cost

$ $

LRSM ID  S21PB

Other Reference Information

SIGNING & STRIPING

LED-Enhanced Sign

An LED-Enhanced Sign has LED lights embedded in the sign to outline the sign itself or the words and symbols on the sign. The LEDs may be set to flash or operate in a steady mode. An LED-enhanced sign improves safety by improving the visibility of signs at locations with visibility limitations or with a documented history of drivers failing to see or obey the sign (e.g. at STOP signs).

Cost

Low Cost / Quick Build alternative available

LRSM ID  NS08
Prohibitions of left turns at locations where a turning vehicle may conflict with pedestrians in the crosswalk or where opposing traffic volume is high. Reduces pedestrian interaction with vehicles when crossing.

Cost
Low Cost / Quick Build alternative available

LRSM ID S15/NS16

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

Cost

LRSM ID NS22PB
### PEDESTRIAN FACILITIES

**Remove Crossing Prohibition**

Removes existing crossing prohibitions and provides marked crosswalk and other safety enhancements for pedestrians to cross the street.

**Cost**

$ Low Cost / Quick Build alternative available

### OTHER

**Remove Obstructions For Sightlines**

Remove objects that may prevent drivers and pedestrians from having a clear sightline. May include installing red curb at intersection approaches to remove parked vehicles (also called "daylighting"), trimming or removing landscaping, or removing or relocating large signs.

**Cost**

$ Low Cost / Quick Build alternative available

**LRSM ID**

NS11

### Other Reference Information

FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads
Retroreflective borders enhance the visibility of traffic signals for aging and color vision impaired drivers enabling them to understand which signal indication is illuminated. Retroreflective borders may also alert drivers to signalized intersections during periods of power outages when the signals would otherwise be dark, and non-reflective signal heads and backplates would not be visible.

Cost: $  
Low Cost / Quick Build alternative available

LRSM ID: S02

Rumble strips create noise and vibration inside the vehicle that alert a driver as they cross the center or edge line. Often this alert is strong enough to get the attention of a distracted or drowsy driver, who can quickly make a corrective steering action to return to the roadway safely. Rumble strips also alert drivers to the lane limits when conditions such as rain, fog, snow, or dust reduce driver visibility.

Cost: $  

LRSM ID: R30/R31

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads
Retroreflective borders enhance the visibility of traffic signals for aging and color vision impaired drivers enabling them to understand which signal indication is illuminated. Retroreflective borders may also alert drivers to signalized intersections during periods of power outages when the signals would otherwise be dark, and non-reflective signal heads and backplates would not be visible.

**Cost**

- Low Cost / Quick Build alternative available

<table>
<thead>
<tr>
<th>LRSM ID</th>
<th>S02</th>
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**SIGNING & STRIPING**

**Upgrade Intersection Pavement Markings**

Upgrading intersection pavement marking can include “Stop Ahead” markings and the addition of centerlines and stop bars. Upgrading intersection pavement markings can improve safety by increasing the visibility of intersections for drivers approaching and at the intersection.

**Cost**

- Low Cost / Quick Build alternative available

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**SIGNALS**

**Upgrade Signal Head**

Upgrading Signal Heads replaces existing 8-inch signal heads with 12-inch signal heads to comply with the California MUTCD’s 2014 guidelines. Upgrading signal heads improves safety by providing better visibility of intersection signals and by aiding drivers’ advanced perception of upcoming intersections.

**Cost**

- $
Upgrade Signs with Fluorescent Sheeting

Upgrading signs with fluorescent sheeting replaces existing signs with new signs that can clearly display warnings by reflecting headlamp light back to vehicles. Upgrading signs with fluorescent sheeting improves safety by increasing visibility of signs to drivers at night.

Cost: $  
Low Cost / Quick Build alternative available

LRSM ID: R22

Yield To Pedestrians Sign

“Yield Here to Pedestrians” signs alert drivers about the presence of pedestrians. These signs are required with advance yield lines. Other sign types can be placed on the centerline in the roadway.

Cost: $
Low Cost / Quick Build alternative available

LRSM ID: NS06

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads
The Advanced Dilemma-Zone Detection system adjusts the start time of the yellow-signal phase (i.e. earlier or later) based on observed vehicle locations and speeds. The Advanced Dilemma-Zone Detection system improves safety by minimizing the number of drivers that are faced with the dilemma of determining if they should stop at the intersection or drive through the intersection based on their speed and distance from the intersection.

Cost $\$\$

LRSM ID S04

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

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

Cost $\$\$

Low Cost / Quick Build alternative available

LRSM ID R32PB
Curb Extensions

A curb extension is a traffic calming measure which widens the sidewalk for a short distance to enhance the pedestrian crossing. This reduces the crossing distance and allowing pedestrians and drivers to see each other when parked vehicles would otherwise block visibility. Paint and plastic curb extensions are a low-cost/quick build option.

Cost

$$
Low Cost / Quick Build alternative available

LRSM ID    NS21PB

Directional Median Openings to Restrict Left Turns

A directional median opening restricts specific turning movements, such as allowing a left-turn from a major street but not from a minor street. A directional median opening to restrict left turn improves safety by reducing the number of conflict points.

Cost

$$
Low Cost / Quick Build alternative available

LRSM ID    S14

Other Reference Information

A curb extension is a traffic calming measure which widens the sidewalk for a short distance to enhance the pedestrian crossing. This reduces the crossing distance and allowing pedestrians and drivers to see each other when parked vehicles would otherwise block visibility. Paint and plastic curb extensions are a low-cost/quick build option.

**Cost** | $$
---|---
**LRSM ID** | NS21PB

**Other Reference Information**
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

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A flashing beacon as Advanced Warning is a blinking light with signage to notify motorists of an upcoming intersection or crosswalk. A flashing beacon improves safety by providing motorists more time to be aware of and slow down for an intersection or yield to pedestrians crossing a crosswalk.

**Cost** | $$
---|---
**LRSM ID** | S10

**Other Reference Information**
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

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A roadway must have an appropriate level of pavement friction to ensure that drivers are able to keep their vehicles safely in the lane. Poor pavement conditions, especially wet pavement, have been identified as one of the major contributing factors in roadway departure crashes. When a pavement surface is wet, the level of pavement friction is reduced, and this may lead to skidding or hydroplaning. Pavement friction is critical for changing vehicle direction and ensuring the vehicle remains in its lane. Traditional friction courses or high friction surface treatments should be considered for curves with numerous wet weather crashes or severe curves with higher operating speeds.

**Cost** | $$
---|---
**LRSM ID** | R21

**Other Reference Information**
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads
Other Reference Information

Intersection Lighting

Lighting is added at an intersection. Adding intersection and/or pedestrian-scale lighting at intersections improves safety by increasing visibility of all road users. This countermeasure is most effective at reducing or preventing collisions at intersections at night.

Cost
$\$ 

LRSM ID
NS01

Median Barrier

Barrier in the center of the roadway that physically separates opposing vehicular traffic. Median barriers can also help control access to and from side streets and driveways, reducing conflict points.

Cost
$\$ 

Low Cost / Quick Build alternative available

LRSM ID
R03

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads
**PEDESTRIAN FACILITIES**

**Pedestrian Countdown Timer**

Displays “countdown” of seconds remaining on the pedestrian signal. Countdown indications improve safety for all road users, and are required for all newly installed traffic signals where pedestrian signals are installed.

- **Cost**: $$
- **LRSM ID**: S17PB

**SIGNALS**

**Pedestrian Scramble**

A form of pedestrian “WALK” phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians to safely cross through the intersection in any direction, including diagonally.

- **Cost**: $$
- **LRSM ID**: S03
A protected left turn can be implemented at signalized intersections (with existing left turns pockets) that currently have a permissive left-turn or no left-turn protection that have a high frequency of angle crashes involving left turning, opposing through vehicles, and non-motorized road users. Left turns are widely recognized as the highest-risk movements at signalized intersections. Providing protected left-turn phases for signalized intersections significantly improve the safety for left-turn maneuvers by removing the need for the drivers to navigate through gaps in oncoming/opposing through vehicles.

Cost: $$

LRSM ID: S06/S07

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A Raised Crosswalk is a pedestrian crosswalk that is typically elevated 3-6 inches above the road or at sidewalk level. A Raised Crosswalk improves safety by increasing crosswalk and pedestrian visibility and slowing down motorists.

Cost: $$

LRSM ID: R36PB
A protected left turn can be implemented at signalized intersections (with existing left turns pockets) that currently have a permissive left-turn or no left-turn protection that have a high frequency of angle crashes involving left turning, opposing through vehicles, and non-motorized road users. Left turns are widely recognized as the highest-risk movements at signalized intersections. Providing protected left-turn phases for signalized intersections significantly improve the safety for left-turn maneuvers by removing the need for the drivers to navigate through gaps in oncoming/opposing through vehicles.

### INTERSECTIONS & ROADWAYS

**Raised Median**

Curbed sections in the center of the roadway that are physically separated from vehicular traffic. Raised medians can also help control access to and from side streets and driveways, reducing conflict points.

- **Cost**: $$
- **LRSM ID**: S12/NS14/R08
- **Cost Note**: Low Cost / Quick Build alternative available

### OTHER

**Red Light Camera**

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

- **Cost**: $$
A Raised Median, or Refuge Island, is a raised barrier in the center of the roadway that can restrict certain turning movements and provide a place for pedestrians to wait if they are unable to finish crossing the intersection. A Raised Median improves safety by reducing the number of potential conflict points with designated zones for vehicles to turn, and a pedestrian refuge island improves safety by reducing the exposure time for pedestrians crossing the intersection. Pedestrian refuge areas constructed from paint and plastic may be implemented as part of a low-cost/quick build project.

**Cost**  
$$
Low Cost / Quick Build alternative available

**LRSM ID**  
NS19PB

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A Road Diet reduces roadway space dedicated to vehicle travel lanes to create room for bicycle facilities, wider sidewalks, or center turn lanes. A Road Diet improves safety by reducing vehicle speeds and creating designated space for all road users.

**Cost**  
$$
Low Cost / Quick Build alternative available

**LRSM ID**  
R14
A Raised Median, or Refuge Island, is a raised barrier in the center of the roadway that can restrict certain turning movements and provide a place for pedestrians to wait if they are unable to finish crossing the intersection. A Raised Median improves safety by reducing the number of potential conflict points with designated zones for vehicles to turn, and a pedestrian refuge island improves safety by reducing the exposure time for pedestrians crossing the intersection. Pedestrian refuge areas constructed from paint and plastic may be implemented as part of a low-cost/quick build project.

Cost

$$

LRSM ID

NS19PB

INTERSECTIONS & ROADWAYS

Refuge Island

At certain hours (eg. late night) a signal remains red for all approaches or certain approaches until a vehicle arrives at the intersection. If the vehicle is going faster than the desired speed, the signal will not turn green until after vehicle stops. If the vehicle is going the desired speed the signal will change to green before the vehicle arrives. This signal timing provides operational benefit to drivers traveling at the desired speed limit. Can be paired with variable speed warning signs.

Cost

$$

LRSM ID

R26

SIGNALS

Speed Sensitive
Rest in Red Signal

SIGNALS

Supplemental
Signal Heads

Additional signal heads allow drivers to anticipate signal changes farther away from intersections. Supplemental traffic signals may be placed on the near side of an intersection, far-left, far-right, or very high.

Cost

$$

LRSM ID

S02
Widened and paved shoulders, which may also include flattening the slopes along the sides of the roadway, create a separated space for bicyclists and also provide motor vehicle safety benefits, such as space for inoperable vehicles to pull out of the travel lane. The addition of a paved shoulder to an existing road can help to reduce run-off-road crashes. Benefits can be realized for high risk rural roads without paved shoulders, regardless of existing lane pavement width. Adding paved shoulders within horizontal curve sections may help agencies maximize benefits of the treatment while minimizing costs as opposed to adding paved shoulders to an entire corridor.

Cost
$$

LRSM ID  R15

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Close Slip Lane

Modifies the corner of an intersection to remove the sweeping right turn lane for vehicles. Results in shorter crossings for pedestrians, reduced speed for turning vehicles, better sight lines, and space for landscaping and other amenities.

Cost
$$$

LRSM ID  NS23PB

Other Reference Information
Concord Local Roadway Safety Plan

PEDESTRIAN FACILITIES

Pedestrian Hybrid Beacon

A pedestrian-hybrid beacon (PHB) is used at unsignalized intersections or mid-block crosswalks to notify oncoming motorists to stop with a series of red and yellow lights. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection.

Cost $$$

LRSM ID NS23PB

INTERSECTIONS & ROADWAYS

Roundabout

A roundabout is a type of circular intersection in which road traffic is permitted to flow in one direction around a central island, and priority is typically given to traffic already in the junction. The types of conflicts that occur at roundabouts are different from those occurring at conventional intersections; namely, conflicts from crossing and left-turn movements are not present in a roundabout. The geometry of a roundabout forces drivers to reduce speeds as they proceed through the intersection; the range of vehicle speeds is also narrowed, reducing the severity of crashes when they do occur. Pedestrians only have to cross one direction of traffic at a time at roundabouts, thus reducing the potential for vehicle/pedestrian conflicts.

Cost $$$

LRSM ID S16/NS04

Low Cost / Quick Build alternative available
Providing roadway lighting improves safety during nighttime conditions by increasing driver awareness, increasing sight distance, and improving visibility of pedestrians and bicyclists.

**Cost** $$$

**LRSM ID** R01

A separated bikeway provides dedicated street space, typically adjacent to outer vehicle travel lanes, with physical separation from vehicle traffic, designated lane markings, pavement legends, and signage. Physical separation may consist of plastic posts, parked vehicles, or a curb. Separated bikeways improve safety by reducing conflicts between bicycles and vehicles on the road and by creating a road-narrowing effect with buffers or vertical barriers, which may reduce vehicle speeds. A raised barrier of plastic posts and painted pavement is a low-cost/quick build option.

**Cost** $$$

Low Cost / Quick Build alternative available

**LRSM ID** R33PB
Providing roadway lighting improves safety during nighttime conditions by increasing driver awareness, increasing sight distance, and improving visibility of pedestrians and bicyclists.

Cost $$$

LRSM ID R01

INTERSECTIONS & ROADWAYS

Signal

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

Cost $$$

LRSM ID NS03

SIGNALS

Signal Interconnectivity and Coordination / Green Wave

Certain timing, phasing, and control strategies can produce multiple safety benefits. Sometimes capacity improvements come along with the safety improvements and other times adverse effects on delay or capacity occur. The emphasis of improving signal coordination for this countermeasure is to provide an opportunity for slow speed signal coordination. Coordinating signals to allow for bicyclist progression, also known as a ‘green wave,’ gives bicyclists and pedestrians more time to safely cross through the ‘green wave’ intersections.

Cost $$$

LRSM ID S03

Other Reference Information
Currently the CMF Clearinghouse has only one reference for ped/vehicle collisions which indicates an increase in crash likelihood. However, a majority of references for all crash types show a decrease in collisions. See additional reference: FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads