K. HSIP Cycle 12 Grant Application Preparation

Recommendation: To authorize the City Engineer to execute a task order in the not to exceed amount of $20,000, with the city on-call traffic engineering consultant STC Traffic Inc. (STC) to provide engineering assistance and complete grant applications for the HSIP Cycle 12 Call-for-Projects Funding Program; and, once completed authorize the City Engineer to submit the HSIP Cycle 12 grant application packages to Caltrans.

July 30, 2024

City of Cathedral City
Engineering Department
68700 Avenida Lalo Guerrero
Cathedral City, CA 92234
Attn: Armando J. Garcia Baldizzone P.E.

Subject: Proposal for HSIP Cycle 12 Grant Applications

Dear Mr. Baldizzone,

STC Traffic, Inc. (STC) is pleased to submit this scope and fee proposal to the City of Cathedral City (City) to prepare grant applications for the Caltrans Highway Safety Improvement Program (HSIP) Cycle 12 "Call for Projects". STC conducted a feasibility analysis based on the latest collision data from the Transportation Injury Mapping System (TIMS), Statewide Integrated Traffic Records System (SWITRS), and data provided by the Cathedral City Police Department, Local Roadway Safety Manual (LRSM) Version 1.7 safety countermeasures, and HSIP Analyzer for Benefit Cost Ratio (BCR) applications to validate HSIP Cycle 12 grant competitiveness for improving pedestrian safety citywide. STC identified potential grant applications and provided them to the city. The following describes the scope of services to prepare each grant that was identified.

BCR Applications

STC will prepare HSIP BCR applications for the projects selected based on feasibility analysis results. The scope of BCR applications include:

- Project Description and Information
- Safety Countermeasures
- Responses to Narrative Questions
- Local Roadway Safety Plan (LRSP) Certification
- Engineer's Checklist
- Vicinity/Location Maps
- Project Maps of Existing Conditions and Proposed Improvements
- Pictures of Existing Conditions
- Benefit Cost Ratio (BCR) HSIP Analyzer Calculations
- Crash Data Analysis
- Project Schedule
- Detailed Cost Estimate
- Collision Diagrams
- Collision Summary Reports
- Additional Narration, Documentation, and Letters of Support
- Smartsheet Electronic Submittal Coordination

Task 1 – HSIP BCR Application – Install Pedestrian Crossing at Uncontrolled Locations

STC will prepare HSIP BCR application for improvements to three uncontrolled pedestrian crossing project locations identified in the analysis phase. The following locations must be included to utilize collision incidence: Dinah Shore Dr/ Corregidor Dr and San Eljay/ Doral Way. One additional location of the remaining 20 locations could be included withing the project improvement budget (approximately $160k).

Task 2 – HSIP Pedestrian Crossing Enhancements Set-Aside Application

STC will prepare HSIP SA application for pedestrian crossing enhancements. The SA application includes the BCR application efforts except collision analysis. The set aside funding is $350k and approximately three additional crossing locations could be included. The City would direct which three of the remaining 19 intersections would be included.

Summary

Three locations will be included in the BCR application and a minimum of three locations will be included in the set aside application. The number of locations included in the set-aside application will be governed by the cost estimate for improvements and $350k budget. It's anticipated that 6 of the 22 locations will be improved.

Cost Proposal

The fee estimate for the two applications above is $20,000 and the applications will be drafted and submitted to the City for review approximately two weeks prior to the September 9, 2024, application due date.

Thank you for the opportunity to submit a proposal for these services. Should you have any questions feel free to contact me at the address below.

Sincerely,

Jason Stack, TE, PTOE
President/Principal-in-Charge

Legal Name: STC Traffic, Inc.

Address: 5973 Avenida Encinas, Suite 218
Carlsbad, CA 92008
www.stctraffic.com

RFP Contact: Jason Stack, TE, PTOE
(714) 315-4640
jason.stack@stctraffic.com

Proposal Accepted By:

CATHEDRAL CITY HSIP 12 FEASIBILITY ANALYSIS

PROJECT NO.	COUNTERMEASURE(S)	LOCATION(S)	PROJECT DESCRIPTION	HSIP GRANT CONSIDERATIONS	CITY MATCH	BENEFIT	FUNDING AT BCR = 20
1	SI18PB - Install pedestrian countdown signal heads	Dinah Shore Dr & Date Palm Dr	Install Pedestrian Countdown Signal Heads	1 Fatal Injury (2023)	10%	$3,925,000	$196,250
2	SI22PB - Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	Dinah Shore Dr & Date Palm Dr	Implement Lead Pedestrian Interval Phasing at multiple locations.	1 Fatal Injury (2023)	10%	$4,710,000	$235,500
2.1		E Palm Canyon Dr & Cathedral Canyon Dr	Implement Lead Pedestrian Interval Phasing at multiple locations.	Pedestrian and Bicycle Crashes Only	10%	$386,000	$19,300
3	NS22PB - Install pedestrian crossing at uncontrolled locations (signs and markings only)	Dinah Shore Dr & Corregidor Dr	Pedestrian Ramp Upgrades, Signing and Striping	Pedestrian and Bicycle Crashes Only	10%	$3,027,500	$151,375
		San Eljay & Doral Way*	Pedestrian Ramp Upgrades, Signing and Striping	Pedestrian and Bicycle Crashes Only	10%	$252,500	$12,625

Note: * = Crosswalk near K-12 Public School

Cathedral City

LOCAL ROAD SAFETY PLAN

June 2021 Final Report

ACKNOWLEDGEMENTS

City of Cathedral City Team

John Corella, City Engineer / Public Works Director
Crystal Sandoval, Assistant Civil Engineer
Carlos Rodriguez, Public Works Supervisor

NAI Consulting

Alexander Klan, Assistant Project Manager
Josh Nickerson, Senior Engineer

Safety Partners

Cathedral City Police Department

Jeffrey Barnett, Police Officer / Traffic Division
Lianna Quintero, Crime Analyst – CCIA

Cathedral City Fire Department

John Muhr, Fire Chief

LRSP Consultant Team

STC Traffic

Jason Stack, Principal Manager
Nick Minicilli, Project Manager
Ashley Adamos, Project Engineer
Ivan Gonzalez, Associate Engineer
Brandon Ramirez, Engineering Intern

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ABC ..... Alcoholic Beverage Control

APP ..... Alcoholic Policing Partnership

BCR ..... Benefit Cost Ratio

CalSTA ..... California State Transportation Agency

Caltrans ..... California Department of Transportation

CHP ..... California Highway Patrol

CON ..... Construction

CRF ..... Crash Reduction Factor

CVAG ..... Coachella Valley Association of Governments

DLA ..... District Local Assistance

DUI ..... Driving Under the Influence

DVMT ..... Daily Vehicle Miles Travelled

EPDO ..... Equivalent Property Damage Only

F+SI ..... Fatal and Severe Injury

FHWA ..... Federal Highway Administration

GIS ..... Geographic Information System

GPS ..... Global Positioning System

HAWK ..... Pedestrian Hybrid Beacon

HSIP ..... Highway Safety Improvement Program

HSM ..... Highway Safety Manual

I ..... Interstate

IISNS ..... Internally Illuminated Street Name Sign

IR ..... Infrared

K-12 ..... Kindergarten to 12th Grade

LED ..... Light-Emitting Diode

LRSM ..... Local Road Safety Manual

LRSP ..... Local Road Safety Plan

LSEV ..... Low-Speed Electric Vehicles

NHTSA ..... National Highway Traffic Safety Administration

OTS ..... Office of Traffic Safety

PCF ..... Primary Collision Factor

PDO ..... Property Damage Only

PE ..... Preliminary Engineering

ROW ..... Right-Of-Way

RRFB ..... Rectangular Rapid Flashing Beacon

SA ..... Set-Aside

SHSP ..... Strategic Highway Safety Plan

SSARP ..... Systemic Safety Analysis Report Program

SWITRS ..... Statewide Integrated Traffic Records System

TIMS ..... Transportation Injury Mapping System

TNC ..... Transportation Network Company

TSM ..... Traffic Safety Marketing

USDOT ..... United States Department of Transportation

V2I ..... Vehicle-to-Infrastructure

V2P ..... Vehicle-to-Pedestrian

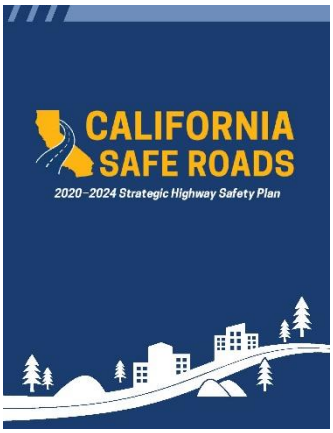
V2V ..... Vehicle-to-Vehicle

The Cathedral City Local Road Safety Plan (LRSP) was prepared within the governance of United States Code Title 23, Section 148 – Highway Safety Improvement Program (h) (4): "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 a location identified or addressed in the reports, surveys, schedules, lists, or other data." [23 U.S.C. §148(h) (4)]

United States Code Title 23, Section 409 – Discovery and Admission of Evidence of Certain Reports and Surveys: "Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data." [23 U.S.C. §409]

1 INTRODUCTION

The United States Department of Transportation (USDOT) Federal Highway Administration (FHWA) Office of Traffic Safety (OTS) began promoting certain infrastructure-oriented safety treatments and strategies based on proven effectiveness and benefits in 2008. This initiative became the Proven Safety Countermeasures List which seeks to encourage widespread implementation by State, Tribal, and Local transportation agencies to reduce crashes that result in fatalities and serious injuries. The Proven Safety Countermeasures List was last updated in 2017 and included the addition of Local Road Safety Plans (LRSP).



The California Department of Transportation (Caltrans) established their Local Road Safety Plan program in 2019 to provide funding to local agencies for developing a framework for identifying, analyzing, and prioritizing roadway safety improvement programs. The LRSP program evolved from the state-funded Systemic Safety Analysis Report Program (SSARP) established in 2016, in order to contribute to the success of the 2020-2024 California Strategic Highway Safety Plan (SHSP). The California SHSP is a statewide traffic safety plan that provides a comprehensive framework for reducing roadway fatalities and serious injuries on California's public roads. The California SHSP includes strategies based on the 5 E's of traffic safety – Engineering, Enforcement, Education, Emergency Response, and Emerging Technologies – and addresses 16 challenge areas:

- Aggressive Driving
- Aging Drivers (>65)
- Bicyclists
- Commercial Vehicles
- Distracted Driving
- Driver Licensing
- Emergency Response
- Emerging Technologies
- Impaired Driving
- Intersections
- Lane Departures
- Motorcyclists
- Occupant Protection
- Pedestrians
- Work Zones
- Young Drivers (15-20)

Cathedral City was selected as one of 250 local agencies in California (as of April 12, 2021) to receive Caltrans funding to develop a Local Road Safety Plan. Development of the Cathedral City LRSP will enable the City to meet the eligibility requirements for Highway Safety Improvement Program (HSIP) grant funding, which Caltrans will require for all future HSIP cycles. Cathedral City has been pursuing HSIP grant funding for infrastructure improvements that enhance safety for all roadway users in the City since 2011 (Cycle 4). Cathedral City has been successful in achieving over $4.7 million in HSIP grant awards.

1.1 Cathedral City At A Glance

The City of Cathedral City is located in the Coachella Valley, in the central portion of Riverside County, and is bounded by the Cities of Palm Springs, Desert Hot Springs, Rancho Mirage, and unincorporated Riverside County lands, as illustrated in *Figure 1-1*. The City encompasses 27.7 square miles and is traversed east-west by Interstate 10 (I-10) in the northern part of the City and California State Route 111 (SR-111) / East Palm Canyon Drive in the southern part of the City. Cathedral City operates and maintains 44 signalized intersections and 480 paved lane miles of public streets. *Figure 1-2* illustrates the project study area. Cathedral City has a population of approximately of 55,000 according to 2019 Census estimates and is the second largest City in the Coachella Valley, with one of the most diverse communities.

Figure 1-1 Vicinity Map

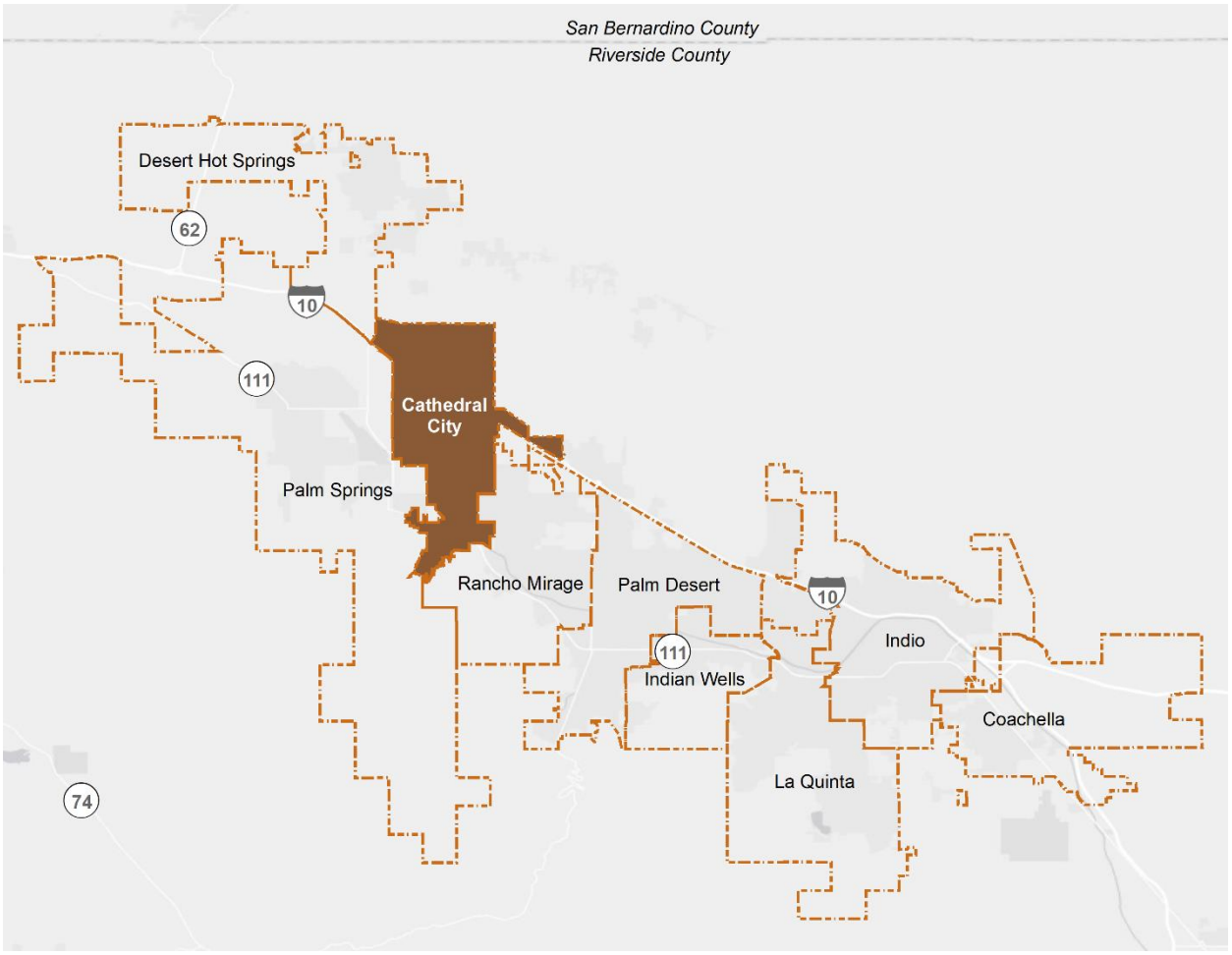
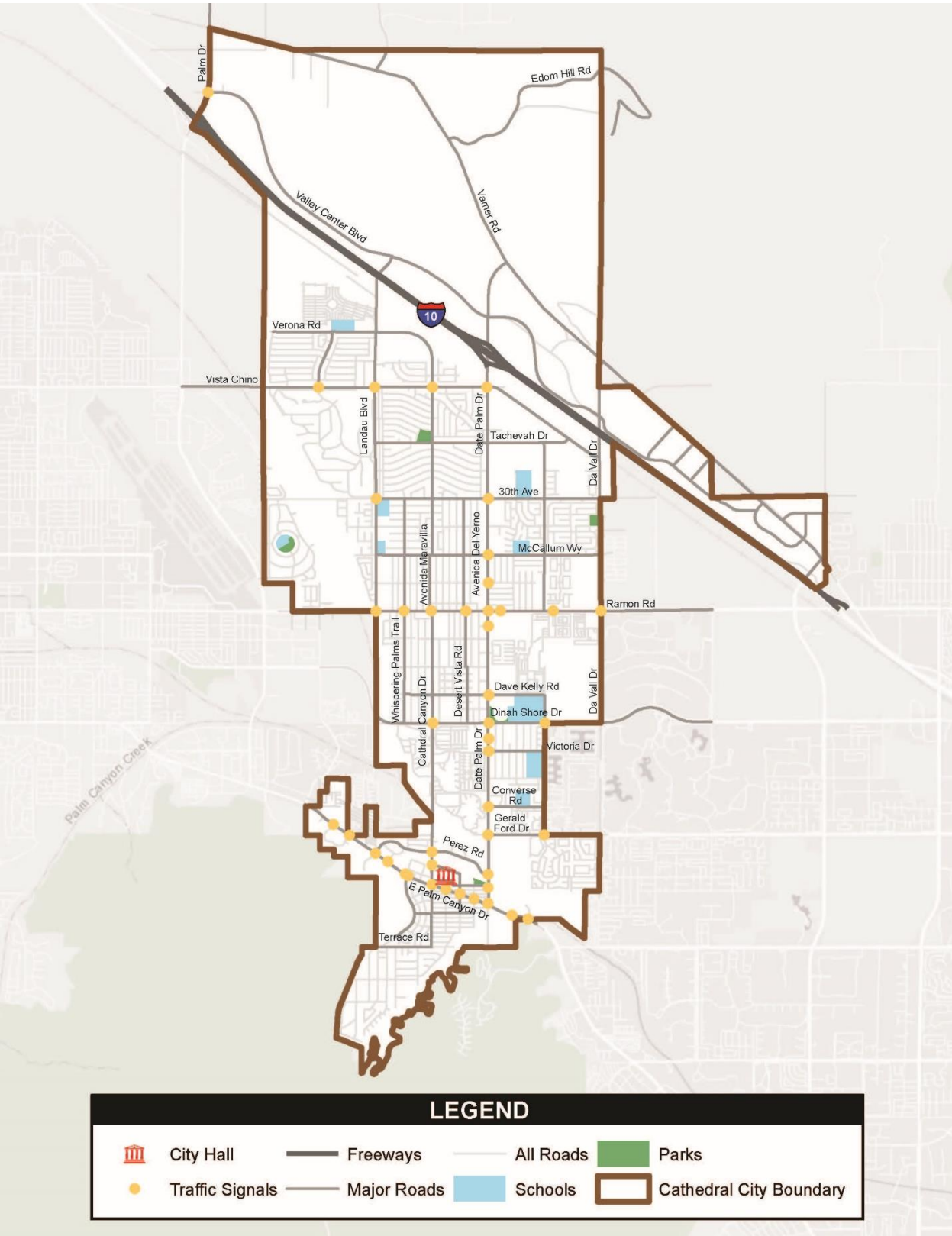


Figure 1-2 Study Area



1.2 Local Road Safety Plan Process

The development of the Cathedral City Local Road Safety Plan followed Caltrans program guidelines, which are based on the United Stated Department of Transportation (USDOT) Federal Highway Administration (FHWA)'s cyclical six (6) step process.

1. **Establish Leadership:**
   - Establish local partnerships with 5E's of traffic safety: Engineering, Enforcement, Education, Emergency Response, and Emerging Technologies
   - Define LRSP Vision and Goals
2. **Analyze Safety Data:**
   - Crash and Roadway Data Collection
   - Crash Data Analysis
   - Roadway Network Screening
3. **Determine Emphasis Areas:**
   - Identify priority areas based on crash data analysis and roadway network screening
4. **Identify Strategies:**
   - Identify safety countermeasures and strategies
   - Develop countermeasure toolbox
5. **Prioritize and Incorporate Strategies:**
   - Apply countermeasures and strategies to develop safety projects
   - Evaluate and prioritize safety projects by benefit cost ratio
   - Implement roadway safety improvement projects and programs
6. **Evaluate and Update**
   - Monitor progress of roadway safety improvement projects and programs
   - Evaluate success of countermeasure toolbox, projects, and programs
   - Review LRSP and update to reflect local changing needs and priorities

1.3 Vision, Mission, and Goals

The Cathedral City Local Road Safety Plan is guided by the core principle that traffic fatalities and severe injuries are preventable. Improvements to roadway safety can be made through a data-driven approach based on alignment with the Federal Highway Administration (FHWA)'s Local Road Safety Plan Proven Safety Countermeasure, California Strategic Highway Safety Plan (SHSP), Caltrans Local Road Safety Program (LRSP), Caltrans Highway Safety Improvement Program (HSIP), feedback from safety partners from the 5E's of traffic safety (Engineering, Enforcement, Education, Emergency Response, and Emerging Technologies), and the City's existing roadway safety plans, policies, and efforts. The following sub-section identifies the key Vision, Mission, and Goals set forth in the Cathedral City LRSP.

VISION	Ensure roadway safety for all users of Cathedral City roads including vehicles, pedestrians, and bicyclists
MISSION	Implement proven safety solutions based on the 5E's of traffic safety (Engineering, Enforcement, Education, Emergency Response, and Emerging Technologies) to systemically reduce roadway crashes and improve safety
GOALS	• Reduce the number of fatal and severe injury crashes towards zero • Reduce collision severity through a reduction in the number of crashes that involve alcohol use, bicyclists, and pedestrians • Reduce collision frequency and severity through a reduction in the number of broadside, rear end, and head-on crashes • Reduce collision frequency and severity through a reduction in the number of crashes that are primarily caused by unsafe speed, automobile right-of-way violations, improper turning, and alcohol use • Increase alternative modes of transportation including walking, biking, and low-speed electric vehicles (LSEV) • Engage with Safety Partners to create a culture within Cathedral City that promotes and implements road safety strategies

1.4 Safety Partners

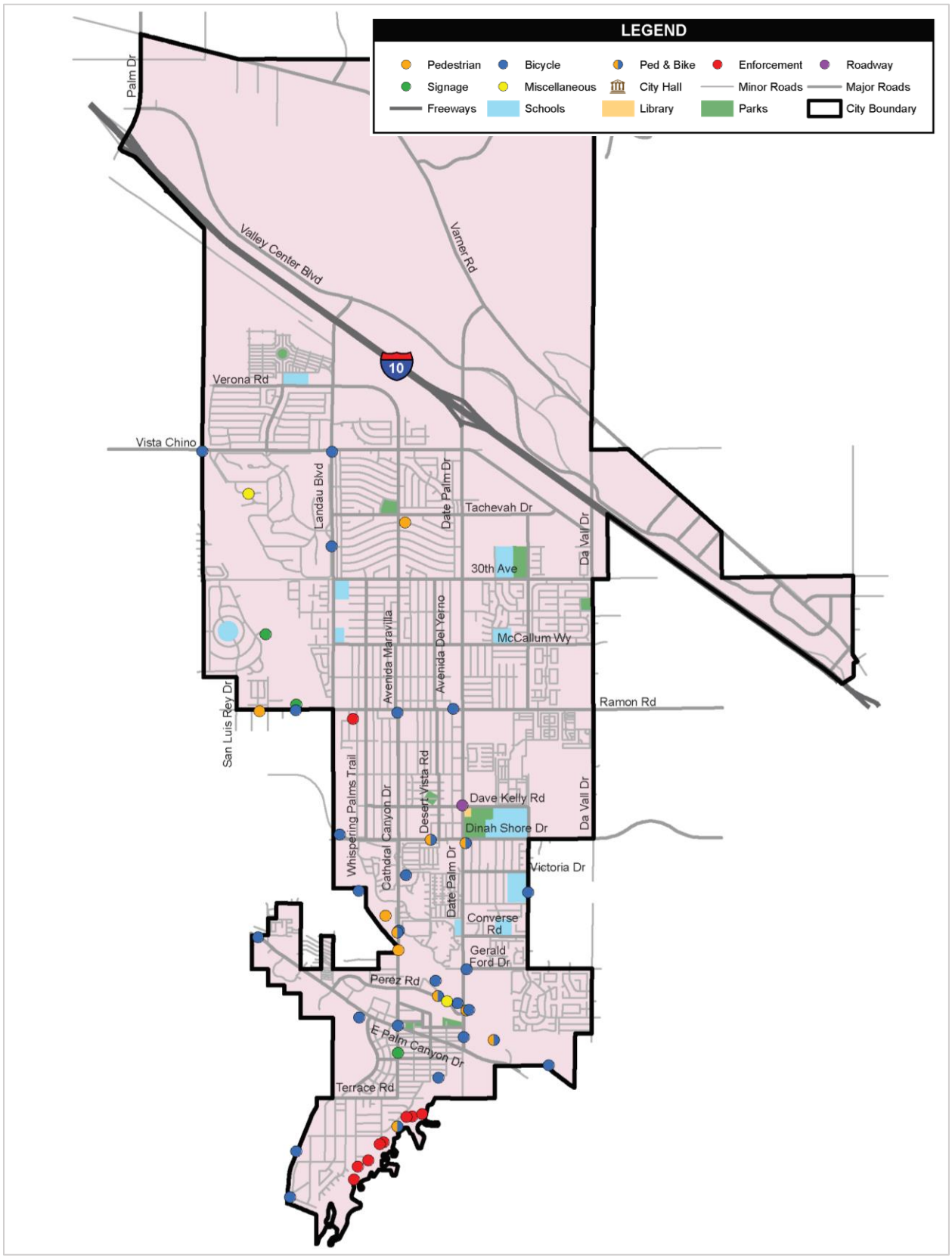
Local safety partners representing the 5E's of traffic safety were engaged to collaboratively address roadway safety in Cathedral City. Participants included representatives from:

- **Cathedral City Public Works Department**
- **Cathedral City Traffic Division**
- **Cathedral City Police Department**
- **Cathedral City Fire Department**
- **Connect Cathedral City**

Two safety partners meetings were conducted and the crash data was reviewed for annual citywide trends in location types, severity, crash types, primary collision factors, and roadway user involvement. Priority locations for signalized intersections, unsignalized intersections, and roadway segments were presented. Feedback was obtained on areas with safety issues that did not have a high rate of reported collisions but were known by the safety partners to have frequent "near-misses" or observance of high-risk behaviors such as vehicular speeding or pedestrian jaywalking, particularly with alcohol-involvement. Relevant roadway safety initiatives and programs were discussed including the Cathedral City Fire and Police Departments' participation in roadway safety educational campaigns at local K-12 schools and public events; the Fire Department successfully achieving grant funding for emergency rescue equipment and to improve emergency response times; and the Police Department successfully achieving California Alcoholic Beverage Control (ABC) grant funding for enforcement of underage and homeless overserving and California Office of Transportation Safety (OTS) grants for reducing pedestrian and bicycle violations. Feedback on desired roadway improvements from the Fire Department included intersection upgrades, medians, lighting, crosswalks, and repairing / upgrading the City's traffic signal preemption system to improve response times. Feedback on desired roadway improvements from the Police department included addressing merging for the southbound right turn at the intersection of Date Palm Drive and Vista Chino, cut-through routes for Palm Springs traffic, and pedestrian alcohol-related crashes on Ramon Road.

Outreach was also conducted with the Connect Cathedral City team, which is a joint venture project between the City and the Coachella Valley Association of Governments (CVAG) to develop projects that support walking, biking, and the use of low-speed electric vehicles (LSEVs) in Cathedral City. Community feedback from project outreach surveys and mapping was collected and documented in the Cathedral City LRSP. This included feedback related to high visibility pedestrian crosswalks, pedestrian hybrid beacons, the citywide bikeway network, and access point to the CV Link – the CVAG Alternative Transportation Route Path. *Figure 1-2* illustrates the feedback received from the safety partners organized by site-specific topics for pedestrians, bicycles, pedestrian-bicycles, enforcement, roadway concerns, signage concerns, and other miscellaneous roadway safety concerns.

Figure 1-3 Safety Partners Feedback by Topic



2 COLLISION ANALYSIS

2.1 Methodology

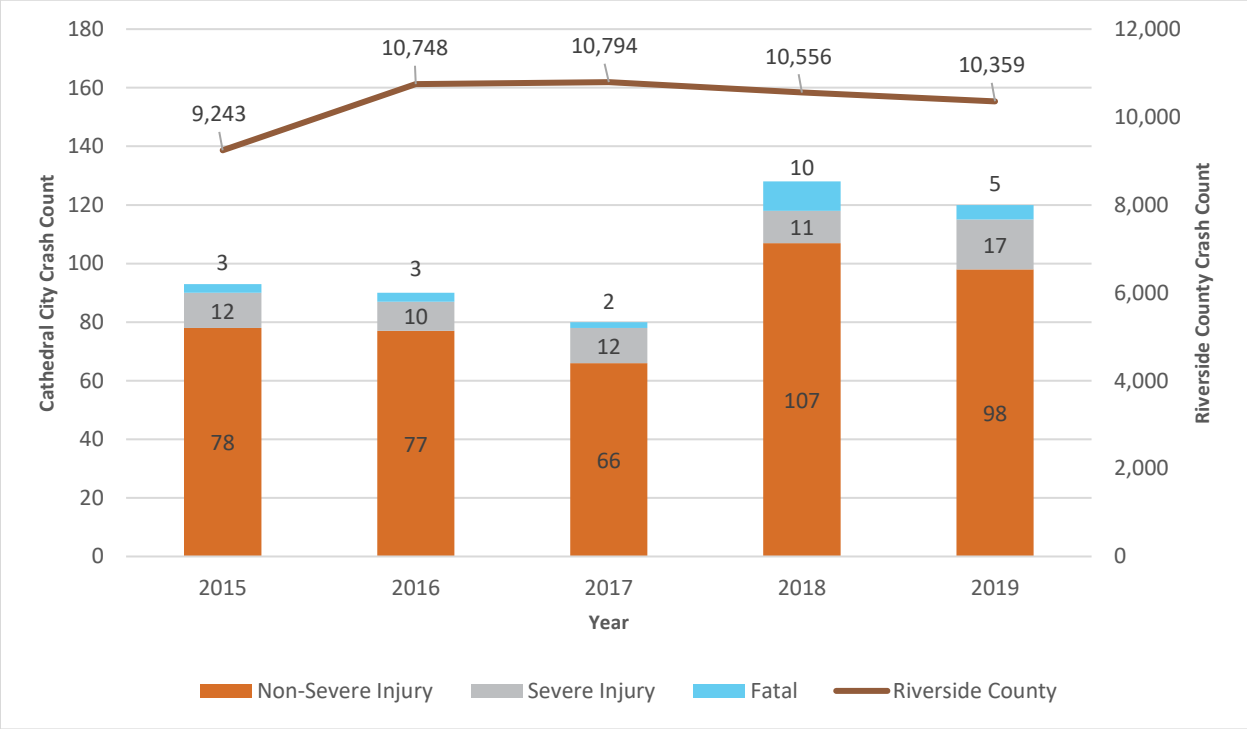
Crash data was obtained from the California Statewide Integrated Traffic Records System (SWITRS) database, the University of California, Berkeley, Transportation Injury Mapping System (TIMS) database, and the Cathedral City Police Department's local collision records. The most recent five (5) years of crash data were obtained from January 1, 2015 to December 31, 2019. Crashes were cross-referenced and geolocated to the local street network in a Geographic Information System (GIS) to create a comprehensive data set. There were 1,126 total collisions during the study period, which includes 507 fatal and injury collisions and 619 Property Damage Only (PDO) collisions. The PDO collisions were obtained from the SWITRS database but could not be geolocated due to a lack of coordinates. These crashes were not included in the citywide network and systemic screening analysis but will be included in the analysis of priority projects to maximize the benefit cost ratio (BCR). Data provided by the Cathedral City Police Department and from the TIMS database only included fatal and injury collisions. The crash data were analyzed to identify citywide crash patterns and trends based on the following characteristics:

- Annual Trends
- California Office of Transportation Safety (OTS) Citywide Traffic Rankings
- Location Type
- Severity
- Crash Type
- Primary Collision Factor
- Roadway User Involvement
- Nighttime Crashes
- Property Damage Crashes

2.2 Annual Trends

Figure 2-1 shows the total number of crashes per year in Cathedral City from 2015 to 2019 for fatal collisions, severe injury collisions, and non-severe injury collisions. The trendline shows the total number of crashes in Riverside County by year. The City's annual crash trends differ from the County's crash trends in the years 2016 through 2017 when the total crashes decreased in Cathedral City versus increased in Riverside County and in the years 2018 and 2019 when the total crashes, particularly in non-severe injury and fatal collisions, increased in Cathedral City versus decreased in Riverside County.

Figure 2-1 Annual Citywide Crash Incidence (2015-2019)



2.3 California Office of Traffic Safety (OTS) Traffic Rankings

The California Office of Traffic Safety (OTS) maintains a ranking system to compare traffic safety statistics among similarly sized California cities. Citywide rankings are based on population, daily vehicle miles traveled (DVMT), crash records, and crash trends from data collected by SWITRS, Caltrans, the California Department of Justice, and the Department of Finance. A ranking of one (1) in a category indicates the worst possible traffic safety performance in relation to other similarly-sized cities. A comparison of California OTS rankings allows cities to identify local trends relative to their peers.

Cathedral City is in "Group C" which consists of cities with populations between 50,001 and 100,000 people. *Table 2-1* summarizes how Cathedral City compares to other Group C peer cities from 2015 to 2017. Due to fluctuations in populations, the total number of cities in Group C will vary from year to year.

Table 2-1 Cathedral City OTS Crash Rankings (2015-2017)

2017 OTS CATEGORY	2015 OTS RANKING (1=POOR)	2016 OTS RANKING (1=POOR)	2017 OTS RANKING (1=POOR)
Total Fatal & Injury	98/105	99/104	102/106
Alcohol Involved	64/105	**65/104**	57/106
Had Been Drinking Driver < 21	70/105	90/104	**17/106**
Had Been Drinking Driver 21-34	52/105	95/104	84/106
Motorcycles	90/105	76/104	82/106
Pedestrians	80/105	90/104	82/106
Pedestrians < 15	**33/105**	**63/104**	**15/106**
Pedestrians 65+	72/105	96/104	76/106
Bicyclists	99/105	91/104	98/106
Bicyclists < 15	**34/105**	**41/104**	**36/106**
Composite	85/105	96/104	73/106
Speed Related	99/105	99/104	99/106
Nighttime (9:00 PM – 2:59 AM)	96/105	91/104	91/106
Hit and Run	93/105	83/104	68/106
DUI Arrests	**16/105**	66/104	55/106

Bold = Cathedral City's Top 3 Lowest Crash Ranking OTS Categories

Table 2-2 summarizes how Cathedral City compares to Palm Desert and Indio, other local Group C peer cities in Riverside County, based on the most recent available OTS rankings from 2017. Data tables for the OTS rankings are provided in *Appendix A*.

Table 2-2 CA OTS Local Crash Rankings (2017)

2017 OTS CATEGORY	CATHEDRAL CITY OTS RANKING (1=POOR)	PALM DESERT OTS RANKING (1=POOR)	INDIO OTS RANKING (1=POOR)
Total Fatal & Injury	102/106	88/106	57/106
Alcohol Involved	57/106	86/106	29/106
Had Been Drinking Driver < 21	**17/106**	20/106	55/106
Had Been Drinking Driver 21-34	84/106	89/106	59/106
Motorcycles	82/106	94/106	67/106
Pedestrians	82/106	104/106	68/106
Pedestrians < 15	**15/106**	89/106	52/106
Pedestrians 65+	76/106	59/106	13/106
Bicyclists	98/106	82/106	83/106
Bicyclists < 15	**36/106**	68/106	67/106
Composite	73/106	88/106	50/106
Speed Related	99/106	77/106	74/106
Nighttime (9:00 PM – 2:59 AM)	91/106	105/106	61/106
Hit and Run	68/106	94/106	30/106
DUI Arrests	55/106	78/106	51/106

Bold = Cathedral City's Top 3 Lowest Crash Ranking OTS Categories

Key OTS Crash Ranking findings include:

- Top 3 lowest 2015 OTS rankings for Cathedral City were: driving under the influence (DUI) arrests, collisions where a pedestrian under the age of 15 was involved, and collisions where a bicyclist under the age of 15 was involved.
- Top 3 lowest 2016 OTS rankings for Cathedral City were: collisions where a bicyclist under the age of 15 was involved, collisions where a pedestrian under the age of 15 was involved, and collisions where alcohol was involved.
- Top 3 lowest 2017 OTS rankings for Cathedral City were: collisions where a pedestrian under the age of 15 was involved, collisions where the driver had been drinking and was under the age of 21, and collisions where a bicyclist under the age of 15 was involved.
- OTS categories for collisions where a pedestrian under the age of 15 was involved and collisions where a bicyclist under the age of 15 was involved were in the top 3 lowest rankings for Cathedral City for the years 2015, 2016, and 2017.
- Cathedral City performed better than both the cities of Palm Desert and Indio in 2017 OTS rankings for: total fatal and injury collisions, collisions where a pedestrian over the age of 65 was involved, collisions involving bicyclists, and speed-related collisions.
- Cathedral City generally performed better than Indio in 2017 OTS rankings except for: collisions where the driver had been drinking and under 21, collisions where a pedestrian under the age of 15 was involved, and collisions where a bicyclist under the age of 15 was involved.

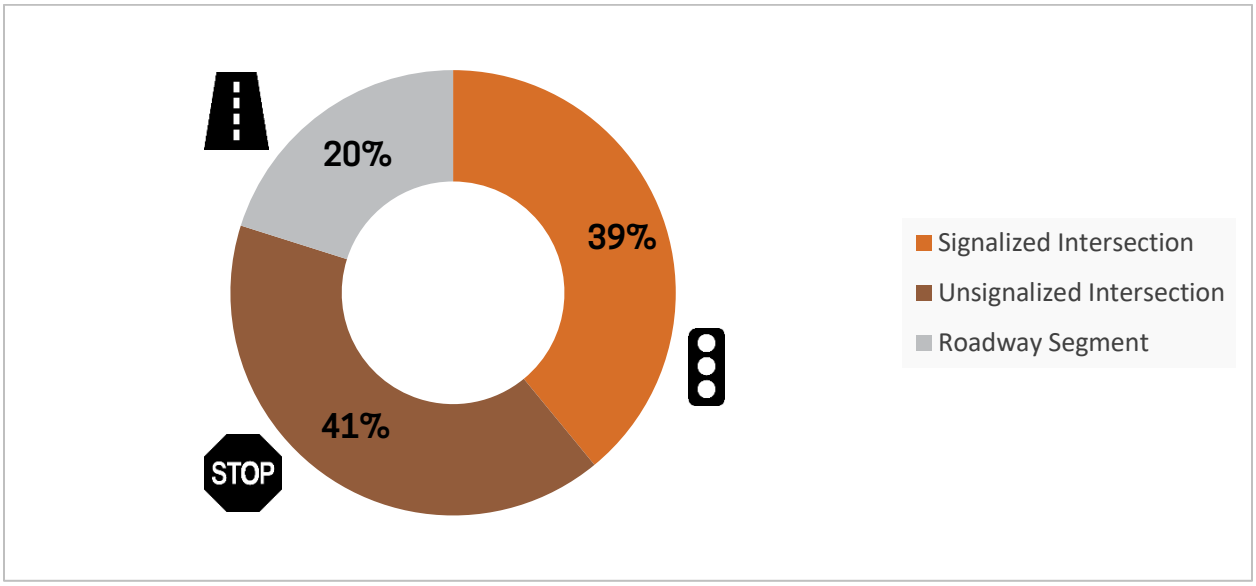
2.4 Location Type

Table 2-3 and Figure 2 summarize the proportion of citywide crashes by location type, which includes signalized intersections, unsignalized intersections, and roadway segments. Most crashes occurred at intersections (80%) which includes signalized intersections (39%) and unsignalized intersections (41%).

Table 2-3 Citywide Collisions by Location Type (2015-2019)

LOCATION TYPE	# OF COLLISIONS (%)
Signalized Intersection	198 (39%)
Unsignalized Intersection	207 (41%)
Roadway Segment	102 (20%)
Total Collisions	**507**

Figure 2-2 Citywide Collisions by Location Type



2.5 Severity

Table 2-4 and *Figure 2-3* summarize the proportion of citywide fatal and injury crashes by severity for fatal, severe injury, and non-severe injury collisions including other visible injury and complaint of pain. The majority of collisions resulted in non-severe injuries (83%), followed by severe injuries (12%), and fatalities (5%).

Table 2-4 Citywide Collisions by Location Type (2015-2019)

SEVERITY	# OF COLLISIONS (%)
Fatal	23 (5%)
Severe Injury	62 (12%)
Other Visible Injury	153 (30%)
Complaint of Pain	269 (53%)
Total Collisions	**507**

Figure 2-3 Citywide Collisions by Crash Severity (2015-2019)

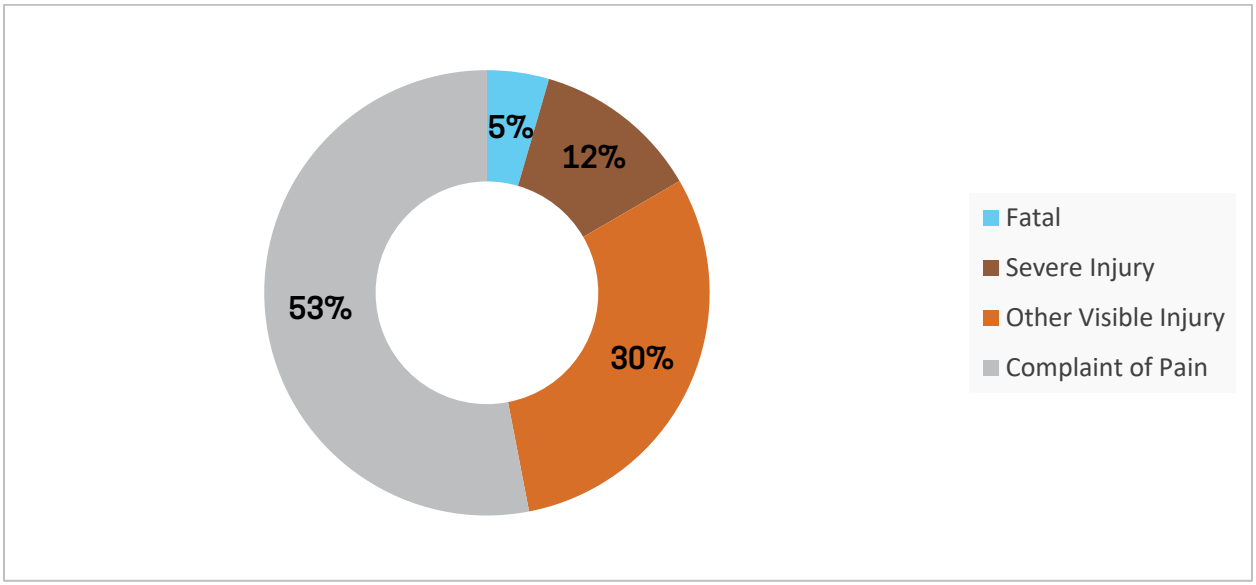


Table 2-5 summarizes the proportion of crash severity by location for signalized intersections, unsignalized intersections, and roadway segments. Intersection collisions resulted in the most fatal and severe injuries including signalized intersections (6% fatal and 10% severe injury of total collisions) and unsignalized intersections (4% fatal and 13% severe injury of total collisions). Roadway segment collisions included 3% fatal and 15% severe injury of total collisions.

While the number of fatal and severe injury collisions that occurred at each location type is a smaller percentage in comparison with the number of overall collisions, intersections were also over-represented in the number of total fatal and severe injury collisions. Signalized intersections represented 48% fatal and 32% severe injury of total fatal and severe injury collisions. Unsignalized intersections represented 39% fatal and 44% severe injury of total fatal and severe injury collisions. Roadway segments represented 13% fatal and 24% severe injury of total fatal and severe injury collisions.

Table 2-5 Citywide Crash Severity by Location Type (2015-2019)

SEVERITY	SIGNALIZED INTERSECTION	UNSIGNALIZED INTERSECTION	ROADWAY SEGMENT	# OF COLLISIONS (%)
Fatal	11 (6%/48%*)	9 (4%/39%*)	3 (3%/13%*)	23 (5%)
Severe Injury	20 (10%/32%*)	27 (13%/44%*)	15 (15%/24%*)	62 (12%)
Other Visible Injury	53 (27%)	69 (33%)	31 (30%)	153 (30%)
Complaint of Pain	114 (58%)	102 (49%)	53 (52%)	269 (53%)
Total Collisions	**198 (39%/36%*)**	**207 (41%/42%*)**	**102 (20%/21%*)**	**507**

Note: *Percentage of total fatal and severe injury collisions only by location

2.6 Crash Type

Table 2-6 and *Figure 2-4* summarize the proportion of all crashes by crash type, which include head-on, sideswipe, rear end, broadside, hit object, overturned, vehicle / pedestrian, other, and not stated collisions. The three most common crash types that occurred are broadside (31%), rear end (24%), and head-on (13%). These account for 68% of total crashes reported.

Table 2-6 Citywide Collisions by Crash Type (2015-2019)

CRASH TYPE	# OF COLLISIONS (%)
Head-On	65 (13%)
Sideswipe	48 (9%)
Rear End	120 (24%)
Broadside	158 (31%)
Hit Object	33 (7%)
Overturned	12 (2%)
Vehicle / Pedestrian	49 (10%)
Other / Not Stated	22 (4%)
Total Collisions	**507**

Figure 2-4 Citywide Collisions by Crash Type (2015-2019)

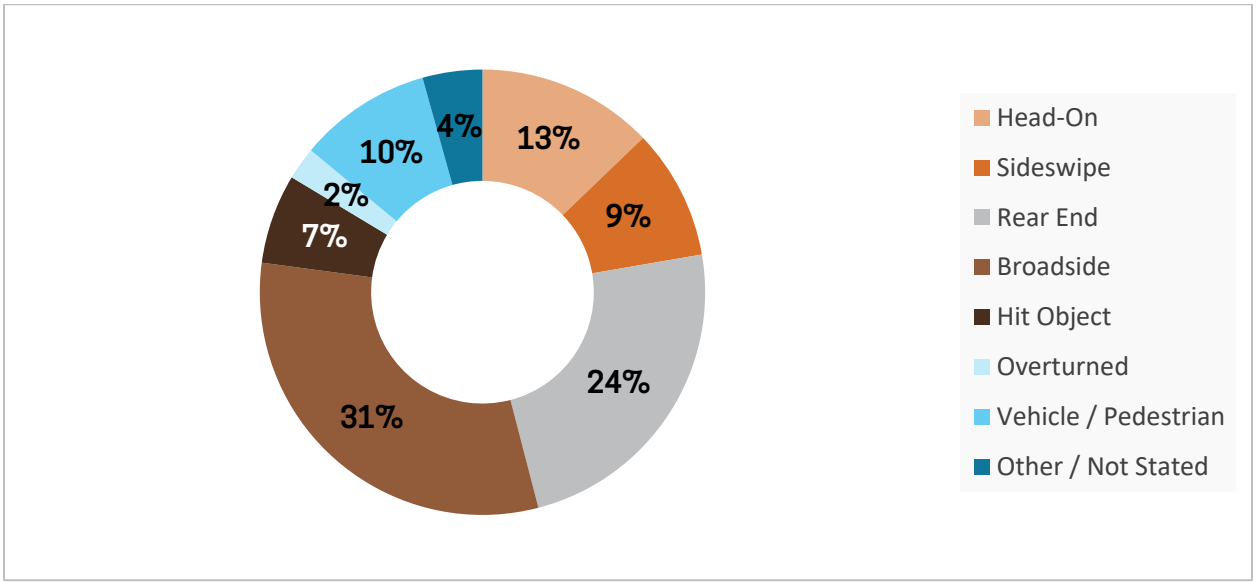


Table 2-7 summarizes the proportion of all crash types by severity. The crash types that resulted in the most fatal and severe injuries include broadside (26% fatal and 26% severe injury), rear end (17% fatal and 18% severe injury), head-on (17% fatal and 15% severe injury), and vehicle/pedestrian collisions (13% fatal and 15% severe injury).

Table 2-7 Citywide Crash Type by Severity (2015-2019)

CRASH TYPE	FATAL	SEVERE INJURY	OTHER VISIBLE INJURY	COMPLAINT OF PAIN	# OF COLLISIONS (%)
Head-On	4 (17%)	9 (15%)	22 (14%)	30 (11%)	65 (13%)
Sideswipe	-	4 (6%)	19 (12%)	25 (9%)	48 (9%)
Rear End	4 (17%)	11 (18%)	30 (20%)	75 (28%)	120 (24%)
Broadside	6 (26%)	16 (26%)	47 (31%)	89 (33%)	158 (31%)
Hit Object	5 (22%)	4 (6%)	8 (5%)	16 (6%)	33 (7%)
Overturned	1 (4%)	7 (11%)	2 (1%)	2 (1%)	12 (2%)
Vehicle / Pedestrian	3 (13%)	9 (15%)	20 (13%)	17 (6%)	49 (10%)
Other / Not Stated	-	2 (3%)	5 (3%)	15 (6%)	22 (4%)
Total Collisions	**23 (5%)**	**62 (12%)**	**153 (30%)**	**269 (53%)**	**507**

Table 2-8 summarizes the proportion of all crash types by location for signalized intersections, unsignalized intersections, and roadway segments. The majority of crashes occurred at intersections, accounting for 80% of total crashes including 39% at signalized intersections and 41% at unsignalized intersections. The most common crash types at signalized intersections were rear end (31%), broadside (30%), and head-on (13%). The most common crash types at unsignalized intersections were broadside (34%), rear end (16%), and sideswipe (12%). The most common crash types at roadway segments were broadside (27%), rear end (25%), and head-on (18%). The most common crash types observed across all three location types were typically consistent with the most common crash types overall: broadside (31%), rear end (24%), and head-on (13%).

Table 2-8 Citywide Crash Type by Location (2015-2019)

CRASH TYPE	SIGNALIZED INTERSECTION	NON-SIGNALIZED INTERSECTION	ROADWAY SEGMENT	# OF COLLISIONS (%)
Head-On	25 (13%)	22 (11%)	18 (18%)	65 (13%)
Sideswipe	15 (8%)	24 (12%)	9 (9%)	48 (9%)
Rear End	62 (31%)	33 (16%)	25 (25%)	120 (24%)
Broadside	59 (30%)	71 (34%)	28 (27%)	158 (31%)
Hit Object	5 (3%)	13 (6%)	15 (15%)	33 (7%)
Overturned	1 (1%)	9 (4%)	2 (2%)	12 (2%)
Vehicle / Pedestrian	20 (10%)	26 (13%)	3 (3%)	49 (10%)
Other / Not Stated	11 (6%)	9 (4%)	2 (2%)	22 (4%)
Total Collisions	**198 (39%)**	**207 (41%)**	**102 (20%)**	**507**

2.7 Primary Collision Factor

Table 2-9 and *Figure 2-5* summarize the Primary Collision Factor (PCF) of crashes by the California vehicle code violation categories. PCF violation categories that represented less than 3% of citywide collisions were graphically combined into a single category on Figure 5. The top primary collision factors were unsafe speed (21%), automobile right-of-way (19%), improper turning (14%), and driving or bicycling under the influence of alcohol or drugs (14%). These account for 68% of total crashes reported.

Table 2-9 Citywide Collisions by Primary Collision Factor (2015-2019)

PRIMARY COLLISION FACTOR VIOLATION CATEGORY	# OF COLLISIONS (%)
Driving or Bicycling Under the Influence of Alcohol or Drugs	70 (14%)
Unsafe Speed	107 (21%)
Following Too Closely*	8 (2%)
Wrong Side of Road	13 (3%)
Improper Passing*	1 (<1%)
Unsafe Lane Change*	2 (<1%)
Improper Turning	69 (14%)
Automobile ROW	95 (19%)
Pedestrian ROW*	9 (2%)
Pedestrian Violation	26 (5%)
Traffic Signals and Signs	53 (10%)
Lights*	1 (<1%)
Other	14 (3%)
Unsafe Starting or Backing*	4 (1%)
Unknown / Not Stated	35 (7%)
Total Collisions	**507**

Note: *PCF Category representing less than 3% of total crashes

Figure 2-5 Citywide Collisions by Primary Collision Factor (2015-2019)

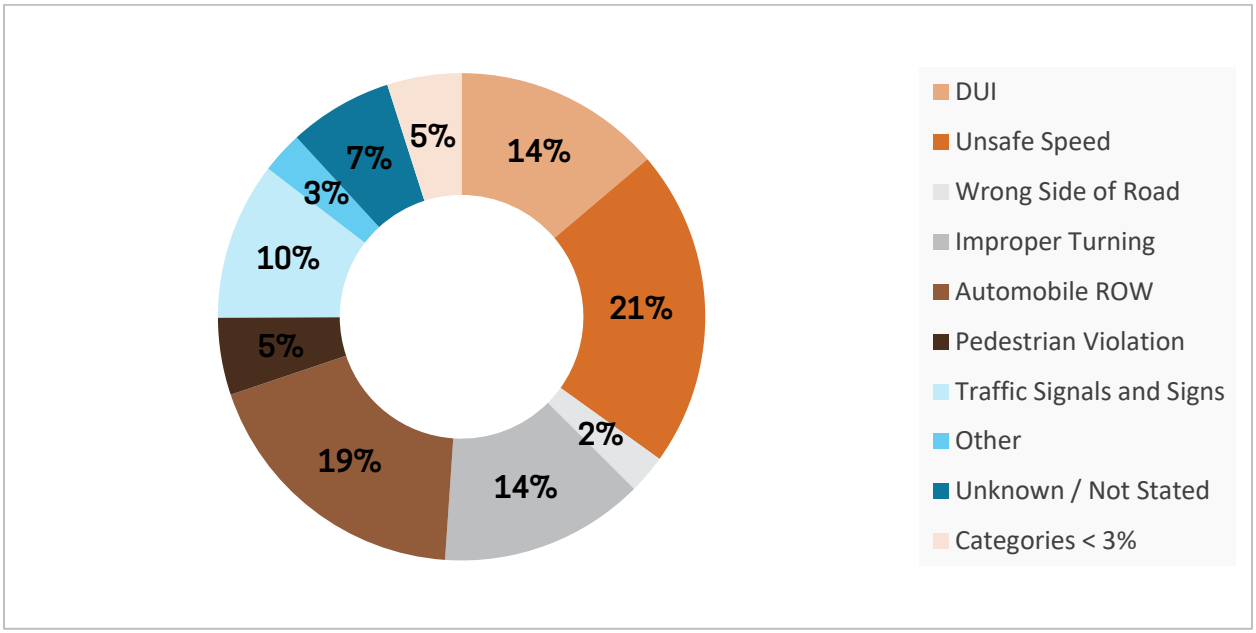


Table 2-10 summarizes the proportion of primary collision factor by severity. The primary collision factors that resulted in the most fatal and severe injuries include driving or bicycling under the influence of alcohol or drugs (26% fatal and 26% severe injury), unsafe speed (17% fatal and 18% severe injury), automobile right-of-way (13% fatal and 13% severe injury), and improper turning (9% fatal and 13% severe injury). Combined, these primary collision factors account for 68% of total crashes reported.

Table 2-11 summarizes the proportion of primary collision factor violation categories by location for signalized intersections, unsignalized intersections, and roadway segments. The top three primary collision factor violation categories at signalized intersections were unsafe speed (31%), traffic signals and signs (20%), and driving or bicycling under the influence of alcohol or drugs (12%). The top three at unsignalized intersections were automobile right-of-way (28%), improper turning (16%), unsafe speed (13%), driving or bicycling under the influence of alcohol or drugs (13%). The top three at roadway segments were driving or bicycling under the influence of alcohol or drugs (21%), unsafe speed (19%), and automobile right-of-way (18%). The most common primary collision factor violation categories observed across all three location types were consistent with the most common crash types overall: unsafe speed (21%), automobile right-of-way (19%), driving or bicycling under the influence of alcohol or drugs (14%), and improper turning (14%). Combined, these primary collision factors account for 68% of total reported crashes.

Table 2-10 Primary Collision Factor Violation Category by Severity (2015-2019)

PRIMARY COLLISION FACTOR VIOLATION CATEGORY	FATAL	SEVERE INJURY	OTHER VISIBLE INJURY	COMPLAINT OF PAIN	# OF COLLISIONS (%)
Driving or Bicycling Under the Influence of Alcohol or Drugs	6 (26%)	16 (26%)	21 (14%)	27 (10%)	70 (14%)
Unsafe Speed	4 (17%)	11 (18%)	24 (15%)	68 (25%)	107 (21%)
Following Too Closely*	-	1 (2%)	-	7 (3%)	8 (2%)
Wrong Side of Road	2 (9%)	4 (6%)	2 (1%)	5 (2%)	13 (3%)
Improper Passing*	-	-	-	1 (<1%)	1 (<1%)
Unsafe Lane Change*	-	-	-	2 (<1%)	2 (<1%)
Improper Turning	2 (9%)	8 (13%)	28 (18%)	31 (12%)	69 (14%)
Automobile ROW	3 (13%)	8 (13%)	31 (20%)	53 (20%)	95 (19%)
Pedestrian ROW*		3 (5%)	4 (3%)	2 (1%)	9 (2%)
Pedestrian Violation	5 (22%)	3 (5%)	11 (7%)	7 (3%)	26 (5%)
Traffic Signals and Signs	-	2 (3%)	15 (10%)	36 (13%)	53 (10%)
Lights*	-	-	-	1 (<1%)	1 (<1%)
Other	-	1 (2%)	1 (1%)	12 (4%)	14 (3%)
Unsafe Starting or Backing*	-	-	1 (1%)	3 (1%)	4 (1%)
Unknown / Not Stated	1 (4%)	5 (8%)	15 (10%)	14 (5%)	35 (7%)
Total Collisions	**23 (5%)**	**62 (12%)**	**153 (30%)**	**269 (53%)**	**507**

Table 2-11 Primary Collision Factor Violation Category by Location (2015-2019)

PRIMARY COLLISION FACTOR VIOLATION CATEGORY	SIGNALIZED INTERSECTION	UNSIGNALIZED INTERSECTION	ROADWAY SEGMENT	# OF COLLISIONS (%)
Driving or Bicycling Under the Influence of Alcohol or Drugs	23 (12%)	26 (13%)	21 (21%)	70 (14%)
Unsafe Speed	61 (31%)	27 (13%)	19 (19%)	107 (21%)
Following Too Closely*	1 (<1%)	4 (2%)	3 (3%)	8 (2%)
Wrong Side of Road	1 (<1%)	6 (3%)	6 (6%)	13 (3%)
Improper Passing*	-	-	1 (1%)	1 (<1%)
Unsafe Lane Change*	-	-	2 (1%)	2 (<1%)
Improper Turning	21 (11%)	34 (16%)	14 (14%)	69 (14%)
Automobile ROW	19 (10%)	58 (28%)	18 (18%)	95 (19%)
Pedestrian ROW*	4 (2%)	5 (2%)	-	9 (2%)
Pedestrian Violation	11 (6%)	12 (6%)	3 (3%)	26 (5%)
Traffic Signals and Signs	40 (20%)	11 (5%)	2 (2%)	53 (10%)
Lights*	-	-	1 (1%)	1 (<1%)
Other	2 (1%)	7 (3%)	5 (5%)	14 (3%)
Unsafe Starting or Backing*	2 (1%)	1 (<1%)	1 (1%)	4 (1%)
Unknown / Not Stated	13 (7%)	16 (8%)	6 (6%)	35 (7%)
Total Collisions	**198 (39%)**	**207 (41%)**	**102 (20%)**	**507**

2.8 Roadway User Involvement

Table 2-12 and *Figure 2-6* summarize the proportion of citywide crashes by roadway user type involved which includes automobiles, motorcycles, bicycles, and pedestrians. The majority of collisions involved motorized roadway users including automobiles (75%) and motorcycles (7%). Non-motorized roadway users were involved in 18% of collisions including bicycles (6%) and pedestrians (12%)

Table 2-12 Citywide Collisions by Roadway User Involvement (2015-2019)

ROADWAY USER	# OF COLLISIONS (%)
Automobiles	**382 (75%)**
Motorcycles	36 (7%)
Bicycles	**29 (6%)**
Pedestrians	60 (12%)
Total Collisions	**507**

Figure 2-6 Citywide Collisions by Roadway User Involvement (2015-2019)

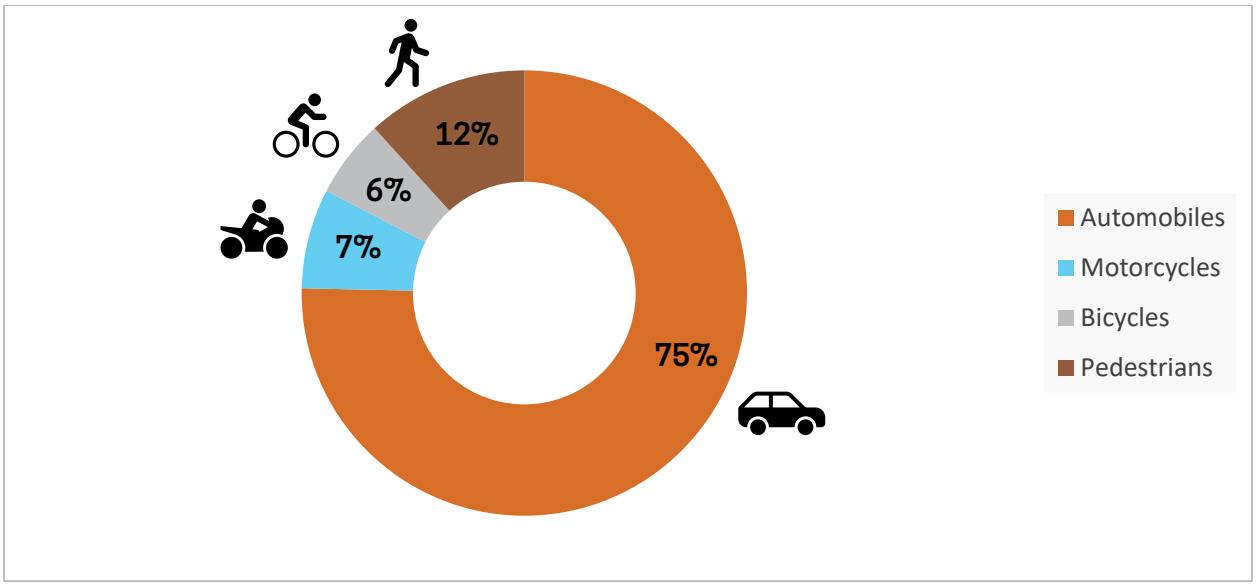


Table 2-13 and *Figure 2-7* summarize the proportion of roadway user type by severity. Of the total collisions, 75% involved automobiles only and the majority resulted in non-severe injuries including other visible injuries and complaint of pain injuries. Automobile collisions represented 48% of total fatal and 61% of total severe injury collisions. Approximately 13% of all automobile collisions resulted in a fatality or severe injury. The majority of collisions involving motorcycles resulted in severe injuries and other visible injuries. Motorcycle collisions represented 9% of total fatal and 19% of total severe injury collisions. Approximately 38% of all motorcycle collisions resulted in a fatality or severe injury. The majority of collisions involving bicycles resulted in other visible injuries and complaint of pain injuries. Bicycle collisions represented 13% of total fatal and 2% of total severe injury crashes. Approximately 14% of all bicycle collisions resulted in a fatality

or severe injury. The majority of pedestrian collisions resulted in other visible injuries and complaint of pain injuries. Pedestrian collisions represented 30% of total fatal and 18% of total severe injury collisions. Approximately 30% of all pedestrian collisions resulted in a fatality or severe injury.

Table 2-13 Roadway User Involvement by Severity (2015-2019)

ROADWAY USER	FATAL	SEVERE INJURY	OTHER VISIBLE INJURY	COMPLAINT OF PAIN	# OF COLLISIONS (%)
Automobiles	11 (48%)	38 (61%)	98 (64%)	235 (87%)	382 (75%)
Motorcycles	2 (9%)	12 (19%)	16 (10%)	6 (2%)	36 (7%)
Bicycles	3 (13%)	1 (2%)	15 (10%)	10 (4%)	29 (6%)
Pedestrians	7 (30%)	11 (18%)	24 (16%)	18 (7%)	60 (12%)
Total Collisions	**23 (5%)**	**62 (12%)**	**153 (30%)**	**269 (53%)**	**507**

Figure 2-7 Roadway User Involvement by Severity (2015-2019)

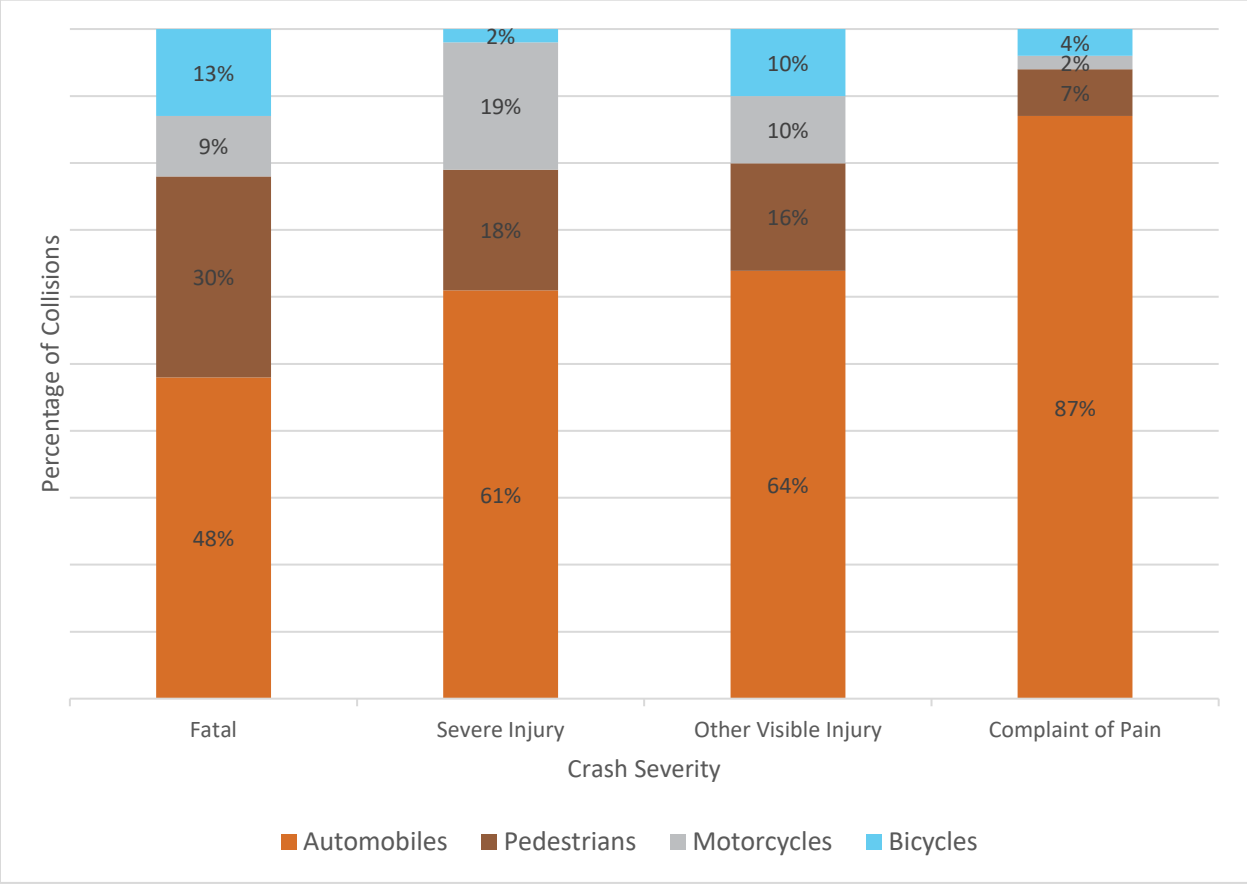
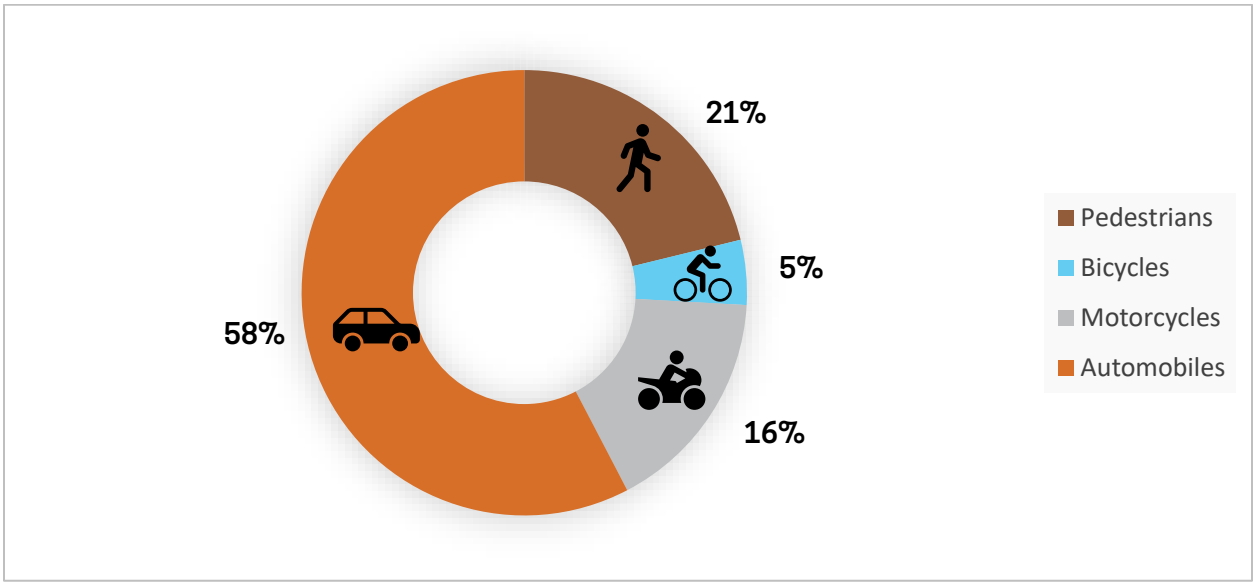


Figure 2-8 summarizes the proportion of roadway user types for fatal and severe injury collisions. Although motorcycles and pedestrians make up a small percentage of total crashes (7% and 12%, respectively), they are over-represented in the number of fatal and severe injury collisions (16% and 21%, respectively), which indicates that they are vulnerable roadway users. Bicycles were

involved in 5% of total fatal and severe injury collisions, which was representative of the 6% of total collisions that bicycles were involved in. Fatal and severe injury crashes involving pedestrians are higher than the percentages of motorcycle and bicycle crashes. This may be attributed to motorcycles and bicycles being more visible to vehicles than pedestrians are due to their higher profile on local roadways.

Figure 2-8 Fatal and Severe Injury Collisions by Roadway User Involvement (2015-2019)



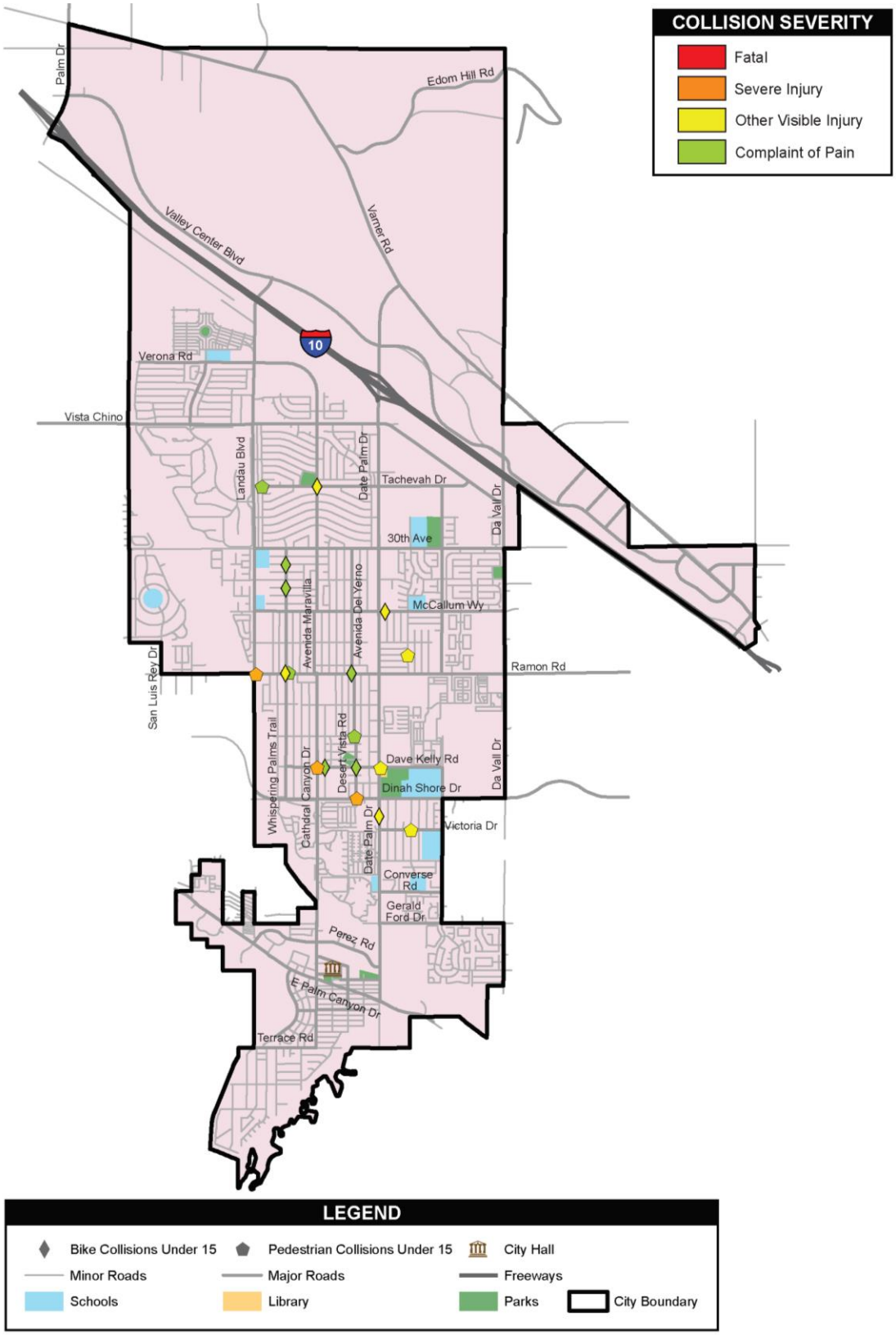
Crashes Involving Pedestrians and Bicycles Under 15

Table 2-14 summarizes the proportion of citywide crashes that involved a pedestrian or a bicyclist under the age of 15 by severity and location. There were 19 total crashes that occurred during the study period including 10 pedestrian collisions and 9 bicycle collisions. There were no fatalities and the 3 severe injury collisions involved pedestrians. The remaining injury collisions included 8 other visible injury (4 pedestrian and 4 bicycle) and 8 complaint of pain (3 pedestrian and 5 bicycle). All the collisions occurred at intersections including 7 at signalized intersections and 12 at unsignalized intersections. *Figure 2-9* displays where collisions involving pedestrians or bicyclists under the age of 15 occurred in relation to community centers, public schools and parks.

Table 2-14 Crash Severity and Roadway User Involvement by Location (2015-2019)

SEVERITY	SIGNALIZED INTERSECTION		UNSIGNALIZED INTERSECTION		# OF COLLISIONS (%)
	PEDESTRIAN	BICYCLE	PEDESTRIAN	BICYCLE	
Fatal	-	-	-	-	-
Severe Injury	1 (33%)	-	2 (29%)	-	3 (16%)
Other Visible Injury	1 (33%)	3 (75%)	3 (43%)	1 (20%)	8 (42%)
Complaint of Pain	1 (33%)	1 (25%)	2 (29%)	4 (80%)	8 (42%)
Total Collisions	**3 (16%)**	**4 (21%)**	**7 (37%)**	**5 (26%)**	**19**

Figure 2-9 Citywide Collisions Involving Pedestrians and Bicyclists Under 15 (2015-2019)



2.9 Nighttime Crashes

Crashes were evaluated from 6:00 PM to 6:00 AM to identify nighttime crash patterns. There were 259 collisions that occurred during the study period and *Figure 2-10* shows a summary of total crashes and severity by time of day. Nighttime crash frequency for all severity types was generally higher from 6:00 PM to 10:00 PM. The most severe crashes (fatal and severe injury) generally occurred from 6:00 PM to 3:00 AM. The highest number of nighttime crashes occurred from 6:00 PM to 7:00 PM. The highest number of fatal and severe injury crashes occurred from 2:00 AM to 3:00 AM. *Figure 2-11* illustrates where the nighttime crashes occurred by severity and roadway user type. *Table 2-15* summarizes nighttime crashes by roadway user and location.

Figure 2-10 Crash Severity by Time Period (2015-2019)

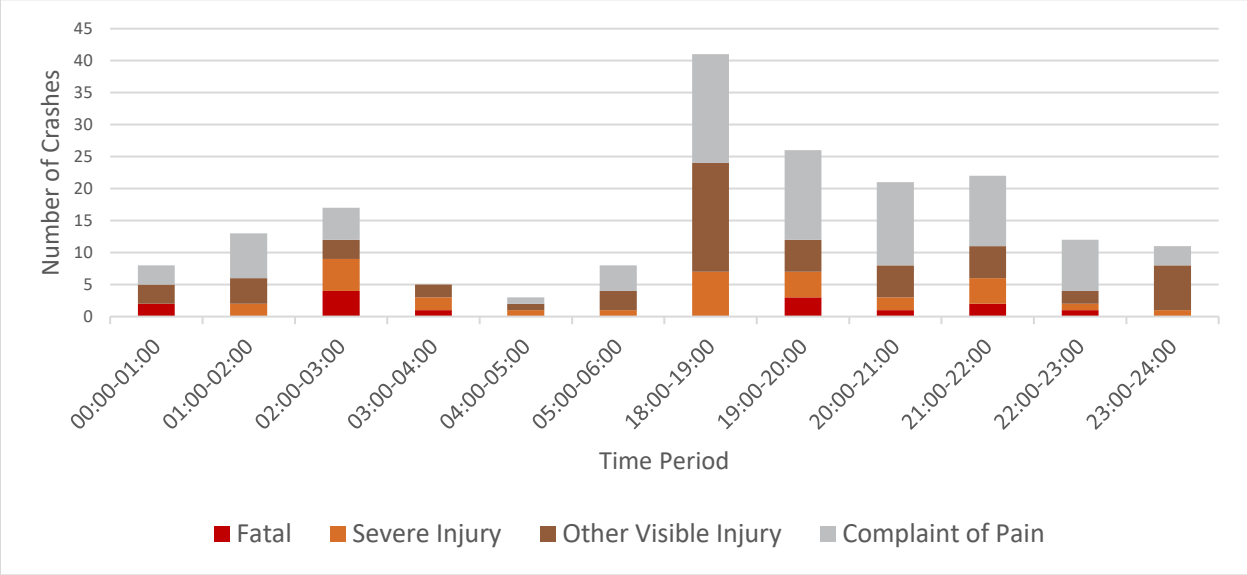
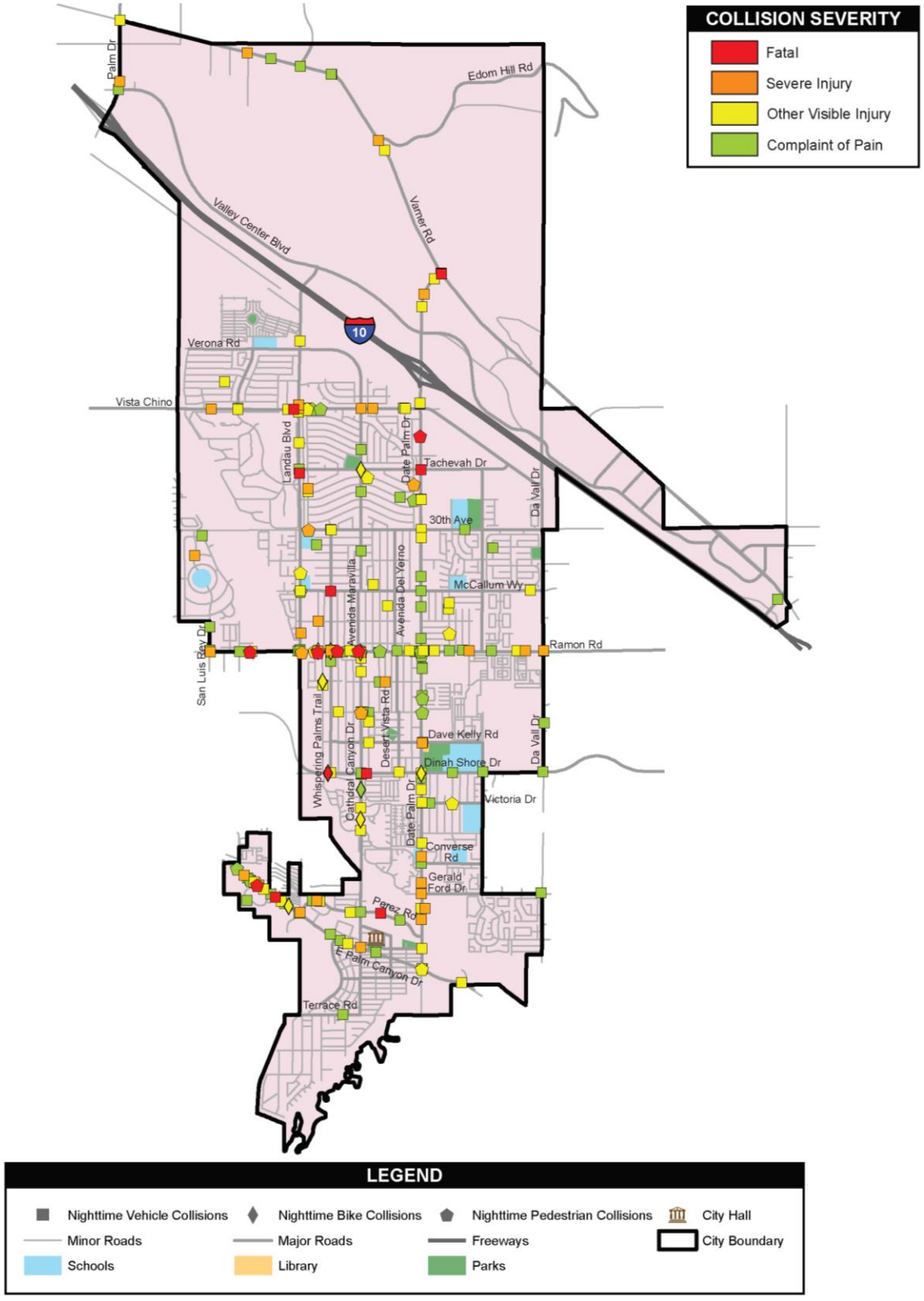


Table 2-15 Citywide Nighttime Collision Severity by Location (2015-2019)

SEVERITY	SIGNALIZED INTERSECTION	UNSIGNALIZED INTERSECTION	ROADWAY SEGMENT	# OF COLLISIONS (%)
Fatal	5 (5%)	8 (8%)	2 (4%)	15 (6%)
Severe Injury	11 (10%)	13 (13%)	12 (21%)	36 (14%)
Other Visible Injury	27 (26%)	36 (37%)	20 (35%)	83 (32%)
Complaint of Pain	62 (59%)	40 (41%)	23 (40%)	125 (48%)
Total Collisions	**105 (41%)**	**97 (37%)**	**57 (22%)**	**259**

Figure 2-11 Citywide Nighttime Crashes (2015-2019)



2.10 Property Damage Collisions

There were 619 property damage collisions reported in the 5-year study period from the SWITRS database. The crashes were not included in the citywide network and screening analysis due to the inability to geolocate them from a lack of coordinate data. Analysis of the property damage collisions is presented for roadway user involvement, crash type, and primary collision factor.

Roadway User

Table 2-16 summarizes the proportion of property damage crashes by roadway user involvement. Nearly all of the property damage collisions only involved automobiles (99%). This is consistent with the collision analysis results for fatal and injury crashes which indicated that motorcycles, bicycles, and pedestrians are more vulnerable roadway users.

Table 2-16 Property Damage Collisions by Roadway User (2015-2019)

ROADWAY USER	# OF COLLISIONS (%)
Automobiles	612 (99%)
Motorcycles	1 (<1%)
Bicycles	3 (<1%)
Pedestrians	3 (<1%)
Total Collisions	**619**

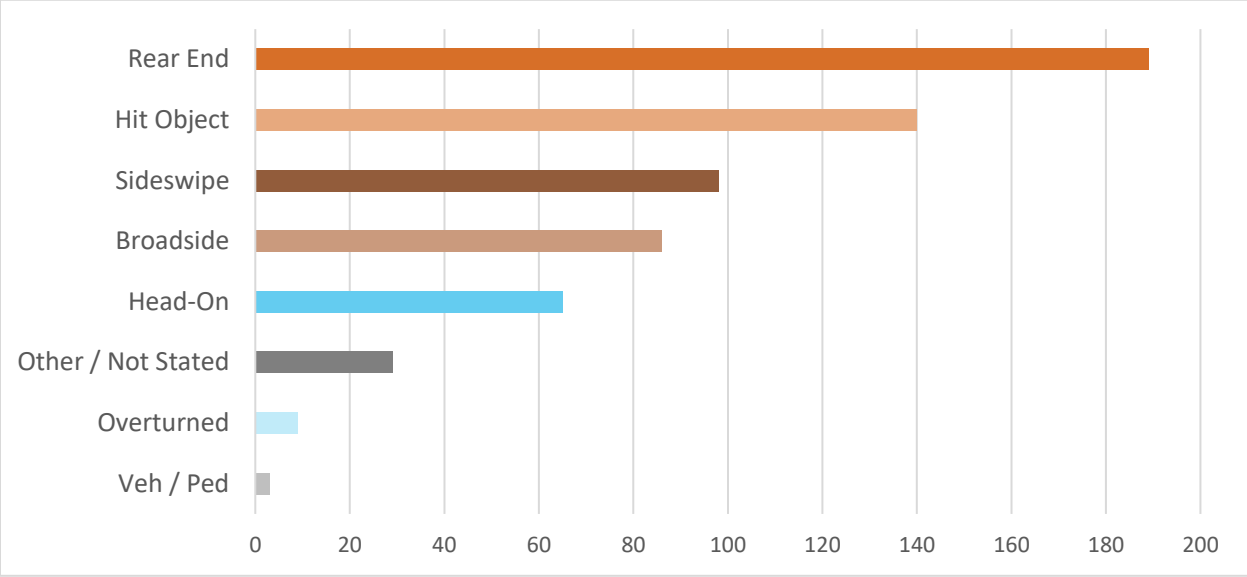
Crash Type

Table 2-17 and *Figure 2-12* summarizes the proportion of property damage collisions by crash type. The three most common crash types that were rear end (31%), hit object (23%), and sideswipe (16%). Rear end collisions were also in the top three crash types for fatal and injury collisions, which also included broadside and head-on.

Table 2-17 Property Damage Collisions by Crash Type (2015-2019)

CRASH TYPE	# OF COLLISIONS (%)
Head-On	65 (11%)
Sideswipe	98 (16%)
Rear End	189 (31%)
Broadside	86 (14%)
Hit Object	140 (23%)
Overturned	9 (1%)
Vehicle / Pedestrian	3 (<1%)
Other / Not Stated	29 (5%)
Total Collisions	**619**

Figure 2-12 Property Damage Collisions by Crash Type (2015-2019)



Primary Collision Factor

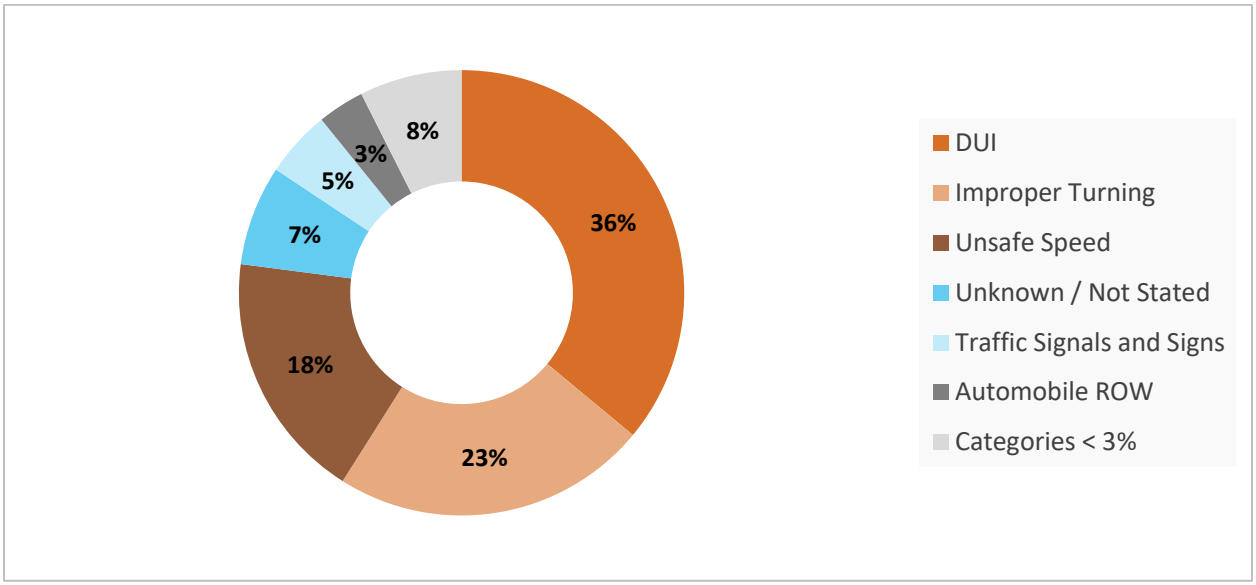
Table 2-18 and *Figure 2-13* summarizes the proportion of property damage crashes by primary collision factor. The top three were driving or bicycling under the influence of alcohol or drugs (36%), improper turning (23%), and unsafe speed (18%). These were consistent with the top primary collision factors identified in the analysis of fatal and injury collisions.

Table 2-18 Property Damage Collisions by Primary Collision Factor (2015-2019)

PRIMARY COLLISION FACTOR VIOLATION CATEGORY	# OF COLLISIONS (%)
Driving or Bicycling Under the Influence of Alcohol or Drugs	223 (36%)
Unsafe Speed	112 (18%)
Following Too Closely*	2 (<1%)
Wrong Side of Road	8 (1%)
Improper Passing*	1 (<1%)
Unsafe Lane Change*	7 (1%)
Improper Turning	142 (23%)
Automobile ROW	21 (3%)
Pedestrian ROW*	2 (<1%)
Pedestrian Violation	1 (<1%)
Traffic Signals and Signs	30 (5%)
Other	9 (1%)
Unsafe Starting or Backing*	16 (3%)
Unknown / Not Stated	45 (7%)
Total Collisions	**619**

Note: *PCF Category representing less than 3% of total crashes

Figure 2-13 Property Damage Collisions by Primary Collision Factor (2015-2019)



2.11 Equivalent Property Damage Only (EPDO) Scoring

Equivalent Property Damage Only (EPDO) scoring per the Highway Safety Manual (HSM) was utilized to analyze crash data and evaluate roadway network performance. Crashes were assigned weighting factors relative to property damage only collisions based on crash costs from the Highway Safety Improvement Program (HSIP) Local Roadway Safety Manual (LRSM) for California Local Road Owners v1.5. The weighting factor generally reflects an order of magnitude difference between the societal costs of fatal and severe injury collisions versus non-severe injury collisions. EPDO score is calculated by multiplying each crash severity total by its associated weight and summing the results, using the following formula:

EPDO Score = (Fatal Weight x Number of Fatal Crashes) + (Severe Injury Weight x Number of Severe Injury Crashes) + (Other Visible Injury Weight x Number of Other Visible Injury Crashes) + (Complaint of Pain Injury Weight x Number of Complaint of Pain Injury Crashes) + Property Damage Only Crashes

EPDO scoring was conducted for signalized intersections, non-signalized intersections, and roadway segments. EPDO scores were organized by quintile and displayed graphically by heat maps. The top quintiles identified priority locations with the highest EPDO scores and corresponds with the highest crash frequency and severity. *Appendix B* provides collision summaries for the priority locations. *Table 2-19* summarizes the crash cost and EPDO score associated with an individual collision by location type and severity. *Figure 2-14* shows the citywide EPDO scoring by quintile for signalized intersections, non-signalized intersections, and roadway segments.

Figure 2-14 Citywide EPDO Scoring

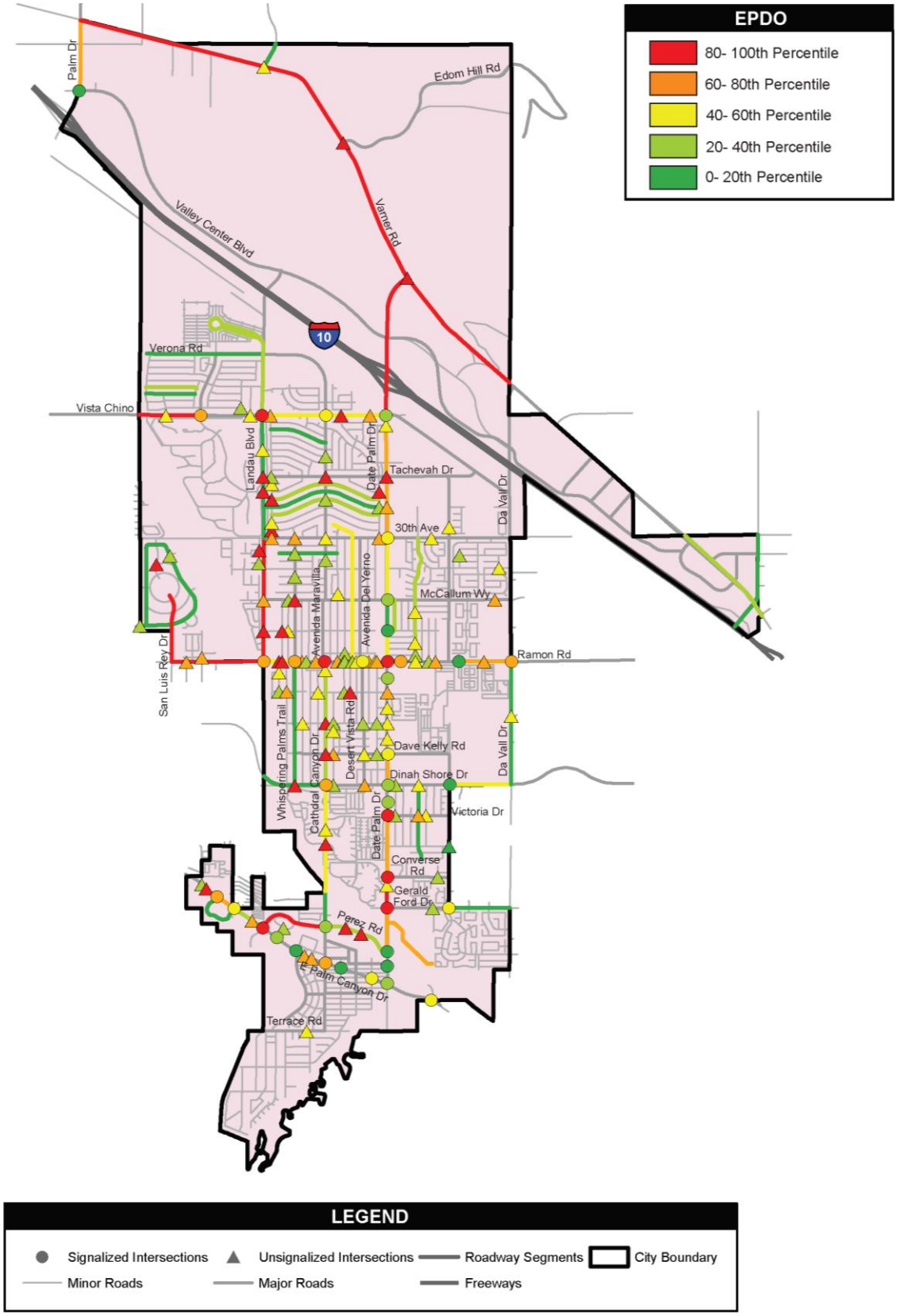


Table 2-19 Crash Weights by Severity and Location Type

LOCATION TYPE	CRASH WEIGHTS BY SEVERITY							
	FATAL AND SEVERE INJURY		OTHER VISIBLE INJURY		COMPLAINT OF PAIN INJURY		PROPERTY DAMAGE ONLY	
	EPDO SCORE	CRASH COST	EPDO SCORE	CRASH COST	EPDO SCORE	CRASH COST	EPDO SCORE	CRASH COST
Signalized Intersection	123.7	$1.46m	10.7	$126,500	6.1	$71,900	1	$11,800
Unsignalized Intersection	195.8	$2.31m						
Roadway	169.5	$1.46m						

Signalized Intersections

Figure 2-15 shows the citywide EPDO scoring by quintile for signalized intersections. The quintiles and corresponding EPDO score ranges are as follows:

- 80 – 100th Percentile: 206.6 to 649.4
- 60 – 80th Percentile: 141.0 to 206.5
- 40 – 60th Percentile: 45.9 to 140.9
- 20 – 40th Percentile: 12.3 to 45.8
- 0 – 20th Percentile: 0.0 to 12.2

The top two quintile signalized intersection locations based on EPDO scores are shown on *Table 2-20* and graphically on *Figure 2-16*. Based on roadway classifications in the Cathedral City General Plan Circulation Element, most of the top quintile signalized intersections locations are along arterial and major highway corridors with fewer intersections on lower-order roadways.

Table 2-20 Top Two Quintile Signalized Intersections by EPDO Score (2015-2019)

RANK	LOCATION	TOTAL COLLISIONS	EPDO
1	Vista Chino & Landau Blvd	12	649.4
2	Date Palm Dr & Gerald Ford Dr	4	369.2
3	Date Palm Dr & Victoria Dr	10	301.6
4	Ramon Rd & Cathedral Canyon Dr / Avenida Maravilla	10	297
5	Date Palm Dr & Converse Rd	6	268
6	East Palm Canyon Dr & Perez Rd	6	263.4
7	Ramon Rd & Date Palm Dr	14	208
8	East Palm Canyon Dr & Canyon Plaza	13	206.5
9	East Palm Canyon Dr & Cathedral Canyon Dr	9	191.3
10	Ramon Rd & Whispering Palms Trail	8	176
11	Vista Chino & Avenida Quintana	8	176
12	East Ramon Rd & Landau Blvd	6	159.2
13	East Ramon Rd & Cathedral Village East	5	157.7
14	East Ramon Rd & Da Vall Dr	5	153.1
15	Dinah Shore Dr & Cathedral Canyon Dr	5	143.9

Figure 2-15 Signalized Intersections EPDO Scoring

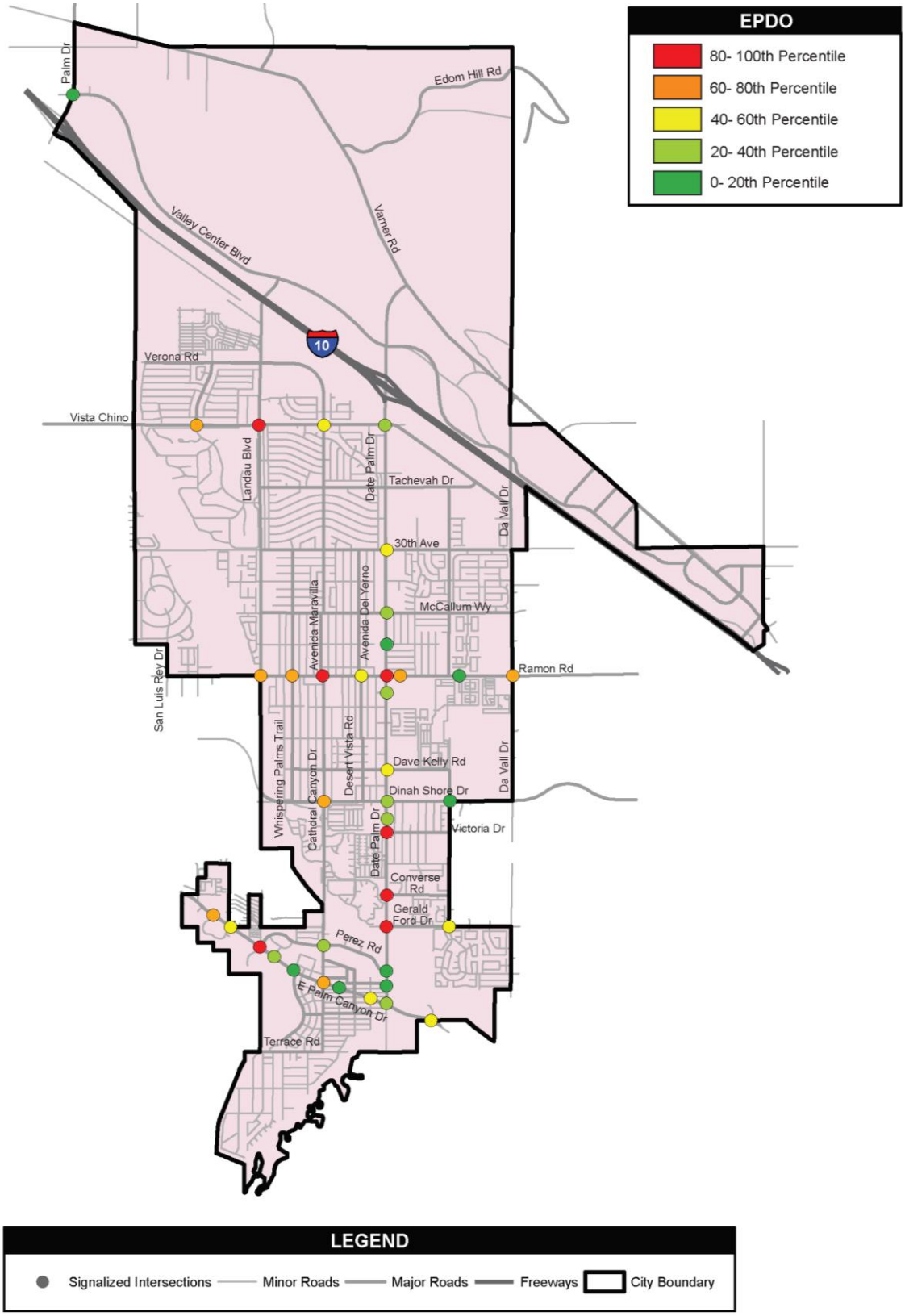
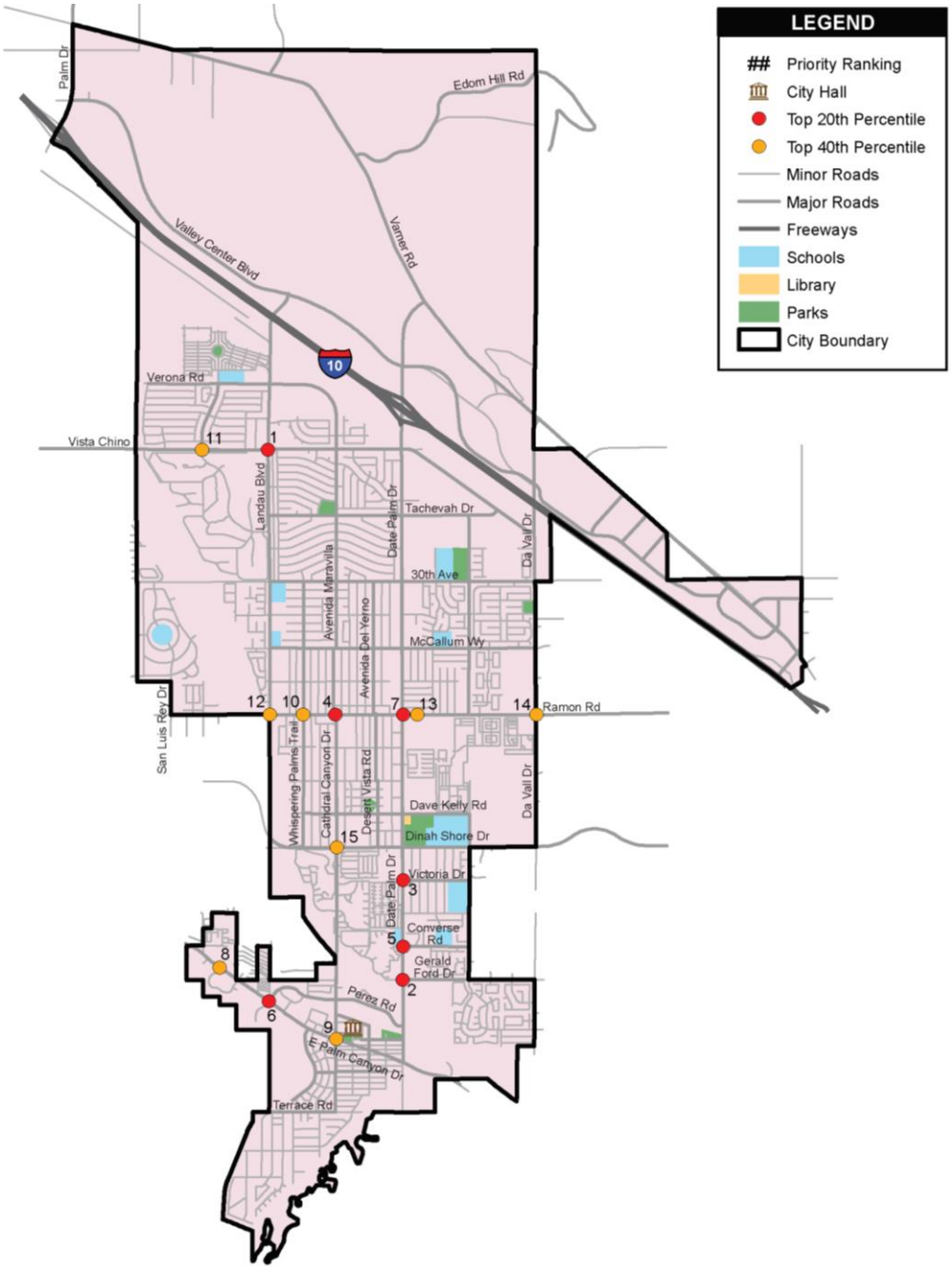


Figure 2-16 Priority Signalized Intersections



RANK	LOCATION	RANK	LOCATION
1	Vista Chino & Landau Blvd	9	East Palm Canyon Dr & Cathedral Canyon Dr
2	Date Palm Dr & Gerald Ford Dr	10	Ramon Rd & Whispering Palms Trail
3	Date Palm Dr & Victoria Dr	11	Vista Chino & Avenida Quintana
4	Ramon Rd & Cathedral Canyon Dr / Avenida Maravilla	12	East Ramon Rd & Landau Blvd
5	Date Palm Dr & Converse Rd	13	East Ramon Rd & Cathedral Village East
6	East Palm Canyon Dr & Perez Rd	14	East Ramon Rd & Da Vall Dr
7	Ramon Rd & Date Palm Dr	15	Dinah Shore Dr & Cathedral Canyon Dr
8	East Palm Canyon Dr & Canyon Plaza		

Unsignalized Intersections

Figure 2-17 shows the citywide EPDO scoring by quintile for unsignalized intersections. The quintiles and corresponding EPDO score ranges are as follows:

- 80 – 100th Percentile: 175.5 to 605.7
- 60 – 80th Percentile: 12.3 to 175.4
- 40 – 60th Percentile: 6.2 to 12.2
- 20 – 40th Percentile: 1.1 to 6.1
- 0 – 20th Percentile: 0.0 to 1.0

The top quintile unsignalized intersection locations based on EPDO scores are shown on *Table 2-21* and graphically on *Figure 2-18*. Based on roadway classifications in the Cathedral City General Plan Circulation Element, the majority priority unsignalized intersections are primarily located on arterial and major corridors with fewer top quintile intersections located on lower-order secondary, collector, and local roadways.

Table 2-21 Top Quintile Unsignalized Intersections by EPDO Score (2015-2019)

RANK	LOCATION	TOTAL COLLISIONS	EPDO
1	Date Palm Dr & Varner Rd	8	605.7
2	E Palm Canyon Dr & Elks Dr	5	403.3
3	Date Palm Dr & Tachevah Dr	5	398.7
4	Ramon Rd & Avenida La Paloma	6	367.6
5	Candlewood Dr & Ramon Rd	5	361.5
6	33rd Ave & Cathedral Canyon Dr	6	234.5
7	Edom Hill Rd & Varner Rd	3	207
8	Avenida La Paz & Concepcion Rd	2	200.9
9	Avenida Maravilla & Tachevah Dr	2	200.9
10	Landau Blvd & Baristo Rd / Calle Agate	2	200.9
11	Cathedral Canyon Dr & Paseo Real	2	200.9
12	Dinah Shore Dr & Whispering Palms Trl	2	200.9
13	Perez Rd & Plaza Dr	2	200.9
14	Landau Blvd & Tachevah Dr	2	196.3
15	Perez Rd & Summit Dr	2	196.3
16	Asistencia Dr & San Luis Rey Dr	1	190.2
17	Avenida La Paloma & Baristo Rd	1	190.2
18	Avenida La Paz & Durango Rd	1	190.2
19	Avenida La Vista & Minerva Rd	1	190.2
20	Corral Rd & Monte Vista Rd	1	190.2
21	Desert Princess Dr & Landau Blvd	1	190.2
22	Mccallum Wy & Whispering Palms Trl	1	190.2
23	Pamela Ln & Travis Ave	1	190.2
24	Panorama Rd & Vista Chino	1	190.2

Figure 2-17 Unsignalized Intersections EPDO Scoring

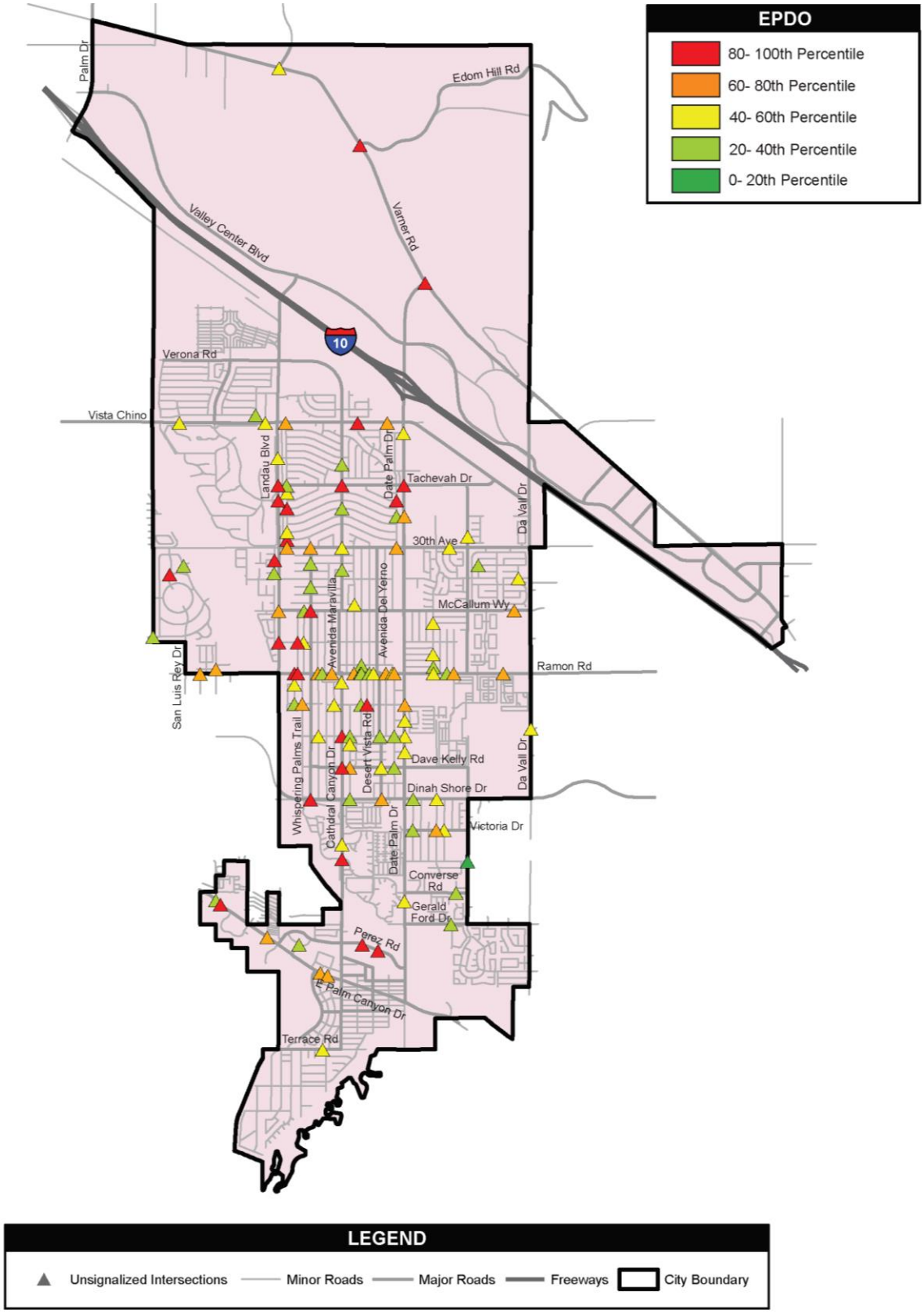
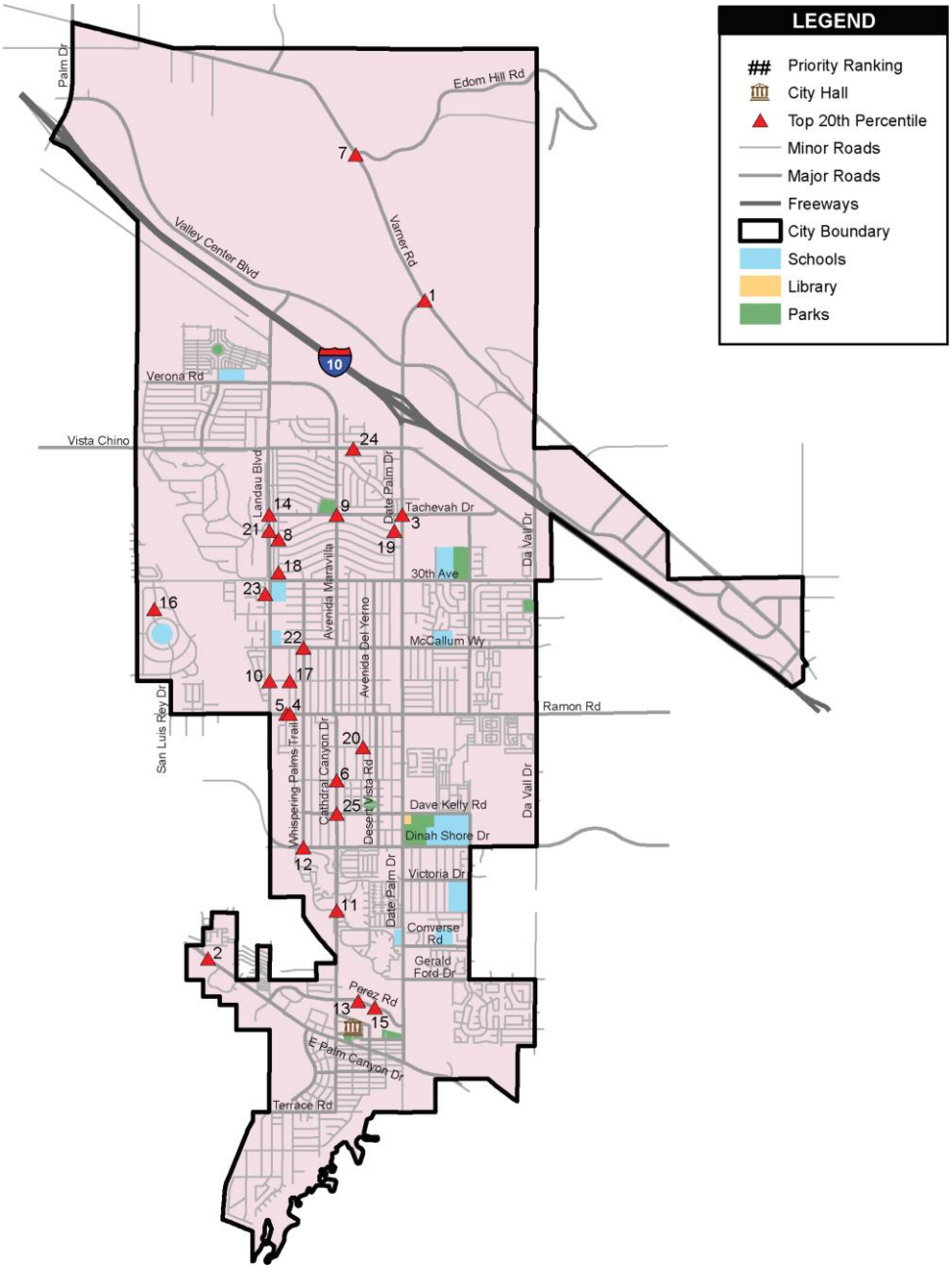


Figure 2-18 Priority Unsignalized Intersections



RANK	LOCATION	RANK	LOCATION
1	Date Palm Dr & Varner Rd	13	Perez Rd & Plaza Dr
2	E Palm Canyon Dr & Elks Dr	14	Landau Blvd & Tachevah Dr
3	Date Palm Dr & Tachevah Dr	15	Perez Rd & Summit Dr
4	Ramon Rd & Avenida La Paloma	16	Asistencia Dr & San Luis Rey Dr
5	Candlewood Dr & Ramon Rd	17	Avenida La Paloma & Baristo Rd
6	33rd Ave & Cathedral Canyon Dr	18	Avenida La Paz & Durango Rd
7	Edom Hill Rd & Varner Rd	19	Avenida La Vista & Minerva Rd
8	Avenida La Paz & Concepcion Rd	20	Corral Rd & Monte Vista Rd
9	Avenida Maravilla & Tachevah Dr	21	Desert Princess Dr & Landau Blvd
10	Landau Blvd & Baristo Rd / Calle Agate	22	Mccallum Wy & Whispering Palms Trl
11	Cathedral Canyon Dr & Paseo Real	23	Pamela Ln & Travis Ave
12	Dinah Shore Dr & Whispering Palms Trl	24	Panorama Rd & Vista Chino

Roadway Segments

Figure 2-19 shows the citywide EPDO scoring by quintile for roadway segments. The quintiles and corresponding EPDO score ranges are as follows:

- 80 – 100th Percentile: 181.6 to 352.3
- 60 – 80th Percentile: 35.2 to 181.5
- 40 – 60th Percentile: 10.8 to 35.1
- 20 – 40th Percentile: 6.2 to 10.7
- 0 – 20th Percentile: 0.0 to 6.1

The top two quintile roadway segment locations based on EPDO scores are shown on *Table 2-22* and graphically on *Figure 2-20*. Based on roadway classifications in the Cathedral City General Plan Circulation Element, the majority of the priority roadway segments are arterial, major, and secondary corridors with fewer located on lower-order roadways.

Table 2-22 Top Two Quintile Roadway Segments by EPDO Score (2015-2019)

RANK	CORRIDOR	LOCATION	TOTAL COLLISIONS	EPDO
1	Ramon Rd	Western City Limits to Landau Blvd	5	352.3
2	Date Palm Dr	Gerald Ford Dr to Converse Rd	3	340.1
3	Vista Chino	Western City Limits to Desert Princess Dr/ Avenida Quintana	2	329.4
4	Varner Rd	Western City Limits to Eastern City Limits	11	234.9
5	Perez Rd	E Palm Canyon Dr / Hwy 111 to Cathedral Canyon Dr	6	209
6	Landau Blvd	Ramon Rd to 30th Ave	3	186.1
7	Date Palm Dr	Vista Chino to Varner Rd	3	186.1
8	San Luis Rey Dr	Ramon Rd to Plaza Cir	4	183
9	Date Palm Dr	Converse Rd to Victoria Dr	3	181.5
10	Date Palm Dr	Perez Rd to Gerald Ford Dr	2	175.4
11	Date Palm Dr	30th Ave to Vista Chino	2	175.4
12	Palm Dr	Paul Rd to Northern City Limits	2	170.8
13	Ramon Rd	Via Campanile / Outdoor Resorts to Eastern City Limits	1	164.7
14	Date Palm Dr	Dinah Shore Dr to Ortega Rd / Dave Kelley Rd	1	164.7
15	Via Estrada	Date Palm Dr to N Paseo Laredo	1	164.7
16	E Palm Canyon Dr / Hwy 111	E Canyon Pl / El Dorado to Canyon Pl	5	39.7

Figure 2-19 Roadway Segments EPDO Scoring

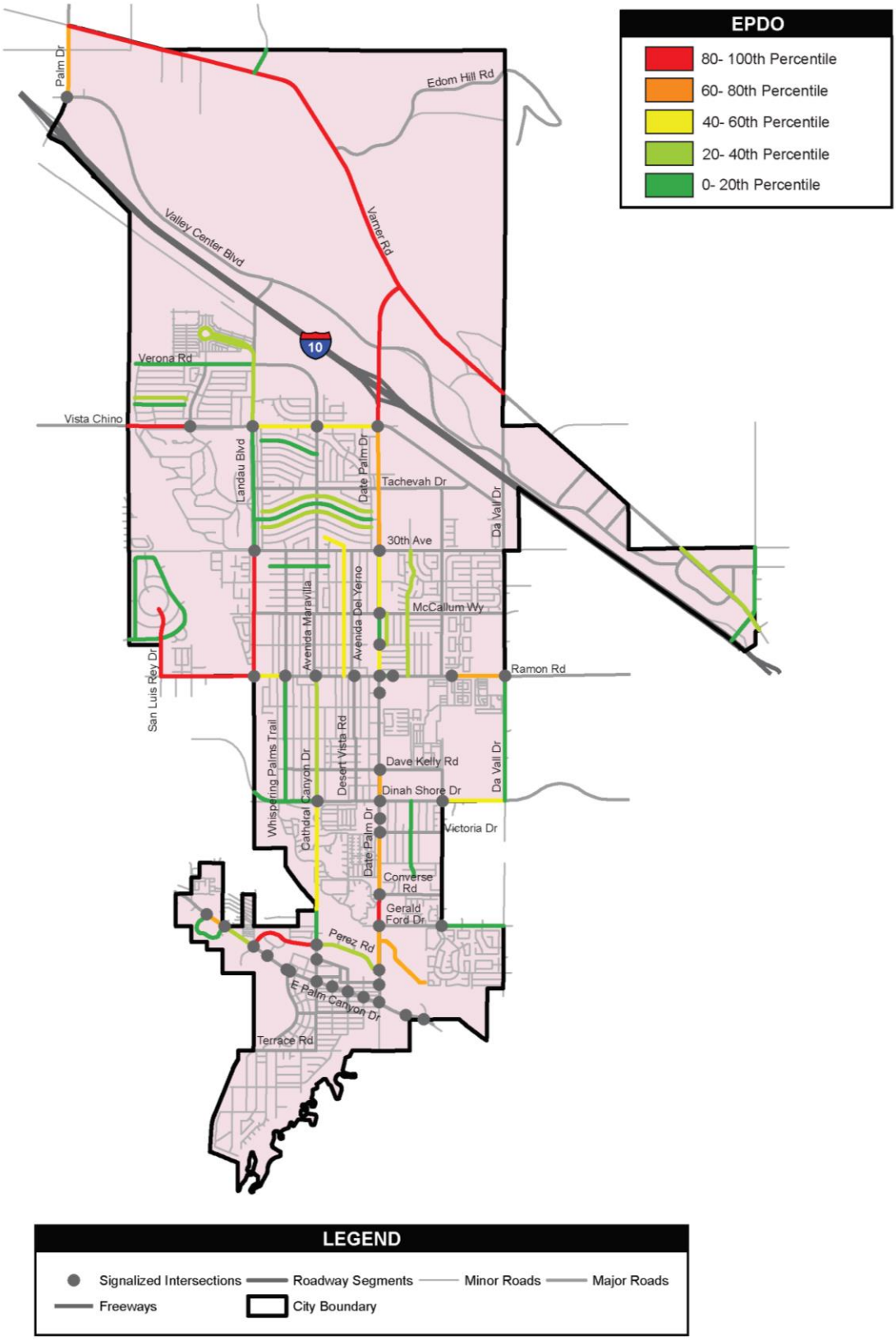
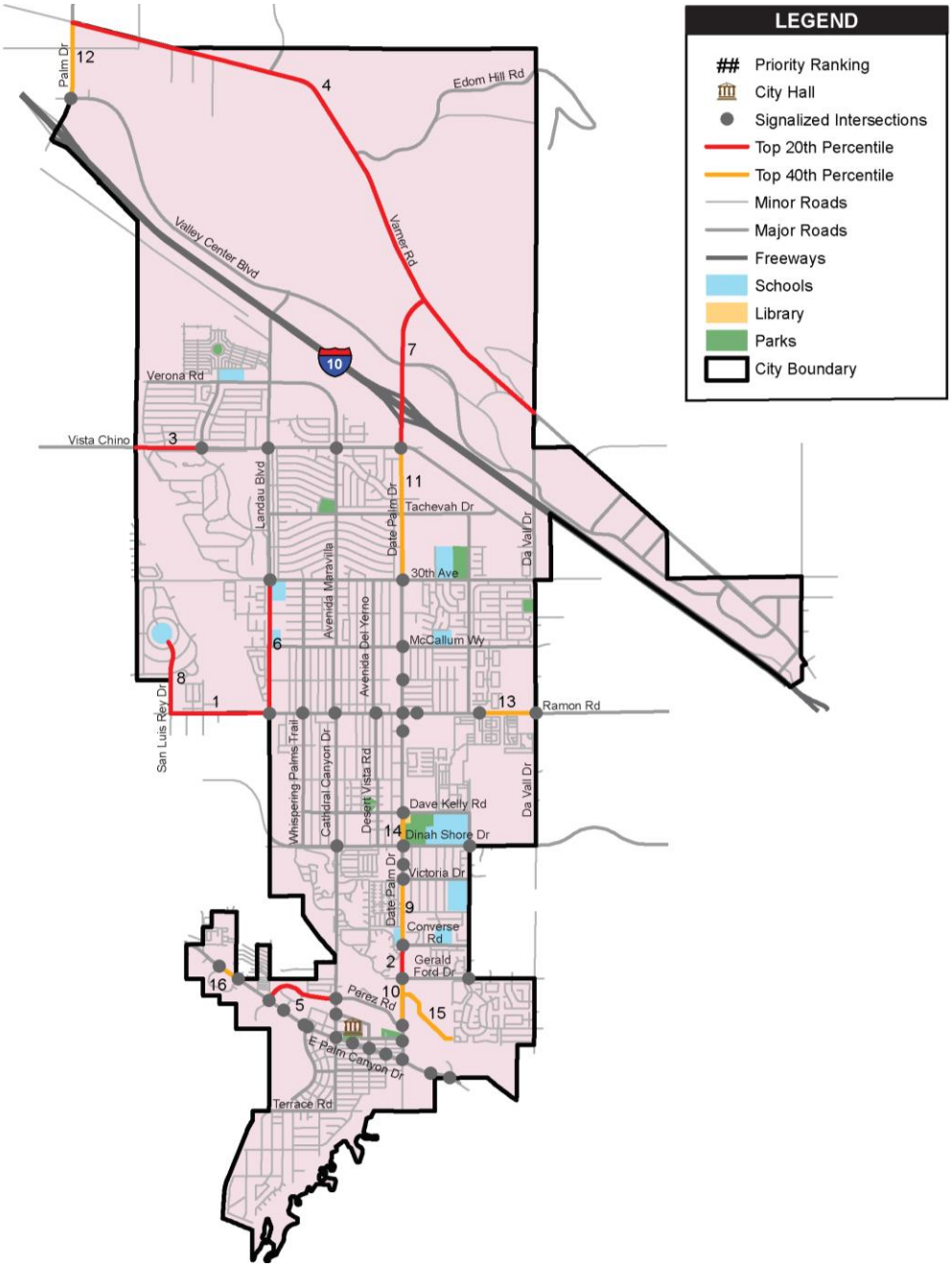


Figure 2-20 Priority Roadway Segments



RANK	LOCATION	RANK	LOCATION
1	Ramon Rd: W City Limits to Landau Blvd	9	Date Palm Dr: Converse Rd to Victoria Dr
2	Date Palm Dr: Gerald Ford Dr to Converse Rd	10	Date Palm Dr: Perez Rd to Gerald Ford Dr
3	Vista Chino: W City Limits to Desert Princess Dr / Avenida Quintana	11	Date Palm Dr: 30th Ave to Vista Chino
4	Varner Rd: W City Limits to E City Limits	12	Palm Dr: Paul Rd to N City Limits
5	Perez Rd: E Palm Canyon Dr / Hwy 111 to Cathedral Canyon Dr	13	Ramon Rd: Via Campanile / Outdoor Resorts to E City Limits
6	Landau Blvd: Ramon Rd to 30th Ave	14	Date Palm Dr: Dinah Shore Dr to Ortega Rd / Dave Kelley Rd
7	Date Palm Dr: Vista Chino to Varner Rd	15	Via Estrada: Date Palm Dr to N Paseo Laredo
8	San Luis Rey Dr: Ramon Rd to Plaza Cir	16	E Canyon Pl / El Dorado to Canyon Pl

2.12 Roadway Characteristics Screening

Roadway characteristic data was obtained from the priority locations determined for signalized intersections, unsignalized intersections, and roadway segments based on EPDO scoring. Data collected was based on information provided by Cathedral City, an online field assessment of aerial imagery, and field visits. The physical roadway characteristics documented is summarized below and the data tables are provided in *Appendix C*.

Signalized and Unsignalized Intersections

- Intersection Control
- Number of Approaches
- Presence of Marked Crosswalks
- Left Turn and Right-Turn Lane Configurations
- Intersection Geometry Complexity (Offset Approaches, Medians, Etc.)

Roadway Segments

- Roadway Surface
- Roadway Geometry Complexity (Horizontal / Vertical Curves, Etc.)
- Number of Lanes
- Posted Speed Limit
- Bike Lanes
- Shoulder Width
- Median Type and Width
- Number of Unsignalized and Signalized Traffic Control Devices
- Roadway Safety Hardware (Guardrail, Fences, Etc.)

The roadway characteristics and crash data analysis were compared to identify commonality which, for the purpose of the Cathedral City LRSP, was defined a potential connection or contributing factor for crashes and does not prove causality. Identification of commonality indicates a potential for higher risk crashes among locations with similar characteristics. This analysis will enable Cathedral City to proactively identify locations that may have higher risk for crashes resulting in fatal or severe injuries but are not reflected in the crash data analyzed. Future development of roadway safety projects and programs that include a combination of priority locations and other high-risk areas not identified from EPDO scoring alone will result in a wholistic approach to addressing roadway safety while maintaining high benefit cost ratios needed for competitive HSIP grant applications.

Based on trends that were consistently present across the priority locations, potential risk factors for intersections and roadway segments were identified and are summarized below.

Signalized and Unsignalized Intersections

- Signalized intersections on arterial and major roads with high vehicle volumes
- Signalized intersections on arterial-arterial, arterial-major, and arterial-secondary roads with high posted speed limits
- Adjacent driveways at signalized intersections
- Lack of medians on signalized intersection approaches
- Offset or skewed intersection approaches
- Side street stop-controlled intersections
- Limited high visibility crosswalk striping
- Limited intersection lighting

Roadway Segments

- Arterial and major roadways with posted speeds of 45 mph or greater
- Multilane (four or more lanes) roadways without raised medians
- Limited roadway lighting
- Frequent driveway access
- Curved roadway alignment
- Narrow/lack of shoulders
- Lack of dedicated bike lanes

The potential risk factors identified for intersections and roadways will be used in combination with the citywide crash data analysis to inform the development of the countermeasure toolbox and future priority roadway safety projects and programs.

3 COUNTERMEASURE TOOLBOX

Based on the results of the citywide collision analysis and roadway network screening, a countermeasure toolbox was developed based on guidance provided by the Federal Highway Administration (FHWA)'s 20 Proven Safety Countermeasures, the California Strategic Highway Safety Plan (SHSP), and the Caltrans Local Roadway Safety Manual (LRSM) for California Local Road owners. Countermeasures were selected based on the 5E's of traffic safety which include the following overarching strategies:

1. **Engineering:** Implementation of infrastructure-oriented safety treatments
2. **Enforcement:** Enforcement of actions that reduce high-risk behaviors
3. **Education:** Education of all roadway users on safe behaviors
4. **Emergency Response:** Improvement of emergency response times and actions
5. **Emerging Technologies:** Application of emerging technologies to roadways, vehicles, and/or roadway users

This section establishes the foundation for determining countermeasures that address the crashes that occur on the local roadway network and is focused on developing a toolbox of engineering countermeasures and improvements that are eligible for HSIP funding. The Cathedral City LRSP is a living document and will be updated based on Caltrans standards for HSIP funding eligibility. Future LRSP updates will include increased development of the countermeasure toolbox for non-engineering countermeasures and strategies.

3.1 Engineering

Engineering countermeasures for infrastructure improvements were selected from the 2020 Caltrans Local Roadway Safety Manual (LRSM) for California Local Road Owners (v1.5) and are summarized based on countermeasure number, countermeasure type, countermeasure name, crash types addressed, crash reduction factor (CRF), HSIP funding eligibility percentage, and opportunity for systemic approach. The LRSM includes infrastructure improvements that are eligible for Highway Safety Improvement Program (HSIP) funding for signalized intersections (S), non-signalized intersections (NS), and roadways (R). *Table 3-1* provides a summary of the countermeasures for signalized intersections, *Table 3-2* provides a summary of countermeasures for unsignalized intersections, and *Table 3-3* provides a summary of countermeasures for roadways.

Table 3-1 Signalized Intersection Countermeasures

CM #	TYPE	CM NAME	CRASH TYPE	CRASH REDUCTION FACTOR	HSIP FUNDING ELIGIBILITY	SYSTEMIC APPROACH OPPORTUNITY
S01	Lighting	Add intersection lighting (S.I.)	Night	40%	100%	Medium
S02	Signal Mod	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	All	15%	100%	Very High
S03	Signal Mod	Improve signal timing (coordination, phases, red, yellow, or operation)	All	15%	50%	Very High
S04	Signal Mod	Provide Advanced Dilemma Zone Detection for high speed approaches	All	40%	100%	High
S05	Signal Mod	Install emergency vehicle pre-emption systems	Emergency Vehicle	70%	100%	High
S07	Signal Mod	Provide protected left turn phase (left turn lane already exists)	All	30%	100%	High
S10	Operation/ Warning	Install flashing beacons as advance warning (S.I.)	All	30%	100%	Medium
S11	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	55%	100%	Medium
S12	Geometric Mod	Install raised median on approaches (S.I.)	All	25%	90%	Medium
S13PB	Geometric Mod	Install pedestrian median fencing on approaches	Ped and Bike	35%	90%	Low
S16	Geometric Mod	Convert intersection to roundabout (from signal)	All	Varies	100%	Low
S17PB	Ped and Bike	Install pedestrian countdown signal heads	Ped and Bike	25%	100%	Very High
S18PB	Ped and Bike	Install pedestrian crossing (S.I.)	Ped and Bike	25%	100%	High
S21PB	Ped and Bike	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	Ped and Bike	60%	100%	Very High

Note: Countermeasures were selected based on applicability to citywide crash patterns and future HSIP applications. A complete list of countermeasures can be found in the Caltrans LRSM

Table 3-2 Non-Signalized Intersection Countermeasures

CM #	TYPE	CM NAME	CRASH TYPE	CRASH REDUCTION FACTOR	HSIP FUNDING ELIGIBILITY	SYSTEMIC APPROACH OPPORTUNITY
NS01	Lighting	Add intersection lighting (NS.I.)	Night	40%	100%	Medium
NS03	Control	Install signals	All	30%	100%	Low
NS04	Control	Convert intersection to roundabout (from all way stop)	All	Varies	100%	Low
NS05	Control	Convert intersection to roundabout (from stop or yield control on minor road)	All	Varies	100%	Low
NS06	Operation/ Warning	Install/upgrade larger or additional stop signs or other intersection warning/ regulatory signs	All	15%	100%	Very High
NS07	Operation/ Warning	Upgrade intersection pavement markings (NS.I.)	All	25%	100%	Very High
NS08	Operation/ Warning	Install Flashing Beacons at Stop-Controlled Intersections	All	15%	100%	High
NS09	Operation/ Warning	Install flashing beacons as advance warning (NS.I.)	All	30%	100%	High
NS12	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	55%	100%	Medium
NS14	Geometric Mod	Install raised median on approaches (NS.I.)	All	25%	90%	Medium
NS17	Geometric Mod	Install right-turn lane (NS.I.)	All	20%	90%	Low
NS18	Geometric Mod	Install left-turn lane (where no left-turn lane exists)	All	35%	90%	Low
NS19PB	Ped and Bike	Install raised medians / refuge islands (NS.I.)	Ped and Bike	45%	90%	Medium
NS20PB	Ped and Bike	Install pedestrian crossing at uncontrolled locations (new signs and markings only)	Ped and Bike	25%	100%	High
NS21PB	Ped and Bike	Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)	Ped and Bike	35%	100%	Medium
NS22PB	Ped and Bike	Install Rectangular Rapid Flashing Beacon (RRFB)	Ped and Bike	35%	100%	Medium
NS23PB	Ped and Bike	Install Pedestrian Signal (including Pedestrian Hybrid Beacon (HAWK))	Ped and Bike	35%	100%	Low

Note: Countermeasures were selected based on applicability to citywide crash patterns and future HSIP applications. A complete list of countermeasures can be found in the Caltrans LRSM

Table 3-3 Roadway Countermeasures

CM #	TYPE	CM NAME	CRASH TYPE	CRASH REDUCTION FACTOR	HSIP FUNDING ELIGIBILITY	SYSTEMIC APPROACH OPPORTUNITY
R01	Lighting	Add segment lighting	Night	35%	100%	Medium
R03	Remove/ Shield Obstacles	Install Median Barrier	All	25%	100%	Medium
R04	Remove/ Shield Obstacles	Install Guardrail	All	25%	100%	High
R08	Geometric Mod	Install raised median	All	25%	90%	Medium
R10PB	Geometric Mod	Install pedestrian median fencing on approaches	Ped and Bike	35%	90%	Low
R11	Geometric Mod	Install acceleration/ deceleration lanes	All	25%	90%	Low
R14	Geometric Mod	Road Diet (Reduce travel lanes from 4 to 3 and add a two way left-turn and bike lanes)	All	30%	90%	Medium
R15	Geometric Mod	Widen shoulder	All	30%	90%	Medium
R17	Geometric Mod	Improve horizontal alignment (flatten curves)	All	50%	90%	Low
R21	Geometric Mod	Improve pavement friction (High Friction Surface Treatments	All	55%	100%	High
R22	Operation/ Warning	Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	All	15%	100%	Very High
R25	Operation/ Warning	Install curve advance warning signs (flashing beacon)	All	30%	100%	High
R26	Operation/ Warning	Install dynamic/variable speed warning signs	All	30%	100%	High
R28	Operation/ Warning	Install edge-lines and centerlines	All	25%	100%	Very High
R30	Operation/ Warning	Install centerline rumble strips/ stripes	All	20%	100%	High
R31	Operation/ Warning	Install edgeline rumble strips/ stripes	All	15%	100%	High
R32PB	Ped and Bike	Install bike lanes	Ped and Bike	35%	90%	High
R33PB	Ped and Bike	Install Separated Bike Lanes	Ped and Bike	45%	90%	High
R34PB	Ped and Bike	Install sidewalk/pathway (to avoid walking along roadway)	Ped and Bike	80%	90%	Medium

CM #	TYPE	CM NAME	CRASH TYPE	CRASH REDUCTION FACTOR	HSIP FUNDING ELIGIBILITY	SYSTEMIC APPROACH OPPORTUNITY
R35PB	Ped and Bike	Install/upgrade pedestrian crossing (with enhanced safety features	Ped and Bike	35%	90%	Medium
R36PB	Ped and Bike	Install raised pedestrian crossing	Ped and Bike	35%	90%	Medium
R37PB	Ped and Bike	Install Rectangular Rapid Flashing Beacon (RRFB)	Ped and Bike	35%	100%	Medium

Note: Countermeasures were selected based on applicability to citywide crash patterns and future HSIP applications. A complete list of countermeasures can be found in the Caltrans LRSM

Detailed information for each engineering countermeasure is provided in *Appendix D* including:

- Caltrans HSIP countermeasure reference
- Example image of the countermeasure
- Description of the countermeasure
- Description of where to use the countermeasure
- Description of why the countermeasure works
- Caltrans HSIP funding eligibility
- Crash types addressed
- Crash reduction factor
- Expected design life
- Planning-level approximate cost

3.2 Enforcement

Enforcement strategies will be further developed during future LRSP updates and will focus on actions that reduce high-risk behaviors and reflect the feedback received from the Cathedral City Police Department's Traffic Division. Strategies that should be considered include:

California Alcoholic Beverage Control (ABC) Grants

California Alcoholic Beverage Control (ABC) grants are administered through the Alcohol Policing Partnership (APP) Program and funded by the California Office of Traffic Safety (OTS) through the National Highway Traffic Safety Administration (NHTSA). The program is designed to put bad operators out of business, keep alcohol away from minors, and bring penalties such as fines, suspensions, or revocations against businesses that violate the law. ABC grants award funding to local law enforcement agencies to increase public safety by combating underage drinking and educating licensees about alcoholic beverage laws. ABC agents have expertise in alcoholic beverage laws and work with local police officers to help reduce alcohol-related community problems. The Cathedral City Police Department has been successful in obtaining ABC grant

funding to reduce the number of alcoholic beverage sales to minors, obviously intoxicated persons, illegal solicitations of alcohol, and other criminal activities such as the sale and possession of illegal drugs.

California Office of Traffic Safety (OTS) Grants

California Office of Traffic Safety (OTS) grants are administered through the California State Transportation Agency (CalSTA) and funded by the Federal Highway Safety Program. The program seeks to prevent serious injury and death resulting from motor vehicle crashes by addressing the behavioral factors that impact roadway safety. OTS grants for priority program areas related to enforcement include: Alcohol Impaired Driving, Distracted Driving, Drug-Impaired Driving, Police Traffic Services, and Roadway Safety and Traffic Records.

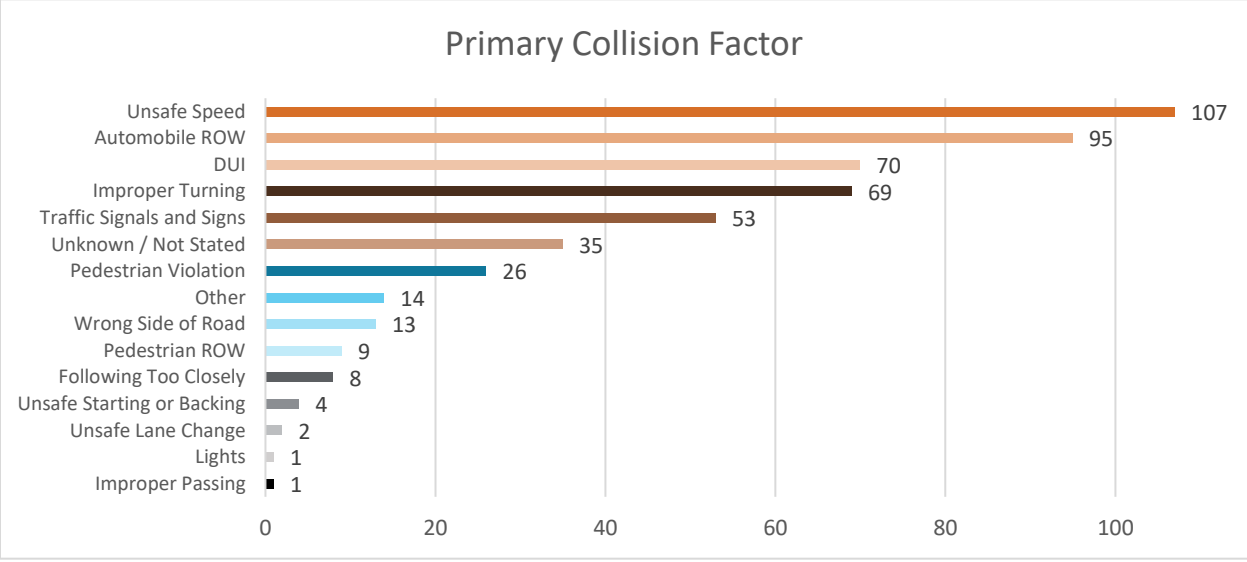
Traffic Safety Marketing (TSM)

Traffic Safety Marketing (TSM) is provided by the National Highway Traffic Safety Administration (NHTSA) through the United States Department of Transportation (USDOT). TSM provides communication resources that can be utilized by local roadway safety advocates for traffic safety campaigns and marketing tools through both traditional and online media. Enforcement-related campaigns include: Distracted Driving, Drunk Driving, Law Enforcement Appreciation, Seat Belts, and Speed Prevention.

Targeted Enforcement Strategies

The primary collision factor (PCF) for citywide crashes that occurred during the study period is illustrated in *Figure 3-1*. The most common collision factors were unsafe speed (21%), automobile right-of-way violations (19%), driving under the influence (14%), and improper turning (14%). Targeted hotspot enforcement for these PCF's is recommended.

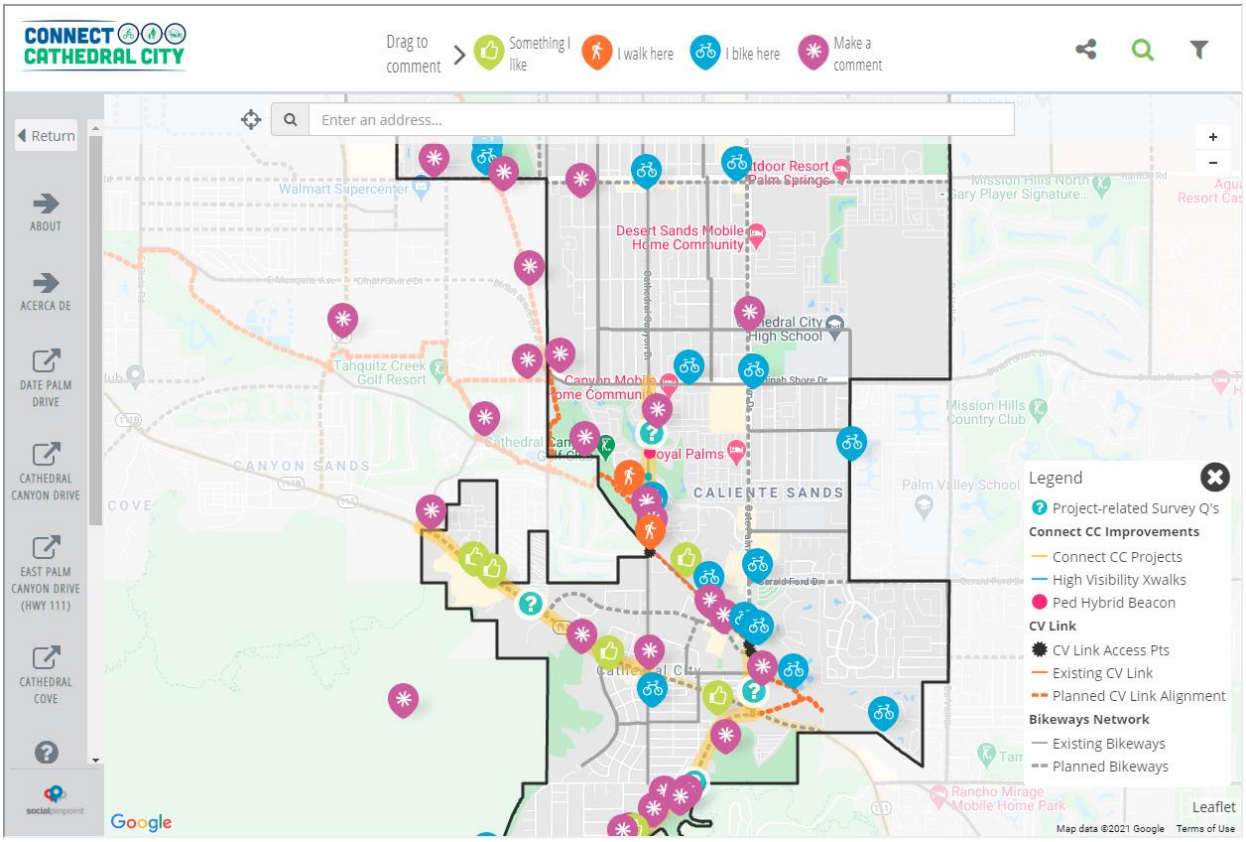
Figure 3-1 Citywide Collisions by Primary Collision Factor (2015-2019)



3.3 Education

Education strategies will focus on actions that provide education to all roadway users on safe behaviors and reflect feedback received by the community. Feedback from the community was received through Connect Cathedral City – a joint initiative between Cathedral City and the Coachella Valley Association of Governments (CVAG) to develop projects that support walking, biking, and the use of low-speed electric vehicles (LSEVs) in the City. *Figure 3-2* illustrates the Connect Cathedral City website utilized by the community to provide feedback on pedestrian, bicycle, and LSEV facilities throughout the City.

Figure 3-2 Connect Cathedral City Feedback Map



Education strategies that should be considered include:

California Office of Traffic Safety (OTS) Grants

California Office of Traffic Safety (OTS) grants are administered through the California State Transportation Agency (CalSTA) and funded by the Federal Highway Safety Program. The program seeks to prevent serious injury and death resulting from motor vehicle crashes by addressing the behavioral factors that impact roadway safety. OTS grants for priority program areas related to education include: Motorcycle Safety, Occupant Protection, Pedestrian and Bicycle Safety, and Public Relations, Advertising, and Marketing.

Traffic Safety Marketing (TSM)

Traffic Safety Marketing (TSM) is provided by the National Highway Traffic Safety Administration (NHTSA) through the United States Department of Transportation (USDOT). TSM provides communication resources that can be utilized by local roadway safety advocates for traffic safety campaigns and marketing tools through both traditional and online media. Education-related campaigns include: Bicycle Safety, Child Safety, Motorcycle Safety, Older Drivers, Pedestrian Safety, Seat Belts, School Bus Safety, Teen Safety, and Vehicle Safety.

3.4 Emergency Response

Emergency response strategies will focus on actions that improve emergency response times and reflect feedback received by the Cathedral City Fire Department. Historically, the Cathedral City Fire Department has conducted both in-person and online public education campaigns and has been successful in obtaining grant funding for new emergency response equipment and resources to improve response times. Additional emergency response strategies that should be considered include:

Caltrans Local Roadway Safety Manual (LRSM) for California Local Road Owners (v1.5) Countermeasure S5: Install Emergency Vehicle Pre-Emption Systems

This countermeasure is eligible for 100% funding through the Caltrans HSIP and is used for installing and/or upgrading existing emergency vehicle preemption systems at signalized intersections to address crashes involving emergency vehicles. This countermeasure can be utilized for both traditional infrared (IR) transmitter systems that rely on line-of-sight between traffic signals and emergency response vehicles and for global positioning system (GPS) systems which can transmit emergency vehicle speed, direction, and turn signal status to traffic signals to provide more efficient clearance of intersections along the route, improve response times, and eliminate traffic operations issues on coordinated corridors due to use of illegal emitters.

California Office of Traffic Safety (OTS) Grants

California Office of Traffic Safety (OTS) grants are administered through the California State Transportation Agency (CalSTA) and funded by the Federal Highway Safety Program. The program seeks to prevent serious injury and death resulting from motor vehicle crashes by addressing the behavioral factors that impact roadway safety. OTS grants for priority program areas related to emergency response include: Emergency Medical Services, Occupant Protection, and Public Relations, Advertising, and Marketing.

Traffic Safety Marketing (TSM)

Traffic Safety Marketing (TSM) is provided by the National Highway Traffic Safety Administration (NHTSA) through the United States Department of Transportation (USDOT). TSM provides communication resources that can be utilized by local roadway safety advocates for traffic safety

campaigns and marketing tools through both traditional and online media. Emergency response-related campaigns include: First Responder Safety, Vehicle Safety, Child Safety, and Seat Belts.

3.5 Emerging Technologies

Strategies that utilize emerging technologies will include actions that are in alignment with the California Strategic Highway Safety Plan (SHSP)'s Emerging Technology Challenge Area which focuses on the use of technology to prevent, identify, and respond to collisions. Emerging technology strategies will include exploring technology advancements that are new or underutilized to potentially reduce frequency or severity of collisions. Emerging technologies can be applied to roadways, vehicles, and / or users. Examples include autonomous and connected vehicles, future vehicle-to-vehicle and vehicle-to-infrastructure communication that will connect all roadway users with the intent to eliminate human error and collisions, the use of Transportation Network Companies (TNCs) for cars, bikes, or scooters, advancements to safety devices in vehicles, mobile applications, improvements to emergency response from drones and roadway videos, and any other technologies that help the 5E's of traffic safety. The CA SHSP identifies six (6) general categories for emerging technologies in transportation safety:

Alerting Drivers at Risk

Alerting drivers at risk includes technology that can alert drivers to the risk of being involved in a collision, can reduce the risk by monitoring speed or blinds spots, and alert drivers to the situation with a visual or audible alert so that drivers can act accordingly.

Assisting Drivers at Risk

Assisting drivers at risk includes technology that can assist a driver when a collision is imminent. An example is lane keeping assist, which helps drivers stay in the designated lane by alerting them through a visual, audible, or tactile warning when they begin to depart from the lane.

Protecting Vehicle Occupants

Protecting vehicle occupants includes technology upgrades by vehicle manufacturers to improve safety features in seatbelts, airbags, and vehicle structure features. These are an important factor in injury severity and fatality during collisions.

Communicating with Drivers and the Environment

Communication between drivers and their environment includes technology that supports alerting drivers to risk and then assisting them. This can fall in several categories including Vehicle-to-Vehicle (V2V) such a blind spot detection, Vehicle-to-Infrastructure (V2I) such as a roadway conditions warning alerting drivers to a collision ahead, and Vehicle-to-Pedestrian (V2P) such as a forward collision warning alerting a driver to a pedestrian in the crosswalk ahead.

Vehicle Performing as Designated

It is important that once vehicles enter the roadway they perform as designed for their full lifespan. This can be done through vehicle upkeep, maintenance and vehicle record keeping. A supporting technology for vehicle upkeep is many cars have an oil change indicator light, which alerts drivers to a potential need to do an oil change after so many miles.

Mobile Technology and Applications

Examples of mobile technology and applications include driving applications which restrict texting and mobile application use and may reduce distracted driving and Transportation Network Companies (TNC) applications for rideshare companies such as Uber and Lyft which may reduce the number of impaired drivers on the road.

4 PRIORITY PROJECTS

Potential safety projects were evaluated based on Cathedral City roadway needs, the crash data analysis, roadway network screening, and countermeasure toolbox. Two (2) priority projects were identified for development of a preliminary project scope, cost estimate, and benefit cost ratio (BCR) analysis utilizing the most recent Cycle 10 HSIP Analyzer. In order to supplement local funds while proactively implementing roadway safety, the priority projects were developed based on eligibility for Highway Safety Improvement Program (HSIP) grant funding. Additionally, recommendations are presented for HSIP funding set-asides.

4.1 Citywide Traffic Signal Hardware Upgrades

Existing safety lighting and street name signs at traffic signals throughout Cathedral City will be upgraded to light-emitting diode (LED) and traffic signal backplates will be upgraded to include retro-reflective tape. Intersection lighting improves visibility of the intersection and helps reduce potential conflicts between all roadway users, including pedestrians and bicyclists who have a smaller intersection footprint. Retro-reflective tape improves the visibility of the illuminated signal faces, which makes them more visible in both daytime and nighttime conditions.

4.2 Pedestrian Hybrid Beacons

Existing pedestrian crosswalks at Cathedral Canyon Dr & Ortega Dr and 30th Ave & Avenida La Paz will be upgraded to include new pedestrian hybrid beacons (HAWK), curb extensions, curb ramps, high visibility crosswalk striping, advanced warning pavement markings and signs, and upgrades to existing roadway signing and striping.

4.3 Pedestrian Crosswalk Upgrades

Existing pedestrian crosswalks at unsignalized intersections throughout Cathedral City will be upgraded to include LED lighting, curb extensions, curb ramps, flashing stop sign beacons, high visibility striping, and upgrades to existing roadway signing and striping.

Table 4-1 provides a summary of the priority projects by HSIP LRSM (v1.5) countermeasures and BCR ranking. *Appendix E* provides more detailed priority project summaries which include:

- LRSM Countermeasure Description
- Project Description
- Map and Table of Project Locations
- Crash Analysis Summary by Severity, Collision Type, and Primary Collision Factor
- Cost Estimate for Construction Items
- Cost Estimate for Preliminary Engineering (PE), Right-of-Way (ROW), and Construction (CON) project phases

- Total Expected Benefit
- Total Project Cost
- Benefit Cost Ratio

Table 4-1 Priority Projects

#	PROJECT LOCATION	LRSM CM	BCR
1	**CITYWIDE LED LIGHTING UPGRADES** 1. Date Palm Dr & 30th Ave 2. Date Palm Dr & Converse Rd 3. Date Palm Dr & Dinah Shore Dr 4. Date Palm Dr & Fire Station #2 5. Date Palm Dr & Gerald Ford Dr 6. Date Palm Dr & Market Pl 7. Date Palm Dr & Mccallum Wy 8. Date Palm Dr & Ortega Rd/Dave Kelly Rd 9. Date Palm Dr & Via Oliveria/Cathedral Village S 10. Date Palm Dr & Victoria Dr 11. Date Palm Dr & Vista Chino 12. Dinah Shore Dr & Cathedral Canyon Dr 13. Dinah Shore Dr & Plumley Rd 14. E Palm Canyon Dr & Canyon Plaza 15. E Palm Canyon Dr & Cathedral Canyon Dr 16. E Palm Canyon Dr & Date Palm Dr 17. E Palm Canyon Dr & E Canyon Plaza /El Dorado 18. E Palm Canyon Dr & Officer Jermaine Gibson Ave 19. E Palm Canyon Dr & Perez Rd 20. E Palm Canyon Dr & W Bankside Dr 21. E Palm Canyon Dr & W Buddy Rodgers Ave 22. E Ramon Rd & Cathedral Canyon Dr/Avenida Maravilla 23. E Ramon Rd & Cathedral Village E 24. E Ramon Rd & Date Palm Dr 25. E Ramon Rd & Desert Vista Rd/Avenida Del Yermo 26. E Ramon Rd & Landau Blvd 27. E Ramon Rd & Via Campanile/Outdoor Resorts 28. E Ramon Rd & Whispering Palms Trail 29. Palm Dr & Paul Rd 30. Perez Rd & Cathedral Canyon Dr 31. Vista Chino & Avenida Quintana 32. Vista Chino & Avenida Maravilla 33. Vista Chino & Landau Blvd 34. E Ramon Rd & Da Vall Dr 35. Cathedral Canyon Dr & Officer David Vasquez Rd 36. Date Palm Dr & Baristo Rd 37. Date Palm Dr & Perez Rd 38. E Palm Canyon Dr & Allen Ave 39. E Palm Canyon Dr & Auto Park Dr 40. E Palm Canyon Dr & Sungate Wy 41. E Palm Canyon Dr & Van Fleet St/Monty Hall Dr 42. Gerald Ford Dd & Plumley Rd/Avenida Del Sol 43. Landau Blvd & 30th Ave 44. E Palm Canyon Dr & E Bankside Dr	S2 – Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	17.08

#	PROJECT LOCATION	LRSM CM	BCR
2	**HAWK SIGNALS** 1. 30th & Avenida La Paz 2. Cathedral Canyon Dr & Ortega Rd	NS23PB – Install Pedestrian Signal (including Pedestrian Hybrid Beacon (HAWK))	20.06
3	**PEDESTRIAN CROSSWALK UPGRADES** 1. Mccallum Wy & Whispering Palms Trl 2. Avenida La Vista & Minerva Rd 3. Asistencia Dr & San Luis Rey Dr 4. Avenida La Paloma & Baristo Rd 5. Vaquero Rd & Victoria Dr 6. Judy Ln & Victoria Dr 7. Avenida Maravilla & Tachevah Dr 8. Avenida La Paz & Tachevah Dr 9. Avenida La Vista & Tortuga Rd 10. Landau Blvd & Mccallum Wy 11. Terrace Rd & Cathedral Canyon Dr	NS1 – Add intersection lighting (NS.I.) NS21PB – Install / upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)	18.93

4.4 Funding Set-Asides

The Caltrans Highway Safety Improvement Program (HSIP) includes two application categories – Benefit Cost Ratios (BCR) and Funding Set-Asides (SA). Set-aside applications differ from the benefit cost ratio applications in that narrative responses related to crash history, collision analysis, and benefit cost ratio calculations are not required. A portion of each HSIP funding cycle is dedicated set-aside applications. In the most recent call for projects, Cycle 10, up to 25% ($55 million) of the $227.6 million in total funding was available for four (4) set-aside categories, with a total of $43 million (18.9%) being selected by Caltrans for award. The HSIP Cycle 10 set-aside categories and funding limits per agency are summarized in *Table 4-2* below. Agencies can submit one (1) application for each set-aside category.

Table 4-2 HSIP Cycle 10 Application Categories

#	DESCRIPTION	FUNDING LIMIT PER AGENCY
1	Guardrail Upgrades	$1 million
2	Pedestrian Crossing Enhancements	$250,000
3	Installing Edgelines	$250,000
4	Tribes	$250,000

In HSIP Cycle 10, set-aside project selection was based on prioritizing based on the order below:

- Agencies who did not have any projects awarded in HSIP Cycles 8 & 9
- Agencies who did not have projects awarded under the same set-aside in HSIP Cycles 8 & 9
- Agencies who have completed a Local Road Safety Plan (LRSP)
- Agencies who have had more Fatal & Severe Injury (F+SI) crashes with the boundaries of their jurisdiction in the last three years with data available from California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS). The applicant does not need to provide this number as the Caltrans District Local Assistance (DLA) will obtain the data from SWITRS if needed.

Guardrail Upgrades

Eligible project work under the guardrail upgrades set-aside funding category includes work related to the upgrade of existing guardrails and end treatments. New guardrail installations and bridge rail upgrades are not eligible.

Pedestrian Crossing Enhancements

Eligible project work under the pedestrian crossing enhancements set-aside funding category includes work consistent with the following LRSM safety countermeasures:

- **S17PB:** Install pedestrian countdown signal heads
- **NS22PB/R37PB:** Install Rectangular Rapid Flashing Beacon (RRFB).
- **NS21PB:** Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)
- **R35PB:** Install/upgrade pedestrian crossing (with enhanced safety features)

Work related to pedestrian crossings/signs, advanced yield lines/signs, and other signs/striping are eligible. Other work related to pedestrian crossing enhancements may be allowed provided the cost is less than 20% of the total project cost. Agencies will be responsible to any non-safety related project costs such as decorative items.

During priority project development, several non-signalized intersections with pedestrian crosswalks throughout the City, including locations in proximity to local public K-12 schools, were identified as good candidates for pedestrian crossing upgrades but did not have sufficient crash frequency and severity to yield a competitive BCR project. It is recommended that the City pursue pedestrian crossings enhancements set-aside applications during future HSIP calls for projects to

upgrade these existing pedestrian crosswalks as the crash history and BCR calculation will not be required, and HSIP set-aside funding is not typically exhausted.

Installing Edgelines

Eligible project work under the installing edgelines set-aside funding category includes the installation of edgelines along roadways and other work, such as signs and other pavement striping or marking, provided the additional cost is less than 20% of the total project cost.

Tribes

In HSIP Cycle 10, $2 million was available to federally recognized tribes in California with a maximum of $250,000 awarded per tribe. No tribes set-aside applications were submitted or awarded during HSIP Cycle 10.

5 IMPLEMENTATION AND EVALUATION

Processes for implementing the Cathedral City Local Road Safety Plan and evaluating the application of the countermeasure toolbox and priority project deployments were developed based on the USDOT FHWA's Implementing A Local Road Safety Plan (July 2020) and the Caltrans LRSM v1.5 (April 2020).

5.1 Implementation

Implementation of the Cathedral City LRSP demonstrates the City's commitment to proactively addressing roadway safety needs for all users. The FHWA outlines six steps for successful LRSP implementation which includes:

- **Maintain Buy-In and Support:** LRSP implementation is strengthened by the support of key City officials and safety partners from the 5E's of traffic safety (Engineering, Enforcement, Education, Emergency Response, and Emerging Technologies).
- **Identify Funding Mechanisms:** Funding for LRSP projects will be identified through local capital improvement projects and public/private development projects, regional MPO grant opportunities, State grant opportunities, and Federal grant opportunities.
- **Identify and Prioritize Projects:** Projects will be prioritized based on a combination of benefit-cost ratio analyses, crash histories, and roadway risk factors. Priority projects will be implemented based on City needs, local resources, and available grant funding opportunities through the HSIP and other roadway safety infrastructure/non-infrastructure programs. Where appropriate, private development will be leveraged to strategically implement safety countermeasures and/or components of priority projects.
- **Determine Project Delivery Methods:** Project delivery will be determined following security of project funding and prior to design. Where appropriate, projects will be bundled to decrease the City's financial and management burdens.
- **Evaluate Effectiveness:** LRSP countermeasure and project implementation effectiveness will be evaluated based on reductions in severity (fatalities and severe injuries) and in overall crash frequency. See section 5.2 for further details.
- **Continue Communication and Coordination:** Active communications and coordination between key City officials, safety partners from the 5E's of traffic safety, and the public will ensure that there is synergy in overall LRSP implementation.

5.2 Evaluation

Following the application of the Cathedral City countermeasure toolbox and deployment of priority projects, the City will evaluate the LRSP strategies based on Section 7 of the Caltrans LRSM of Evaluation of Improvements. An initial evaluation will be conducted shortly after project construction through a field review that ensures the project is operating as intended. A database will be developed to track countermeasure installations, SWITRS/TIMS crash history, and field assessments on an annual basis. Feedback from the public, LRSP safety partners, and Cathedral City maintenance crews will also be included in annual evaluation. A before-and-after assessment of crashes for frequency and severity should be evaluated after 3 to 5 years of data is collected – matching the initial crash data period analyzed for the 'before' condition during the priority project BCR scoring process – to reduce the effects of the random nature of roadway crashes. *Table 5-1* provides an example countermeasure deployment history database per the Caltrans LRSM. The database will provide Cathedral City with the necessary information to make informed decisions on whether countermeasures from the toolbox contribute to an increase in safety, whether they should be installed at other locations through the City, and which factors may have contributed to the countermeasure's success.

Table 5-1 Example Countermeasure Deployment History Database

PROJECT LOCATION	CM INSTALLED	DATE INSTALLED	CRASHES BEFORE (DURATION AND SEVERITY)	CRASHES AFTER (DURATION AND SEVERITY)	COMMENTS

5.3 Future LRSP Updates

The Cathedral City Local Road Safety Plan is a living document and must be updated at least every five (5) years to remain compliant with Caltrans HSIP grant funding eligibility requirements. However, it is recommended that the City update the LRSP every two (2) years in alignment with typical Caltrans HSIP cycles / calls-for-projects. This will ensure the most competitive benefit cost ratios (BCRs) are achieved for any HSIP grant applications that the City may pursue. More frequent updates will also allow the City to ensure the LRSP continually reflects the most recent crash data, crash trends, countermeasures, and BCR calculations. Between LRSP updates, Cathedral City staff will continue to monitor roadway crashes, identify locations with high crash frequency and severity, match locations with the countermeasure toolbox, and implement priority projects in coordination with the City's current CIP and development opportunities.

Future updates to the LRSP will include expansion of the Cathedral City Countermeasure Toolbox to the other traffic safety E's for Enforcement, Education, Emergency Response, and Emerging Technologies. To maximize City resources, the toolbox in this LRSP was primarily developed for HSIP-eligible engineering infrastructure improvements that could be applied to priority locations identified through the collision analysis EPDO scoring and roadway characteristics screening. Future updates to the LRSP will also include revisiting the Cathedral City LRSP Vision, Mission, and Goals statements based on feedback from the 5E's safety partners and the annual / before-after evaluations of safety countermeasures, priority projects, and ongoing safety projects and programs within Cathedral City.

Guidelines for developing and implementing Local Road Safety Plans are continually being updated by the FHWA and Caltrans. Future updates to the LRSP should include reviewing the following resources to ensure the latest best-practices are followed:

- FHWA Local Road Safety Plan Do-It-Yourself Website
- FHWA Proven Safety Countermeasures List
- FHWA Local and Rural Road Safety Program
- FHWA Local and Rural Road Safety Briefing Sheets
- FHWA Developing Safety Plans: A Manual for Local and Rural Roads
- FHWA Implementing A Local Road Safety Plan
- National Association of County Engineers (NACE) – A Template for Local Road Safety Plans
- California Strategic Highway Safety Plan
- Caltrans LRSP and HSIP Programs
- Caltrans Local Roadway Safety Manual (LRSM)