



IMPERIAL COUNTY

Local Roadway Safety Plan





(Per Section 148 of Title 23, United States Code [23 U.S.C. §148(h) (4)] REPORTS
DISCOVERY AND ADMISSION INTO EVIDENCE OF CERTAIN REPORTS,
SURVEYS, AND INFORMATION — Notwithstanding any other provision of law,
reports, surveys, schedules, lists, or data compiled or collected for any purpose
relating to this section, shall not be subject to discovery or admitted into evidence in
a Federal or State court proceeding or considered for other purposes in any action
for damages arising from any occurrence at a location identified or addressed in the
reports, surveys, schedules, lists, or other data.

SIGNED BY _____

Jason Melchor



Table of Contents

Executive Summary	1
1. Introduction	4
2. Vision and Goals	5
Goal #1: Identify areas with a high risk for crashes.	5
Objectives:	5
Goal #2: Illustrate the value of a comprehensive safety program and the systematic process.	5
Objectives:	5
Goal #3: Define safety improvements for the near-, mid- and long-term, including projects for HSIP, SS4A and other program funding considerations.	5
Objectives:	6
Goal #4: Identify emphasis areas to prioritize countermeasure application.	6
Objectives:	6
Goal #5: Proposed List of Conceptual Priority Projects for Implementation of Countermeasures	6
Objectives:	6
3. Process	7
3.1 Guiding Manuals	7
3.1.1 Local Roadway Safety Manual	8
3.1.2 Highway Safety Manual	8
3.2 Analysis Techniques	9
3.2.1 Crash and Network Screening Analysis	9
3.2.2 Statistical Performance Measures	10
3.3 Future Analysis	13
4. Public Engagement and Agency Coordination	14
4.1 Stakeholder Meeting	14
4.2 Field Tour Meeting	14
5. Existing Efforts	15
6. Data Summary	18
6.1 Roadway Network	18
6.2 Crash Data	18



7. Crash Safety Trends	21
7.1 All Crashes	21
7.2 Fatalities & Severe Injuries	22
7.3 Injury Levels	22
7.4 Cause of Crash	24
7.5 Vulnerable Users	25
7.5.1 Pedestrian Crashes	25
7.5.2 Bicycle Crashes	25
7.6 Time of Day	27
7.7 Behavioral Driving	27
7.8 Driver Age	27
7.9 Statewide Comparison	27
7.10 Crash Network Screening Analysis Results	28
8. Equity	39
8.1 Equity Analysis	39
9. Best Practices Evaluation and Emphasis Areas	44
9.1 Best Practices Evaluation	44
9.2 Emphasis Areas	47
9.2.1 Emphasis Area #1: Lane Departure	47
9.2.2 Emphasis Area #2: Occupant Protection	48
9.2.3 Emphasis Area #3: Aggressive Driving	48
9.2.4 Emphasis Area #4: Intersection Improvements	48
9.2.5 Emphasis Area #5: Impaired Driving	49
10. Potential Improvements	50
10.1 Improvement (Countermeasure) Selection Process	50
10.2 Infrastructure Improvements	50
10.3 Non-Infrastructure Improvements	55
11. Funding Sources & Next Steps	56
11.1 Funding Sources	56
11.1.1 Highway Safety Improvement Program (HSIP)	56
11.1.2 Caltrans Active Transportation Program	56
11.1.3 California SB 1	57



11.1.4 California Office of Traffic Safety Grants.....57

11.1.5 Safe Streets and Roads for All (SS4A) Grant Program.....57

11.1.6 Infrastructure Investment and Jobs Act58

11.2 Implementation Plan58

11.2.1 Monitoring58

11.2.2 Analysis Update58

11.2.3 Implementation Strategies.....59

11.3 Next Steps59

Appendix A – Case Study Sheets60

LIST OF FIGURES

Figure 1 – Critical Crash Rate Formula	11
Figure 2 – Probability of Specific Crash Types Exceeding Threshold Proportion	13
Figure 3 – Functional Classification & Signalized Intersections	19
Figure 4 – Fatal & Severe Injury Collisions (2016-2021).....	20
Figure 5 – Crash Type by Year (2013-2018 and 2016-2021).....	21
Figure 6 – Crashes by Injury Levels (2016-2021)	23
Figure 7 – Crashes by Injury Levels (2013-2018)	23
Figure 8 – Pedestrian & Bicycle Crashes (2016-2021).....	26
Figure 9 – Crash Network Screening Analysis Results – Intersections (2016-2021).....	29
Figure 10 – Crash Network Screening Analysis Results – Roadways (2016-2021)	30
Figure 11 – Climate and Economic Justice Census Tracts – Disadvantaged.....	41
Figure 12 – Climate and Economic Justice Census Tracts – Low Income	42
Figure 13 – Climate and Economic Justice Census Tracts.....	43

LIST OF TABLES

Table 1 – Review of Existing County Plans.....	15
Table 2 – Review of Existing County Projects	16
Table 3 – Fatal and Severe Injury Crashes Categorized by Modes Involved (2013-2018 and 2016-2021)	22
Table 4 – Cause of Crashes (2013-2018 and 2016-2021)	24
Table 5 – Comparison of Statewide and Imperial County Fatal & Severe Injury Crashes (2009-2018)	28
Table 6– Analysis Results: Intersections	33
Table 7– Analysis Results: Segments	33
Table 8 – County of Imperial County Population by Race/Ethnicity	39
Table 9 – Summary of Programs, Policies, and Practices	44
Table 10 – General Countywide Safety Countermeasure Toolbox	52
Table 11 – Non-Engineering Safety Strategy Countermeasures	55

Executive Summary

Imperial County has created a Local Roadway Safety Plan (LRSP), which identifies a framework to identify, analyze, and develop traffic safety enhancements on the County's roadway network. The LRSP was developed in response to local issues and needs. Through the analysis, this report has identified emphasis areas to inform and further guide safety evaluation and planning for the County's transportation network. The LRSP also analyzes crash data on an aggregate basis as well as at specific locations to identify high-crash locations, high-risk locations, and Countywide trends and patterns. The analysis of crash history on the County's transportation network allows for opportunities to:

1. Identify factors in the transportation network that inhibit safety for all roadway users;
2. Improve safety at specific high-crash locations, and;
3. Develop safety measures using the four Es of safety: Engineering, Enforcement, Education, and Emergency Response to encourage safer driver behavior and better severity outcomes.

With this LRSP, the County continues its safety efforts by identifying areas of emphasis and systemic recommendations to enhance safety.

The County's vision is to enhance the transportation network and reduce traffic fatalities and severe injury related crashes, and the goals for the County of Imperial County include the following:

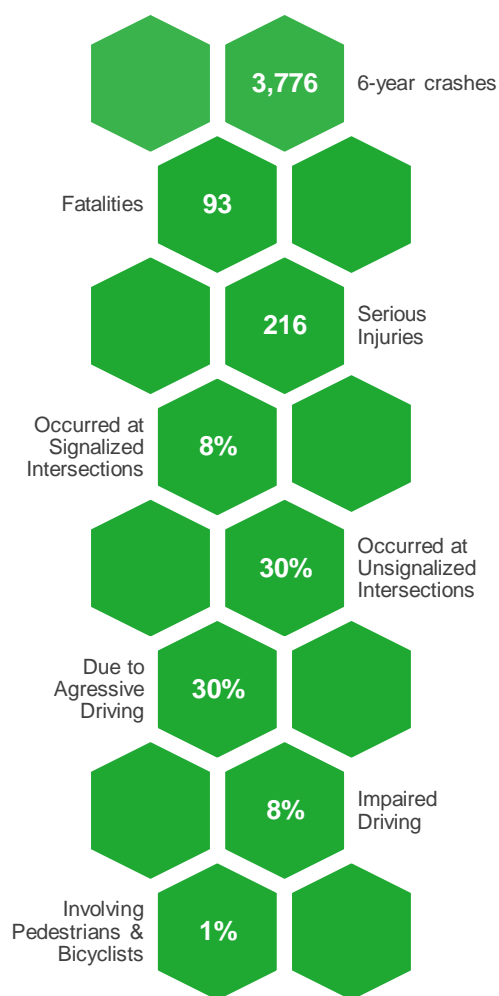
Goal #1: Identify areas with a high risk for crashes.

Goal #2: Illustrate the value of a comprehensive safety program and the systemic process.

Goal #3: Plan future safety improvements for near-, mid- and long-term.

Goal #4: Define safety projects for HSIP and other program funding consideration.

This LRSP analyzes the most recent 6-year range of crash data (January 1, 2016 – December 31, 2021) and roadway improvements to assess historic trends, patterns, and areas of increasing concern.



Source: Imperial County Crash Database (2016- 2021)



Further, the crash history was analyzed to identify locations with elevated risk of crashes either through their crash histories or their similarities to other locations with more active crash patterns. Using a network screening process, locations were identified within the County that will most likely benefit from safety enhancements. Using historic crash data, crash risk factors for the entire network were derived. The outcomes informed the identification and prioritization of engineering and non-infrastructure safety measures to address certain roadway characteristics and related behaviors that contribute to motor vehicle crashes with active transportation users.

Emphasis areas were developed by revisiting the vision and goals developed at the onset of the planning process and comparing them with the trends and patterns identified in the crash analysis.

Emphasis Area #1: Lane Departure

Emphasis Area #2: Occupant Protection

Emphasis Area #3: Aggressive Driving

Emphasis Area #4: Intersection Improvements

Emphasis Area #5: Impaired Driving

The crash locations were identified through the analysis process based on their crash histories, public engagement and input, the observed crash patterns, and their different characteristics to provide the most insight into potential systemic safety countermeasures that the County can employ to achieve the most cost-effective safety benefits. Countermeasures are subjected to a benefit/cost assessment and scored according to their potential return on investment. The potential benefit of these countermeasures at locations with similar design characteristics can then be extrapolated regardless of crash history, allowing for proactive safety enhancements that can prevent future safety challenges from developing. Additionally, this information can be used to help the County apply for grants and other funding opportunities to implement these safety improvements. These grants and funding opportunities include the Highway Safety Improvement Program (HSIP), administered by Caltrans, the Safe Streets for All (SS4A) administered by the federal government, and the Active Transportation Program (ATP) funds, which are administered by the State of California. There are also funding sources administered by the Imperial County Transportation Commission (ICTC). The completion of an LRSP is required for some of these programs and will allow the Imperial County to be eligible for these funds.

Near-term action items were identified to accelerate the County's achievement of the goals and vision of this LRSP. The County can:

- Actively seek other funding opportunities to improve safety for all modal users,
- Collaborate with established safety partners & neighboring municipalities as improvements are made to create a cohesive transportation network, and
- Iteratively evaluate existing and proposed transportation safety programs and capital improvements to design a safer transportation network in Imperial County.



These recommendations provide Imperial County with a look-ahead for safety improvements that can be applied systemically. An evaluation and implementation plan were created that identifies actionable items that will help the County achieve the goals and vision set out in this report. This section will lay out next steps for the County to continue to capitalize on the analysis and information provided in this report. It is recommended that the County Council formally adopt this plan, and to update the plan once every five years.



1. Introduction

This Local Road Safety Plan (LRSP) identifies emphasis areas to inform and guide further safety evaluation of the County's transportation network. The emphasis areas include the type of crash, focused locations, and notable relationships between current efforts and crash history. The LRSP analyzes crash data on an aggregate basis as well as at specific locations to identify high-crash locations, high-risk locations, and Countywide trends and patterns. The analysis of crash history throughout the County's transportation network allows for the following opportunities:

1. Identify factors in the transportation network that inhibit safety for all roadway users,
2. Improve safety at specific high-crash locations, and
3. Develop safety measures using the four Es of safety (Engineering, Enforcement, Education, and Emergency Response,) to encourage safer driver behavior and better severity outcomes.

Imperial County has taken steps to enhance all modal safety throughout the County and with this LRSP, Imperial County is continuing to prioritize safety in its planning processes. In 2020, the California Office of Traffic Safety ranked Imperial County 58 out of the 58 counties in the state for traffic injuries after normalizing for population and Vehicle Miles Traveled (VMT), which suggests that the County is the best performer in the state for limiting injuries on County roadways.

Based on University of California Berkeley's Transportation Injury Mapping System (TIMS) and California Department of Transportation (Caltrans) Vehicle Operation Cost Parameters, Imperial County's economic losses due to traffic injuries amounted to approximately \$53 million from 2013 to 2022. This report identifies factors associated with the most vehicle crashes particular to the County and proposes matching countermeasures to reduce or eliminate those crashes.

The intent of the LRSP is to:

- Create a greater awareness of road safety and risks
- Reduce the number of fatal and severe-injury crashes
- Develop lasting partnerships
- Support for grant/funding applications, and
- Prioritize investments in traffic safety.



2. Vision and Goals

The Imperial County LRSP evaluates the transportation network as well as non-infrastructure programs and policies within the County. Mitigation measures are evaluated using criteria to analyze the safety of road users (drivers, bicyclists, and pedestrians), the interaction of modes, the influences on the roadway network from adjacent municipalities, and the potential benefits of safety countermeasures. Through analysis of historical data and trends, community outreach and input, and proactive identification, safety opportunities can be identified and implemented without relying solely on a reaction and response to crashes as they occur.

As cities, counties and regions across the country have implemented LRSPs and systemically addressed the conditions leading to fatal and severe-injury crashes, the Federal Highway Administration (FHWA) has found that LRSPs effectively improve safety. LRSPs provide a locally developed and customized roadmap to directly address the most common safety challenges in the given jurisdiction. This project's vision, goals, and objectives have been established to reflect discussions with Imperial County staff, various stakeholders identified by County staff, input from community members, and a review of existing plans/policies in the area.

VISION:

To enhance the transportation network for all users to move towards a goal of zero traffic fatalities and serious injuries

Goal #1: Identify areas with a high risk for crashes.

Objectives:

- Evaluate the County's roadway network for crash activity.
- Identify intersections and segments in need of mitigation.
- Identify areas of interest with respect to safety concerns for pedestrians and bicycles.

Goal #2: Illustrate the value of a comprehensive safety program and the systematic process.

Objectives:

- Demonstrate the systemic process' ability to identify locations with higher risk for crashes based on present characteristics closely associated with severe crashes.
- Demonstrate, through the systemic process, the gaps and data collection activities that can be improved upon.

Goal #3: Define safety improvements for the near-, mid- and long-term, including projects for HSIP, SS4A and other program funding considerations.



Objectives:

- a. Create the outline for a prioritization process that can be used in forth-coming funding cycles.
- b. Demonstrate the correlation between the proposed safety countermeasures with the Vision Zero Initiative and the California State Highway Safety Plan (SHSP).

Goal #4: Identify emphasis areas to prioritize countermeasure application.

Objectives:

- a. Use systemic crash analysis to identify emphasis areas.
- b. Prioritize emphasis areas for countermeasure development.
- c. Align emphasis areas with County goals & objectives.
- d. Align emphasis areas with current County areas of concern: lane departure, occupant protection, aggressive driving, intersection improvement, and impaired driving.

Goal #5: Proposed List of Conceptual Priority Projects for Implementation of Countermeasures

Objectives:

- a. Identify conceptual priority projects for implementation.
- b. Identify similar areas where countermeasures can be implemented.
- c. Prioritize these countermeasures for implementation based on cost, effort, and timeline.



3. Process

The primary goal for the County and their safety partners is to provide safe, sustainable, and efficient mobility choices for their residents and visitors. Through the development and implementation of this LRSP, the County will continue its collaboration with safety partners to identify and discuss safety issues within the community.

Guidance on the LRSP process is provided at both the national (FHWA) and state (Caltrans) level, and both agencies have developed a general framework of data and recommendations for an LRSP.

FHWA encourages the following:

- The establishment of a working group (stakeholders) to participate in developing an LRSP.
- A review of crash, traffic, and roadway data to identify areas of concern.
- The identification of goals, priorities, and countermeasures to recommend improvements at spot locations, systemically, and comprehensively.

Caltrans guidance follows a similar outline with the following steps:

- Establish leadership.
- Analyze the safety data.
- Determine emphasis areas.
- Identify strategies.
- Prioritize and incorporate strategies.
- Evaluate and update the LRSP.

This LRSP documents the results of data and information obtained, including the preliminary vision and goals for the LRSP, existing safety efforts, initial crash analysis, and developed emphasis areas. The LRSP recommendations consider the four Es of traffic safety defined by the California Strategic Highway Safety Plan (SHSP): Engineering, Enforcement, Education, and Emergency Response.

3.1 Guiding Manuals

This section describes the analysis process undertaken to evaluate safety within Imperial County at a systemic level. This report identifies specific locations within the County that will benefit from safety enhancements and derives crash risk factors based on historic crash data using a network screening process. The outcome will inform the identification and prioritization of engineering and non-infrastructure safety measures by addressing certain roadway characteristics and related driving behaviors contributing to crashes. This process uses the latest national and state best practices for statistical roadway analysis described.



3.1.1 Local Roadway Safety Manual

The *Local Roadway Safety Manual: A Manual for California's Local Road Owners* (Version 1.6, April 2022) encourages local agencies to pursue a proactive approach when identifying and analyzing safety issues and preparing to compete for project funding opportunities. A proactive approach is the analyzation of safety in an entire roadway network through either a one-time network wide analysis or a routine analysis of the roadway network.¹

According to the *Local Roadway Safety Manual* (LRSM), “the California Department of Transportation (Caltrans) – Division of Local Assistance is responsible for administering California’s federal safety funding intended for local safety improvements.”

To provide the most beneficial and competitive funding approach, the analysis leading to countermeasure selection should focus on both intersections and roadway segments and maintain consideration of roadway characteristics and traffic volumes. The result should reflect a list of locations that are most likely to benefit from cost-effective countermeasures, preferably prioritized by benefit/cost ratio. The manual suggests using a mixture of quantitative and qualitative measures to identify and rank locations using both crash frequency and crash rates. These findings should then be screened for crash type and severity patterns to determine the cause of crashes and the potential effective countermeasures. Qualitative analysis should include field visits and a review of existing roadway characteristics and devices. The specific roadway context can then be used to assess conditions that may decrease safety at the site and at systematic levels.

Countermeasure selection should be supported using Crash Modification Factors (CMFs). These factors are a peer reviewed product of research quantifying the expected rate of crash reduction expected from a given countermeasure. If more than one countermeasure is under consideration, the LRSM provides guidance on appropriate application of CMFs.

3.1.2 Highway Safety Manual

The American Association of State Highway and Transportation Officials (AASHTO) *Highway Safety Manual* (HSM), published in 2010, presents a variety of methods for quantitatively estimating crash frequency or severity at a variety of locations.² This four-part manual is divided into the following parts: A) Introduction, Human Factors, and Fundamentals, B) Roadway Safety Management Process, C) Predictive Method, D) Crash Modification Factors.

In Chapter 4 of Part B in the HSM, the “Network Screening Process” is a tool for an agency to analyze the entire network and identify/rank locations that are most likely or least likely to realize a reduction in the frequency of crashes.

¹ Local Roadway Safety Manual (Version 1.6) 2022. Page 5.

² AASHTO, Highway Safety Manual, 2010, Washington D.C., <http://www.highwaysafetymanual.org/Pages/About.aspx>



The HSM identifies five steps in this process:³

1. **Establish Focus:** Identify the purpose or intended outcome of the network screening analysis. This decision will influence data needs, the selection of performance measures and the screening method that can be applied.
2. **Identify Network and Establish Reference Populations:** Specify the types of sites or facilities being screened (i.e., segments, intersections, geometrics) and identify groupings of similar sites or facilities.
3. **Select Performance Measures:** There are a variety of performance measures available to evaluate the potential to reduce crash frequency at a site. In this step, the performance measure is selected as a function of the screening focus and the data and analytical tools available.
4. **Select Screening Method:** There are three principal screening methods described in this chapter (i.e., ranking, sliding window, peak searching). Each method has advantages and disadvantages; the most appropriate method for a given situation should be selected.
5. **Screen and Evaluate Results:** The final step in the process is to conduct the screening and analysis and evaluate the results.

The HSM provides several statistical methods for screening roadway networks and identifying high risk locations based on overall crash histories.

3.2 Analysis Techniques

3.2.1 Crash and Network Screening Analysis

Intersections and roadways were analyzed using four crash metrics:

- Number of Crashes
- Critical Crash Rate (HSM Ch. 4)
- Probability of Specific Crash Types Exceeding Threshold Proportion (HSM Ch. 4)
- Equivalent Property Damage Only (HSM Ch. 4)

The initial steps of the crash analysis established sub-populations of roadway segments and intersections that have similar characteristics. For this study, intersections were grouped by their control type (Signalized, or Unsignalized) and segments by their roadway category (Prime Arterial, Minor Arterial, Major Collector, Minor Collector, or Local Streets). Individual crash rates were calculated for each sub-population. The population level crash rates were then used to assess whether a specific location has more or fewer crashes than expected. These sub-

³ AASHTO. *Highway Safety Manual*. 2010. Washington, DC. Page 4-2.



populations were also used to determine typical crash patterns to help identify locations where unusual numbers of specific crash types are seen.

The network screening process ranks intersections and roadway segments by the number of crashes that occurred at each one over the analysis period, and then identifies areas that had more of a given type of crash than would be expected for that type of location. These crash type factors were 1) crash injury (fatal, severe injury, other visible injury, complaint of pain, property damage only), 2) crash type (broadside, rear-end, sideswipe, head-on, hit object, overturned, bicycle, pedestrian, other), 3) environmental factors (lighting, wet roads), 4) driver behavior (aggressive), and 5) driver impairment. With these additional factors, the locations were further analyzed and assigned a new rank.

From the results of the network screening analyses, a short-list of locations was chosen based on crash activity, crash severity, crash patterns, location type, and area of the County to provide the greatest variety of locations covering the widest range of safety opportunities for safety toolbox development. The intent is to populate the safety toolbox with mitigation measures that will be applicable to most of the crash activity in the County. As a result, ten locations have been selected for mitigation analysis.

3.2.2 Statistical Performance Measures

Critical Crash Rate (CCR)

Reviewing the number of crashes at a location is a method used to understand the cost to society incurred at the local level; however, it does not give a complete indication of the level of risk for those who use that intersection or roadway segment daily. The Highway Safety Manual describes the Critical Crash Rate method which provides a statistical review of locations to determine where risk is higher than that experienced by other similar locations. It is also the first step in analyzing patterns that may suggest systemic issues that can be addressed at that location, and proactively at others to prevent new safety challenges from emerging.

The Critical Crash Rate compares the observed crash rate to the expected crash rate at a location based on facility type and volume using a locally calculated average crash rate for the specific type of intersection or roadway segment being analyzed. Based on traffic volumes and a weighted countywide crash rate for each facility type, a critical crash rate threshold is established at the 95% confidence level to determine locations with higher crash rates that are unlikely to be random. The threshold is calculated for each location individually based on its traffic volume and the crash profile of similar facilities.



Figure 1 – Critical Crash Rate Formula

$$R_{c,i} = R_a + \left[P \times \sqrt{\frac{R_a}{MEV_i}} \right] + \left[\frac{1}{(2 \times (MEV_i))} \right]$$

Where,

$R_{c,i}$ = Critical crash rate for intersection i

R_a = Weighted average crash rate for reference population

P = P -value for corresponding confidence level

MEV_i = Million entering vehicles for intersection i

Source: Highway Safety Manual

DATA NEEDS

CCR can be calculated using:

- Daily entering volume for intersections, or VMT for roadway segments.
- Intersection control types to separate them into like populations.
- Roadway functional classification to separate them into like populations.
- Crash records in GIS or tabular form including coordinates or linear measures.

STRENGTHS

- Reduces low volume exaggeration.
- Considers variance.
- Establishes comparison threshold.

CCR Methodology

The process of analyzing the CCR and comparing locations (separately by intersections and segments) is a multi-step process. The following is a high-level description of the process undertaken to develop the initial ranking of locations.

The first step in the process was to establish a Countywide crash rate for each facility population. These populations are broken into two categories with sub-categories:

- Intersection:
 - Signalized
 - Unsignalized
- Roadway Classification:
 - Prime Arterial
 - Minor Arterial
 - Major Collector
 - Minor Collector
 - Local Street



The individual crash rate for each location was then calculated based on the associated traffic volume. This volume was either collected through data count resources or calculated based on the roadway classification. The next step was to establish a Significance Threshold. This threshold was used to determine what level of exceedance (how much the crash rate exceeded the critical crash rate) a location must have based on traffic volume to provide a high level of confidence that the crash occurring at the location is not random. For this study, a confidence level of 95% was used. The local crash rates were then compared to Significance Threshold to see if each location exceeded the expected CCR and if so, by how much. After this analysis was completed, the locations were ranked by their categories according to that level of exceedance.

Equivalent Property Damage Only (EPDO)

The equivalent property damage only (EPDO) method is described in the Highway Safety Manual. This method assigns weighting factors to crashes based on injury level (severe, injury, property damage only) to develop a property damage only score. In this analysis, the injury crash costs were calculated for each location (based on the latest Caltrans injury costs). This figure is then divided by the injury cost for a property damage only crash. The resulting number is the equivalent number of property damage only crashes at each site. This figure allows all locations to be compared based on injury crash costs (Highway Safety Manual, Chapter 4).

Probability

The Highway Safety Manual describes the methodology for determining the probability that crash type is greater than an identified threshold proportion. This helps to identify locations where a crash type is more likely to occur.

DATA NEEDS

The probability of a specific crash type can be determined using crashes records with location data, and classifications of the locations (intersections or segments) studied.

STRENGTHS

- Can be used as a diagnostic tool.
- Considers variance in data.
- Not affected by selection bias.

The HSM methodology first determines the frequency of a specific crash type at an individual location, then determines the observed proportion of that crash type relative to all crash types at that location. A threshold proportion is then determined for the specific crash type; HSM suggests utilizing the proportion of the crash type observed in the entire reference population (e.g. throughout the entire County).

These proportions are then utilized to determine the probability that the proportion of a specific crash type is greater than the long-term expected proportion of that crash type.



Figure 2 – Probability of Specific Crash Types Exceeding Threshold Proportion

$$P(p_i > \overline{p}_i^* / N_{observed,i} / N_{observed,i(TOTAL)}) = 1 - \text{betadist}(\overline{p}_i^*, a + N_{observed,i}, \beta + N_{observed,i(TOTAL)} - N_{observed,i})$$

Where:

\overline{p}_i^* = Threshold proportion

p_i = Observed proportion

$N_{observed,i}$ = Observed target crashes for a site i

$N_{observed,i(TOTAL)}$ = Total number of crashes for a site i

Source: Highway Safety Manual

3.3 Future Analysis

The County will conduct regular crash monitoring as described in **Section 11.2**. The County will then refresh the analysis and update the LRSP every 5 years to maintain eligibility for HSIP funding, as described in **Section 11.2**.



4. Public Engagement and Agency Coordination

Members of the public and local agency partners were included in the development of this report to ensure the local perspective was maintained at the forefront of planning efforts. A stakeholder group of County staff and external representatives from the Imperial County Transportation Commission Technical Advisory Committee and Imperial County Traffic Advisory Committee.

The members of the public agency partners were called together to offer insight on the safety issues present in the County's transportation network. After the initial network screening and safety analysis, the stakeholder group met to discuss potential countermeasures and challenge areas through a field visit. The summary of the field visit meeting is outlined below.

4.1 Stakeholder Meeting

Two stakeholder meetings were conducted On December 14th, 2024, and December 27th, 2024. At the meetings, the stakeholders were introduced to the project and provided an overview of the data used, the required outputs, and the potential outcomes of the study.

In addition to the overview, stakeholders were asked to provide local insight and knowledge at several "case study" locations that were identified after the initial screening and crash analysis process. This stakeholder input was valuable to the development of the LRSP by guiding the project team to emphasis areas and by providing experiential data on case study locations.

4.2 Field Tour Meeting

On January 3rd, 2024, the project team visited each of the 10 potential case study locations. This process was important to understand the factors that were contributing to the collision history. The working group then performed a field visit and walking tour of various locations through the County. The discussions during the field visits helped to inform the project development that will be discussed later in this plan.



5. Existing Efforts

Existing plans, policies, and projects that were recently completed, planned, or on-going were compiled at the start of the LRSP process to gain perspective on the existing efforts for transportation-related improvements within the County. High-level key points regarding transportation improvements and safety-related topics were identified to inform decision making in this LRSP. **Table 1** outlines the relevant existing County plans and **Table 2** outlines the relevant existing county projects and their respective timelines.

Table 1 – Review of Existing County Plans

Document Name	Transportation Policies/Improvements
Imperial County General Plan-Circulation and Scenic Highway Element (2008)	<ul style="list-style-type: none"> A comprehensive document which outlines the transportation needs of the county and alternative modes of transportation to meet these needs. Element also prioritizes the needs of protecting and enhancing scenic resources within both rural and urban scenic highway corridors. Developing a circulation system is important to provide the movement of goods and people, including pedestrians, bicycles, transit, train, air, and automobile traffic flow within and through the community.
Imperial County Regional Active Transportation Plan (2022)	<ul style="list-style-type: none"> Document conducted by Imperial County Transportation Commission that allocated research, analyzes, and engagement with communities to identify active transportation needs. Comprehensive document is intended to achieve short, mid, and long-term projects for walking, bicycling, use of public transit, and other related transportation.
Imperial County Pedestrian Master Plan (2021)	<ul style="list-style-type: none"> A plan to help integrate a system of pedestrian facilities for the unincorporated communities within the county. The plan develops formal sidewalks, walking paths, safe routes for children, and adults to walk to school and to destinations in the communities. The plan highlights needs and priorities that address issues such as safety, security, environmental issues, convenience accessibility, and connectivity of pedestrian infrastructure.
Imperial County Long Range Transportation Plan (2013)	<ul style="list-style-type: none"> Outlines existing conditions of the transportation infrastructure and includes goods movement, transit program, land use, as well as Transportation Demand Management (TDM) and Transportation System Management (TSM) strategies. Examines regional priority for funding, connectivity with local jurisdictional mobility and circulation elements. Details a prioritized list of highway facility and roadway improvement projects within Imperial County.



Document Name	Transportation Policies/Improvements
Imperial County Regional Climate Action Plan (2021)	<ul style="list-style-type: none"> Purpose of the document is to address the impacts of climate change and reduce greenhouse gas emissions in the Imperial Valley region. Document develops local strategies, measures and actions aimed to reduce GHG emissions.
Mobility Hub Strategy	<ul style="list-style-type: none"> Document developed by Imperial County Transportation Commission and San Diego Association of Governments to demonstrate how transportation services, amenities, and supporting technologies can work together to make it easier for communities to access transit and other shared mobility choices.

Table 2 – Review of Existing County Projects

Project Name	Timeline	Transportation Policies/Improvements
I-8 Update Imperial County	2017 - 2020	Construction of continuously reinforced concrete pavement for about 48 miles
Overlay of Picacho Road from Winterhaven Drive to Quechan Drive	2021 - 2022	Clean and seal all cracks wider than ¼ inch with a rubberized crack filler material. Installation of a Tensar Glaspave 50 over a 1-inch leveling course and installation of 2 inches of A.C. pavement.
Bombay Beach Townsite Roadway Improvement Project	2023	Street sections to be improved by installing variable depth hot mix overlay, ARAM and Type 2 slurry. Improvements also include for some sections of A.C. skin patch followed by a variable depth hot mix overlay, ARAM and Type 2 slurry.
Orchard road Improvements from State Route 7 to Alamo River	2022 - 2023	Pavement and striping improvements
Aten Road Class I Bicycle Path	2023 - 2024	Installation of bicycle path and solar LED pedestrian scale light poles
Traffic Signal at SR-86 and Borrego Salton Seaway	2015	Traffic signal improvements
Traffic Signal at SR-86 & Dogwood Rd	Planned for 2026	Traffic signal improvements



Project Name	Timeline	Transportation Policies/Improvements
Calexico East Port of Entry Bridge Expansion	2021 - 2023	Project will widen the Bridge on its east side to minimize traffic impacts. Project will add four northbound lanes; two commercial vehicle lanes and two passenger vehicle lanes
Calexico Intermodal Transportation Center	Begin Construction 2024	Project is composed of design and construction of a new Intermodal Transportation Center. Will serve as a regional mobility hub that will accommodate bus bays for Imperial Valley Transit, farm Labor Buses, taxis, and Greyhound or other interregional bus services
Forrester Road Improvement	In Planning Stage	Road improvements from Forrester Road between I-8 and SR-78/86.
SR-86 Border Patrol Checkpoint Expansion	In Planning Stage	Improvement of checkpoint includes installation of canopy with 2 northbound primary inspection lanes on the existing SR-86 and have one dedicated truck inspection lane to secondary inspection
Interstate 8 Imperial Avenue Interchange	2020 - 2023	Provide access from Interstate 8 (I-8) to southbound Imperial-Avenue planned to be extended south of the freeway by the County of El Centro, and eliminate the current out of direction travel on County roadway



6. Data Summary

This section describes the data sources used for the analysis process of this LRSP.

6.1 Roadway Network

The California Department of Transportation (Caltrans) California Road System (CRS) GIS database was used to build the base roadway network used for this analysis. Intersections and roadway segments were divided into control and classification categories so that each set could have its own crash rates and be compared with similar facilities or control type. Traffic volumes and signal locations were provided by the County (from the SSAR) and were included in the analysis network. Functional Classifications were imported from the County's General Plan and confirmed by County staff. **Figure 3** illustrates the Imperial County's roadway functional classification and intersection control type, respectively, as used for this study.

6.2 Crash Data

Crash data was collected from Crossroads Software for the period from January 1, 2016, through December 31, 2021. Six years of data are utilized instead of the standard three years to provide more history to evaluate trends or patterns. Analysis of the raw crash data is the first step in understanding the specific and systemic challenges faced throughout the County. Analyzing the six years of data provided insight on the crash trends and patterns detailed in **Section 7**. The locations of fatal and severe injury crashes are displayed in **Figure 4**.



Figure 3 – Functional Classification & Signalized Intersections

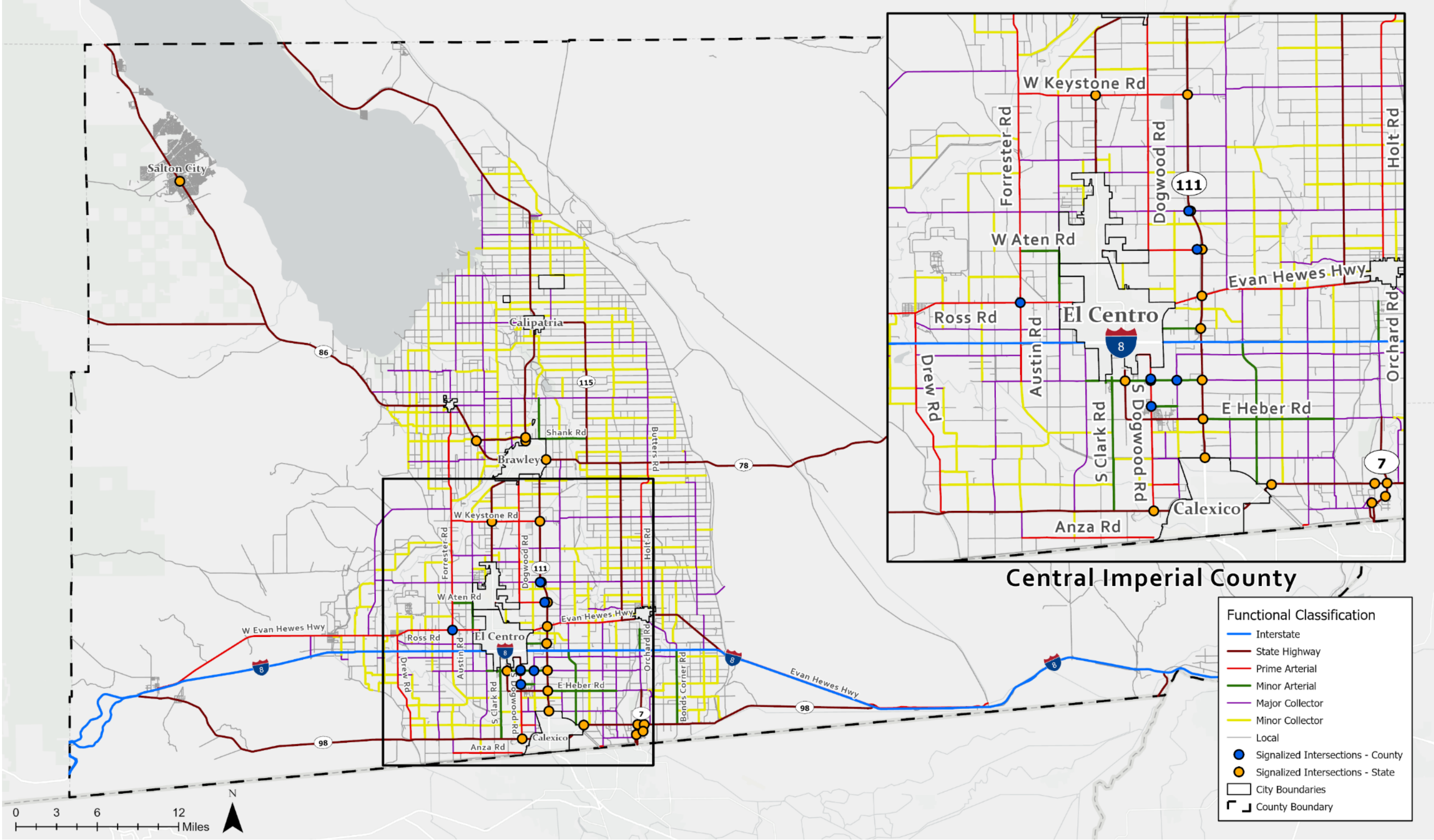
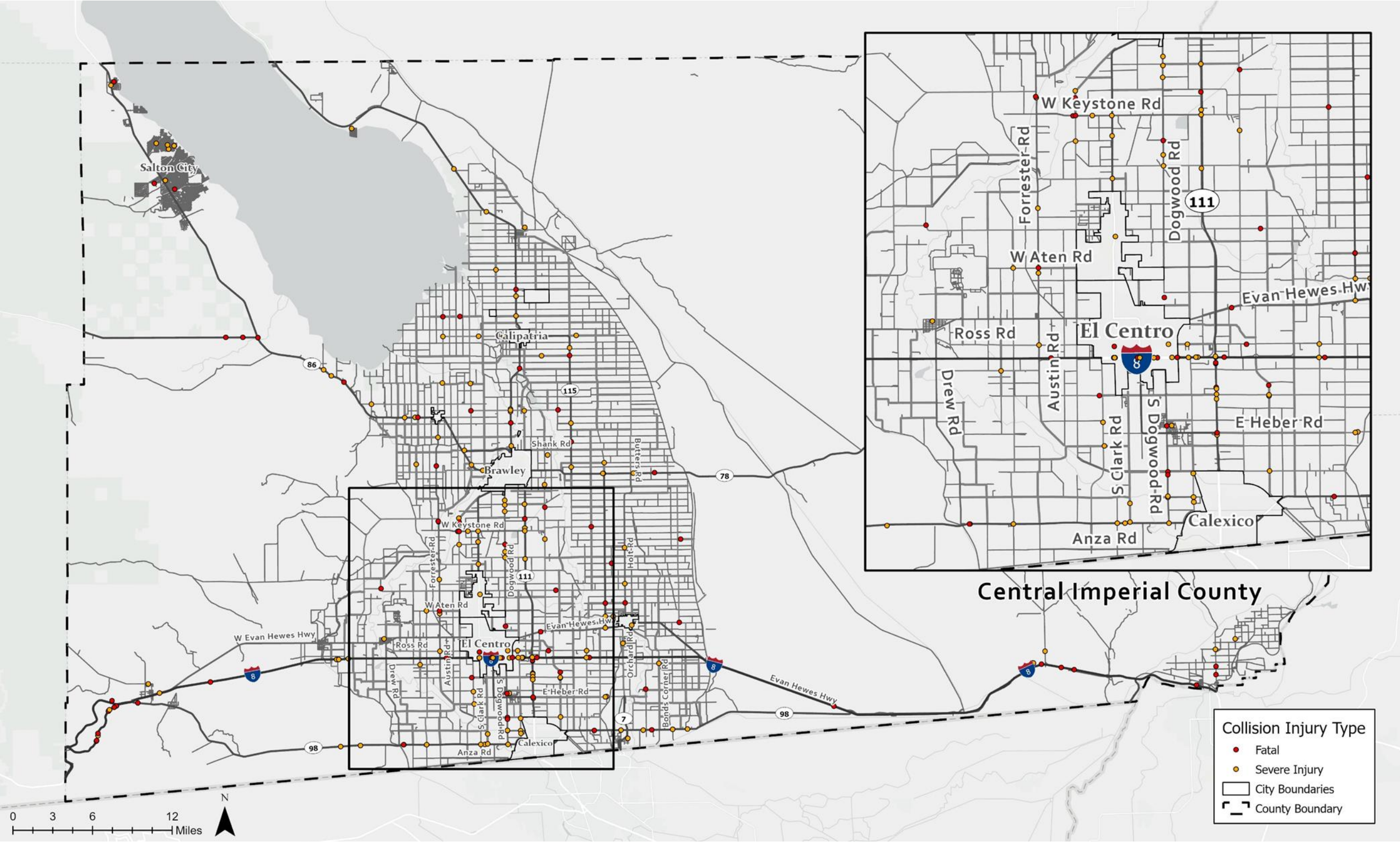




Figure 4 – Fatal & Severe Injury Collisions (2016-2021)



7. Crash Safety Trends

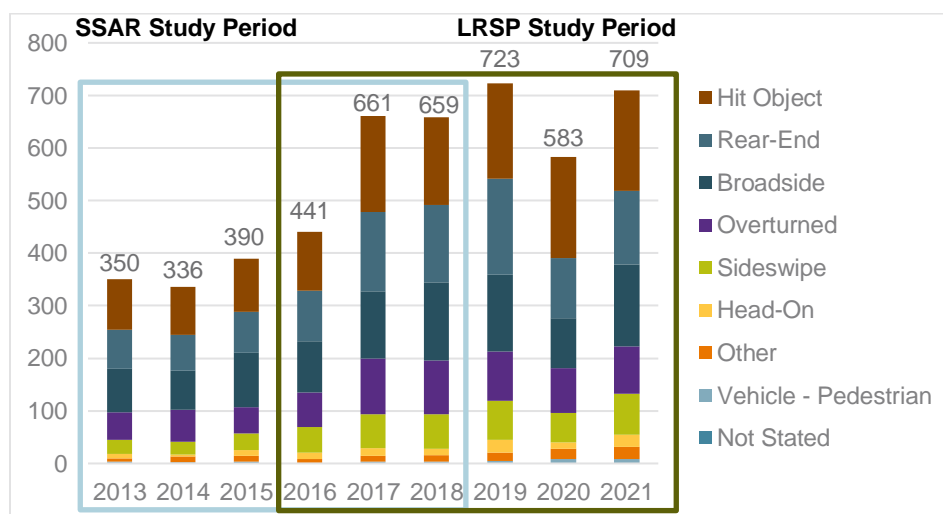
The analysis was conducted using a network screening process for the County-maintained roadway system based on crash records spanning from January 1, 2013, through September 30, 2022. This section contains the results of the analysis, which included the evaluation of Imperial County's fatal and severe injury (generally denoted as K+SI) crashes, statewide K+SI crashes, pedestrian crashes, bicycle crashes, crash severity levels, and crash causes.

7.1 All Crashes

This report utilized crash data for a six-year period as the LRSP Study Period to provide a better understanding of trends and to reflect the patterns in crashes that have occurred on County streets. Additional data for a six-year period (2013-2018) was incorporated to analyze data from the SSAR. Additional data included from SSAR compares similarities and differences to the LRSP dataset. Data used for this report was extracted from Crossroads Software on October 31, 2022, and was current as of that date. Crash data from January 1, 2016, through December 31, 2021 (the most recent data available) as reported to Crossroads from the local enforcement indicated that during this time there were 3,776 crashes recorded within Imperial County.

During this time, the most common occurring crash types were Hit Objects (27%) and Rear-Ends (22%). The total number of collisions remained roughly constant throughout the study period, as shown in **Figure 5**. In comparison, the most common occurring collision types during the 2013-2018 collision period were Hit-Object (27%) and Broadside (22%). Collision patterns in Imperial County reflect national trends.

Figure 5 – Crash Type by Year (2013-2018 and 2016-2021)



Source: Crossroads Database (2013-2022)

7.2 Fatalities & Severe Injuries

During the study period, 93 fatal crashes and 216 severe injury crashes occurred during the LRSP Study Period, as seen in **Figure 4**. In comparison, 75 fatal collisions and 120 severe injury collisions occurred during the 2013-2018 period. **Table 3** outlines the fatal and severe injury crashes categorized by modes involved.

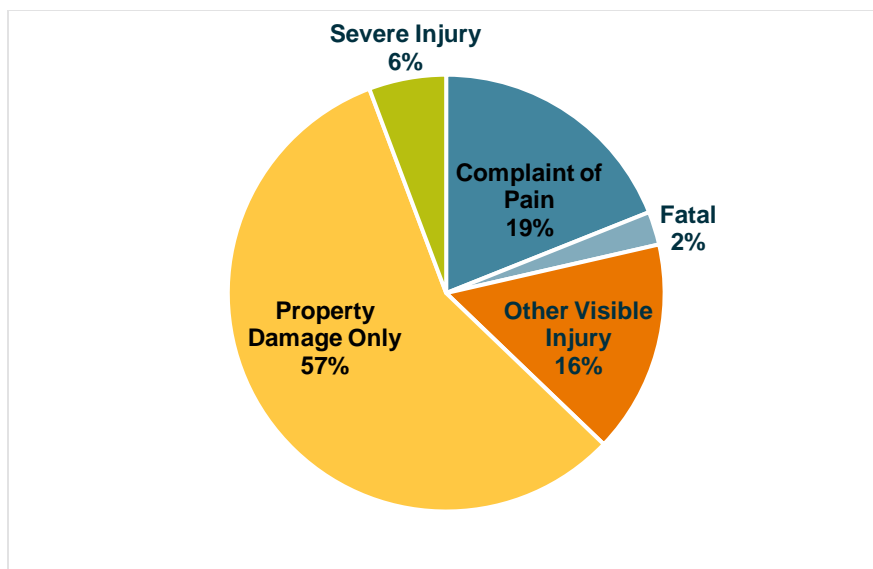
Table 3 – Fatal and Severe Injury Crashes Categorized by Modes Involved (2013-2018 and 2016-2021)

Involved With	# of Fatal Collisions (2013-2018)	# of Severe Injury Collisions (2013-2018)	# of Fatal Collisions (2016-2021)	# of Severe Injury Collisions (2016-2021)
Other Motor Vehicle	34	55	40	91
Non-Collisions (Overturned)	18	24	18	51
Fixed Object	13	27	20	51
Pedestrian	5	1	10	7
Other Object	-	3	-	8
Bicycle	1	2	3	2
Parked Motor Vehicle	2	3	1	2
Motor Vehicle on Other Roadway	1	4	-	3
Animal	1	1	1	-
Train	-	-	-	1
TOTAL	75	120	93	216

7.3 Injury Levels

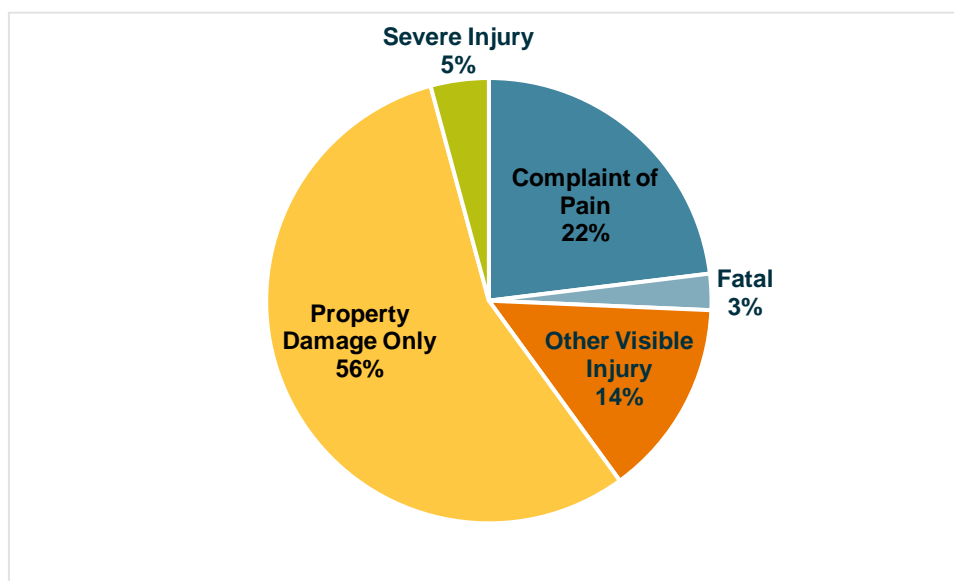
As shown in **Figure 6**, 57% of the collisions reported during the time-period (2016-2021) resulted in property damage only, followed by 19% of complaint of pain and 16% of other visible injuries. Fatalities and severe injuries totaled 8% of all collisions. In comparison, the most common collision reported during the 2013-2018 period resulted in 56% in property damage only, followed by 22% of compliant of pain and 14% of other visible injuries as shown in **Figure 7**.

Figure 6 – Crashes by Injury Levels (2016-2021)



Source: Crossroads Database (2016-2021)

Figure 7 – Crashes by Injury Levels (2013-2018)



Source: Crossroads Database (2013-2018)

7.4 Cause of Crash

The highest recorded cause of crashes in Imperial County during the LRSP Study Period (2016-2021) is Improper Turning at 32.5%, followed by Unsafe Speed at 25.5% and Auto Right-of-Way Violation at 14.5%, as shown on **Table 4**. Issues with Driving Under the Influence also had a substantial impact on the County, comprising 8.2% of the collisions. The highest recorded cause of collisions for the SSAR which utilized 2013-2018 collision data was also Improper Turning at 32.7%, followed by Unsafe Speed at 23.6%, and Auto Right-of-Way Violation at 15.8% of the total collisions.

Table 4 – Cause of Crashes (2013-2018 and 2016-2021)

Primary Collision Factor	No. of Collisions (2013-2018)	%	No. of Collisions (2016-2021)	%
Improper Turning	929	32.7%	1226	32.5%
Unsafe Speed	669	23.6%	964	25.5%
Auto R/W Violation	448	15.8%	547	14.5%
Driving Under Influence	235	8.3%	308	8.2%
Ignoring Traffic Signals and Signs	132	4.7%	170	4.5%
Wrong Side of Road	102	3.6%	118	3.1%
Unsafe Starting or Backing	77	2.7%	81	2.1%
Other Than Driver or Ped	66	2.3%	131	3.5%
Unknown	33	1.2%	33	0.9%
Unsafe Lane Change	31	1.1%	61	1.6%
Other Hazardous Movement	29	1.0%	29	0.8%
Improper Passing	25	0.9%	35	0.9%
Following Too Closely	19	0.7%	15	0.4%
Other Equipment	16	0.6%	22	0.6%
Pedestrian Violation	8	0.3%	19	0.5%
Other Improper Driving	7	0.2%	11	0.3%
Other	6	0.2%	2	0.1%
Impeding Traffic	2	0.1%	3	0.1%
Lights	2	0.1%	-	-
Ped R/W Violation	1	0.04%	-	-
Hazardous Parking	-	-	1	0.03%
Total	2837	100%	3776	100%

Source: Crossroads Database (2013-2018 and 2016-2021)



7.5 Vulnerable Users

7.5.1 Pedestrian Crashes

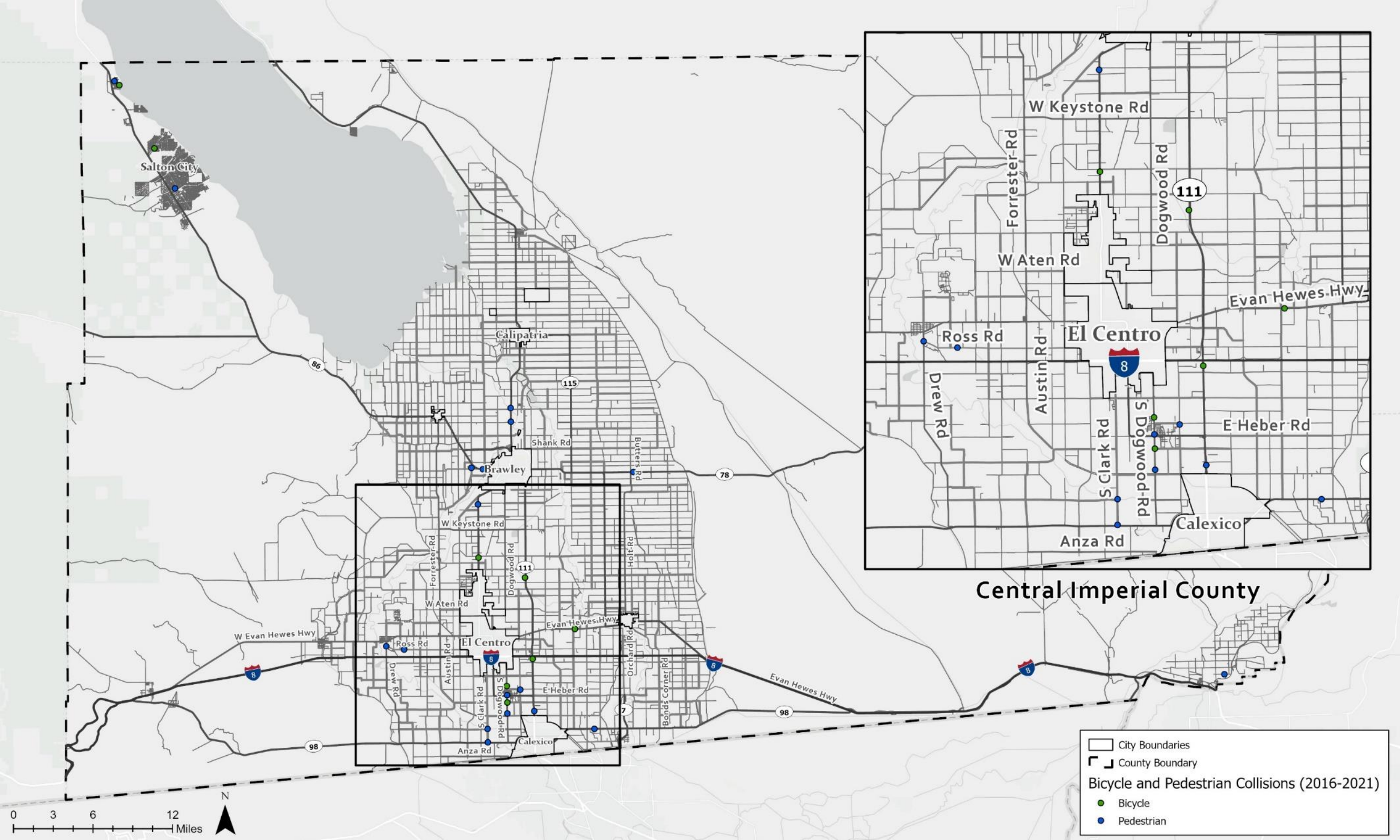
30 pedestrian involved collisions occurred during the LRSP Study Period (2016-2021), resulting in 10 fatal collisions, 7 severe injuries, and 13 collisions with some other form of reported injury or pain. A majority of the County is rural, therefore, pedestrian facilities such as sidewalks and crosswalks are limited to areas with urban and suburban densities. **Figure 8** shows the locations of pedestrian crashes during the LRSP Study Period (2016-2021).

7.5.2 Bicycle Crashes

During the LRSP Study Period (2016-2021), 14 collisions involving bicycles were reported. Of these, 3 were fatal, and 2 resulted in severe injuries. **Figure 8** shows the location of bicycle crashes during the LRSP Study Period (2016-2021).



Figure 8 – Pedestrian & Bicycle Crashes (2016-2021)





7.6 Time of Day

Collisions during the LRSP Study Period (2016-2021) in the County occurred more in the PM hours versus the AM hours, with 58% of collisions occurring in the PM hours, and 42% occurring in the AM hours. There were two peak periods of collision activity, from 6 AM to 9 AM, and from 1 PM to 6 PM. The 3-4 PM hour period was the most common time for collisions. This appears to match general traffic volume trends in the County. A significant number of collisions also occurred in the nighttime hours. 28% of collisions occurred at night or during the dusk/dawn hours. 24% of collisions occurred at night at locations with no streetlights.

During the SSAR Study Period (2013-2018), collisions in the County occurred more in the PM hours versus the AM hours. 56% of collisions occurred in the PM hours, and 44% occurred in the AM hours. There were two peak periods of collision activity, from 5 AM to 7 AM, and from 3 PM to 5 PM. About 15% of collisions occurred at night or during dusk/dawn hours. 22% of collisions occurred at night at locations with no streetlights.

7.7 Behavioral Driving

Aggressive driving and impaired driving are two important behavioral factors that often significantly contribute to collision patterns. These areas are studied in the analysis.

Caltrans defines aggressive driving as behaviors that include driving at an Unsafe Speed, Following Too Closely, and Ignoring Traffic Signals and Signs. These behaviors contributed to slightly over 30% of the collisions in Imperial County during the LRSP Study Period (2016-2021). In SSAR Study Period (2013-2018), 29% of the collisions contributed to aggressive driving.

Impaired driving is defined by Caltrans as any instance where a driver, pedestrian, bicyclists, or motorcyclist is under the influence of alcohol, illicit drugs, or prescribed or over-the-counter medication. Approximately 8% of the collisions in Imperial County during SSAR Study Period (2013-2018) were impaired driving related. Compared to 2016-2021, impaired driving related collisions also resulted in about 8%.

7.8 Driver Age

Two groups of drivers typically have a higher impact on the number of collisions. Aging Drivers (age 65 and up) and Young Drivers (ages 15-20) are more often found at fault for collisions they are involved in. The collision data for 2016-2021 period indicated that 10% of the collisions within Imperial County involved Aging Drivers and 12% involved Young Drivers. These percentages are similar to those seen statewide. In comparison, collision data for 2013-2018 indicated that 5% of the collisions within Imperial County involved Aging Drivers and 8% involved Young Drivers.

7.9 Statewide Comparison

A comparison of fatal & severe injury collision data to the State averages was conducted for data from 2009-2018 (the most recent statewide data available). These numbers may vary slightly from those mentioned previously due to the differences in the years of the study period. The study period for this comparison is 10 years to explore the trends over a longer time period. The following are areas where Imperial County's collision rates are higher or lower than those of the State. These numbers specifically compare the proportion of fatal and severe injury crashes that have the characteristics listed in **Table 5**.



Table 5 - Comparison of Statewide and Imperial County Fatal & Severe Injury Crashes (2009-2018)

California SHSP Challenge Areas	Imperial County No. of Fatal and Severe Injury Collisions	Imperial County % of Fatal and Severe Injuries in Challenge Area	Statewide % of Fatal and Severe Injuries in Challenge Area	% Difference
Lane Departure	375	62.4%	43.3%	19.1%
Commercial Vehicles	98	16.3%	6.4%	9.9%
Occupant Protection	139	23.1%	14.2%	8.9%
Aging Drivers	96	16.0%	12.4%	3.6%
Distracted Driving	33	5.5%	5.0%	0.5%
Work Zones	7	1.2%	1.4%	-0.2%
Young Drivers	71	11.8%	13.1%	-1.3%
Intersections	127	21.1%	23.6%	-2.5%
Impaired Driving	122	20.3%	25.3%	-5.0%
Bicyclists	10	1.7%	8.3%	-6.6%
Motorcyclists	67	11.1%	21.0%	-9.9%
Aggressive Driving	131	21.8%	33.1%	-11.3
Pedestrians	31	5.2%	19.2%	-14.0%

7.10 Crash Network Screening Analysis Results

Figure 9 shows the results of the LRSP crash network screening analysis, with the number of crashes at both intersections and mid-block roadway segments.



Figure 9 – Crash Network Screening Analysis Results – Intersections (2016-2021)

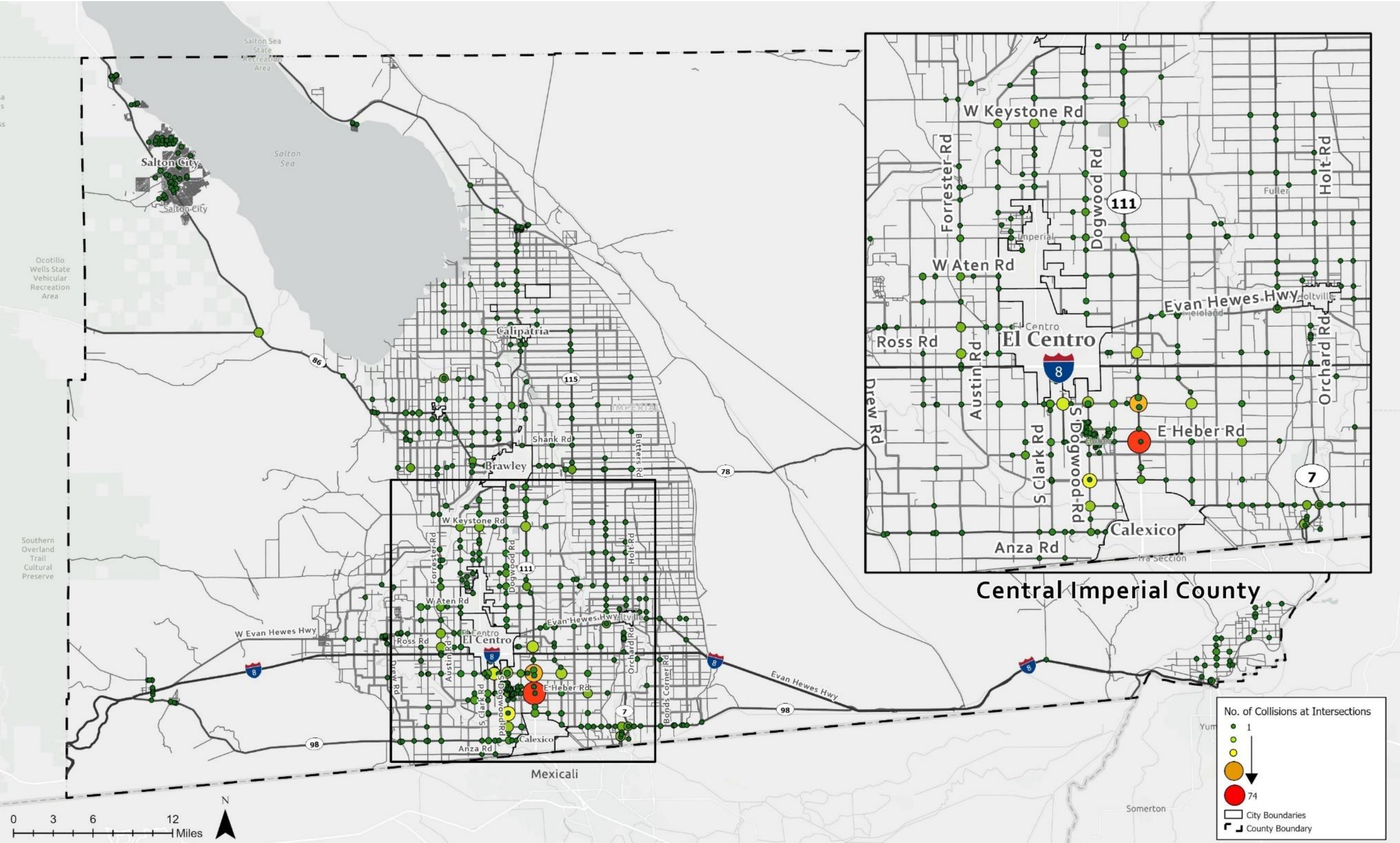




Figure 10 – Crash Network Screening Analysis Results – Roadways (2016-2021)

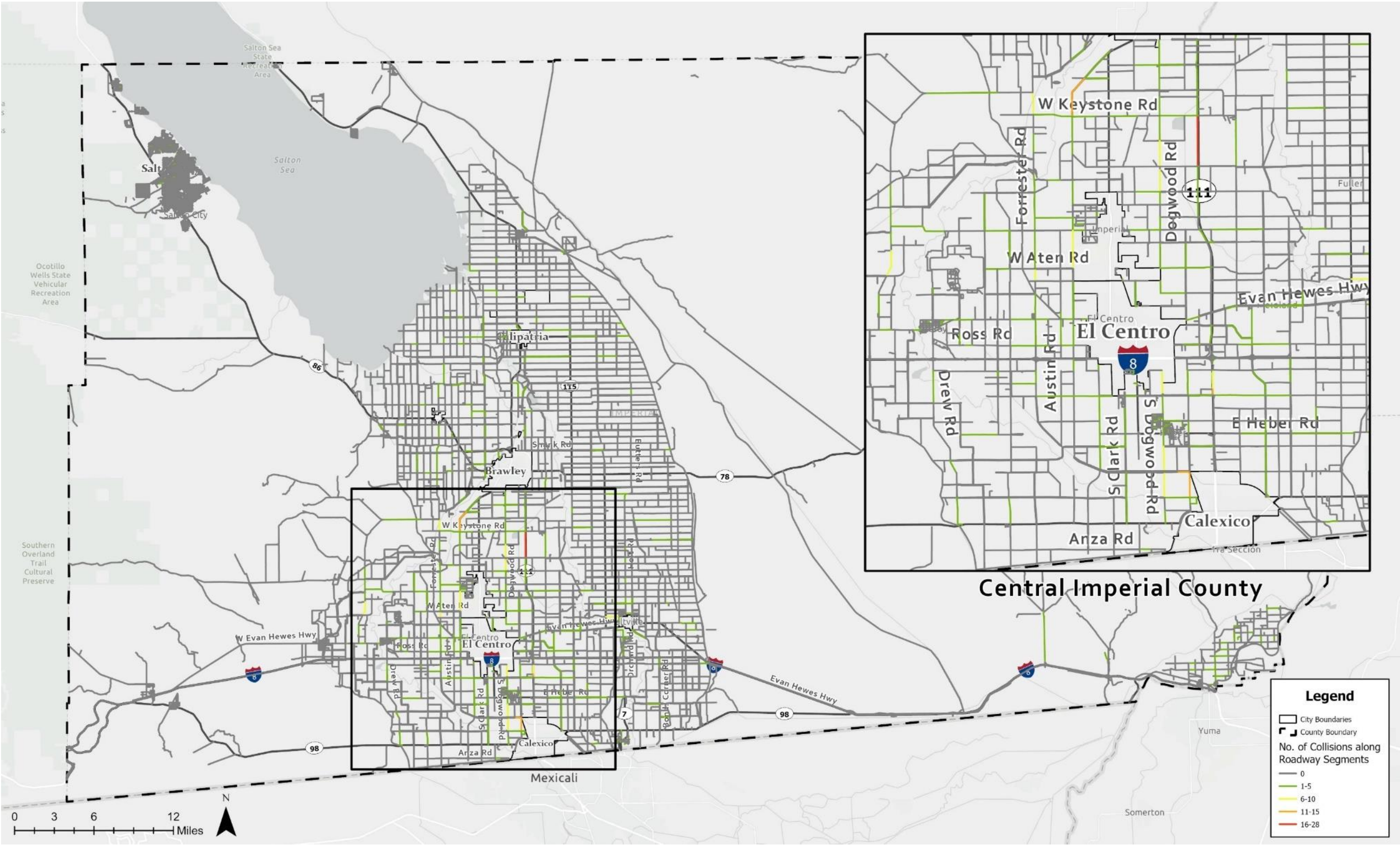




Table 6 – Analysis Results: Intersections and **Table 7 – Analysis Results: Segments** show the number of crashes occurring at locations in Imperial County by crash type for the locations and highlight locations in which the probability of those crash types exceeding the threshold proportion is greater than 33%.

The tables are ordered by the number of collisions that occurred at that segment or intersection (for the 2016-2021 Study Period). The number of collisions in the SSAR Study Period (2013-2018) are also shown as a comparison. In order to be statistically significant, only locations where more than two collisions occurred are represented. At locations with two or less collisions, random chance can account for crash history as much or more than specific roadway characteristics.

The tables are separated into sub-sections visible by the blue gradient. The Collisions columns show traffic collisions between 2013 - 2018 and between 2016 - 2021, respectively. Alternatively, the Local Critical Crash Rate (CCR) Differential column represents the level of crash activity relative to other similar locations.

Per guidance from the Local Roadway Safety Manual (LRSM), each sub-population of locations was ranked according to the number of crashes. The CCR column highlights whether or not the crash activity was higher or lower than the average for the sub-population based on the individual segment or intersection volume at a statistically significant threshold. This volume was either collected through data count resources or calculated based on the roadway classification. All averages used in the CCR calculation were established based on Imperial County crash data to determine what locations might be best to prioritize at the local level. This process highlights locations of crashes that are unusual for the County to determine challenge areas, and not problems faced by peer cities that do not apply in Imperial County. The remaining columns total crashes by type, to evaluate each sub-population and understand what proportion of crashes in the County are of a particular type. The Countywide proportion was compared with the local intersection or segment specific proportion to determine which locations have more of a given crash type than would be expected when considering the County average. A confidence level of 95% was used for the CCR Calculations. For this study, two categories of ranges were highlighted:

- **Light Gray:** >70% probability that this crash type is over-represented on this segment/intersection as compared to other characteristically similar locations within the Imperial County. Although these locations have a slightly higher probability of this crash type than their counterparts, they are not necessarily highly significant.
- **Medium Gray:** >80% probability that this crash type is over-represented on this segment/intersection as compared to other characteristically similar locations within the Imperial County. Although these locations have a higher probability of this crash type than their counterparts, they have potential to be further investigated.
- **Dark Gray:** >90% probability that this crash type is over-represented on this segment/intersection as compared to other characteristically similar locations within the Imperial County. These locations are highly significant regarding the number of collisions occurring here and should be further investigated.



After this analysis was completed, the locations were ranked against other similar locations within the County by their categories according to the expected proportion of that crash type within Imperial County. Locations with higher-than-expected crashes of that type were identified by the probability that random chance would not account for exceedances.

Additionally, it should be noted that the columns for Crash Severity, Type, Involved With, and Behavior are additional characteristics of the crashes and should not be counted as a separate crash.



Table 6 – Analysis Results: Intersections

Intersection	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential ¹	EPDO ²	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Signalized Intersections																								
State Hwy 111 & E Heber Rd	86	74	0.37	735	2	1	6	22	43	17	8	45	4	0	0	0	0	0	51	0	3	28	2	5
State Hwy 111 & McCabe Rd	45	40	0.02	317	0	1	7	9	23	3	5	28	0	2	2	0	0	0	24	0	3	9	1	1
State Hwy 86 & W McCabe Rd	21	25	3.59	123	0	0	7	6	12	16	0	6	1	0	1	1	0	0	17	0	0	8	0	1
State Hwy 111 & E Ross Rd	18	22	-0.11	81	0	0	5	2	15	3	4	14	1	0	0	0	0	0	17	0	0	4	0	3
S Dogwood Rd & E McCabe Rd	23	20	-0.07	59	0	0	3	2	15	0	4	13	1	2	0	0	0	0	16	0	0	2	0	1
Menvielle Rd & State Hwy 7	21	16	0.71	41	0	0	1	3	12	0	6	8	0	0	1	1	0	0	6	0	0	4	0	2
Forrester Rd & W Evan Hewes Hwy	8	15	0.35	45	0	0	1	4	10	2	1	10	0	1	0	1	0	0	8	0	2	4	0	3
State Hwy 86 & W Keystone Rd	17	15	-0.13	387	1	1	3	3	7	6	0	7	0	2	0	0	0	0	10	0	2	5	0	1
State Hwy 98 & Menvielle Rd	19	14	0.42	187	0	1	1	0	12	2	1	10	0	1	0	0	0	0	10	0	0	3	0	3
State Hwy 7 & State Hwy 98	11	13	0.14	43	0	0	1	4	8	5	0	5	0	2	0	1	0	0	8	0	0	5	1	3
Old Highway 111 & E Worthington Rd	20	12	0.58	37	0	0	1	3	8	3	2	7	0	0	0	0	0	0	10	0	0	2	0	0
State Hwy 111 & Jasper Rd	25	11	-0.27	41	0	0	1	4	6	0	2	9	0	0	0	0	0	0	7	0	0	4	0	1
S Dogwood Rd & Correll Rd	10	10	-0.19	35	0	0	1	3	6	2	0	8	0	0	0	0	0	0	6	0	0	1	0	0
Pitzer Rd & E McCabe Rd	4	10	0.23	46	0	0	0	7	3	7	1	0	2	0	0	0	0	0	4	0	0	2	1	0
Dogwood Rd & State Hwy 98	8	9	0.13	336	0	2	0	0	7	3	3	1	0	2	0	0	0	0	6	0	0	2	0	1
S Dogwood Rd & McCabe Rd (S)	7	6	-0.37	21	0	0	0	3	3	0	1	2	0	1	2	0	0	0	2	0	3	5	1	0
Unsignalized Intersections																								
S Dogwood Rd & Willoughby Rd	31	30	2.94	471	1	1	6	11	11	20	1	5	2	1	1	0	0	0	4	0	4	4	2	0
Bowker Rd & E McCabe Rd	13	20	3.68	541	0	3	1	4	12	14	0	1	2	0	3	0	0	0	4	0	1	10	1	1
Dogwood Rd & Cole Rd	9	18	1.58	583	1	2	4	7	4	12	1	2	2	0	1	0	0	0	6	0	1	7	0	1
Old Highway 111 & E Keystone Rd	15	17	4.01	870	1	4	2	3	7	13	0	2	0	2	0	0	0	0	11	0	1	5	1	5
Forrester Rd & Ross Rd	16	16	2.10	239	0	1	4	4	7	10	1	4	0	1	0	0	0	0	5	0	0	1	0	2
Barbara Worth Rd & E Heber Rd	16	15	3.46	40	0	0	1	3	11	13	0	0	0	1	0	1	0	0	3	0	0	5	0	3
State Hwy 86 & State Hwy 78	1	15	0.67	386	1	1	4	1	8	7	1	2	1	1	3	0	0	0	4	0	1	4	1	6
Gentry Rd & W Walker Rd	11	14	8.68	236	0	1	5	2	6	1	2	0	0	8	3	0	0	0	10	0	0	7	2	3
Austin Rd & W Keystone Rd	16	12	6.35	384	1	1	2	5	3	12	0	0	0	0	0	0	0	0	2	1	0	2	0	2
State Hwy 115 & Evan Hewes Hwy	12	12	0.59	196	0	1	1	2	8	5	2	2	0	3	0	0	0	0	2	0	1	5	0	2



Intersection	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential ¹	EPDO ²	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
State Hwy 115/Wiest Rd & State Hwy 78	10	12	2.88	36	0	0	2	1	9	4	0	1	1	5	1	0	0	0	5	0	1	6	0	2
Wieman Rd & W Cady Rd	7	12	2.64	42	0	0	2	2	8	0	0	0	1	10	1	0	0	0	7	0	0	6	1	0
S La Brucherie Rd & W Wahl Rd	8	11	2.37	200	0	1	1	3	6	6	2	0	1	1	1	0	0	0	2	0	0	2	0	2
Forrester Rd & W Aten Rd	8	11	0.47	368	1	1	2	2	5	8	2	0	0	1	0	0	0	0	2	0	0	2	1	3
S Clark Rd & W McCabe Rd	5	11	0.53	31	0	0	1	2	8	7	2	1	1	0	0	0	0	0	2	0	0	3	0	0
Dogwood Rd & Neckel Rd	11	10	1.09	30	0	0	0	4	6	2	2	4	0	2	0	0	0	0	5	0	1	3	1	0
State Hwy 86 & Kalin Rd	10	10	0.85	223	0	1	3	4	2	5	1	1	1	2	0	0	0	0	1	0	0	2	0	1
S Dogwood Rd & State Hwy 86	8	10	0.20	30	0	0	0	4	6	4	2	3	0	1	0	0	0	0	3	0	1	4	1	2
S Clark Rd & W Heber Rd	12	9	0.70	63	0	0	4	3	2	9	0	0	0	0	0	0	0	0	2	0	0	2	0	0
Picacho Rd & Quechan Rd	7	9	0.34	14	0	0	0	1	8	2	0	3	0	3	0	1	0	0	4	0	0	4	0	1
Willoughby Rd & Kloke Rd	10	8	3.72	231	0	1	1	4	2	0	0	0	0	6	1	1	0	0	2	0	1	3	0	0
Picacho Rd & Haughtelin Rd	8	8	6.31	8	0	0	0	0	8	2	2	0	0	4	0	0	0	0	1	1	0	3	1	2
W Aten Rd & Silsbee Rd	8	8	3.47	37	0	0	3	0	5	0	0	0	0	7	1	0	0	0	5	0	1	8	1	0
Forrester Rd & W Worthington Rd	6	8	0.61	72	0	0	5	3	0	7	0	1	0	0	0	0	0	0	0	0	1	2	0	2
State Hwy 111 & Rutherford Rd	6	8	0.19	355	0	2	1	2	3	3	0	0	1	2	2	0	0	0	2	0	1	2	0	1
Dogwood Rd & E Worthington Rd	5	8	0.04	38	0	0	1	4	3	3	0	2	1	2	0	0	0	0	5	0	1	6	0	0
Lack Rd & State Hwy 86	6	7	0.12	508	1	2	1	0	3	4	0	1	0	2	0	0	0	0	1	0	0	5	0	3
Dogwood Rd & E Harris Rd	5	6	0.16	204	0	1	3	1	1	3	2	1	0	0	0	0	0	0	0	0	1	1	0	1
Austin Rd & W Evan Hewes Hwy	10	6	0.10	16	0	0	0	2	4	4	0	2	0	0	0	0	0	0	3	0	0	1	0	0
S Dogwood Rd & Hawk St	8	6	-0.05	190	1	0	1	2	2	4	0	1	0	1	0	0	0	0	2	0	1	0	0	0
Old Highway 111 & E Harris Rd	7	6	5.70	25	0	0	2	0	4	5	0	1	0	0	0	0	0	0	2	0	2	0	0	2
Old Highway 111 & Mead Rd	7	6	3.36	16	0	0	1	0	5	1	0	0	0	3	1	1	0	0	0	0	0	2	0	0
Evan Hewes Hwy & McConnell Rd	6	6	0.24	36	0	0	2	2	2	1	0	2	0	1	2	0	0	0	2	0	1	2	0	0
S Clark Rd & State Hwy 98	5	6	0.47	175	0	1	0	1	4	0	0	0	0	4	1	0	1	0	4	0	0	2	0	0
Austin Rd & W McCabe Rd	5	6	2.67	16	0	0	1	0	5	1	1	4	0	0	0	0	0	0	3	0	0	0	0	0
Barbara Worth Rd & McCabe Rd	5	6	7.25	31	0	0	0	5	1	4	0	0	0	2	0	0	0	0	3	0	0	3	0	0
State Hwy 111 & Scharzt Rd	5	6	-0.08	363	1	1	2	2	0	3	0	1	0	1	1	0	0	0	1	0	0	2	0	1
Evan Hewes Hwy & Bowker Rd	3	6	0.21	30	0	0	2	1	3	4	1	1	0	0	0	0	0	0	1	0	0	0	0	1
Barbara Worth Rd & State Hwy 98	10	5	-0.08	15	0	0	1	0	4	4	0	0	1	0	0	0	0	0	0	0	0	2	0	1
Brockman Rd & State Hwy 98	7	5	4.77	183	0	1	1	1	2	2	1	1	0	1	0	0	0	0	2	0	0	0	0	1
Gentry Rd & Eddins Rd	7	5	2.14	174	0	1	0	1	3	1	1	0	1	2	0	0	0	0	3	0	0	4	0	0
Kloke Rd & Maddox Rd	2	5	0.74	169	0	1	0	0	4	1	0	1	3	0	0	0	0	0	2	0	0	1	0	0



Intersection	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential ¹	EPDO ²	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Dogwood Rd & Ralph Rd	6	5	0.33	34	0	0	3	0	2	4	0	0	0	1	0	0	0	0	3	0	0	1	0	1
State Hwy 86 & Schartz Rd	6	5	-0.15	29	0	0	2	1	2	0	1	2	0	2	0	0	0	0	2	0	1	2	0	0
Brandt Rd & Eddins Rd	1	5	5.73	25	0	0	1	2	2	4	0	0	0	1	0	0	0	0	3	0	0	2	0	1
State Hwy 86 & Desert Shores Dr	2	5	-0.08	15	0	0	1	0	4	2	0	2	0	1	0	0	0	0	0	0	1	2	1	1
State Hwy 98 & 0.1 mi W of Drew Rd	5	5	3.83	10	0	0	0	1	4	0	0	0	0	4	1	0	0	0	0	0	0	2	0	0
Forrester Rd & Andre Rd	5	5	0.32	183	0	1	1	1	2	2	0	2	0	1	0	0	0	0	2	0	0	0	0	1
Bowker Rd & E Heber Rd	4	5	0.43	20	0	0	0	3	2	4	0	0	0	0	1	0	0	0	3	0	0	2	0	0
State Hwy 86 & W Carey Rd	4	5	-0.15	15	0	0	0	2	3	0	1	2	0	2	0	0	0	0	2	0	0	0	0	2
Hoskins Rd & State Hwy 86	4	5	-0.02	174	0	1	0	1	3	5	0	0	0	0	0	0	0	0	0	0	0	3	1	2
Cruickshank Rd & Dogwood Rd	3	5	5.70	10	0	0	0	1	4	2	0	1	0	0	1	1	0	0	1	0	0	1	0	0
State Hwy 86 & W Harris Rd	7	4	-0.18	28	0	0	2	1	1	0	0	2	0	2	0	0	0	0	1	0	1	3	0	0
S Dogwood Rd & Black Hills Rd	6	4	-0.15	28	0	0	2	1	1	3	1	0	0	0	0	0	0	1	0	0	0	2	0	0
Holt Rd & Norrish Rd	5	4	2.51	177	1	0	1	0	2	4	0	0	0	0	0	0	0	0	3	0	0	1	0	1
Austin Rd & Ross Rd	1	4	0.29	9	0	0	0	1	3	2	1	0	0	0	1	0	0	0	1	0	0	0	1	0
State Hwy 86 & Larsen Rd	5	4	-0.12	182	0	1	1	1	1	3	0	0	0	0	0	1	0	0	0	0	1	2	0	0
Flood Rd & Bailey Rd	2	4	2.81	4	0	0	0	0	4	0	0	0	0	3	1	0	0	0	3	0	0	4	0	0
Dogwood Rd & Schartz Rd	1	4	-0.04	24	0	0	1	2	1	1	1	1	0	1	0	0	0	0	1	0	1	1	0	0
Butters Rd & State Hwy 78	1	4	2.36	19	0	0	1	1	2	2	0	1	0	0	0	1	0	0	2	0	0	3	0	3
Brandt Rd & State Hwy 86	1	4	0.04	9	0	0	0	1	3	3	0	0	1	0	0	0	0	0	1	0	0	1	0	0
Wiest Rd & E Albright Rd	2	4	9.53	177	1	0	1	0	2	2	0	1	0	1	0	0	0	0	2	0	1	0	0	1
Marina Dr & Service Rd	2	4	2.59	14	0	0	1	0	3	2	1	1	0	0	0	0	0	0	1	0	0	1	0	0
S La Brucherie Rd & W McCabe Rd	4	4	0.54	19	0	0	1	1	2	1	0	3	0	0	0	0	0	0	2	0	1	1	0	0
Picacho Rd & Indian Rock Rd	4	4	1.13	19	0	0	1	1	2	2	1	0	0	1	0	0	0	0	0	0	1	1	0	0
Willoughby Rd & S Clark Rd	3	4	0.20	4	0	0	0	0	4	0	0	2	0	2	0	0	0	0	2	0	1	3	0	0
Bowker Rd & E Jasper Rd	3	4	0.13	188	0	1	1	2	0	3	0	0	0	1	0	0	0	0	1	0	0	0	0	1
Maple Ave & Correll Rd	3	4	2.52	9	0	0	0	1	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Base Line Rd & Arnold Rd	3	4	1.58	4	0	0	0	0	4	1	0	0	0	2	1	0	0	0	1	0	0	0	1	1
Picacho Rd & Ross Rd	3	4	4.13	28	0	0	2	1	1	1	0	0	0	3	0	0	0	0	1	1	1	3	0	0
Forrester Rd & Bannister Rd	3	4	1.51	9	0	0	0	1	3	3	0	0	0	1	0	0	0	0	1	0	0	0	0	0
State Hwy 115 & E Worthington Rd	12	3	1.00	18	0	0	1	1	1	2	0	0	0	1	0	0	0	0	2	0	0	2	0	1
State Hwy 111 & Yocum Rd	5	3	-0.16	3	0	0	0	0	3	0	1	1	0	1	0	0	0	0	1	0	0	1	0	0
Rockwood Rd & State Hwy 98	2	3	1.34	22	0	0	2	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2



Intersection	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential ¹	EPDO ²	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
State Hwy 98 & Hammer Rd	2	3	-0.05	13	0	0	1	0	2	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0
State Hwy 98 & 0.6 mi W of Bonesteele Rd	2	3	0.53	186	0	1	2	0	0	0	0	0	0	0	3	0	0	0	0	0	1	3	0	0
Base Line Rd & Haughtelin Rd	2	3	4.72	8	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	1	2
Orchard Rd & Edwards Rd	1	3	-0.07	172	0	1	0	1	1	0	0	1	1	1	0	0	0	0	1	0	1	2	0	0
Ave F & Flood Rd	0	3	0.34	22	0	0	2	0	1	0	0	1	0	1	1	0	0	0	1	0	0	1	0	0
James Rd & E Worthington Rd	1	3	0.85	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0
Barbara Worth Rd & E Jasper Rd	4	3	1.96	18	0	0	1	1	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0
State Hwy 115 & Harris Rd	1	3	3.62	8	0	0	0	1	2	0	1	0	0	2	0	0	0	0	0	0	0	3	2	2
Casey Rd & Keystone Rd	1	3	7.83	167	1	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	0	3	0	0
Urquhart Rd & W Carter Rd	2	3	3.21	3	0	0	0	0	3	0	0	0	0	2	1	0	0	0	2	0	0	3	0	0
Bryant Rd & Mead Rd	2	3	4.44	8	0	0	0	1	2	0	0	0	0	3	0	0	0	0	2	0	1	2	0	0
State Hwy 78 & Fifield Rd	1	3	0.26	3	0	0	0	0	3	1	0	0	0	2	0	0	0	0	0	0	1	2	0	1
Forrester Rd & W Cady Rd	4	3	-0.02	22	0	0	2	0	1	2	0	0	0	0	1	0	0	0	2	0	1	0	0	0
Kalin Rd & Cady Rd	1	3	1.95	3	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	2	0	1
Hoskins Rd & Wieman Rd	2	3	0.44	3	0	0	0	0	3	0	1	0	0	0	2	0	0	0	1	0	0	1	0	2
State Hwy 86 & Andre Rd	2	3	-0.17	13	0	0	1	0	2	2	0	1	0	0	0	0	0	0	1	0	0	1	0	0
Rutherford Rd & N Best Rd	1	3	5.11	176	0	1	1	0	1	0	1	0	0	1	1	0	0	0	2	0	1	1	0	0
Treadwell Blvd & Bering Ave	1	3	3.01	167	0	1	0	0	2	3	0	0	0	0	0	0	0	0	1	0	2	0	0	0
Camino Dr & Bering Ave	0	3	2.18	8	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S La Brucherie Rd & W Heber Rd	3	3	4.97	3	0	0	0	0	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Rockwood Rd & State Hwy 86	3	3	-0.12	3	0	0	0	0	3	1	0	1	0	0	0	1	0	0	3	0	0	1	0	0
State Hwy 115 & E Alamo Rd	3	3	0.62	176	0	1	1	0	1	1	0	2	0	0	0	0	0	0	2	0	0	1	0	1
Nance Rd & W Worthington Rd	3	3	0.12	13	0	0	1	0	2	0	1	1	0	0	0	1	0	0	0	0	1	1	0	0
Hoskins Rd & Andre Rd	3	3	1.01	13	0	0	0	2	1	2	0	1	0	0	0	0	0	0	3	0	0	0	0	2
Hovley Rd & W Rutherford Rd	3	3	1.64	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2	0	0	2	0	0
W McCabe Rd & Sperber Rd	3	3	0.94	8	0	0	0	1	2	0	1	2	0	0	0	0	0	0	2	0	0	1	0	0
1. Local Critical Crash Rate Differential																								
2. Equivalent Property Damage Only Crashes																								



Table 7 – Analysis Results: Segments

Facility	Limits	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential ¹	EPDO ²	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Prime Arterial																									
Dogwood Rd	Ralph Rd – E Harris Rd	5	10	1.17	45	0	0	2	3	5	0	0	0	0	3	7	0	0	0	1	0	0	4	1	1
Forrester Rd	W Keystone Rd – Imler Rd	8	8	0.59	355	1	1	2	0	4	0	1	0	1	6	0	0	0	0	1	0	1	4	0	1
Dogwood Rd	Willoughby Rd – Cole Rd	6	8	0.16	201	1	0	2	2	3	0	1	1	0	5	1	0	0	0	1	0	2	2	1	0
Forrester Rd	Aten Rd – 0.50 mi S of Aten Rd	4	7	0.42	171	0	1	0	0	6	0	1	1	1	3	1	0	0	0	1	0	0	3	0	2
S Dogwood Rd	Willoughby Rd – E Fawcett Rd	7	7	0.05	51	0	0	3	3	1	0	0	1	0	2	3	0	1	0	1	0	1	4	0	0
Dogwood Rd	E Harris Rd – 1 mi N of Harris Rd	5	6	0.18	204	0	1	3	1	1	1	1	0	2	1	1	0	0	0	0	0	2	3	0	0
Forrester Rd	Steiner Rd – Monte Rd	6	5	0.40	20	0	0	1	1	3	0	0	0	0	2	3	0	0	0	0	0	0	2	0	1
Dogwood Rd	1 mi S of Keystone Rd – Keystone Rd	3	5	0.03	15	0	0	0	2	3	1	1	1	0	1	1	0	0	0	2	0	0	0	0	0
Forrester Rd	Hackleman Rd – Evan Hewes Hwy	6	5	-0.25	25	0	0	1	2	2	1	1	1	0	0	2	0	0	0	1	0	1	3	0	1
Forrester Rd	Ross Rd – W Evan Hewes Hwy	4	5	0.02	20	0	0	1	1	3	0	1	0	0	3	1	0	0	0	0	0	2	2	0	1
S Dogwood Rd	W Black Hills Rd – W McCabe Rd	4	5	-0.32	15	0	0	1	0	4	1	0	1	0	1	1	1	0	0	1	0	0	3	1	0
Forrester Rd	W Cady Rd – Monte Rd	3	4	-0.29	168	1	0	0	0	3	0	1	0	0	2	1	0	0	0	1	0	1	1	0	0
W Keystone Rd	Forrester Rd – Austin Rd	2	4	-0.28	177	1	0	1	0	2	0	1	1	0	0	2	0	0	0	1	0	0	2	0	0
Dogwood Rd	W Aten Rd – E Huston Rd	6	4	-0.31	14	0	0	0	2	2	0	0	1	0	2	0	1	0	0	2	0	0	2	0	0
E Evan Hewes Hwy	James Rd – Meloland Rd	5	4	-0.29	14	0	0	1	0	3	0	0	1	0	1	2	0	0	0	1	0	0	2	0	0
Drew Rd	Lyons Rd – 0.46 mi N of State Hwy 98	1	4	0.22	19	0	0	1	1	2	0	0	0	0	3	1	0	0	0	1	0	0	2	0	0
Forrester Rd	Andre Rd – W Baughman Rd	1	3	-0.33	13	0	0	1	0	2	0	1	0	0	2	0	0	0	0	0	0	0	2	0	0
Dogwood Rd	0.38 mi S of Mead Rd – Schartz Rd	4	3	-0.42	172	0	1	0	1	1	0	0	0	0	3	0	0	0	0	1	0	0	1	1	0
W Keystone Rd	0.70 mi W of State Hwy 98 – 0.91 mi E of Dogwood Rd	2	3	3.78	3	0	0	0	0	3	0	0	1	0	2	0	0	0	0	2	0	0	1	1	0
Minor Arterial																									
Austin Rd	Evan Hewes Hwy – Aten Rd	12	7	0.33	31	0	0	2	1	4	0	0	2	0	4	1	0	0	0	2	0	1	3	0	0
Bowker Rd	E Chick Rd – 0.46 mi N of McCabe Rd	3	4	0.04	14	0	0	1	0	3	0	0	0	0	4	0	0	0	0	0	0	0	2	0	0
Correll Rd	S Dogwood Rd – Bloomfield St	6	4	0.20	9	0	0	0	1	3	1	1	0	1	1	0	0	0	0	0	0	1	2	0	0
Bowker Rd	E McCabe Rd – 0.46 mi N of McCabe Rd	2	3	0.02	167	1	0	0	0	2	0	0	0	0	2	1	0	0	0	0	0	0	1	0	0
W McCabe Rd	Clark Rd – Corfman Rd	2	3	-0.17	8	0	0	0	1	2	0	0	1	1	1	0	0	0	0	2	0	0	1	1	0
S Clark Rd	W Heber Rd – Hospital Loop	3	3	-0.56	13	0	0	0	2	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0
S Clark Rd	W Wahl Rd – W Heber Rd	0	3	-0.23	3	0	0	0	0	3	0	0	0	0	1	2	0	0	0	0	0	1	1	0	0
Bowker Rd	Cole Rd – E Jasper Rd	1	3	-0.51	13	0	0	1	0	2	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0



Facility	Limits	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential ¹	EPDO ²	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Major Collector																									
Austin Rd	W Aten Rd – W Worthington Rd	10	7	4.10	12	0	0	0	1	6	2	2	0	0	3	0	0	0	0	1	0	1	4	0	0
Huff Rd	Hetzel Rd – Adair Rd	5	7	0.39	12	0	0	0	1	6	0	0	0	0	4	3	0	0	0	4	0	0	2	0	3
Austin Rd	Grimes Rd – W Keystone Rd	6	4	-0.59	14	0	0	1	0	3	0	0	0	0	3	1	0	0	0	0	0	0	1	0	0
Bowker Rd	E Gillett Rd – Sandoval Ln	1	4	0.49	14	0	0	1	0	3	0	1	2	0	1	0	0	0	0	0	1	1	0	0	0
Gentry Rd	Bowles Rd – Eddins Rd	0	3	0.82	3	0	0	0	0	3	0	0	1	0	1	0	1	0	0	1	0	0	2	0	0
Austin Rd	Evan Hewes Hwy – Ross Rd	3	3	-1.06	13	0	0	0	2	1	1	0	2	0	0	0	0	0	0	2	0	0	3	0	0
S La Brucherie Rd	W Van Der Poel Rd – W McCabe Rd	2	3	6.33	3	0	0	0	0	3	1	0	0	0	0	2	0	0	0	0	0	0	1	0	0
Minor Collector																									
Austin Rd	W Keystone Rd – Weaver Rd	4	13	1.03	177	1	0	0	0	12	0	1	0	0	8	3	1	0	0	3	0	1	4	0	0
Brandt Rd	Walker Rd – New River	1	4	-0.45	14	0	0	1	0	3	0	0	0	0	0	4	0	0	0	0	0	1	1	0	0
Cross Rd	0.7 mi S of Kadin Dr – Villa Ave	5	3	-0.81	8	0	0	0	1	2	0	1	1	0	1	0	0	0	0	1	0	0	1	0	0
Local Street																									
E Alamo Rd	State Hwy 115 – Melon Rd	3	8	-1.66	192	0	1	1	2	4	1	0	1	1	5	0	0	0	0	1	0	2	5	1	0
Old Highway 111	Carey Rd – Keystone Rd	4	5	3.42	169	0	1	0	0	4	0	2	1	0	1	1	0	0	0	1	0	0	2	0	0
Old Highway 111	Harris Rd – Ralph Rd	5	5	2.37	183	0	1	1	1	2	0	2	0	0	1	2	0	0	0	0	0	0	2	0	2
San Pasqual Rd	Picacho Rd – Baseline Rd	5	5	6.94	15	0	0	1	0	4	1	1	0	0	2	0	0	1	0	1	0	1	2	1	0
Menvielle Rd	State Hwy 98 – Gateway Rd	6	5	0.68	15	0	0	0	2	3	0	0	4	0	1	0	0	0	0	4	0	0	0	0	0
Cruickshank Rd	Dogwood Rd – Cooley Rd	2	4	0.93	19	0	0	1	1	2	0	1	0	0	2	1	0	0	0	0	0	1	1	0	0
Old Highway 111	Mead Rd – 0.5 mi S of Mead Rd	1	3	0.90	8	0	0	0	1	2	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0
Old Highway 111	Schartz Rd – Carey Rd	2	3	0.91	3	0	0	0	0	3	1	0	1	0	0	1	0	0	0	0	0	0	1	0	2
Old Highway 111	E Ross Rd – E Gillett Rd	2	3	2.31	13	0	0	0	2	1	0	1	0	0	1	1	0	0	0	0	0	0	1	1	0
Fredricks Rd	Elder Rd – Kalin Rd	0	3	9.81	172	0	1	0	1	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
1. Local Critical Crash Rate Differential																									
2. Equivalent Property Damage Only Crashes																									

8. Equity

The analysis was conducted using Climate and Economic Justice Screening Tool (CEJST), a tool used to score census tracts in the state of California on a system of metrics used to identify disadvantaged communities. The metrics used are indicators of burdens that disadvantaged communities face related to climate change, the environment, health, and economic opportunity.

8.1 Equity Analysis

This report utilized crash data for a six-year period and CEJST census tracts to reflect the patterns in crashes that have occurred in disadvantaged tracts in Imperial County. Data used for this report was extracted from Climate and Economic Justice Screening Tool (CEJST), and 2016-2021 census tract data was utilized for the analysis process. Twenty-nine (29) census tracts out of thirty-one (31) are identified as disadvantaged communities in the county as shown in **Figure 11**. **Figure 12** shows the location of low-income census tracts, twenty-four (24) out of thirty-one (31) tracts are low-income in Imperial County.

Race/Ethnicity

The County of Imperial County has a population of 180,051, according to the US Census Bureau. **Table 8** lists the population of Imperial County by race/ethnicity. The County is predominately Hispanic (85.3%) followed by White (9.74%), and Black (2.47%).

Table 8 – County of Imperial County Population by Race/Ethnicity

Race/ Ethnicity	Number of People by Race/Ethnicity	Percent of People by Race/Ethnicity
Asian	2,238	1.24%
Black or African American	4,445	2.47%
Hispanic or Latino	153,575	85.3%
White	17,545	9.74%
Other	2,248	1.25%
Total	180,051	

Total Collisions by Race/Ethnicity

Collision data shows that most people involved in collisions in Imperial County were Hispanic (75%). The second highest race/ethnicity involved in collisions is White (15%). 5% did not have a race reported. The remainder of race/ethnicity consist of Black (2%), Other (2%) and Asian (1%). Of the 6-year collision report, 80% of collisions involved people of color (Hispanic, Black, Asian, and other).

Climate and Economic Justice Screening Tool (CEJST)

Equity analysis provides a tool to ensure specific needs are met in underserved communities. CEJST 2016-2021 dataset was utilized to identify low-income census tracts, disadvantaged census tracts, and census tracts with thresholds criteria exceeded. Census tracts with thresholds criteria exceeded is for associated socioeconomic, environmental, climate or other burdens. Each



category was analyzed with collision data to determine where crashes are compared to CEJST census tracts. CEJST census tracts with thresholds criteria exceeded had fatal and severe injury collisions that occurred in census tracts with 2-10 burdens as shown in **Figure 13**. This analysis also considered census tracts that are low-income and disadvantaged. All fatal and severe injury collisions are in disadvantaged communities shown in **Figure 11**. Out of all the fatal and serious injury collisions in the county, forty-seven percent (47%) of those collisions occurred in low-income tracts shown in **Figure 12**. Within the county, the low-income tracts have a total population of 132,226. About 73% of the population is in low-income tracts. Equity analysis provides tools to help decision-makers meet the specific needs of underserved communities. Equitable solutions should identify locations where prioritized improvements from the general countywide safety countermeasure toolbox should be implemented to benefit disadvantaged communities.

Figure 11 – Climate and Economic Justice Census Tracts – Disadvantaged

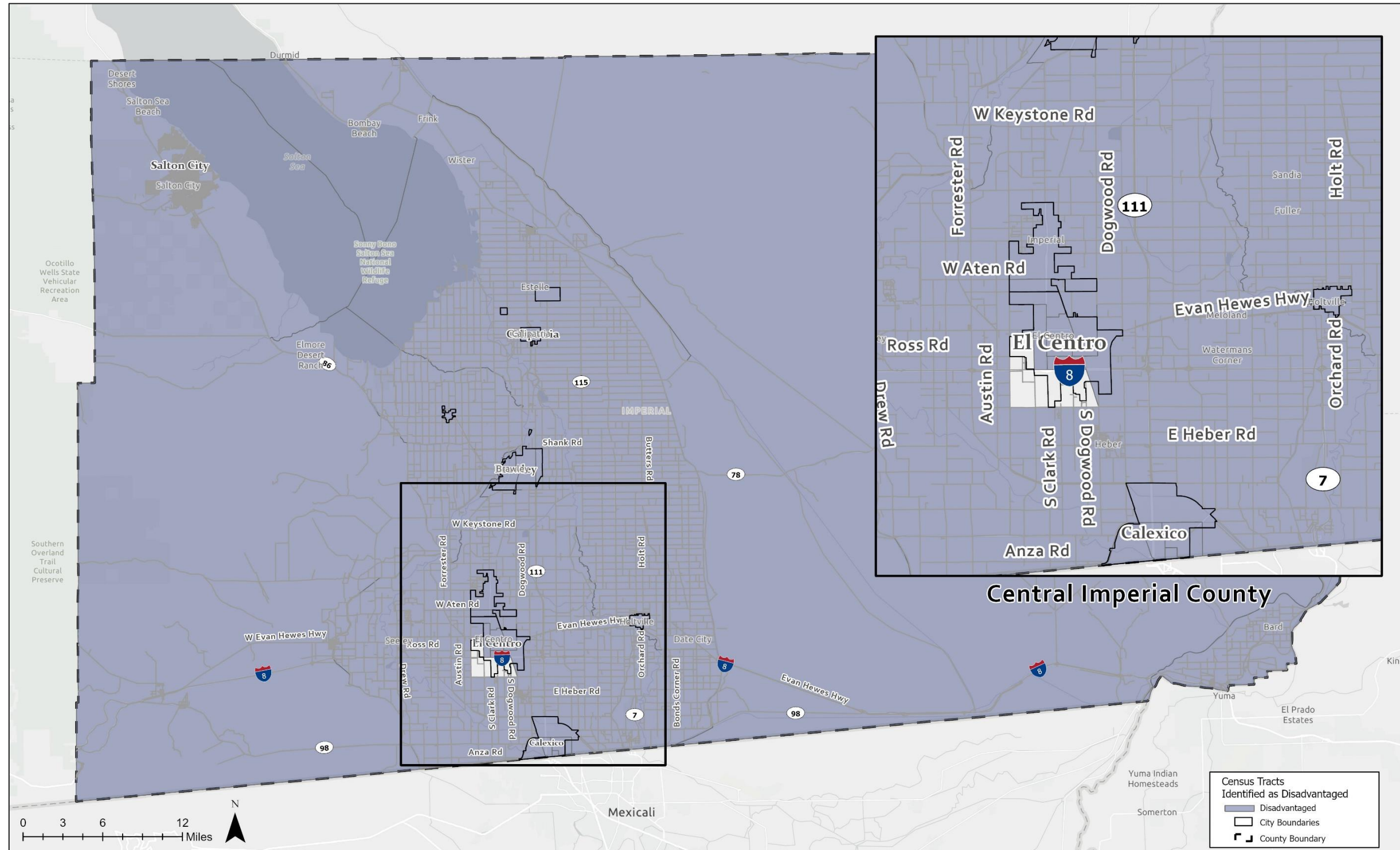




Figure 12 – Climate and Economic Justice Census Tracts – Low Income

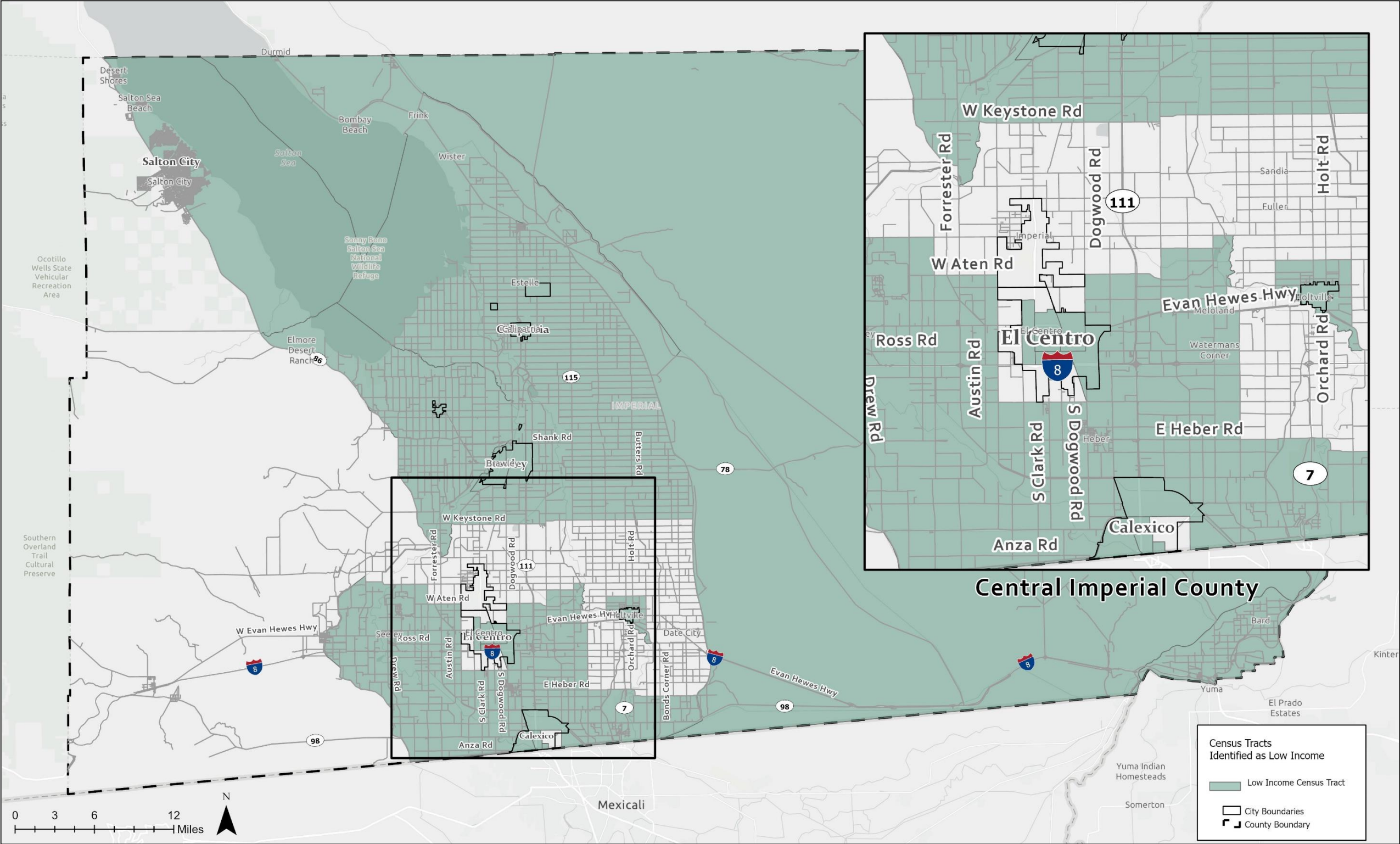
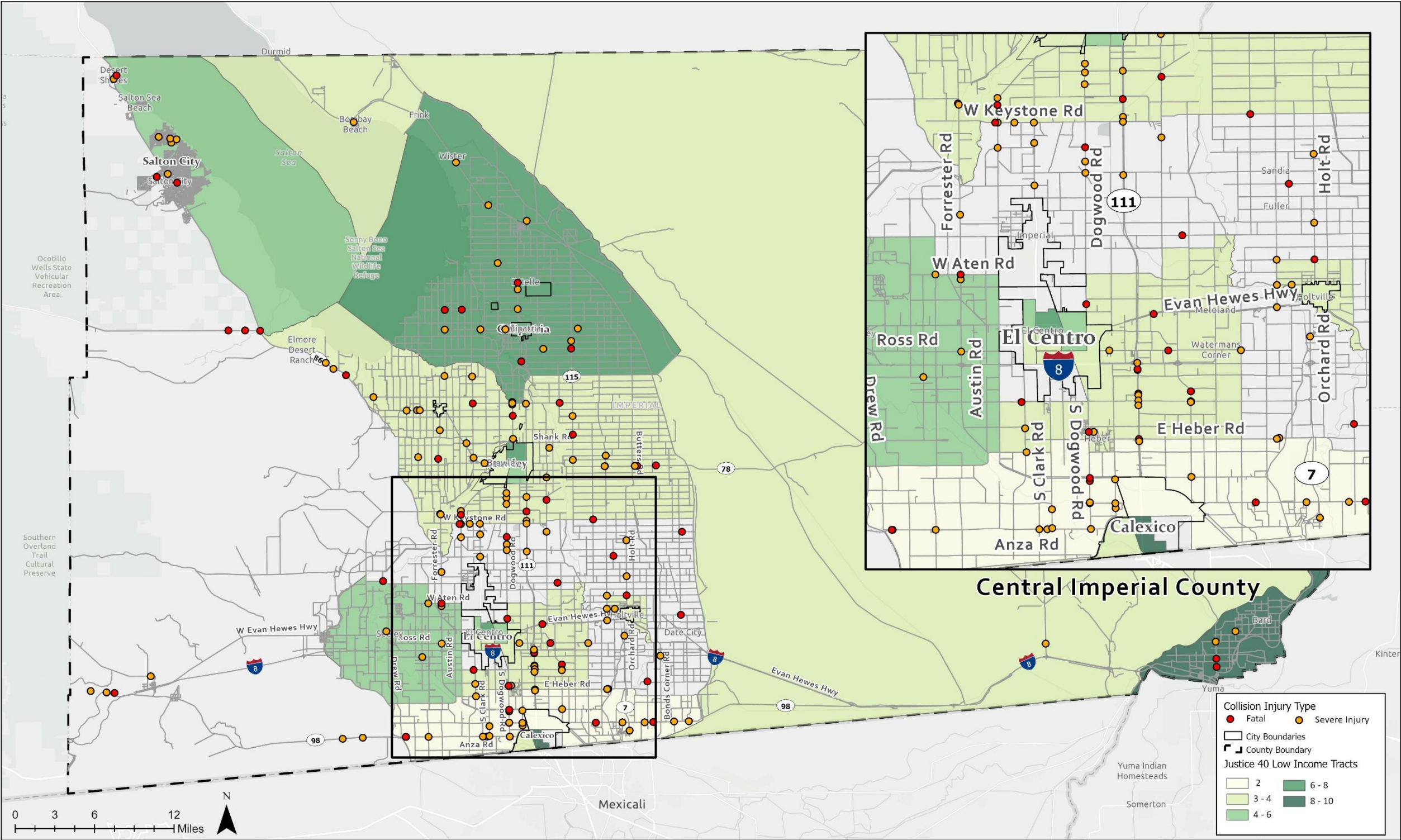




Figure 13 – Climate and Economic Justice Census Tracts



9. Best Practices Evaluation and Emphasis Areas

9.1 Best Practices Evaluation

Table identifies existing plans and policies that were recently completed, or are planned, or on-going within the County. The intent of this review is to provide an idea of the types of strategies in place or encouraged by the County that may impact the safety analysis process. It will also identify opportunity areas where the County could adopt non-infrastructure countermeasures. This table also ties each topic and enhancement to the emphasis areas that are laid out in **Section 9.2**.

Table 9 – Summary of Programs, Policies, and Practices

Topic	Initiatives / Current Status	Opportunities for Implementation or Enhancement
COMMITTEES / ROLES		
Active Transportation Coordinator	The County of Imperial does not currently have an Active Transportation Coordinator.	Create an Active Transportation Coordinator role with existing staff or add role; Plan to maintain the role through personnel changes.
Does the County have a Safety or Active Advisory Committee?	The County of Imperial does not have a Safety or Active Advisory Committee, but there is a Traffic Advisory Committee.	Form a board committee to discuss roadway and transportation safety issues and efforts.
Does the County have an Active Transportation Safety Education Program?	Project Ride, Walk, Learn is a non-infrastructure, educationally focused program that provides information to students and parents on bicycle and pedestrian safety. The program is available in underserved communities in Imperial County where infrastructure is in poor condition or is limited.	Continue to implement education efforts.
POLICY / PLANS		
Does the County have a Complete Streets Plan?	The County of Imperial does not have a Complete Streets Plan.	Consider developing a policy that complies with the California Complete Streets Act.
Does the County assess Traffic Impact Fees?	The County of Imperial assesses Traffic Impact Fees based on land use.	Continue to assess Traffic Impact Fees and apply funding to transportation safety improvements.
Does the County have a Safe Routes to School program?	The County of Imperial has a Safe Routes to School Regional Master Plan, adopted in April 2016.	Continue to apply and identify other grant sources that can be used.



Topic	Initiatives / Current Status	Opportunities for Implementation or Enhancement
Does the County implement Traffic Calming Policies?	The County of Imperial does not have a formal traffic calming policy.	Look to develop traffic calming policies where necessary. Some locations mentioned in this plan.
Does the County regularly conduct Speed Surveys?	The County of Imperial does not regularly conduct speed surveys.	Continue to update as required by California Vehicle Code; Identify opportunities for speed limit reduction allowable under AB 43.
Does the County utilize Warrants for Stop Signs and Signals?	The County of Imperial utilizes MUTCD warrants for stop signs and signals.	Continue to utilize warrants for stop signs and signals, consider developing local warrants when needed.
Is the County planning for Density and Walkable Areas?	The County is working to create more walkable areas within its communities.	Continue to expand efforts to align TDM and VMT reduction policies with state guidelines.
Does the County have Transportation Demand Management (TDM) or Vehicle Miles Travelled (VMT) Reduction policies?	The County of Imperial does not have Transportation Demand Management (TDM) or Vehicle Miles Travelled (VMT) reduction policies.	Develop countywide VMT thresholds and appropriate TDM strategies using latest California Air Pollution Control Officers Association (CAPCOA) guidance.
Does the County perform Traffic Crash Monitoring?	The County does perform Traffic Crash Monitoring.	Continue to perform traffic crash monitoring.
Does the County have an Active Transportation Master Plan?	The County of Imperial does have a Regional Active Transportation Plan, adopted in February 2022.	Continue to monitor implementation plan and pursue funding opportunities to accelerate project development.
Does the County have MUTCD-compliant Pedestrian Signal Timing?	Timing for traffic signal provided with pedestrian crossings would need to be reviewed.	Establish pedestrian timing standards and implement throughout County.
Does the County implement Crosswalks at high pedestrian locations?	The County has outlined recommendations in the Regional Active Transportation Plan to install High Visibility Crosswalks at most intersections.	Continue to implement these improvements where feasible; keep updated with best practices regarding pedestrian improvements.
What type of traffic enforcement does the County conduct?	CHP and Imperial County Sheriff conduct traffic enforcement.	Continue to enforce traffic laws at key locations; Apply for OTS funding to expand enforcement activities.



Topic	Initiatives / Current Status	Opportunities for Implementation or Enhancement
What types of transit does the County have?	Imperial Valley Transit is the main transit agency in Imperial County. The agency operates various bus routes in cities throughout the county. Yuma County Area Transit also serves Winterhaven and El Centro in Imperial County.	Develop first/last mile safety strategies for transit stops in Imperial County.
What types of wayfinding does the County have?	The County does not use wayfinding signage.	Identify key destinations where wayfinding can be incorporated to reduce driver distraction and minimize conflicts between transportation modes.
DATA COLLECTION / INVENTORY		
Does the County have an Inventory of Pedestrian Signs and Signals?	No, the County of Imperial does not have an inventory of pedestrian signs and signals.	Adopt a process to take inventory of these signals as they are updated/installed; Incorporate inventory into GIS database.
Does the County have an Inventory/Mapping of Active Transportation Routes?	The County of Imperial does have a GeoHub but does not have an inventory/mapping of active transportation routes.	Continue to update inventory as active transportation routes are expanded; Incorporate into GIS database.
Does the County utilize Crossroads Database for crashes?	The County of Imperial does not utilize a Crossroads Database for collisions.	Consider the use of Crossroads database and regularly update.
Does the County have Active Transportation Volume Counting?	The County of Imperial does not have Active Transportation Volume Counting Program.	Leverage emerging big data sources, and implement policy to require bicycle and pedestrian volumes as a part of future traffic counting programs and projects.
COORDINATION / FEEDBACK		
What ways can citizens give feedback about roadway safety?	Citizens can give road condition reports and confer with the Traffic Advisory Committee.	Continue to expand ways that citizens can give feedback and make improvements to service request tool if necessary. Incorporate requests into GIS maps to show hotspots for requests.

Topic	Initiatives / Current Status	Opportunities for Implementation or Enhancement
What types of Coordination with other County organization does your department perform?	Public Works has participated in the Safe Routes to School workgroup meetings hosted by Imperial County Public Health Department or Imperial County Office of Education.	Continue to engage across departments and organizations; continue to involve these organizations in crash analysis and countermeasure development process.
What types of School Engagement does the County perform?	Project Ride, Walk, Learn is a non-infrastructure, educationally focused program that provides information to students and parents on bicycle and pedestrian safety. The program is available in underserved communities in Imperial County where infrastructure is in poor condition or is limited.	Continue to engage across departments and organizations; continue to involve school engagement in roadway safety planning.
What types of Law Enforcement/Emergency Service Engagement does the County perform?	There is involvement and feedback during the Traffic Advisory Committee.	Continue to engage law enforcement in roadway safety planning.

9.2 Emphasis Areas

Emphasis areas represent crash factors that are common in the County and provide the opportunity to reduce the largest number of traffic injuries with strategic investment. Emphasis areas were developed by revisiting the vision and goals of this planning process and comparing them with the trends and patterns identified in the crash analysis.

9.2.1 Emphasis Area #1: Lane Departure

Description: Instances where a vehicle runs off the road or crosses into the opposing lane prior to the collision. Lane departure includes head-on, hit-object, and overturned collisions. 62.4% of fatal and severe injury crashes were caused by lane departure.

Goals for Emphasis Area #1:

- Identify hot spots and priority corridors for head-on, hit-object, and overturned collisions.
- Reduce head-on, hit-object, and overturned collisions on both major streets and local residential streets.
- Apply for funding and implement improvements to address lane departure.

Strategies for Emphasis Area #1:

- Engineering improvements could include but are not limited to improving curve delineation, friction treatments in curves and other spot locations, and edge line, shoulder and center line rumble strips.
- Intersection improvements aimed to keep vehicles in the lane and minimize severity of collisions.

9.2.2 Emphasis Area #2: Occupant Protection

Description: Collisions noted to have involved inappropriate occupant protection as a factor and most commonly involved misuse, non-use, or improper use of safety belts or child restraint. 23.1% of fatal and severe injury crashes involved inappropriate use of occupant protection.

Goal for Emphasis Area #2:

- Increase occupant protection use by children.
- Increase seat belt compliance.
- Increase child safety seat usage.
- Apply for funding to implement countermeasures and programs.

Strategies for Emphasis Area #2:

- Establish additional enforcement programs to improve occupant protection, such as:
 - Educate drivers to use occupant protection for themselves and other people in their vehicle through formal driver education and targeted outreach programs.
 - Increase occupant protection high visibility enforcement activities.
 - Target high risk populations with education and enforcement to increase occupant protection use.

9.2.3 Emphasis Area #3: Aggressive Driving

Description: Aggressive driving includes several behaviors such as speeding, tailgating, and ignoring traffic signals and signs. 21.8% of fatal and severe injury crashes were caused by aggressive driving.

Goal for Emphasis Area #3:

- Reduce the number of crashes due to aggressive driving in the county.
- Identify hot spots and priority corridors where more aggressive driving collisions occur.
- Apply for funding and implement countermeasures to address aggressive driving.

Strategies for Emphasis Area #3:

- Educational campaign to target aggressive driving.
- Increase law enforcement presence near aggressive driving hot spots.
- Increase coordination with law enforcement and other community organizations.

9.2.4 Emphasis Area #4: Intersection Improvements

Description: Collisions involved at intersections, interchanges, and other roadway access. 21.1% of the fatal and severe injury collisions in Imperial County involved intersections, compared to 23.6% statewide.

Goal for Emphasis Area #4:

- Reduce the number of crashes at intersections, interchanges, and other roadway access.
- Identify hot spots and prioritize locations for intersection improvements.
- Apply for funding and implement countermeasures to address collisions at intersections.

Strategies for Emphasis Area #4:

- Engineering improvements could include but are not limited to the use of backplates with reflective borders for traffic signals, left and right turn lanes at two-way controlled intersections, and protected left-turn movements.

9.2.5 Emphasis Area #5: Impaired Driving

Description: Impaired driving includes collisions where any evidence of drug or alcohol use by the driver is present, even if the driver was not over the legal limit. 20.3% of fatal and severe injury crashes were caused by impaired driving.

Goal for Emphasis Area #5:

- Reduce the number and severity of impaired driving crashes in the County.
- Increase impaired driving awareness on Imperial County roads.

Strategies for Emphasis Area #5:

- Establish or enhance enforcement programs to reduce impaired driving, such as:
 - Policies and program activities that aim to reduce underage drinking and impaired driving.
 - Promote the use of transportation alternatives such as ride hailing, public transit, and designated sober driver programs.
 - High visibility enforcement to promote public awareness of the dangers of impaired driving and change high-risk behaviors.

10. Potential Improvements

This section provides information on identified issues, crash reduction factors, improvements, and countermeasures identified for the County, as well as for specific project locations identified as part of this analysis. Potential improvements/countermeasures are based on data analysis, stakeholder input, and site visits.

10.1 Improvement (Countermeasure) Selection Process

Part D of the HSM provides information on Crash Modification Factors (CMF) for roadway segments, intersections, interchanges, special facilities, and road networks. CMFs are used to estimate the safety effects of highway improvements, specifically to compare and select highway safety improvements. A CMF of less than 1.0 indicates that a treatment has the potential to reduce crashes. A CMF greater than 1.0 indicates that a treatment has the potential to increase crashes. A Crash Reduction Factor (CRF) is directly connected to the CMF and is “defined mathematically as $(1 - \text{CMF})$ (the higher the CRF, the greater the expected reduction in crashes)⁴.” CMFs can help decision makers weigh potential alternative projects but are only one measure of a project’s value and should be considered part of a larger decision-making process. Furthermore, it is important to note that not all CMFs are as reliable as others. The FHWA maintains a federal depository of CMFs and includes a star rating system to help users determine which CMFs are bolstered by the best and most thorough research. Key factors to consider when applying CMFs include:

1. Selection of an appropriate CMF;
2. Estimation of crashes without treatment;
3. Application of CMFs by type and severity; and,
4. Estimation of the combined effect for multiple treatments.

Examples of Safety Countermeasures can be found through several sources. This Report utilizes the countermeasures found in the California LRSM and the CMF Clearinghouse (CMF CH) website. Countermeasures/improvements are based on the data analysis and site visits. Additional countermeasures were identified for the high-level issues on a Countywide level and are discussed in **Section 10.2**.

10.2 Infrastructure Improvements

This evaluation considered Countywide trends to identify countermeasures that would likely provide the most benefit with widespread implementation.

Table outlines the Countywide safety project opportunities, which is also referred to as the “Countermeasure Toolbox”. Within the toolbox, the description of the countermeasure along with its Local Roadway Safety Manual (LRSM) ID number are listed. In the Crash Reduction Factor (CRF) Column, “multiplicative factors used to estimate the expected reduction in number of crashes after implementing a given countermeasure at a specific site (the lower the CRF, the

⁴ Local Roadway Safety Manual (Version 1.6) 2022. Page 28.



greater the expected reduction in crashes ⁵.” For improvements that do not have a related countermeasure in the LRSM, a conservative 5% crash reduction factor was applied. For each of these countermeasures, a planning level benefit/cost analysis was completed.

Applying the benefit/cost analysis at the Countywide level assumed some randomness in crash distribution. The location characteristics, such as whether there is a traffic signal, and the type of crashes, were used at the Countywide level to calculate an average cost of crashes that the countermeasure might reduce. The benefit per location was then factored out to a 20-year lifecycle savings, with an Opinion of Project Probable Cost (OPPC) for the initial installation costs and a per-year maintenance cost estimate. The costs shown in

Table should be considered initial planning costs using 2024 dollars and not assumed to be final. These costs are based on typical construction conditions. Additional costs may be incurred based on unusual factors or other site-specific conditions. Treatments that are eligible for the HSIP set-aside categories are called out in the table. IDs for countermeasures are based on Local Roadway Safety Manual and Crash Modification Factors Clearinghouse

⁵ Local Roadway Safety Manual (Version 1.6) 2022. Page 28.



Table 10 – General Countywide Safety Countermeasure Toolbox

ID	Potential Countermeasures	Where to apply?	CRF	Per Unit Cost	Unit
NS05	Convert intersection to roundabout (from stop or yield control on minor road)	Intersections with moderate traffic volume and patterns of right-angle and left-turn collisions	5%	Varies	Per intersection
NS06	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	Intersections with patterns of rear-end, right-angle, or turning collisions related to lack of driver awareness of presence of intersection	15%	\$2,400	Per sign
NS07	Upgrade intersection pavement markings (Non-Signalized Intersection)	At intersections to provide additional warnings to approaching motorists	25%	\$38,400	Per intersection
NS08	Install flashing beacons at stop-controlled intersections	At stop-controlled intersections to supplement existing signage to mitigate collisions related to stop sign violations	15%	\$25,000	Per beacon
NS10	Install transverse rumble strips on approaches	At intersection approaches to provide auditory and tactile sensation to drivers approaching an intersection	20%	\$15,600	Per approach
R04	Install Guardrail	Roadway segments where lane departure collisions result in injury or fatality due to a fixed object or steep embankment	25%	\$282,000	Per mile
R21	Improve pavement friction (High Friction Surface Treatment)	Roadway segments where skidding is determined to be a problem or inability to stop due to insufficient skid resistance	55%	\$186,000	Per approach
R22	Install/upgrade signs with new fluorescent sheeting (regulatory or warning)	Roadway segments with a pattern of nighttime collisions	15%	\$2,400	Per sign
R23	Install chevron signs on horizontal curves	Along road curves to provide additional emphasis and guidance for a change in horizontal alignment of a road	40%	\$2,400	Per sign



ID	Potential Countermeasures	Where to apply?	CRF	Per Unit Cost	Unit
R24	Install curve advance warning signs	Used in advance of curves that have an advisory speed of less than 30 mph	25%	\$2,400	Per sign
R25	Install curve advance warning signs (flashing beacon)	Roadways with high level of collisions on relatively sharp curves	30%	\$12,000	Per sign
R26	Install dynamic/variable speed warning signs	Roadway segments with a significant number of collisions due to unsafe speeds	30%	\$22,800	Per sign
R27	Install delineators, reflectors and/or object markers	Roadway segments with a risk of fixed object collisions or on curves	15%	\$40,800	Per mile
R28	Install edgelines and centerlines	Roadway segments with collisions that resulted in run-off-road right/left, head-on, or opposite-direction-sideswipe with an ADT greater than 6,000	25%	\$100,800	Per mile
R30	Install centerline rumble strips/stripes	Roadway segments where there is a history of roadway departures or head-on collisions	20%	\$76,800	Per mile
R31	Install edgeline rumble strips/stripes	Roadway segments where roadway departure collisions are a risk	15%	\$76,800	Per mile
R37PB	Install rectangular rapid flashing beacon (RRFD)	Midblock locations 1500+ feet away from an existing signal with significant pedestrian demand where the speed limit is up to 35 mph	35%	\$54,000	Per crossing
S02	Improve signal hardware: lenses, back plates with retroreflective borders, mounting, size, and number	Signalized intersections where signal heads are not equipped with these features	15%	\$26,400	Per intersection
S03	Improve signal timing (coordination, phases, red, yellow, or operation)	Signalized intersections with a history of broadside and rear-end crashes, and is not maximized for yellow and all red time; coordination can be applied for speed management on corridors with signals placed close enough together to develop vehicle platoons	15%	\$14,400	Per intersection



ID	Potential Countermeasures	Where to apply?	CRF	Per Unit Cost	Unit
S07	Provide protected left-turn phase (left turn already exists)	Locations where currently have a permissive left-turn or no left-turn protection that have a high frequency of angle crashes	30%	\$45,600	Per intersection
S10	Install flashing beacons as advance warning (Signalized Intersection)	Locations where drivers are unable to see the traffic control device in time to comply	30%	\$25,000	Per beacon
CMF 9194	Install safety edge treatment	Locations where drop-off-related collisions occur	23%	Varies	Per location
CMF 9525	Flatten horizontal curve	Roadways with sharp horizontal curve and consistent collision history despite repeated efforts to reduce such collisions	69%	Varies	Per location
CMF 10312	Install in-lane-curve warning pavement markings	Curves where additional striping or warning messages can bring additional awareness of areas with high rates of collision to drivers	35%	Varies	Per marking
CMF 10361	Install sequential dynamic chevrons	Roadways with high level of collisions on relatively sharp curves related to speeding	44%	Varies	Per system



10.3 Non-Infrastructure Improvements

These identified countermeasures were derived from the crash analysis and build on the actions identified in **Section 10.2**. These relate to the additional Es of Traffic Safety outside of Engineering, which include Enforcement, Education, and Emergency Response.

Table 11 – Non-Engineering Safety Strategy Countermeasures

PROPOSED COUNTERMEASURE	POTENTIAL PARTNERS	EXAMPLES OF COUNTERMEASURE
ENFORCEMENT		
Increase visibility of enforcement program for speeding and stop sign/signal running	Imperial County Sheriff's Office, California Highway Patrol, California Office of Traffic Safety	CHP's Regulate Aggressive Driving and Reduce Speed (RADARS) program
Increased enforcement near pedestrian and bicyclist activity hot spots	Imperial County Sheriff's Office, California Highway Patrol, California Office of Traffic Safety	Obtain or allocate funding for enhanced enforcement near pedestrian bicycle hot spots to enforce safe driving laws for drivers and county code for bicyclists and pedestrians
Increased enforcement near school zones	Imperial County Sheriff's Office, Local school districts, California Highway Patrol, California Office of Traffic Safety	Obtain grant funding for additional personnel in school zones
EDUCATION		
Campaign to target speeding drivers and drivers running	Imperial County Public Works	CHP's Regulate Aggressive Driving and Reduce Speed (RADARS) program
Bicycle and pedestrian safety campaign	Imperial County Public Works	SCAG's "Go Human" campaign
Coordinate safety education campaigns	Imperial County Public Works	Coordination of safety education with schools and community organizations
Explore safe routes to school education grants to expand program	School districts, Imperial County Sheriff's Office, California Highway Patrol	Safe Routes to School Program (funded by Caltrans)
EMERGENCY RESPONSE		
Coordinate with emergency services on potential improvements and other safety projects	Imperial County Sheriff's Office, Imperial County Fire Department, ambulance agencies	Incorporating law enforcement/fire department as stakeholders on transportation improvement projects
Regularly review emergency response data to supplement crash data and identify hot spots	Imperial County Sheriff's Office, Imperial County Fire Department, ambulance agencies	Adjust safety project development processes to include emergency response and fire department data



11. Funding Sources & Next Steps

11.1 Funding Sources

Competitive funding resources are available to assist in the development and implementation of safety projects. The County should continue to seek available funding and grant opportunities from local, state, and federal resources to accelerate their ability to implement safety improvements throughout Imperial County. This section provides a high-level introduction to some of the main funding programs and grants for which the County can apply.

11.1.1 Highway Safety Improvement Program (HSIP)

The Highway Safety Improvement Program (HSIP) is a federally-funded, Caltrans-managed program that apportions funding as a lump sum for each state, which is then divided among apportioned programs. These flexible funds can be used for projects to preserve or improve safety conditions and performance on any Federal-aid highway, bridge projects on any public road, facilities for non-motorized transportation, and other project types. Safety improvement projects eligible for this funding include:

- Curb extensions
- Pedestrian warning flashing beacons
- High visibility crosswalks
- Other projects listed in the Caltrans Local Road Safety Manual

California's local HSIP focuses on infrastructure projects with national recognized crash reduction factors. Normally, HSIP call-for-projects is made at an interval of one to two years. The applicant must be a city, a county, or a tribal government federally recognized within the State of California.

Additional information regarding this program at the Federal level can be found online at: <https://safety.fhwa.dot.gov/hsip/>. California specific HSIP information, including dates for upcoming call for projects, can be found at: <http://www.dot.ca.gov/hq/LocalPrograms/hsip.html>. HSIP Cycle 12 applications are expected to be due in September 2024.

11.1.2 Caltrans Active Transportation Program

Caltrans Active Transportation Program (ATP) is a statewide funding program, created in 2013, consolidating several federal and state programs. The ATP funds projects that encourage increased mode share for walking and bicycling, improve mobility and safety for non-motorized users, enhance public health, and decrease greenhouse gas emissions. Projects eligible for this funding include:

- Bicycle and pedestrian infrastructure projects
- Bicycle and pedestrian planning projects (e.g., safe routes to school)
- Non-infrastructure programs (education and enforcement)

Funding is provided annually. ATP call for projects typically comes out in the spring. Information on this program and cycles can be found online at <http://www.dot.ca.gov/hq/LocalPrograms/atp/>.



11.1.3 California SB 1

The California SB 1 is a landmark transportation investment to rebuild California by fixing neighborhood streets, freeways, and bridges in communities across California and targeting funds toward transit and congested trade and commute corridor improvements.

California's state-maintained transportation infrastructure will receive roughly half of SB 1 revenue: \$26 billion. The other half will go to local roads, transit agencies and an expansion of the state's growing network of pedestrian and cycle routes. Each year, this new funding will be used to tackle deferred maintenance needs both on the state highway system and the local road system, including:

- Local Street and Road Maintenance and Rehabilitation: \$1.5 billion
 - This funding is dedicated to improve local road maintenance, rehabilitation, and/or safety through projects such as restriping and repaving.
- Bike and Pedestrian Projects: \$100 million
 - This funding will go to cities, counties, and regional transportation agencies to build or convert more bike paths, crosswalks, and sidewalks. It is a significant increase in funding for these projects through the ATP.
- Local Planning Grants: \$25 million

11.1.4 California Office of Traffic Safety Grants

This program has funding for projects related to traffic safety, including transportation safety education and encouragement activities. Grants applications must be supported by local crash data (such as the data analyzed in this report) and must relate to the following priority program areas:

- Alcohol Impaired Driving
- Distracted Driving
- Drug-Impaired Emergency Medical Services
- Motorcycle Safety
- Occupant Protection
- Pedestrian and Bicycle Safety
- Police Traffic Services
- Public Relations, Advertising, and Marketing Program
- Roadway Safety and Traffic Records

11.1.5 Safe Streets and Roads for All (SS4A) Grant Program

This program has allocated \$1 billion annually for the next 3 years for cities, counties, metropolitan planning organizations, and other roadway owners (excepting state DOTs) for safety improvement grants for safety planning, education, enforcement, and roadway improvements. This program is not benefit/cost based. Evaluation criteria are oriented to the project's alignment with the Safe Systems approach. There is a 20% local match requirement (can be in-kind



contribution via staff billable hours). Planning Grants are open to any eligible agency, and Implementation Grants are open to agencies with a completed safety plan such as a Local Roadway Safety Plan. Planning Grants are expected to range from \$100 thousand to \$1 million, and Implementation Grants are expected to range from \$1 million to \$20 million. Grant applications are expected to be due in July 2024.

11.1.6 Infrastructure Investment and Jobs Act

In November 2021, the President signed into law the \$1.2 trillion Infrastructure Investment and Jobs Act. In addition to the SS4A grant program described above, this law provides billions of dollars in additional funding for improvements and investment in the transportation sector nationwide. The law provides \$30 billion in funding over 5 years for competitive Rebuilding American Infrastructure with Sustainability and Equity Grants for transportation projects, as well as additional funding for repair and environmental mitigation projects. As these grant programs continue to be developed, the County can position itself by identifying potential projects and programs to pursue.

11.2 Implementation Plan

Once the Local Roadway Safety Plan has been completed, the County can plan to regularly review and monitor crash data for trends and changes. The County can also plan to prioritize and implement certain improvements that were identified in this plan.

11.2.1 Monitoring

The County can plan to regularly monitor the success of the LRSP and its related implementations by performing the following steps. This before-and-after analysis can be performed every second year. The County can also meet with the Imperial County Sheriff's Office and California Highway Patrol on a regular basis to discuss roadway safety issues and compare the latest crash analysis.

- Review crash data to determine year-over-year trend.
- Use mapping or GIS software to review the number of crashes occurring at specific locations. Locations where improvements have been made should receive priority for monitoring.
- Based upon changes in crash activity, determine efficacy of improvements and adjust strategies going forward.

11.2.2 Analysis Update

The County can plan to update the analysis every two years as part of a monitoring program, as described in **Section 11.2.1**. Every 5 years, the County will perform a major update to the analysis and the Local Roadway Safety Plan by performing the following steps. This update will maintain eligibility for the HSIP grant funding for the County. This analysis should continue to focus on both systemic and location-specific safety needs.

1. Continue obtaining geocoded crash data from California Highway Patrol Traffic Collision Reports.
2. Identify new or changing hot spots through GIS mapping. Review crash data in changing trends, new land uses, and evolving driver behavior.



3. Evaluate crash trends to determine whether new emphasis areas are emerging.
4. Document implemented countermeasures and review changes in crash activity.
5. Review the Crash Toolbox to determine if any additional countermeasures should be considered for implementation.

11.2.3 Implementation Strategies

The opportunities identified in this report provide systemic and location-specific countermeasures that can be implemented within the County. Implementation will be dictated by funding and available resources; this guidance is preliminary and subject to change. Over the near-term and mid-term, the County can concentrate its efforts on the following emphasis areas.

- Lane Departure
- Occupant Protection
- Aggressive Driving
- Intersection Improvement
- Impaired Driving

Analysis conducted at the Countywide level indicated that these factors were some of the most frequent influences contributing to crashes within the County. Projects that address these focused areas Countywide will be most likely to have a near-term impact on countywide crash rates. For location-specific improvements, the County can utilize benefit-cost ratio calculations to help prioritize projects as funding and resources become available.

The County can also plan to implement the non-engineering improvements identified on this report, including actions related to Enforcement, Education, and Emergency Response. These actions will require coordination with internal and external stakeholders, such as County departments, law enforcement, local government organizations, and local community organizations. Early buy-in and engagement from these stakeholders will be key to the success of these actions.

To aid in these actions, the County can assemble a 'Task Force' of representatives from different County departments, such as Public Works, Community Development, and Sheriff's Office. This task force will be instrumental in the monitoring, analysis update, project development and project implementation outlined in this plan.

11.3 Next Steps

The County has completed this LRSP to guide the process of future transportation safety improvements for years to come. In addition to the actions identified in the Implementation Plan, the County can perform the following to guide the success of this LRSP and the safety efforts overall.

- Develop investment program to help achieve the County's crash reduction goals.
- Work with state and partner agencies on implementation of large-scale programs and policies.
- Incorporate safety analysis findings in future updates of safety programs.
- Monitor statewide safety priorities, guidance, and funding opportunities.



Appendix A – Case Study Sheets



Case Study Sheet: Location #1

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

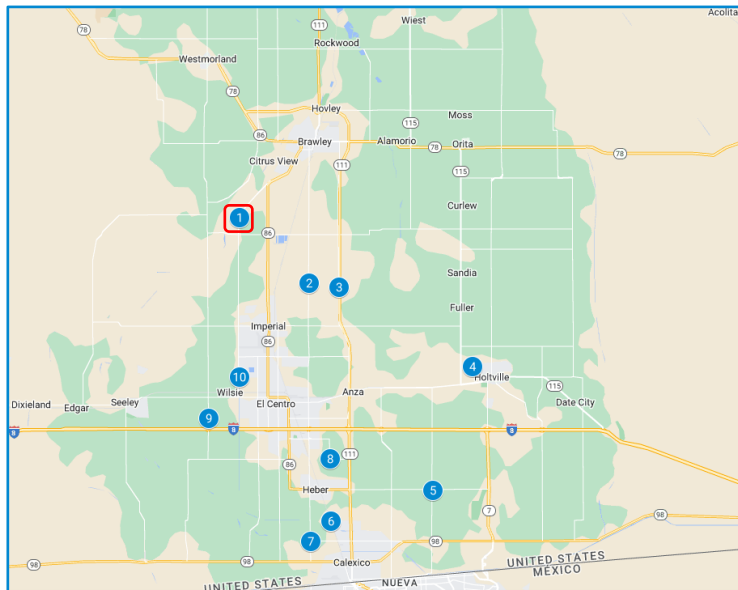
Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

**ROADWAY
SEGMENT**

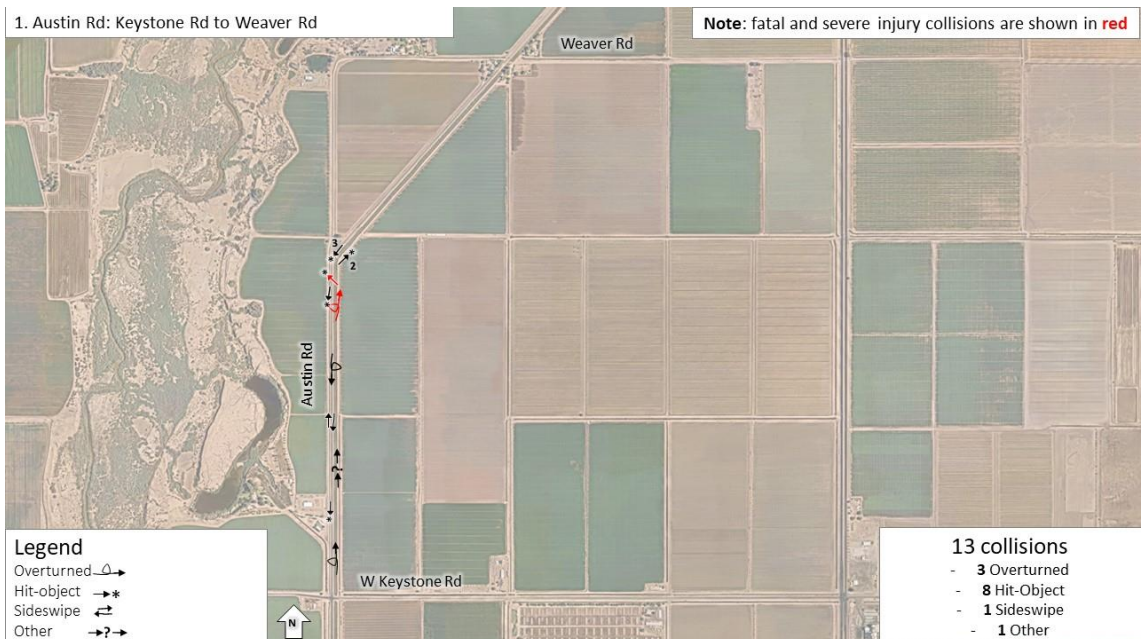
Project Location, Description & Maps

Segment: Austin Road: Keystone Road to Weaver Road

Example of Similar Segment: Huff Road: Hetzel Road to Adair Road



1. Austin Rd: Keystone Rd to Weaver Rd



Project Location, Description & Maps

Collision Data	
Total Collisions	13
Fatal and Severe Injury Collisions	1
Top 3 Collision Types (%)	Hit-Object (61%) Overturned (23%) Sideswipes (7%)
Dark Collisions	4
Impaired Collisions	1

Collision Data	
Number of Approaches	2
Average Daily Traffic	1,500
Crosswalk Condition	
Control Type	Segment
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
13	0	0

Field Visit Notes

- Several collisions near the curves
- Deep canal along east edge of road and curve
- Existing dirt recovery zones/shoulders

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	15% (R22)	\$680,940	\$14,400	47.29
Install curve advance warning signs (flashing beacon)	30% (R25)	\$1,361,880	\$24,000	60.33
Install edgeline rumble strips/stripes	15% (R31)	\$680,940	\$85,000	8.01
Install dynamic/variable speed warning signs	30% (R26)	\$1,361,880	\$45,600	31.75
Install Guardrail	25% (R04)	\$1,134,900	\$ \$200,000	10.43

Countermeasure Evaluation (continued)

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Sequential Dynamic Chevrons	44% (CMF ID: 10361)	\$1,997,424	Varies	-
In-Lane curve warning pavement markings	35% (CMF ID: 10312)	\$1,579,781	Varies	-



Case Study Sheet: Location #2

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

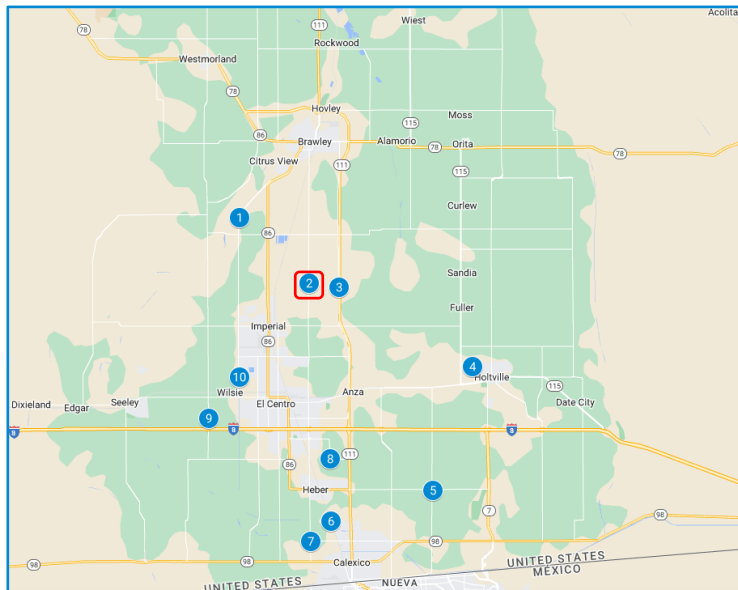
Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

**ROADWAY
SEGMENT**

Project Location, Description & Maps

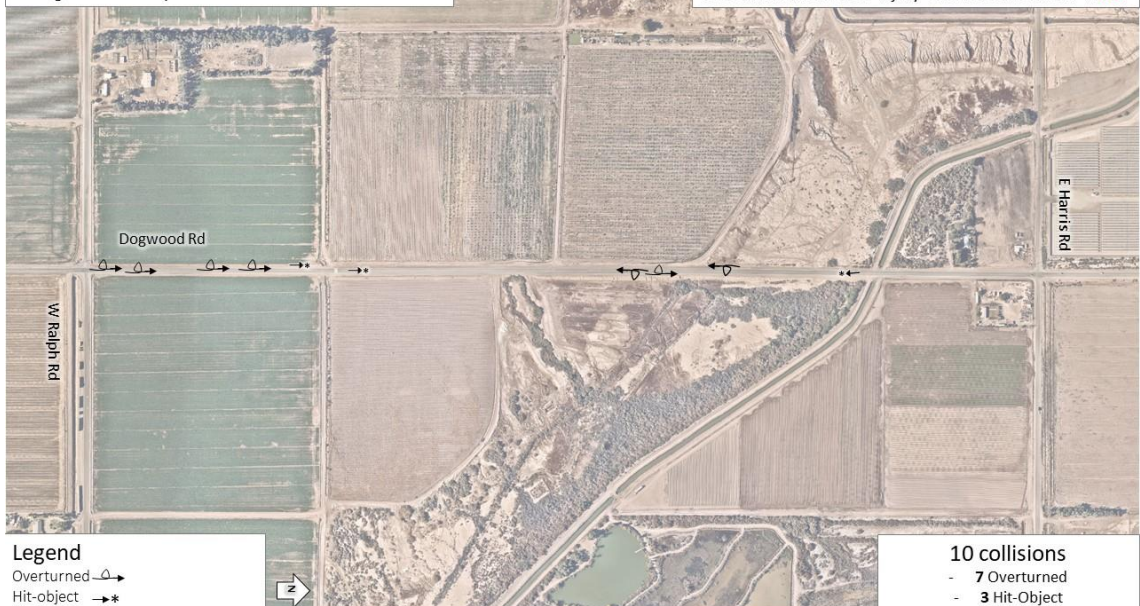
Segment: Dogwood Road: Ralph Road to Harris Road

Example of Similar Segment: West Worthington Road: Forrester Road to Austin Road



2. Dogwood Rd: Ralph Rd to Harris Rd

Note: fatal and severe injury collisions are shown in red



Project Location, Description & Maps

Collision Data	
Total Collisions	10
Fatal and Severe Injury Collisions	0
Top 2 Collision Types (%)	Overturned (70%) Hit-Object (30%)
Dark Collisions	4
Impaired Collisions	0

Collision Data	
Number of Approaches	2
Average Daily Traffic	6,197
Crosswalk Condition	
Control Type	Segment
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
10	0	0

Field Visit Notes

- Significant number of overturned vehicles
- Generally has wide dirt shoulders with the exception of a pinch point at Rose Canal
- Significant portion of roadway allows passing on opposing lane

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install safety edge treatment	23% (CMF ID: 9194)	\$29,690	Varies	-
Install centerline rumble strips/stripes	20% (R30)	\$118,760	\$23,750	5.00
Install edgeline rumble strips/stripes	15% (R31)	\$89,070	\$47,500	1.88
Install dynamic/variable speed warning signs	30% (R26)	\$178,140	\$45,600	3.91
Install delineators, reflectors and/or object markers	15% (R27)	\$89,070	\$38,760	2.30



Case Study Sheet: Location #3

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

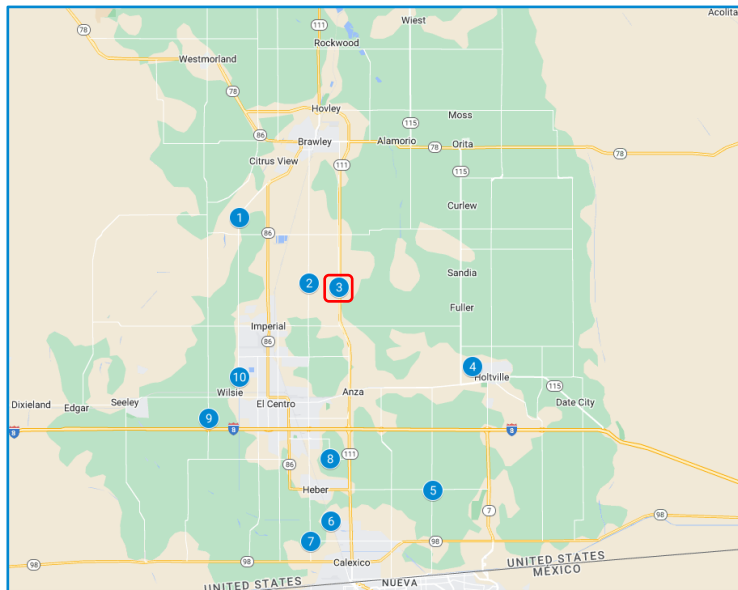
Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

**ROADWAY
SEGMENT**

Project Location, Description & Maps

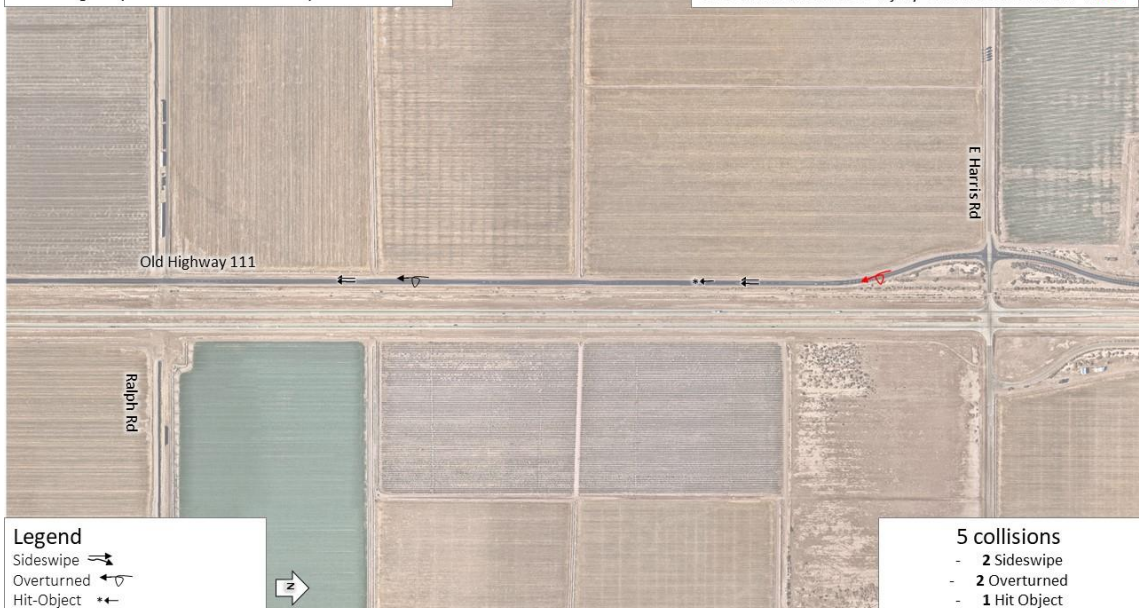
Segment: Old Highway 111: Harris Road to Ralph Road

Example of Similar Segment: Old Highway 111: East Keystone Road to Schartz Road



3. Old Highway 111: Harris Road to Ralph Road

Note: fatal and severe injury collisions are shown in red



Project Location, Description & Maps

Collision Data	
Total Collisions	5
Fatal and Severe Injury Collisions	1
Top 3 Collision Types (%)	Overtaken (40%) Sideswipe (40%) Hit-Object (20%)
Dark Collisions	2
Impaired Collisions	0

Collision Data	
Number of Approaches	2
Average Daily Traffic	750
Crosswalk Condition	
Control Type	Segment
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
5	0	0

Field Visit Notes

- Parallel to State Highway 111
- Fast speeds by curve towards E Harris Rd & Old Hwy 111

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install delineators, reflectors and/or object markers	15% (R27)	\$365,970	\$40,800	8.96
Install centerline rumble strips/stripes	20% (R30)	\$487,960	\$25,000	19.51
Install edgeline rumble strips/stripes	15% (R31)	\$365,970	\$50,000	7.31
Install chevron signs on horizontal curves	40% (R23)	\$975,920	\$28,800	33.88
Install safety edge treatment	23% (CMF ID: 9194)	\$551,395	Varies	-

Countermeasure Evaluation (continued)

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	15% (R22)	\$365,970	\$4,800	76.24
Install Guardrail	25% (R04)	\$609,950	\$320,000	1.90



Case Study Sheet: Location #4

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

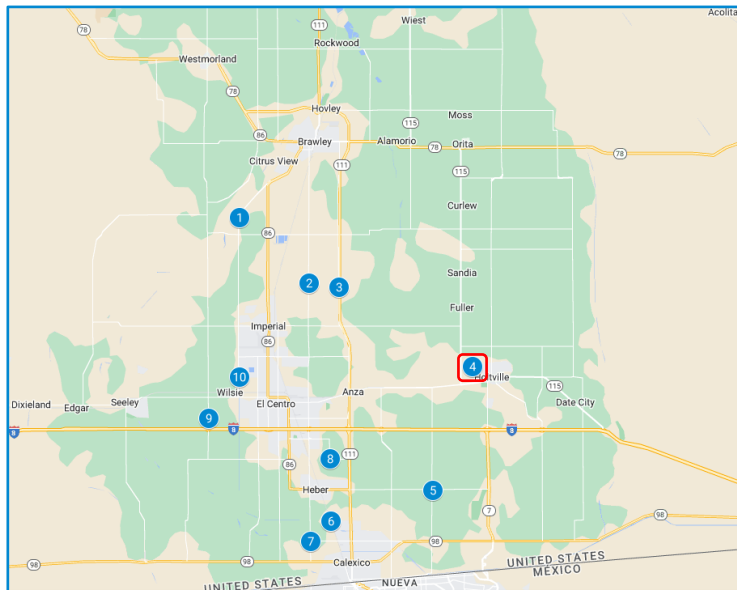
Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

**ROADWAY
SEGMENT**

Project Location, Description & Maps

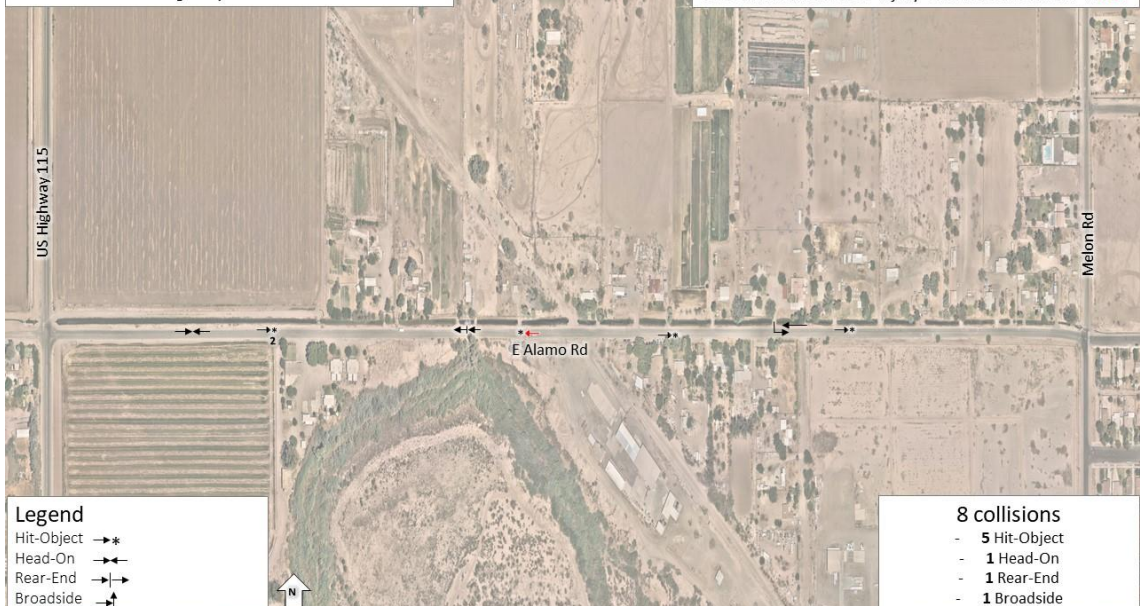
Segment: Alamo Road: State Highway 115 to Melon Road

Example of Similar Segment: Old Highway 111: Carey Road to Keystone Road



4. Alamo Rd: State Highway 115 to Melon Rd

Note: fatal and severe injury collisions are shown in red



Project Location, Description & Maps

Collision Data	
Total Collisions	8
Fatal and Severe Injury Collisions	1
Top Collision Type (%)	Broadside (62%)
Dark Collisions	5
Impaired Collisions	2

Collision Data	
Number of Approaches	2
Average Daily Traffic	1,500
Crosswalk Condition	
Control Type	Segment
Lighting	Limited Lighting
Posted Speed Limit	40

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
8	0	0

Field Visit Notes

- Many driveways to local residences
- Shrubbery and trees limit size of shoulder on some sections of the eastbound direction
- Ninth Street Ditch limits side of shoulder on the westbound direction

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install flashing beacons as advance warning (S.I)	30% (S10)	\$764,190	\$61,200	12.48
Install edge-lines and centerlines	25% (R28)	\$636,825	\$100,800	6.31
Install edgeline rumble strips/stripe	15% (R31)	\$509,460	\$100,000	3.82
Install centerline rumble strips/stripes	20% (R30)	\$382,095	\$50,000	10.18
Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	15% (R22)	\$382,095	\$19,200	19.90

Countermeasure Evaluation (continued)

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install dynamic/variable speed warning signs	30% (R26)	\$764,190	\$45,600	16.75

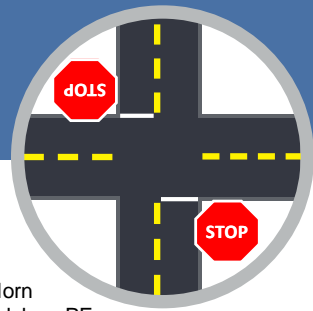


Case Study Sheet: Location #5

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

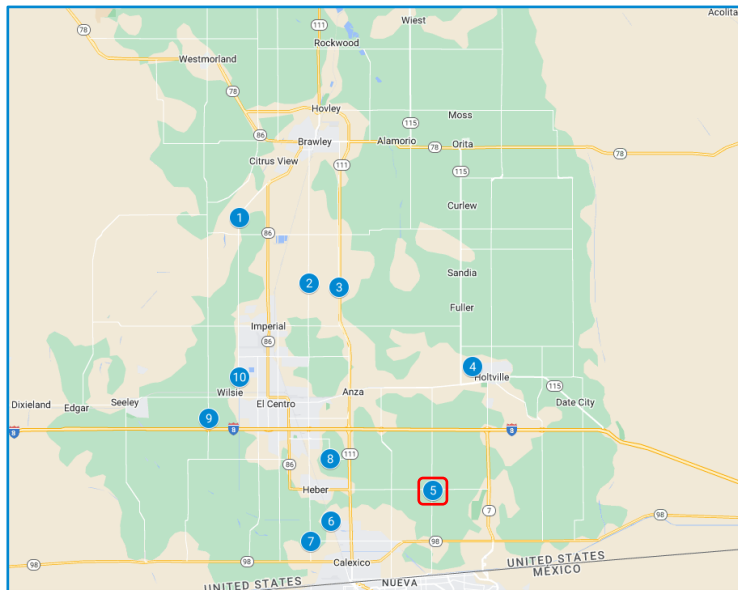
**TWO-WAY-STOP
INTERSECTION**



Project Location, Description & Maps

Intersection: Barbara Worth Road & Heber Road

Example of Similar Intersection: Austin Road and Larsen Road



5. Barbara Worth Rd & Heber Rd



Project Location, Description & Maps

Collision Data	
Total Collisions	15
Fatal and Severe Injury Collisions	0
Top 3 Collision Types (%)	Broadside (86%) Hit-Object (6%) Other (6%)
Dark Collisions	5
Impaired Collisions	0

Collision Data	
Number of Approaches	4
Average Daily Traffic	219
Crosswalk Condition	
Control Type	Two – way stop
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
15	0	0

Field Visit Notes

- Skewed intersection requires more driver attention to cross on Barbara Worth Road to avoid head-on collisions
- Traffic on East Heber Road does not stop
- Potential for installation of warnings of stop sign on Barbara Worth Road

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Convert intersection to roundabout (from stop or yield control on minor road)	5% (NS05)	\$26,565	Varies	-
Flatten horizontal curve	69% (CMF ID 9525)	\$363,941	Varies	-
Install Flashing Beacons at Stop-Controlled Intersections	15% (NS08)	\$382,095	\$24,000	15.92

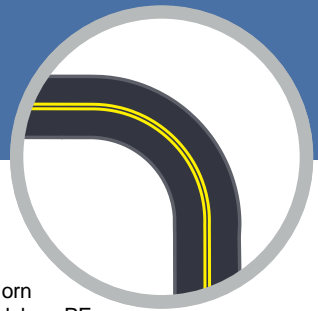


Case Study Sheet: Location #6

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

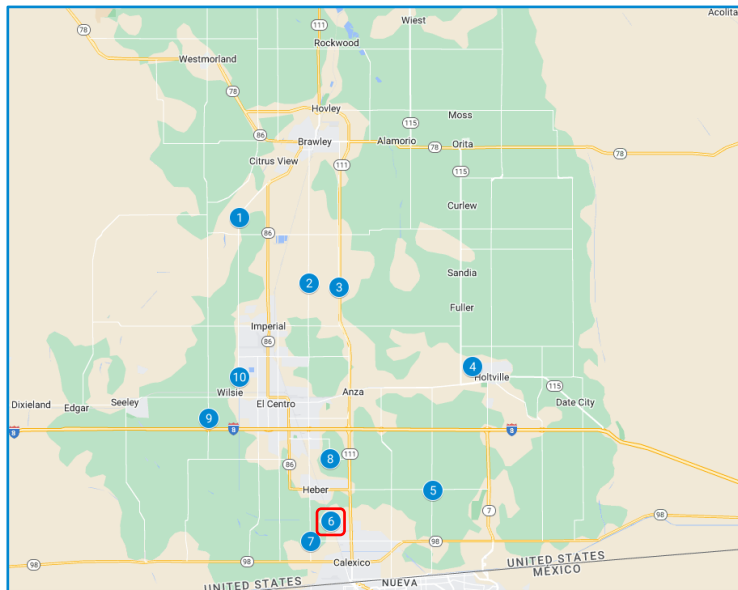
**ROADWAY
CURVE**



Project Location, Description & Maps

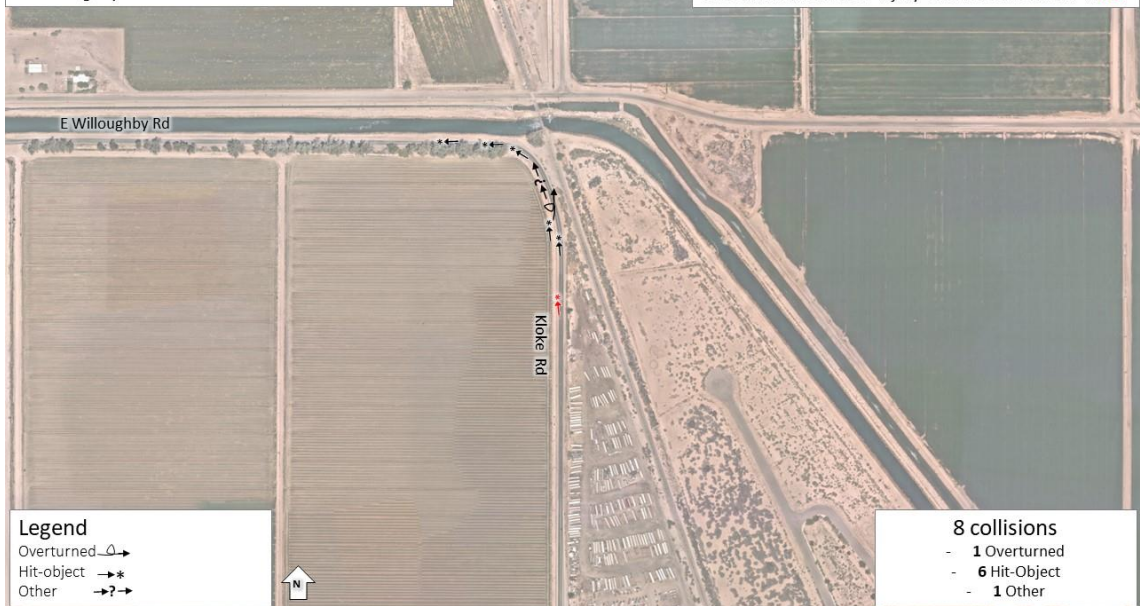
Intersection: Willoughby Road & Klope Road

Example of Similar Intersection: State Highway 78 and State Highway 115



6. Willoughby Rd & Klope Rd

Note: fatal and severe injury collisions are shown in red



Project Location, Description & Maps

Collision Data	
Total Collisions	8
Fatal and Severe Injury Collisions	1
Top 3 Collision Types (%)	Hit-Object (75%) Overturned (12%) Other (12%)
Dark Collisions	3
Impaired Collisions	1

Collision Data	
Number of Approaches	2
Average Daily Traffic	244
Crosswalk Condition	
Control Type	Unsignalized Segment
Lighting	Limited Lighting
Highest Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
8	0	0

Field Visit Notes

- Drivers are at a high speed when taking the curve
- Guardrail has shown past signs of damage from collisions

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install chevron signs on horizontal curves	40% (R23)	\$253,920	\$19,200	13.23
Install curve advance warning signs	25% (R24)	\$158,700	\$4,800	33.06
Install curve advance warning signs (flashing beacon)	30% (R25)	\$190,440	\$24,000	7.94
Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	15% (R22)	\$95,220	\$19,200	4.96
Sequential dynamic chevrons	44% CMF ID: 10361	\$279,312	Varies	-

Countermeasure Evaluation (continued)

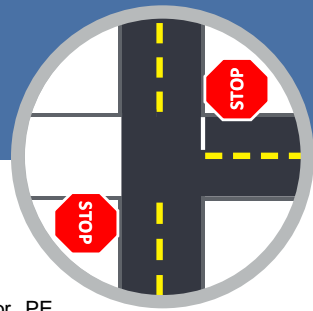
Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Improve/upgrade guardrail	25% (R04)	\$158,700	\$200,000	0.79
Install transverse rumble strips on approaches	20% (NS10)	\$83,740	\$15,600	5.37



Case Study Sheet: Location #7

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

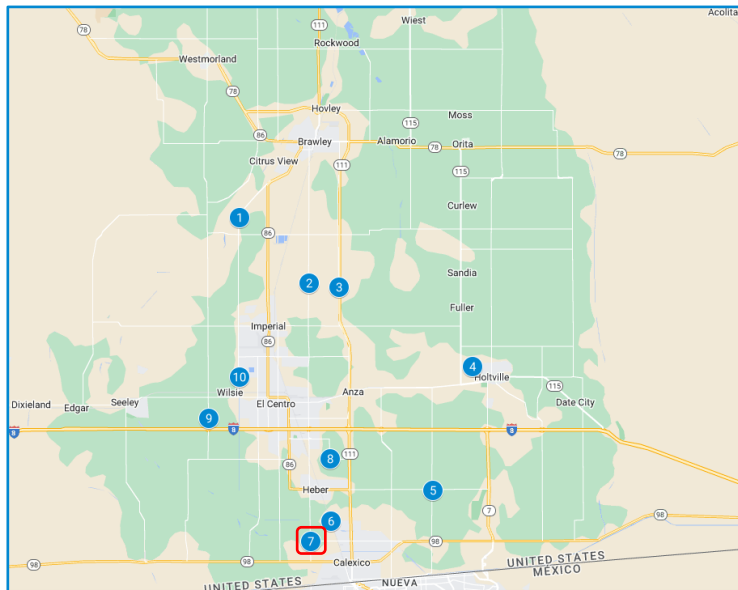


**TWO-WAY-STOP
INTERSECTION**

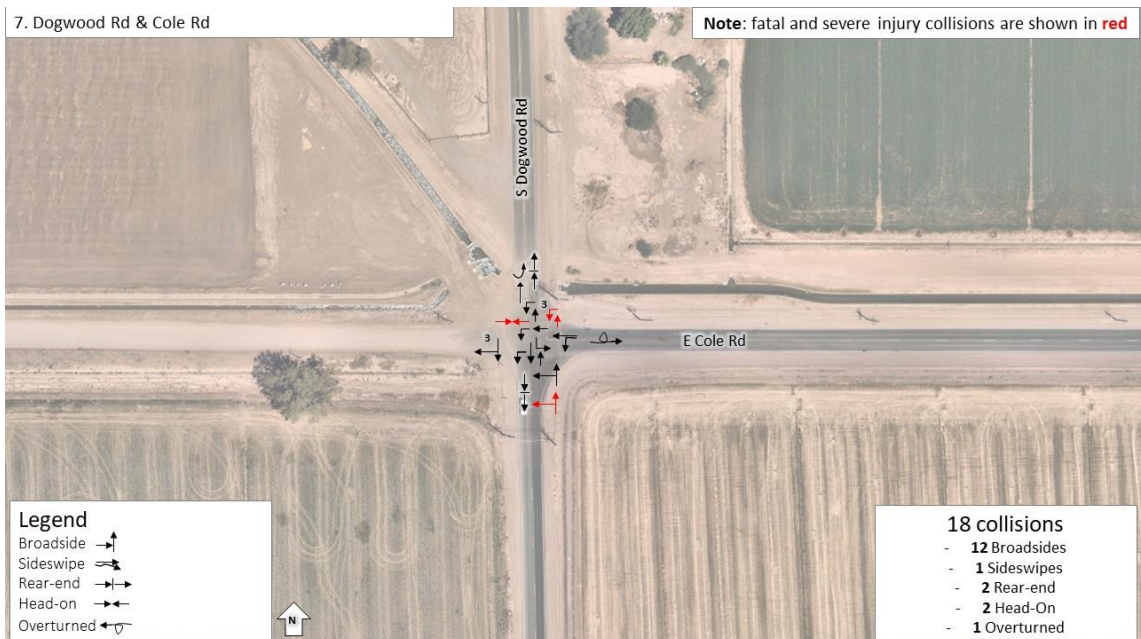
Project Location, Description & Maps

Intersection: Dogwood Road & Cole Road

Example of Similar Intersection: Bowker Road & East Cole Road



7. Dogwood Rd & Cole Rd



Project Location, Description & Maps

Collision Data	
Total Collisions	18
Fatal and Severe Injury Collisions	3
Top 3 Collision Types (%)	Broadside (66%) Head-On (11%) Rear-End (11%)
Dark Collisions	7
Impaired Collisions	1

Collision Data	
Number of Approaches	4
Average Daily Traffic	9,776
Crosswalk Condition	
Control Type	Two-way stop
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
18	0	0

Field Visit Notes

- Traffic on Dogwood Road does not stop
- Stop bar and text is faded
- Multiple headwalls, utility poles, and objects on road shoulders

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	15% (NS06)	\$1,163,805	\$16,800	69.27
Install transverse rumble strips on approaches	20% (NS10)	\$1,551,740	\$31,200	49.74
Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	15% (R22)	\$1,163,805	\$14,400	80.82

Countermeasure Evaluation (continued)

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Improve/upgrade Guardrail	25% (R04)	\$158,700	\$200,000	0.79
Install flashing beacons at stop-controlled intersection	15% (NS08)	\$1,163,805	\$25,000	46.55

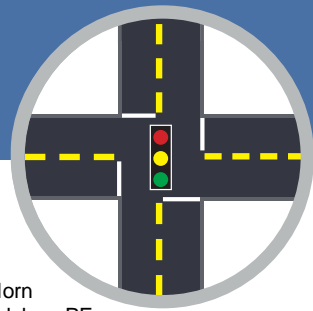


Case Study Sheet: Location #8

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

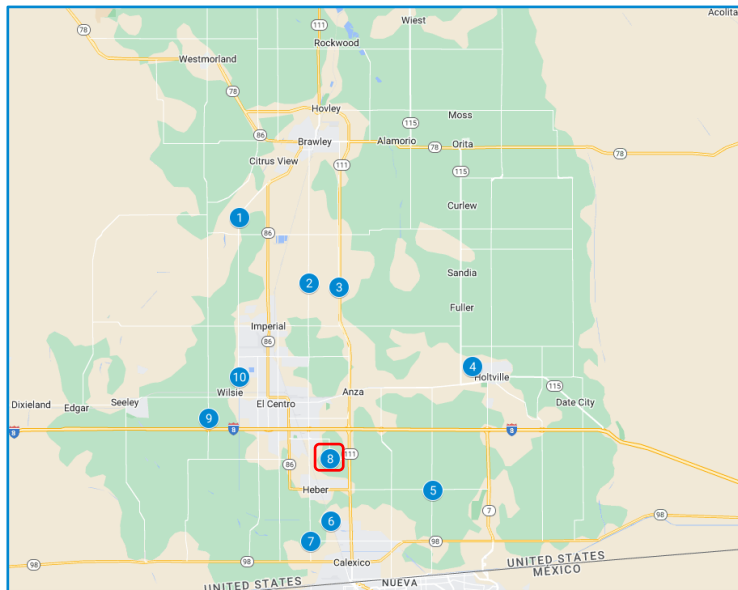
**SIGNALIZED
INTERSECTION**



Project Location, Description & Maps

Intersection: Pitzer Road & McCabe Road

Example of Similar Intersections: State Highway 86 & McCabe Road; Forrester Road & Evan Hewes Highway



8. Pitzer Road & McCabe Road



Project Location, Description & Maps

Collision Data	
Total Collisions	10
Fatal and Severe Injury Collisions	0
Top 3 Collision Types (%)	Broadside (70%) Head-On (20%) Sideswipes (10%)
Dark Collisions	2
Impaired Collisions	0

Collision Data	
Number of Approaches	4
Average Daily Traffic	5,687
Crosswalk Condition	
Control Type	Signalized Intersection
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
10	0	0

Field Visit Notes

- Permissive left turn on Pitzer Road
- Pedestrian push button and heads, but no crosswalk or curb ramp
- Large number of broadsides

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Improve signal hardware; lenses, back plate with retroreflective borders, mounting, size, and number	15% (S02)	\$90,930	\$26,400	3.44
Improve signal signals timing (coordination, phases, red, yellow, or operations)	30% (S03)	\$181,860	\$270,000	0.67
Install upgrade signs with new fluorescent sheeting (regulatory or warning)	15% (R22)	\$90,930	\$9,600	9.47
Provide protected left turn phase (left turn lane already exists)	30% (S07)	\$181,860	\$45,600	3.99

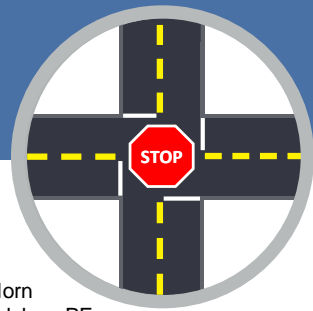


Case Study Sheet: Location #9

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

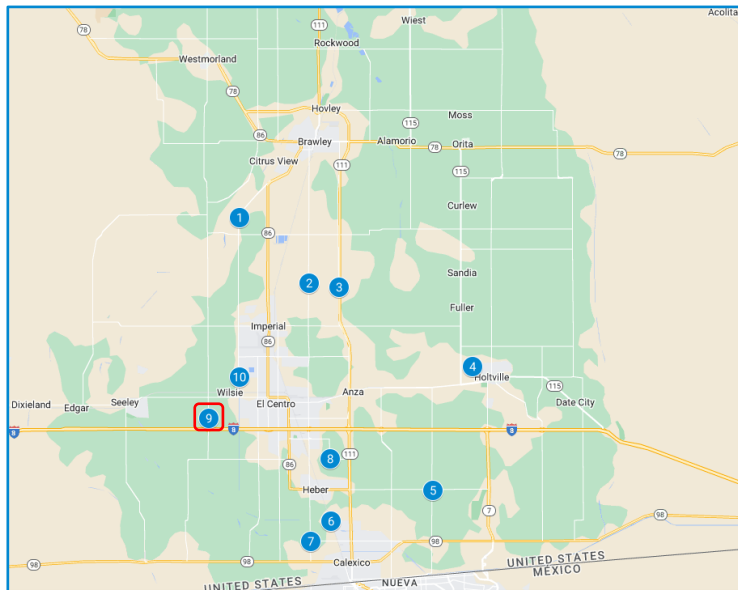
**ALL-WAY-STOP
 INTERSECTION**



Project Location, Description & Maps

Intersection: Forrester Road & Ross Road

Example of Similar Intersection: Austin Road & Keystone Road



9. Forrester Rd & Ross Rd



Project Location, Description & Maps

Collision Data	
Total Collisions	16
Fatal and Severe Injury Collisions	0
Top 3 Collision Types (%)	Broadside (62%) Rear-End(25%) Sideswipe(6%)
Dark Collisions	1
Impaired Collisions	0

Collision Data	
Number of Approaches	4
Average Daily Traffic	3,357
Crosswalk Condition	
Control Type	Four-way stop
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
16	0	0

Field Visit Notes

- Large stop sign with flashing red light already mounted on four intersections
- Existing bike lane on Ross Road
- Ross Road is slightly offset comparing its eastbound and westbound leg

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	15% (NS06)	\$476,385	\$16,800	28.36
Upgrade intersection pavement markings (NS.I.)	25% (NS07)	\$793,975	\$38,400	20.68
Install transverse rumble strips on approaches	20% (NS10)	\$635,180	\$31,200	20.36
Install delineators, reflectors and/or object markers	15% (R27)	\$476,385	\$16,320	29.19



Case Study Sheet: Location #10

Project Name: Imperial County LRSP
Agency Name: Imperial County
Contact Name: Francisco Olmedo, PE
Email: FranciscoOlmedo@co.imperial.ca.us

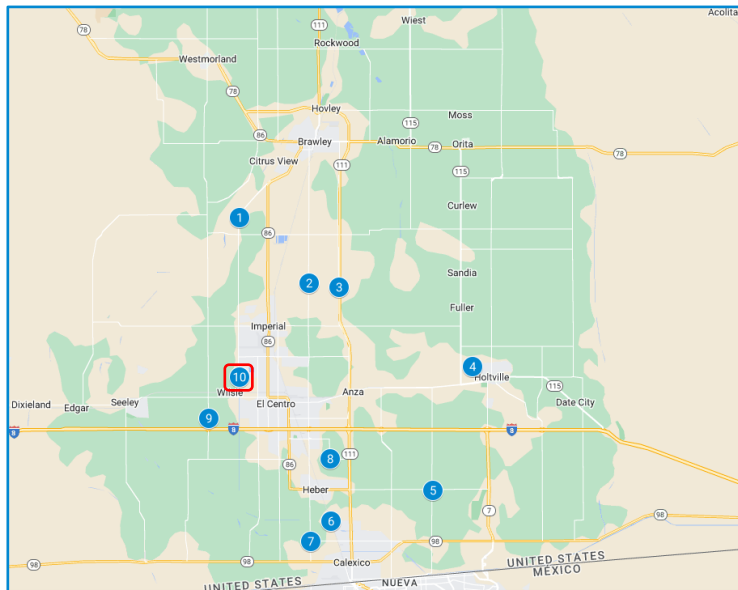
Prepared by: Kimley-Horn
Checked by: Jason Melchor, PE
Date: 2024

**ROADWAY
SEGMENT**

Project Location, Description & Maps

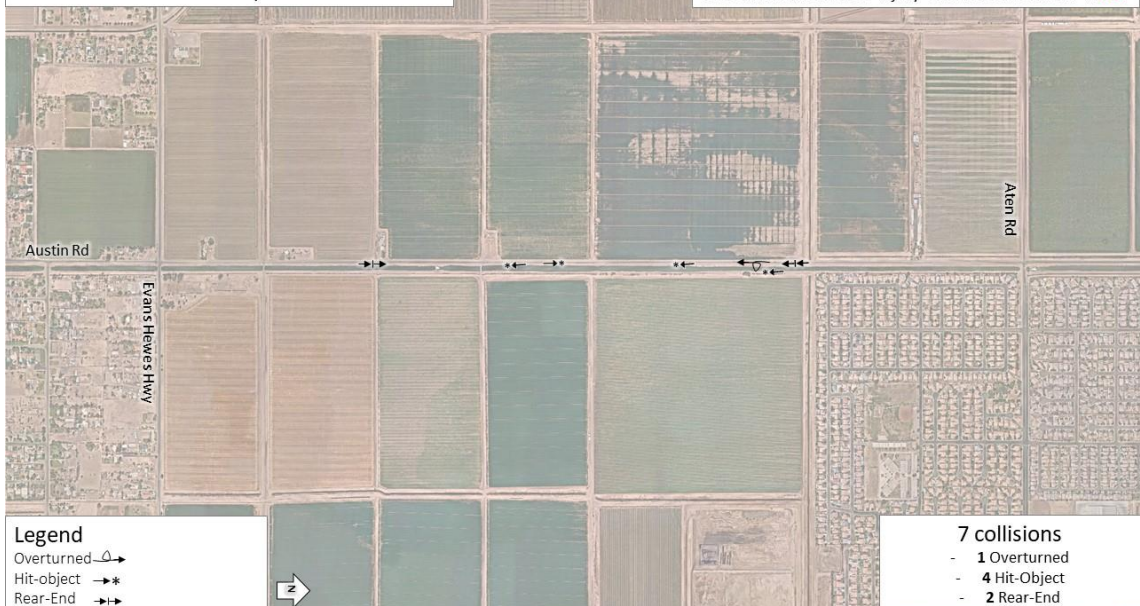
Segment: Austin Road: Evans Hewes Hwy to Aten Road

Example of Similar Segment: Old Highway 111: Cruickshank Road to Aten Road



10. Austin Rd: Evans Hewes Hwy to Aten Rd

Note: fatal and severe injury collisions are shown in red



Project Location, Description & Maps

Collision Data	
Total Collisions	7
Fatal and Severe Injury Collisions	0
Top 3 Collision Types (%)	Hit-Object (57%) Rear-End (28%) Overturned (14%)
Dark Collisions	3
Impaired Collisions	1

Collision Data	
Number of Approaches	2
Average Daily Traffic	1,905
Crosswalk Condition	
Control Type	Segment
Lighting	Limited Lighting
Posted Speed Limit	55

Collisions Involved With		
Vehicular	Pedestrian	Bicycle
7	0	0

Field Visit Notes

- Existing at-grade railroad crossing in middle of segment
- Significant portion of roadway allows passing on opposing lane

Countermeasure Evaluation

Potential Countermeasures	Crash Reduction Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C Ratio
Install centerline rumble strips/stripes	20% (R30)	\$83,740	\$50,000	1.67
Install edgeline rumble strips/stripes	15% (R31)	\$62,805	\$100,000	0.63
Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	15% (R22)	\$62,805	\$19,200	3.27
Install safety edge treatment	23% (CMF ID: 9194)	\$551,395	Varies	-