



PALMDALE SUSTAINABLE TRANSPORTATION PLAN

May 2023



Federal Transit Administration



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Acknowledgements

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Executive Summary

The Palmdale Sustainable Transportation Plan (STP) serves as the City of Palmdale’s primary guide for transportation improvements in the City, with the core goals of improving safety for all road users and achieving sustainable reductions in vehicle miles traveled (VMT) by expanding access to multi-modal transportation options and updates to local development processes. The core goals of the STP align with the vision and goals in the Palmdale 2045 General Plan. As the City’s population continues to grow, the City wants to ensure that the transportation network in Palmdale reflects the desires and travel patterns of its current and future residents. If growth is not managed effectively, issues such as urban sprawl, congestion, and long travel distances to jobs and services may be exacerbated. These impacts may disproportionately affect residents in disadvantaged communities.

This STP analyzes key transportation issues involving traffic safety, VMT, and equity to develop targeted recommendations to achieve the Plan’s goals. Three separate reports accompany this document and provide more detail regarding safety, VMT, and equity.

The safety analysis identified intersections and roadway segments with particularly high crash rates and factors that contribute most to local traffic collisions. The safety analysis used a GIS-based safety tool for network screening and monitoring of traffic safety. This plan analyzes the most recent range of crash data (January 1, 2017 – December 31, 2021) and roadway improvements to assess historic trends, patterns, and areas of increasing concern. While the COVID-19 pandemic altered traffic conditions and collision patterns in 2020 and 2021, these years of data were ultimately included to understand recent trends. Figure 1 summarizes several statistics derived from the collision analysis. Further, the collision history was analyzed to identify locations with elevated risk of collisions either through the location’s collision history or its similarities to other locations with more active collision patterns. Using a network screening process, locations were identified within the City that will most likely benefit from safety enhancements. The analysis outcomes informed the identification and prioritization of infrastructure and non-infrastructure safety measures to address certain roadway characteristics and related behaviors that may contribute to motor vehicle collisions with active transportation users. A Highway Safety Improvement Program (HSIP) grant application will be developed based on the safety analysis conducted in the STP.

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
Intersections

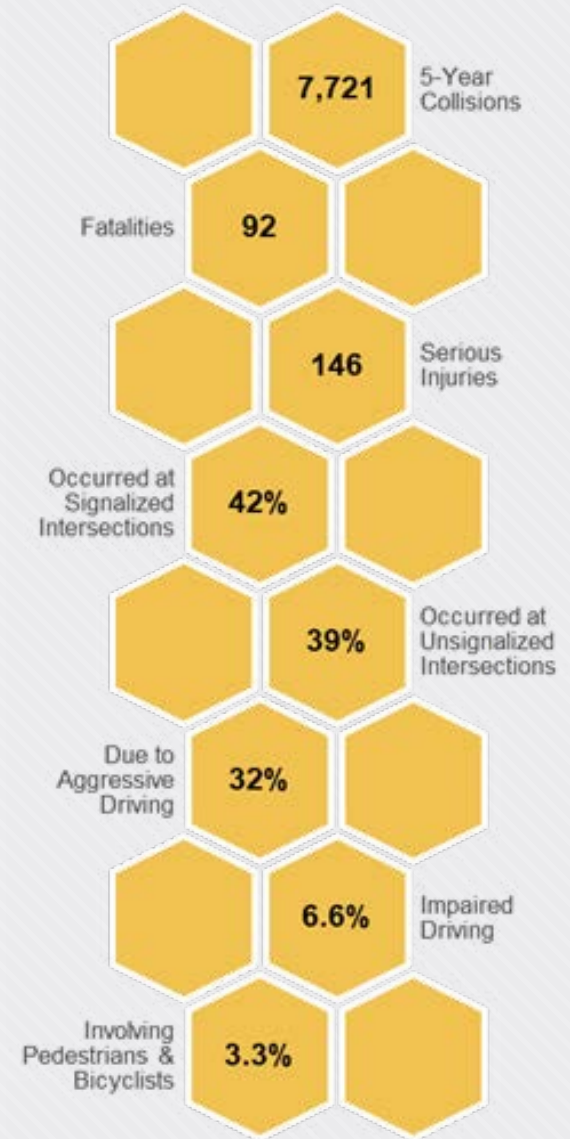


Emphasis Area #2
Impaired Drivers



Emphasis Area #3
Young Drivers

Figure 1: Collision Summary



Source: Palmdale Collision Database (2017-2021)

Ten case study locations were chosen to be representative of the corridor and intersection configurations throughout the City. These locations were identified through the analysis process based on their crash history, stakeholder engagement, the observed crash patterns, and their different characteristics to provide the most insight into potential systemic safety countermeasures that the City can employ to achieve the most cost-effective safety benefits. Additionally, this information can be used to help the City apply for grants and other funding opportunities to implement these safety improvements. These opportunities were assembled into a “countermeasure toolbox.” Non-infrastructure improvements such as policies and programs were also identified in the safety analysis. The improvements were developed by referencing the Caltrans Proven Safety Countermeasures and will incorporate the Caltrans Safe System Approach in their implementation. These improvements were identified in the equity analysis as well. Many of the improvements identified in this Sustainable Transportation Plan align with the Circulation and Mobility Element of the City’s Palmdale 2045 General Plan. The improvements outlined in the STP also align with the State Guidance Documents (including the Moving Towards Roundabouts in California guidance), Regional Guidance Documents, and Caltrans Modal Plans.

The VMT analysis examined various future development scenarios and were analyzed to understand their impacts on vehicle trips, trip length and resulting greenhouse gas (GHG) emissions. The VMT analysis analyzed land uses in the base year of 2017 and the 2045 Preferred Plan from the Palmdale 2045 analysis. The VMT analysis also identified potential infrastructure, program, and policy improvements that have the potential to mitigate VMT. These improvements include infill developments, increase bus services, bicycle projects, and additional transit projects. The analysis determined the reduction in VMT and GHG from these improvements. The VMT analysis used a City-calibrated VMT model (utilizing the TREDLite software) that helped develop, identify, and mitigate VMT impacts.

The equity analysis considered the implications of the safety and VMT analyses in the context of equity to communities. The equity analysis also identified three equity priority areas in the City using federal, state, and county definitions of equity communities. The safety and VMT data were compared with the equity priority areas and trends were identified through this process. Following this analysis, recommendations were made relating to equity in infrastructure, policies, and program. These recommendations included a Safe Routes to School program, developing Vision Zero and Complete Streets policies, updating land use policies, and implementing



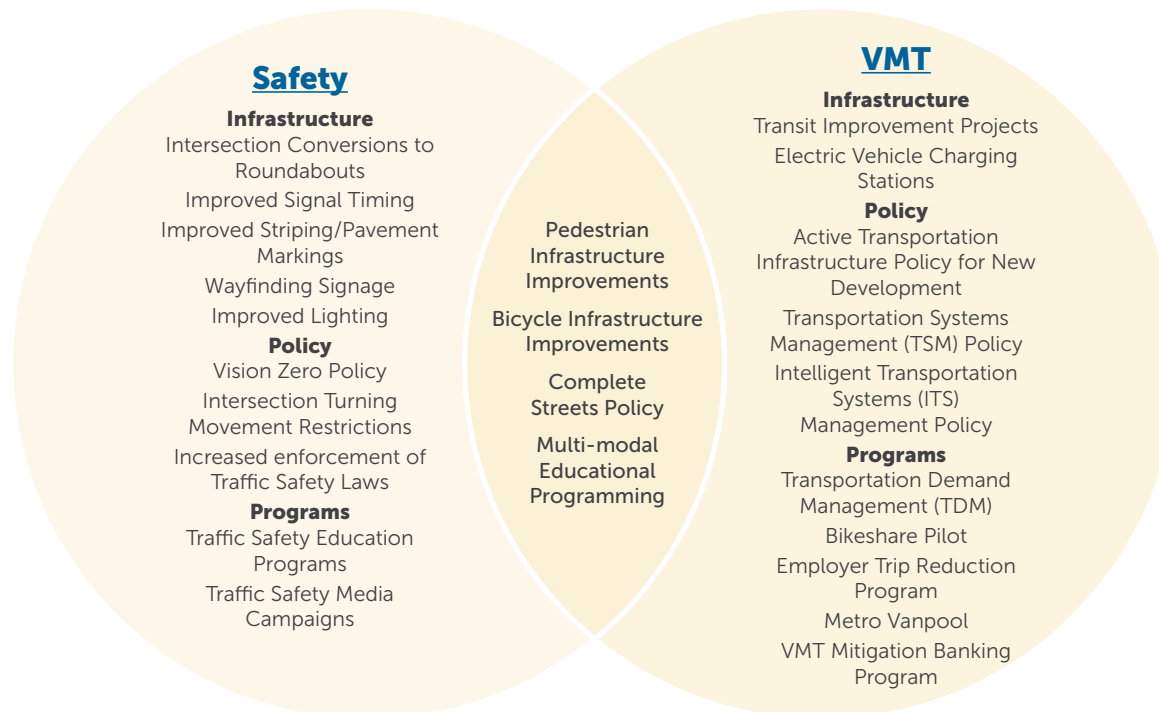
programs such as bikeshare pilots, vanpooling, and microtransit.

Throughout the Plan development, robust community engagement efforts were taken to understand resident concerns and desires through two public workshops, online survey tools, and a participatory budgeting process to identify priority projects. As part of the safety analysis, the City engaged with stakeholders such as the Antelope Valley Transit Authority (AVTA) and the Palmdale School District Transportation staff. These stakeholders were asked to provide local insight on the identification of safety issue priority areas. The general public was also engaged throughout the planning process. The first round of engagement began in the Summer of 2022 with five listening sessions and three community workshops to explain the Plan and gather feedback on residents needs and concerns. The feedback was used to further develop the Plan strategies and alternatives. The second round of engagement was held in the Fall of 2022 with three workshops and a participatory budgeting exercise. The public was able to give additional feedback and identify their top funding priorities in the City. An online survey was also made available throughout the Plan's development. Throughout the engagement process 56 people attended the workshops and the survey received 246 responses. The online engagement was performed using a 'Social Pinpoint' website, which the City will use to provide ongoing two-way communication with the public as the Plan is implemented.

The STP additionally identified potential funding opportunities for the recommendations and alternatives. These funding sources included federal, state, regional, and local sources. The available grant funding has a specific focus on increasing equitable community development and addressing climate change goals. These funding sources will be essential in the planning and implementation of projects to achieve the City's safety and VMT reduction goals.

Moving forward, the City now has funding sources identified and the tools in place to implement projects that achieve the STP goals and recommendations. **Figure 2** outlines the recommendations that are made in the report. In addition to implementing the recommendations identified in the STP, the City can collaborate with state and partner agencies on the implementation of large-scale programs and policies, incorporate findings from the Plan analysis into future City policy-making and initiatives, and monitor national and statewide transportation guidance and priorities to guide the success of this STP and transportation improvement efforts overall.

Figure 2: Palmdale Sustainable Transportation Plan Recommendations



Introduction

The Palmdale Sustainable Transportation Plan (STP) serves as the City of Palmdale's primary guide to transportation improvements in the City, with the core goals of promoting safety for all road users and achieving sustainable reductions in vehicle miles traveled (VMT). By expanding access to multi-modal transportation options, updates to local development processes, and programs to encourage active transportation along with transportation demand management (TDM) strategies VMT can be reduced in Palmdale. As the City's population continues to grow, the City wants to ensure that the transportation network in Palmdale reflects the desires and travel patterns of its current and future residents. If growth is not managed effectively, issues such as urban sprawl, congestion, and long travel distances to jobs and services may be exacerbated. These impacts may disproportionately affect residents of disadvantaged communities.

The STP aligns with the goals and priorities set out in the City's General Plan Palmdale 2045, specifically the Mobility and Circulation Chapter of the plan. Many of the recommendations in this Plan are consistent with the Implementation Actions laid out in the General Plan Mobility and Circulation Chapter. The improvements outlined in the STP also align with statewide plans such as the the Caltrans California Transportation Plan (CTP) 2050, the Caltrans Strategic Management Plan 2020-2024, the Caltrans Climate Action Plan for Transportation Infrastructure (CAPTI), the California High Speed Rail Business Plan, the Caltrans Rail Plan, the Caltrans Transit Plan, the Caltrans Bicycle and Pedestrian Plan, and the Moving Towards Roundabouts in California guidance document. The STP also aligns with Regional Guidance Documents such as the Los Angeles North County Transportation Coalition Guidance, LA Metro 2020 Long Range Plan, and the Antelope Valley Transit Authority (AVTA) Strategic Plan.

This STP analyzes key transportation issues involving traffic safety, vehicle miles traveled (VMT), and equity to develop targeted recommendations to achieve the plan's goals. The safety analysis identified intersections and roadway segments with particularly high crash rates and factors that contribute most to local traffic collisions. The VMT analysis examined various future development scenarios to understand impacts on vehicle trips, trip length and resulting greenhouse gas emissions (GHG). The equity analysis considered the implications of the safety and VMT analyses in the context of equity to communities and identifying priority areas for parts of the City that met different definitions of disadvantaged communities. Throughout the Plan's development, robust community engagement efforts were taken to understand resident concerns and desires through two public workshops, online survey tools, and a participatory budgeting process to identify priority projects.

This report provides an overview of the Plan's recommendations and the analysis conducted to construct the plan. It is laid out as follows:



1. RECOMMENDATIONS

Presents the recommendations developed for the Plan, including emphasis areas and a toolbox of countermeasures identified from the safety analysis and VMT reduction strategies, while also considering how these recommendations should be targeted and prioritized to provide equity to disadvantaged communities.



2. METHODOLOGY

Outlines the specific processes used to conduct safety, VMT, and equity analyses.



3. EXISTING CONDITIONS

Provides an overview of high collision locations and their causes while prioritizing equity throughout the City.



4. ANALYSIS RESULTS

Presents the findings from the safety, VMT, and equity analyses that were used to produce the Plan recommendations.



5. FUNDING SOURCES

Outlines where federal, state, regional, and local funding sources may be obtained.



6. CONCLUSION

Provides a summary of the Plan and outlines the next steps.

1 - Policy and Program Recommendations

Safety

Emphasis Areas

Emphasis areas represent crash factors that are common in the City and provide the opportunity to promote the reduction of 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. The collision data from 2017 through 2021 was used in preparation of this Plan.

<div data-bbox="119 514 283 678"> 1 </div> <div data-bbox="304 581 581 617"> Emphasis Area #1 </div> <div data-bbox="300 652 462 678"> Intersections </div> <ul style="list-style-type: none"> This emphasis area includes all collisions that occur within 250 feet of an intersection 82% of all collisions and 51 % of the fatal and severe injury collisions occurred within 250 feet of an intersection Countermeasures for intersection collisions can include: <ul style="list-style-type: none"> » Signal visibility improvements » Median and crosswalk improvements » Signal timing improvements » Install Leading Pedestrian Interval (LPI) timing » Reduce speed 	<div data-bbox="758 514 921 678"> 2 </div> <div data-bbox="940 581 1218 617"> Emphasis Area #2 </div> <div data-bbox="936 652 1140 678"> Impaired Drivers </div> <ul style="list-style-type: none"> This emphasis area includes any collision involving a roadway user that is under the influence of alcohol or drugs 6% of the collisions in the study period involved impaired roadway users Countermeasures for impaired drivers can include: <ul style="list-style-type: none"> » Impaired driving educational campaigns » Sobriety checkpoint programs » Media campaigns to discourage impaired driving » Improve lighting » Reduce speed 	<div data-bbox="1396 514 1560 678"> 3 </div> <div data-bbox="1579 581 1856 617"> Emphasis Area #3 </div> <div data-bbox="1575 652 1751 678"> Young Drivers </div> <ul style="list-style-type: none"> This emphasis area includes collisions involving drivers aged 15 to 20 9% of collisions involved young drivers Countermeasures for collisions involving young drivers can include: <ul style="list-style-type: none"> » Implement drivers education courses » Increase enforcement to address young driving behaviors » Install advanced warning signs » Reduce speed » Alter signal operations to reduce driver workload (longer yellow, longer all-red times)
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Examples of Potential Countermeasures from Case Study Locations

Following the site visit and analysis process, several potential countermeasures were identified for the case study locations. These countermeasures were developed by referencing the California Local Roadway Safety Manual (LRSM) and the Caltrans Proven Safety Measures. Examples of these countermeasures include:

INSTALLING RECTANGULAR RAPID FLASHING BEACONS (RRFBs)



INSTALLING BUFFERED BICYCLE LANES



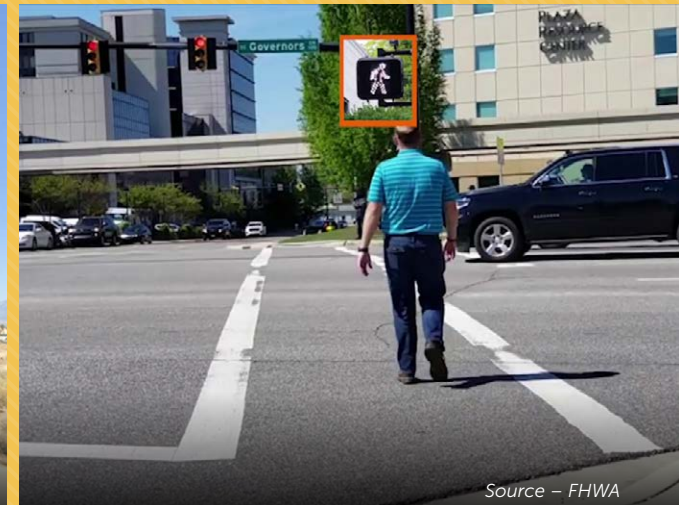
INSTALLING CURB EXTENSIONS/BULB-OUTS



IMPROVING SIGNAL TIMING



ADDING SEGMENT LIGHTING



IMPLEMENTING LEADING PEDESTRIAN INTERVAL (LPI) TIMING AT KEY LOCATIONS



Recommendations

Safety Countermeasure Toolbox

From the overall safety analysis process, a list of potential countermeasures was assembled for locations throughout the City. Proven safety countermeasures are documented by Caltrans in the LRSM, the Federal Highway Administration's Countermeasures That Work, and the Crash Modification Factor Clearinghouse. The LRSM was the primary source for infrastructure safety countermeasures in this study. Within the toolbox below, the description of the countermeasure along with its LRSM ID number is listed. The Crash Reduction Factor (CRF) column are multiplicative factors used to estimate the expected reduction in number of crashes after implementing a given countermeasure at a specific site (the higher the CRF, the greater the expected reduction in crashes). For each of these countermeasures, a planning level benefit/cost analysis was completed. Many of these improvements are consistent with the Implementation Actions set out in the Mobility Element of the General Plan.

Table 1 – Safety Countermeasure Toolbox

Countermeasure ID	Potential Countermeasures	Where to apply?	CRF	Per Unit Cost	Unit
NS04	Convert intersection to roundabout (from all way stop)	Where warranted by an intersection control evaluation	Varies	Varies	Varies
NS07	Upgrade intersection pavement markings (to make more visible)	At intersections where outdated or degraded striping and pavement markings exist	25%	\$38,400	per intersection
NS20PB	Install pedestrian crossing at uncontrolled locations (new signs and markings only)	Where speed limits are less than 35 mph	25%	\$22,000	per intersection
NS22PB	Install Rectangular Rapid Flashing Beacon (RRFB)	Unsignalized locations with significant pedestrian demand where speed limit is up to 35 mph	35%	\$30,000	per intersection
R01	Add segment lighting	At locations that are currently unlit where likely traffic conflict exists	35%	\$900,000	per mile
R08	Install raised median	Higher speed, undivided roadways with 4+ lanes	25%	\$840	per LF for a 10' wide median
R14	Road Diet	Roadway segments with high number of sideswipe collisions	35%	\$50,000	per mile
R17	Improve horizontal alignment (flatten curves)	Locations with excessive lane departure crashes due to roadway geometry	50%	Varies	Varies
R27	Install delineators, reflectors and/or object markers	Locations with a high number of fixed object collisions and collisions on curved segments	50%	Varies	Varies
R30	Install centerline rumble strips/strips	Where travel speeds are greater than 45 mph and either curvature or traffic volumes warrant	20%	\$50,000	per mile
R31	Install edgeline rumble strips/strips	Where travel speeds are greater than 45 mph and either curvature or traffic volumes warrant	15%	\$50,000	per mile
R33PB	Install separated bike lanes	Locations where existing lane widths allow The City has been working to provide buffered bike lanes when roads are repaved, where possible, by decreasing lane widths. This has already been implemented along 25th St W between Ave P-8 and Elizabeth Lake Road	45%	\$50,000	per mile
R35PB	Install/Upgrade pedestrian crossing (with enhanced safety features)	Locations with no controlled crossing for significant distances	35%	\$30,000	per crossing



Countermeasure ID	Potential Countermeasures	Where to apply?	CRF	Per Unit Cost	Unit
R37PB	Install Rectangular Rapid Flashing Beacon (RRFB)	Midblock locations 1500+ feet away from an existing signal with significant pedestrian demand where speed limit is up to 35 mph	35%	\$30,000	per crossing
R34PB	Install sidewalk/pathway (to avoid walking along roadway)	Along roadways where sidewalks currently do not exist	80%	\$300	per LF for 4' sidewalk
S02	Improve signal hardware; lenses, back plate with retroreflective borders, mounting, size, and number	Signalized intersections where signals heads to do not meet current standards	15%	\$26,400	per intersection
S03	Improve signal timing (coordination, phasing, red, yellow, operation)	Signalized intersections where there is insufficient clearance time with current timing plans or where signals placed closely enough to impact free flowing operations of the street	15%	\$25,000	per intersection
S04	Provide Advanced Dilemma Zone Detection for high-speed approaches	Signalized intersections with significant right-angle and rear-end collisions due to unsafe stopping during yellow phases	40%	\$40,000	per intersection
S06	Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)	Locations that have significant left-turn volumes and no left-turn lane with sufficient right-of-way	55%	\$80,000 (simple) to \$350,000 (raised median and signal modification)	per intersection
S16	Convert intersection to roundabout (from signal)	Signalized intersections with a significant collisions due to complex lane configurations	Varies	Varies	Varies
S18PB	Install crosswalk at signalized intersection	Signalized intersection that do not have crosswalks and have significant pedestrian volumes	25%	\$32,000	per intersection
S19PB	Pedestrian Scramble	High volume locations with significant volumes on all intersection legs	40%	\$122,000	per intersection
S21PB	Modify signal phasing to implement a Leading Pedestrian Interval (LPI) with new controller	Signalized Intersections – especially those with high pedestrian activity	60%	\$15,000	per intersection
-*	Restrict uncontrolled left turn	Unsignalized intersections with alternative access opportunities where turning volumes are low	5%	Varies	Varies
-*	Curb Extension/Bulb-Out	Intersections with high pedestrian activity	5%	Varies	Varies
-*	Make wayfinding signs bilingual	Citywide	5%	Varies	Varies
-*	Apply for funding to Safe Routes to School (Active Transportation Program)	Citywide	5%	Varies	Varies
-*	Mark pavement with supplementary warning messages	Locations with right turn pockets	30%	Varies	Varies
-*	Improve pavement (dips)	Where water pools consistently at a level to create driving hazards or where the general speed of traffic is too high for the level of dip	5%	Varies	Varies

*There were not approved countermeasures for these improvements in the Local Roadway Safety Manual, so a conservative CRF was assumed.



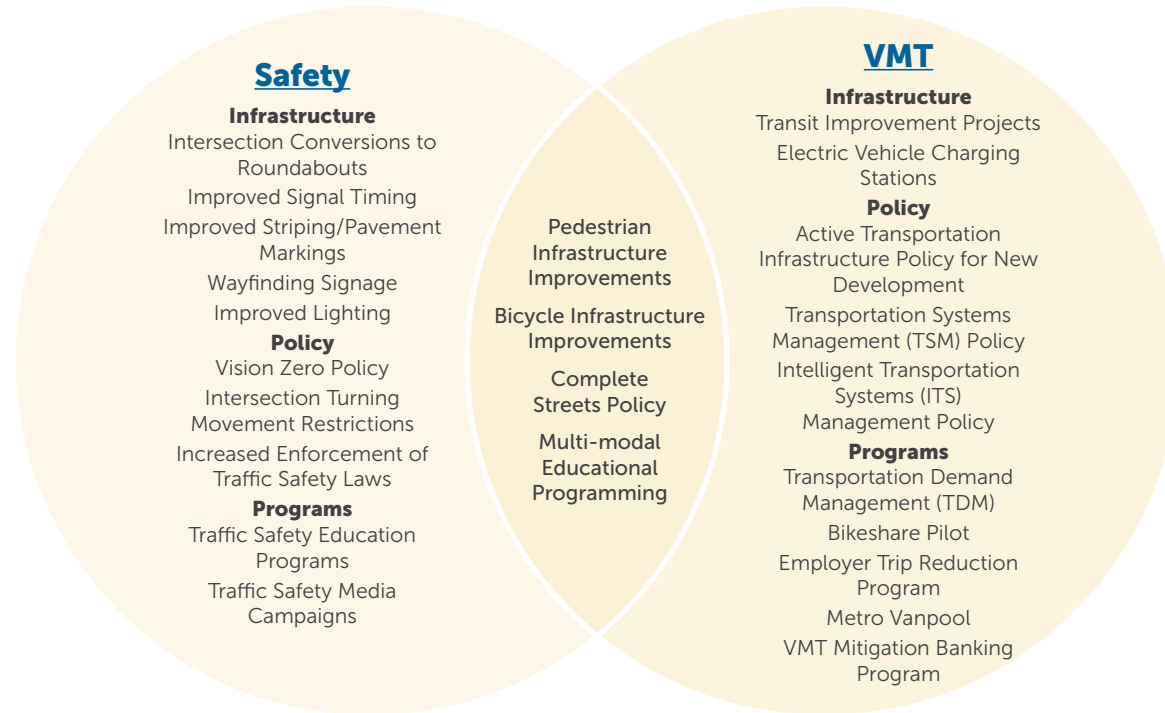
VMT

Several strategies have been identified for reduction in VMT and GHG. These strategies include active transportation projects, transit improvement projects, and programmatic improvements such as the implementation of a vanpool program or an employer trip reduction program. The table below summarizes the strategies and their potential GHG emission reductions.

Table 2: Daily Transportation GHG Reduction Quantification

STP Strategy	Quantification Approach	2017 Existing	2045 Preferred Plan	
Population	GP Forecast	188,488	225,692	
Total Auto VMT	Travel Demand Model	7,699,173	7,387,266	
Initial GHG Results (Transportation)		GHG (tons)	GHG (tons)	GHG Change (%)
GHG Scenario Results	EMFAC 2021	2,912	1,779	-38.9%
Off-Model Reductions			Reduction in GHG (tons)	GHG Change (%)
Bicycle Projects	Off-Model		-1.4	-0.1%
Transit Improvements	Off-Model		-12.5	-0.7%
Electric Vehicle Infrastructure Charging Incentive Program	Off-Model		-4.0	-0.2%
Transportation System Management/ Intelligent Transportation Systems	Off-Model		-32.5	-1.8%
Metro Van Pool Program	Off-Model		-1.4	-0.1%
Employer Trip Reduction Program	Off-Model		-82.2	-4.6%
VMT Banking/Exchange	City Model/Off-Model		-21.4	-1.2%
Results		GHG (tons)	GHG (tons)	GHG Change (%)
Total Off Model GHG Reductions (CO2 Tons)		-	-155.4	-8.7%
Total Emissions per Weekday (CO2 Tons)		2,912	1,624	-44.23%

Comparing Safety and VMT Recommendations



Factoring in Equity

Infrastructure

- Target infrastructure improvements within census tracts in equity priority area where a majority of pedestrian and bicycle collisions result in fatal or severe injuries.
- Provide bilingual wayfinding signage for pedestrians and bicyclists.
- Seek Safe Routes to School program funding to target the expansion of pedestrian and bicycle infrastructure near schools.
- Promote multimodal street infrastructure near job hubs to facilitate sustainable commuting and alternative mobility options.
- Implement design standards to improve bus stop infrastructure that provides safety and comfort for transit users.

Policy

- Develop citywide policies such as Vision Zero and Complete Streets to target improvements within equity priority areas. Prioritize pedestrian and cycling infrastructure that connects transit facilities and job centers, as well as schools and parks.
- Incorporate safety analysis findings in safety programs to ensure communities with the greatest need are being considered.
- Monitor state and federal safety priorities, guidance, and funding opportunities, many of which have a specific focus on increasing equitable community development and addressing climate change goals.
- Align transportation and land use policies and projects to ensure increased access to multi-modal transportation facilities.

Program

- Target Safe Routes to School programs that promote walking, biking, and rolling to school and increase community advocacy for improved pedestrian and bicycle safety near schools.
- Organize and host low-cost tactical urbanism projects to pilot safety improvements, gather community feedback, and help build community buy-in.
- Organize pedestrian and bike programs that educate the public on safety measures and provide community resources.
- Target programs such as bikeshare pilots, vanpooling, and microtransit within equity priority communities.
- Collaborate with state and regional agencies on expanding electric vehicle and charging infrastructure access within priority area equity communities.

2 - Methodology

Safety

Collision Analysis

The collision analysis was performed using Crossroads collision data from January 2017 to December 2021, using the following steps.

The City's roadway network including functional classification types and intersection types were identified from the City's Palmdale 2045 General Plan and utilized in the roadway analysis. The safety analysis used a GIS-based safety tool for network screening and monitoring of traffic safety.

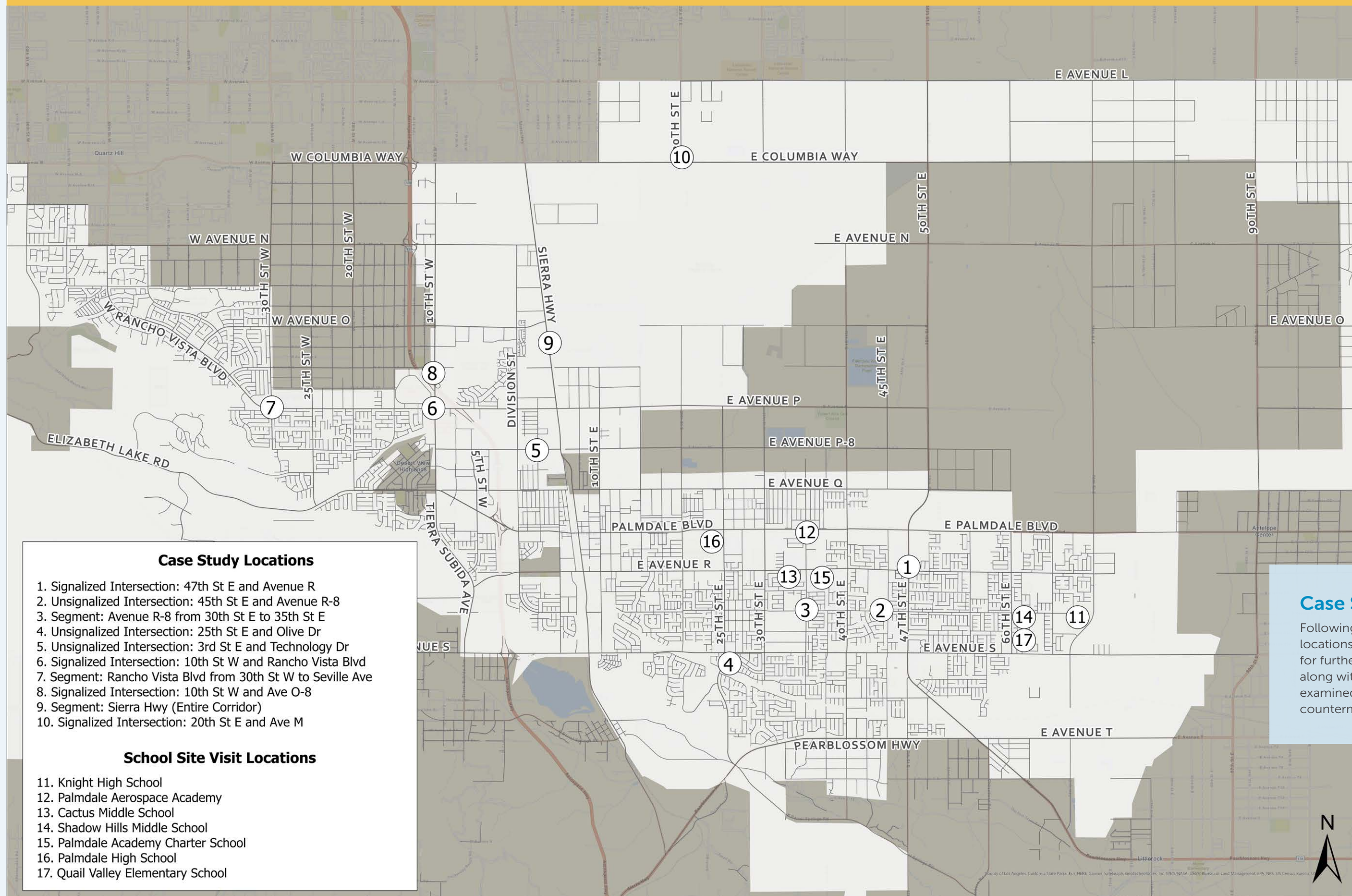
The roadway network and collision data were analyzed to determine the number of collisions at intersections and along roadway segments. Intersection collisions included any collision within 250 feet of an intersection and segment collisions included any collision more than 250 feet from an intersection. The number of collisions of a certain type were also determined for each intersection and roadway. These types included injury (fatal, severe injuries, etc.), collision type (rear-end, broadside, pedestrian, bicycle), and other factors (such as aggressive driving, dark, or wet conditions). Aggressive driving is defined as collisions caused by speeding, following too closely, or running stop signs or traffic signals.

A factor called Critical Crash Rate (CCR) was calculated. This factor determined the collision rate while taking into consideration roadway volume and roadway/intersection type. The crash rate at each location was compared to the expected crash rate for a certain roadway/intersection type. A positive value signifies that a location has more collisions than expected, while a negative value signifies there are less collisions than expected.

A factor called Equivalent Property Damage Only (EPDO) was calculated for each location. This method assigns a statistical weight 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 was then divided by the injury cost for a property damage only crash. The resulting number was the equivalent number of property damage only crashes at each site. This figure allows all locations to be compared based on injury crash costs.

High Injury Networks (HINs) for several types of collisions were also created for different types of collisions (aggressive driving collisions, broadside, pedestrian, dark, etc) to show where fatal and severe injury collisions of those types were concentrated. The creation of these (HINs) is helpful in prioritizing locations for specific countermeasures and other improvements throughout the City.

Figure 3: Case Study Locations



Case Study Locations

Following the collision analysis, 10 case study locations were selected throughout the City for further examination. These locations, along with seven Palmdale schools were examined during a site visit and potential countermeasures were proposed.

Engagement with Safety Partners

Local stakeholders were included in the development of this report to ensure the local perspective was placed at the forefront of planning efforts. A stakeholder group of City staff and external partners consisted of representatives from the Antelope Valley Transit Authority and the Palmdale School District Transportation staff. The project team also contacted representatives from the Los Angeles County Sheriffs Department (LASD), the Los Angeles County Fire Department, and California Highway Patrol. Members of the public were also offered the opportunity to participate in an online survey. The survey received 246 responses.

The local stakeholders were encouraged to offer comments on the safety concerns present in the City's transportation network. After the initial network screening and safety analysis, the stakeholder group met to discuss potential countermeasures and examined areas through a field visit on August 15, 2022. At the meeting, stakeholders including City officials and representatives from the Antelope Valley Transit Authority and the Palmdale School District Transportation staff were introduced to the project and the data used, the outputs, and the potential outcomes of the study.

In addition, stakeholders were asked to provide local insight and comments for 10 "case study" locations that were identified after the initial network screening and crash analysis process (refer to **Figure 1** on page 1 of the STP). Potential countermeasures were recommended, and emphasis/challenge areas were discussed, specifically speeding as a major factor in collisions throughout the City.

Stakeholder feedback was reviewed and incorporated into the study process for the development of the safety plan.



Rancho Vista Blvd - East of 30th St W



Technology Dr & 3rd St E



Technology Dr & 3rd St E



Palmdale Bl and 35th St E

Countermeasure Selection

Following the collision analysis and field visits, potential countermeasures were identified. These countermeasures included infrastructure and non-infrastructure improvements that can be implemented at specific locations or locations throughout the City. These are proven safety countermeasures that were sourced from the California Local Roadway Safety Manual (LRSM) and the Caltrans Proven Safety Countermeasures. Each countermeasure was assessed for the number of collisions it was expected to reduce per year, which was then extrapolated to a 20-year safety benefit in dollars using the latest Caltrans-approved methods. The benefit of each counter measure was then compared to the cost of implementing the countermeasure over 20-years to provide a benefit-cost ratio. The benefit-cost ratio allows the City to prioritize and strategize the implementation of the specific improvements. The City may use these results to apply for future safety grants, including the Highway Safety Improvement Program (HSIP).

VMT

Study Area and Demographic Forecasts

The study area for the VMT analysis includes the City of Palmdale and the City's sphere of influence. As part of the Palmdale 2045 General Plan update, various future land use alternatives were developed of which one was determined to be the Preferred Plan alternative. This plan is based off the Preferred Alternative. The land use alternatives were developed for the geographic area covered by the Palmdale sphere of influence (SOI), which includes City of Palmdale and the surrounding areas as illustrated in **Figure 4**. The sphere of influence used in this analysis was derived from the traffic analysis completed in the 2045 general plan update.

Figure 4: Palmdale Sphere of Influence

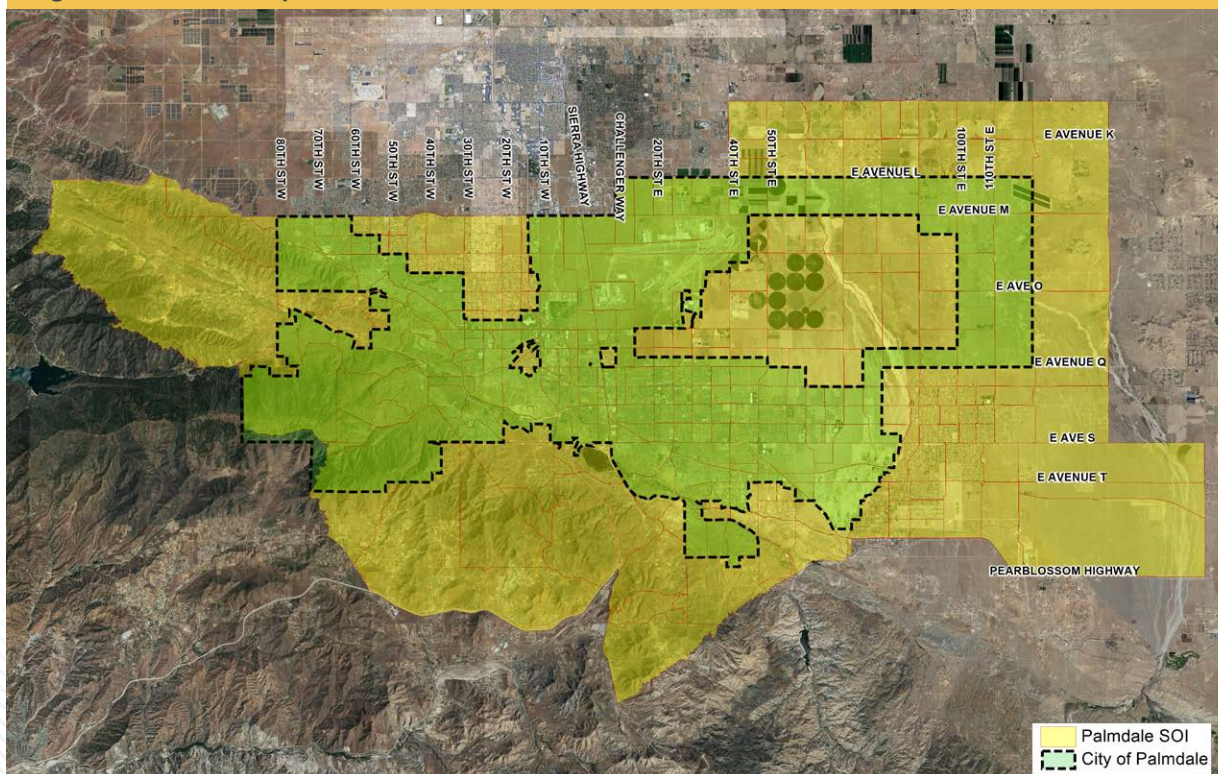








Table 3: Summary of Palmdale Demographic Forecasts

City of Palmdale Sphere of Influence

2017		
		
188,488 Population	53,626 Households	49,501 Employment
2045 Preferred Plan		
		
225,692 Population	70,618 Households	74,804 Employment

For the VMT analysis, demographic forecasts from the Palmdale General Plan were used. The Palmdale General Plan land use projections are consistent with the SCAG regional assumptions. A summary of demographic forecasts for Palmdale SOI is provided above in **Table 3**.

Quantification Approaches

Future traffic forecasts for the General Plan update were performed using the City's Regional Travel Demand Model and VMT and GHG impacts were quantified based on these traffic forecasts. The City's model is a refined subarea of the larger SCAG Regional Model, which is the basis for the Regional Transportation Plan and Sustainable Communities Strategy. **Table 4** details the quantification approaches that were undertaken in support of reporting required VMT and GHG results.

Table 4: Palmdale VMT and GHG Quantification Approaches

Sustainable Community Strategy	Quantification Approach
Targeted infill/increase density	SCAG Model
Bus Service	SCAG Model
Bicycle Projects	Off-Model
High Speed Rail	Off-Model
Brightline West Connection To Las Vegas	Off-Model
Antelope Valley Line Improvement	Off-Model
Telecommuting	Off-Model
Rule 9410 (Transportation Demand Measures)	Off-Model
Electric Vehicle Incentive Strategy	Off-Model
Electric Vehicle Infrastructure Charging Incentive Program	Off-Model
Transportation System Management/Intelligent Transportation Systems	Off-Model
Metro Vanpool Program	Off-Model
VMT Mitigation Banking	SCAG/Off-Model

Calculating Potential VMT and GHG Reductions

A number of methods were utilized to calculate the potential VMT and GHG reductions. These recommendations are discussed later in the report. In order to calculate the reduction benefits of the active transportation recommendations, the National Cooperative Highway Research Program (NCHRP) 552 methodology was utilized. For the railway improvements, ridership estimates were used to calculate potential reductions in GHG and VMT. For other programmatic improvements, a number of additional methods were used. The VMT analysis used a City-calibrated VMT model (utilizing the TREDLite software) that also helped develop, identify, and mitigate VMT impacts. Detail regarding these methods can be found in the full Palmdale Sustainable Transportation Plan.



Equity

Equity communities were identified using relevant federal, state, and regional definitions. Additional details for each definition are provided within the body of the report.



Federal

Under the federal definition, equity communities included census tracts meeting the “Historically Disadvantaged Community and Areas of Persistent Poverty” definition for Bipartisan Infrastructure Law (BIL) grant programs administered through the United States Department of Transportation (USDOT), (The interim guidance for the Justice40 Initiative). According to USDOT, a “Historically Disadvantaged Community” is defined based on factors related to transportation access as well as health, environmental, social, and economic vulnerabilities.



State

Under the State definition, equity communities included census tracts meeting Senate Bill 535’s (SB 535) disadvantaged communities’ definition through the California Office of Environmental Health Hazard Assessments CalEnviroScreen program, which scores census tracts based on indicators measuring exposure to pollutants and toxins, adverse conditions caused by such exposure, sensitive populations, and socioeconomic characteristics.



Regional

Under the regional definition, equity communities included census tracts meeting the Los Angeles County Metropolitan Transportation Authority’s (LA Metro) definition for equity focus communities, which considers income, race and ethnicity, and household vehicle ownership.

Equity communities were then categorized into three tiers, or Priority Areas, to determine areas of the City with the highest needs and that would benefit most from funding opportunities.

■ Priority Area 1

Meets all three equity definitions (federal, state, regional)

■ Priority Area 2

Meets two equity definitions (federal and regional or state and regional)

■ Priority Area 3

Meets one equity definition (federal, state, or regional)

An analysis of safety and VMT data was then applied using Geographic Information Systems (GIS) technologies. Safety and VMT data were overlaid on census tracts meeting federal, state, and regional equity definitions. Safety data analyzed included collision data for pedestrians, bicycles, and automobiles used in the LRSP. VMT data was separated into employment-related VMT, employment density, and VMT per capita for all vehicles and trip purposes. Employment-related VMT and VMT per capita data for the City of Palmdale was then compared to the VMT average for North Los Angeles County and assigned a value depicting existing VMT levels relative to VMT significance threshold for CEQA. The equity analysis of safety and VMT data and recommendations provided are discussed for each equity priority area within the report.

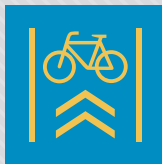
Community Engagement

As part of the project, the City engaged with people who live, work, and spend time in Palmdale to identify places where sustainable transportation improvements would be most effective. Residents, visitors, and commuters were all invited to participate in developing Palmdale's STP.

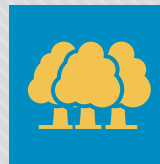
The first round of engagement began in the Summer of 2022 with five listening sessions to learn about public concerns and opportunity areas related to traffic safety and reducing GHG emissions. Then the project team held three community workshops to provide an overview of the STP and gather additional feedback. The workshops were attended by 25 people and 28 comments were received. **The project team additionally utilized the Social Pinpoint platform to distribute project information and host interactive engagement and mapping tools.** With this mapping tool, residents were able to click and drag areas of concern on a map and provide additional comments. A survey was also distributed to identify travel patterns and transportation priorities in the City. The online engagement was performed using a 'Social Pinpoint' website, which the City will continue to use to provide ongoing two-way communication with the public. The project team also organized several pop-ups at various locations to promote events and surveys. Feedback from the public was used for further research to identify additional alternatives that could help improve connectivity, safety, and mobility for all modes of travel.

In Fall 2022, the project team hosted the second round of workshops to gather additional public input on the proposed strategies. Feedback from the public was used to further refine the STP.

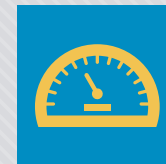
Comments from the first round of workshops and surveys include:



Implement more bike lanes/paths



Plant more trees for better shade



Reduce speeds



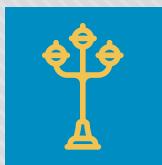
Install more sidewalks and grade separated railroad crossings



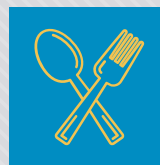
Improve signage for pedestrians, bicyclists, and motorists



Implement safer pathways along the railroad tracks and roads



Install more lighting in public areas



Develop more dining areas and grocery stores throughout the City



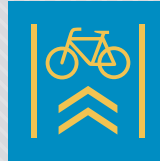
Install more transit stops and improve transportation centers

The second round of engagement began in Fall 2022 with three community workshops to provide project updates, discuss potential improvements, proposed strategies, and gather feedback. The workshops consisted of a presentation followed by a poll and a participatory budgeting exercise using the Social Pinpoint Platform. In this exercise, attendees were asked to review the proposed improvements and denote how much they would spend on each improvement. Attendees preferred infrastructure improvements, followed by policy and enforcement measures, and education and programming. A total of 31 people attended the workshop and 33 comments were received. The Social Pinpoint platform was again used to distribute a survey regarding transit improvements within the City.

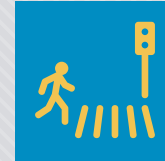
The comments from the second round of workshop and surveys include:



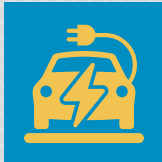
Install more speed bumps (currently not allowed under City policy) and optimize traffic signals to minimize speeding



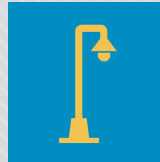
Implement more bike lanes but make them more protective for cyclists to use



Improve existing sidewalks and crosswalks around school and construction zones to make them more accessible for all pedestrians



Subsidize electric vehicles and charging stations, and increase emissions checkpoints to address air quality



Install more lighting along the roads, bike paths, and transit stations and bus stops across the city

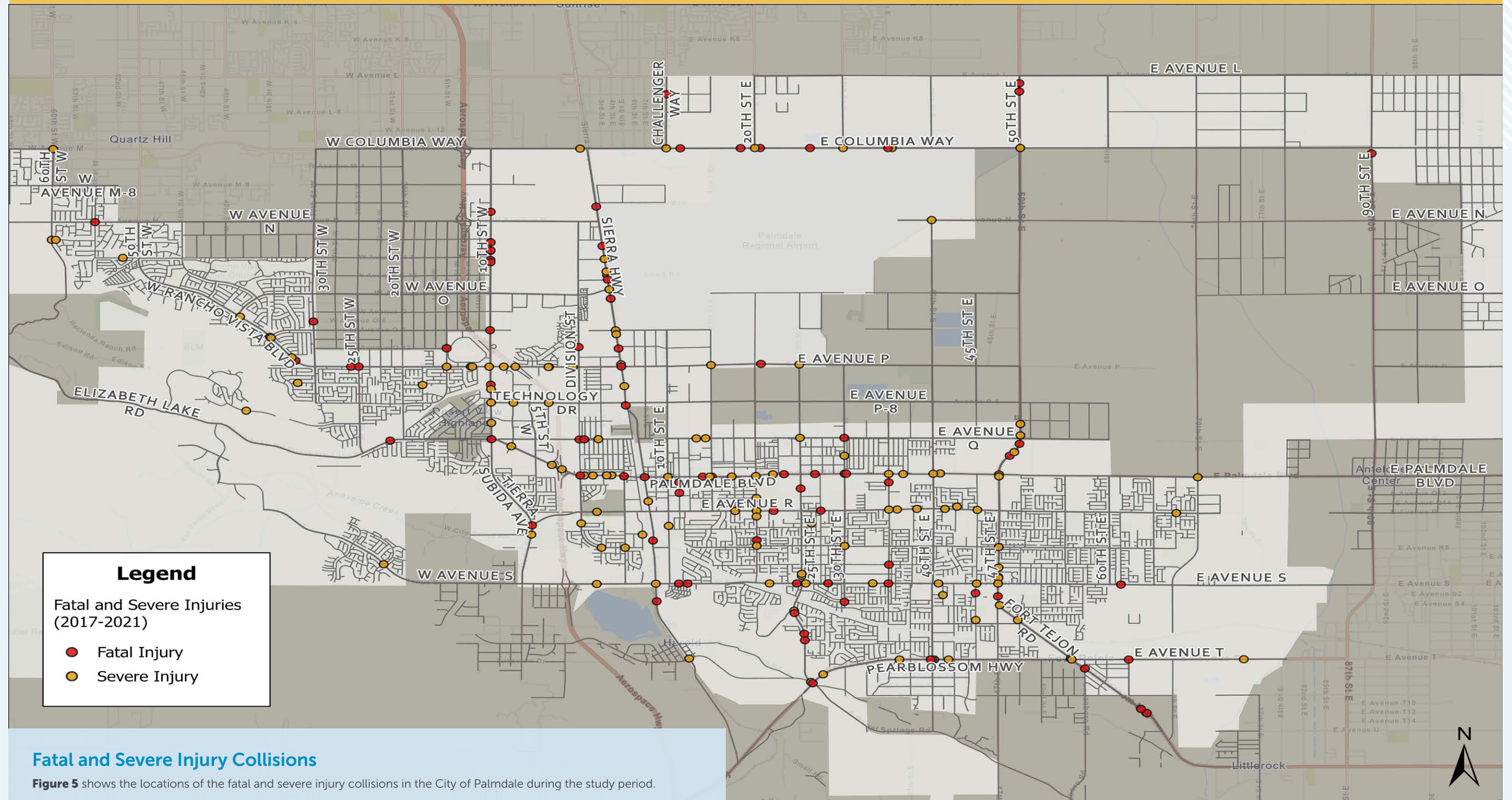


Rancho Vista Blvd and 10th St W

3 - Existing Conditions

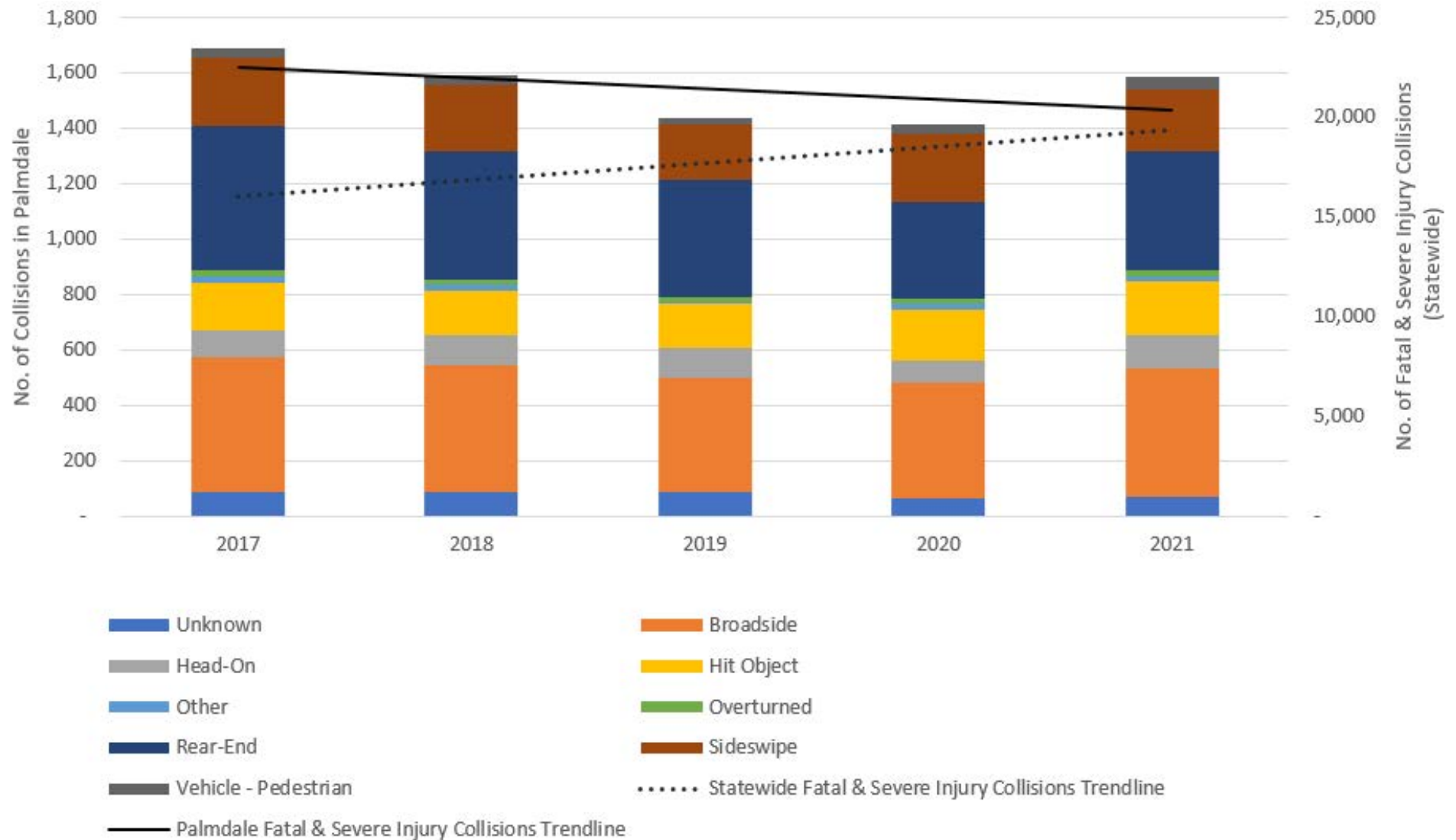
Safety

Figure 5: Fatal and Severe Injury Collisions



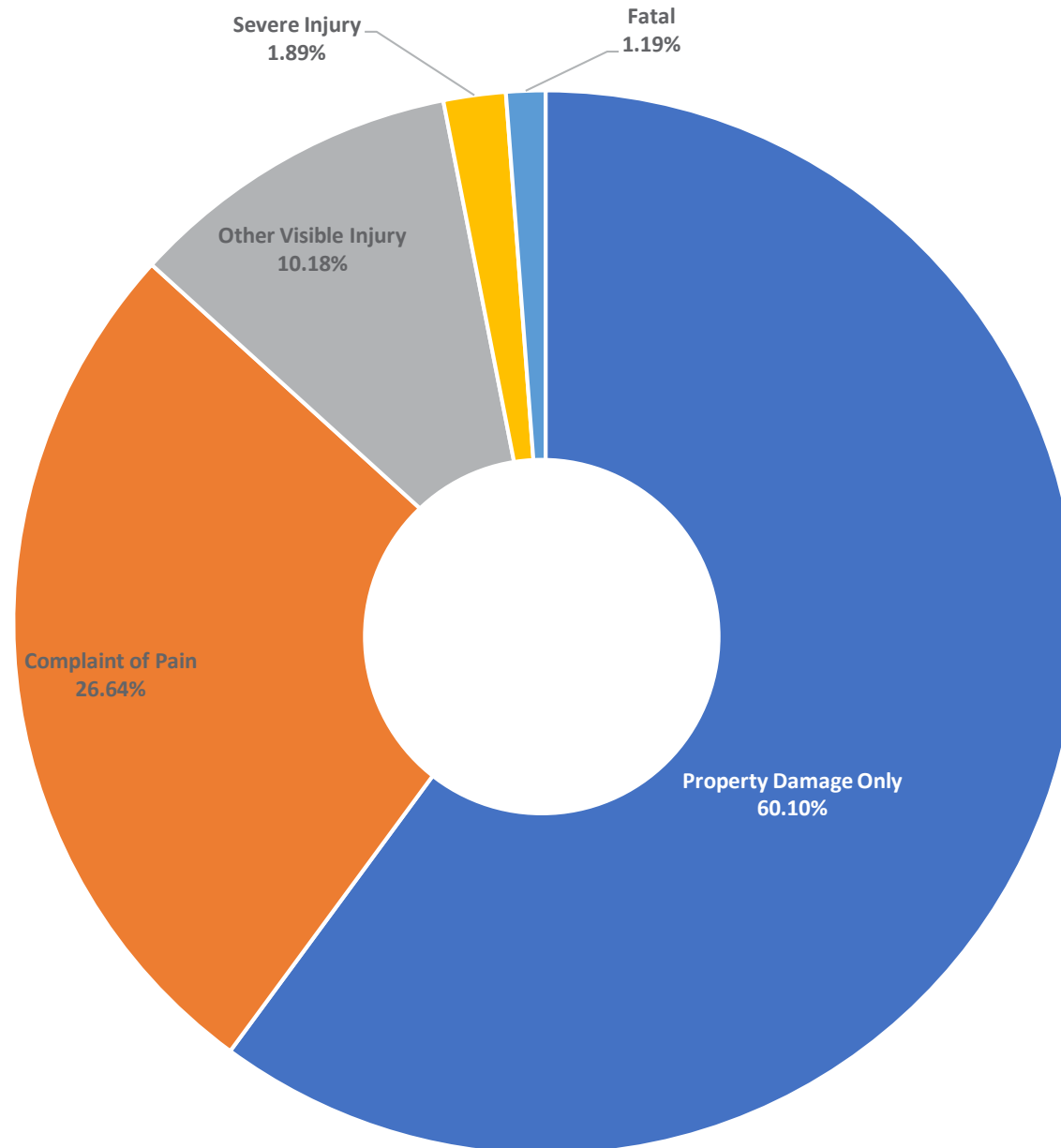
Collisions by Type and by Year

The figure below shows the collisions by type per year during the study period. The most common collision types were Broadside and Rear-Ends. The number of collisions trended downward from 2017-2020, with a slight increase in 2021. There was a decrease in collisions in 2020 likely due to decreased traffic volumes during the COVID-19 pandemic. The dotted line in the figure shows the trendline for fatal and severe collisions statewide. The solid line illustrates the trendline for fatal & severe injury collisions in Palmdale during the STP study period. While statewide the fatal and severe injury collisions are increasing, in Palmdale they are decreasing.



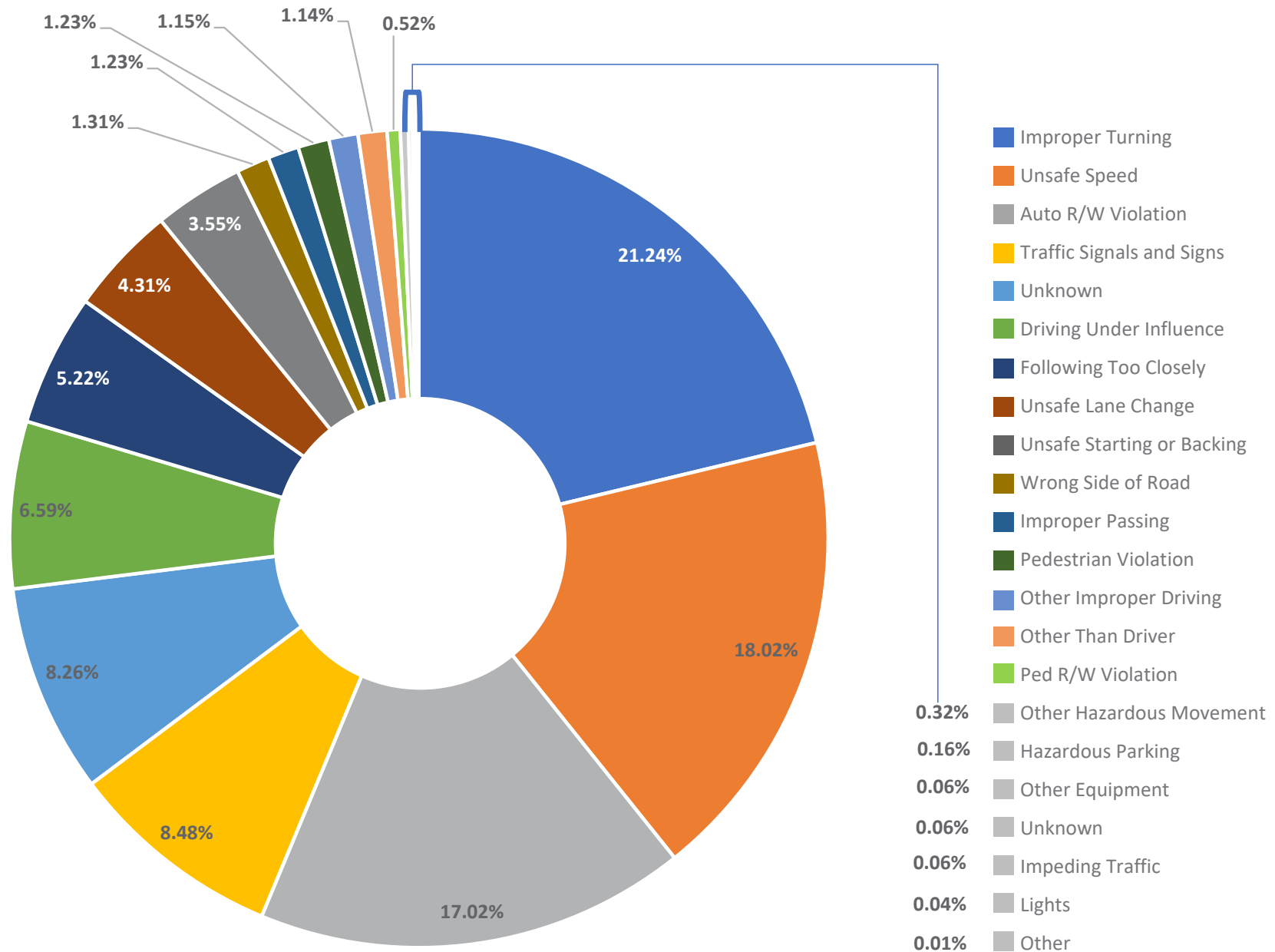
Collisions by Injury Level

The figure below shows the collisions distribution by injury level. A total of 60.1 percent of collisions reported during the study period resulted in property damage only. Fatalities accounted for 1.2 percent of all reported collisions and severe injuries totaled 1.9 percent .



Collisions by Cause

The figure below shows the collisions by cause during the study period. The most common cause was Improper Turning, followed by Unsafe Speed, and automobile right-of-way violations.





Existing Conditions

Statewide Comparison

A comparison of fatal and severe (F&S) injury collision data to the State averages were conducted for data from 2010-2019 (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 challenge area comparison was used to inform the selection of emphasis areas.






Table 5 - Comparison of Statewide and Palmdale Fatal & Severe Injury Crashes (2010-2019)

California SHSP Challenge Area	Statewide %	Palmdale %	Percentage Difference
Palmdale has a Higher Percentage of F&S Crashes			
Intersections	23.6%	51.1%	27.5%
Impaired Driving	25.3%	31.2%	5.9%
Young Drivers	13.1%	16.1%	3.0%
Driver Licensing	24.7%	25.6%	0.9%
Pedestrians	19.2%	19.9%	0.7%
Distracted Driving	5.0%	5.2%	0.2%
Work Zones	1.4%	1.6%	0.2%
Palmdale has a Lower Percentage of F&S Crashes			
Commercial Vehicles	6.4%	5.9%	- 0.5%
Aggressive Driving	33.1%	31.9%	- 1.2%
Occupant Protection	14.2%	12.7%	- 1.5%
Aging Drivers	12.4%	9.3%	- 3.1%
Bicyclists	8.3%	4.5%	- 3.8%
Motorcyclists	21.0%	16.5%	- 4.5%
Lane Departure	43.3%	34.6%	- 8.7%

*Available for Fatal Only.

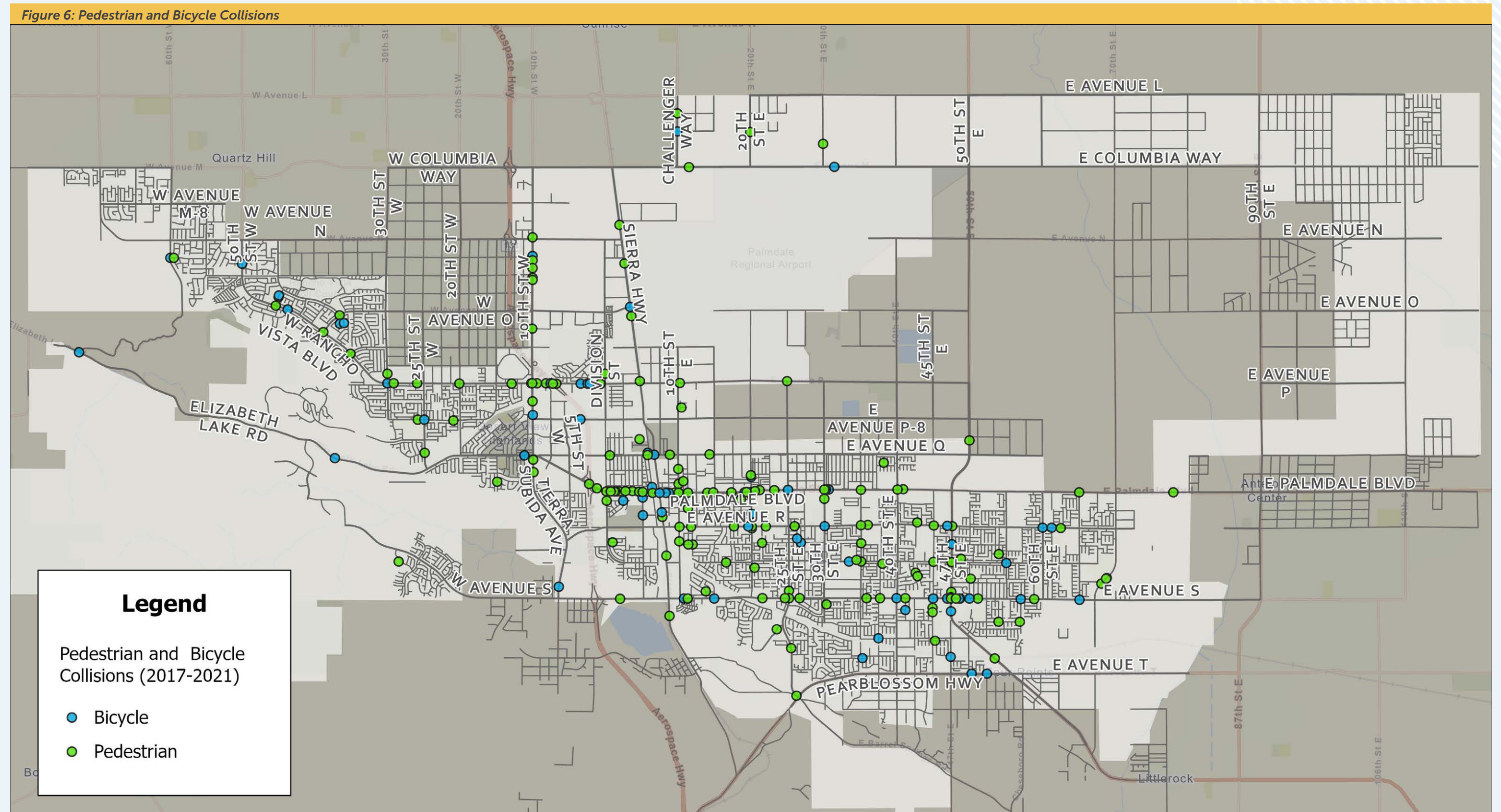
Fatal and Severe Injury Collisions by Mode Involved

The table below shows the fatal and severe injury collisions by mode involved.

Involved With	No. of Fatal Collisions	No. of Severe Injury Collisions	No. of Total Collisions
 Other Motor Vehicle Any collision with another motor vehicle on the same roadway	48	83	5,252
 Fixed Object Any collision between a motor vehicle and a fixed object, such as a guardrail, pole, or embankment	14	19	935
 Parked Motor Vehicle Any collision between a motor vehicle in transport and a motor vehicle that is parked	0	1	630
 Pedestrian Any collision between a motor vehicle and a pedestrian	28	25	185
 Other Object Any collision between an object that is not fixed, such as an animal or a fallen tree	0	2	93
 Non-Collision Any collision involving a motor vehicle that does not come into contact with another object, which can occur when the vehicle is overturned	1	5	87
 Bicycle Any collision between a motor vehicle and a bicycle	0	9	74
 Motor Vehicle on Other Roadway Any collision between a motor vehicle that leaves the roadway and collides with a vehicle on another roadway	1	2	69

Pedestrian and Bicycle Collisions

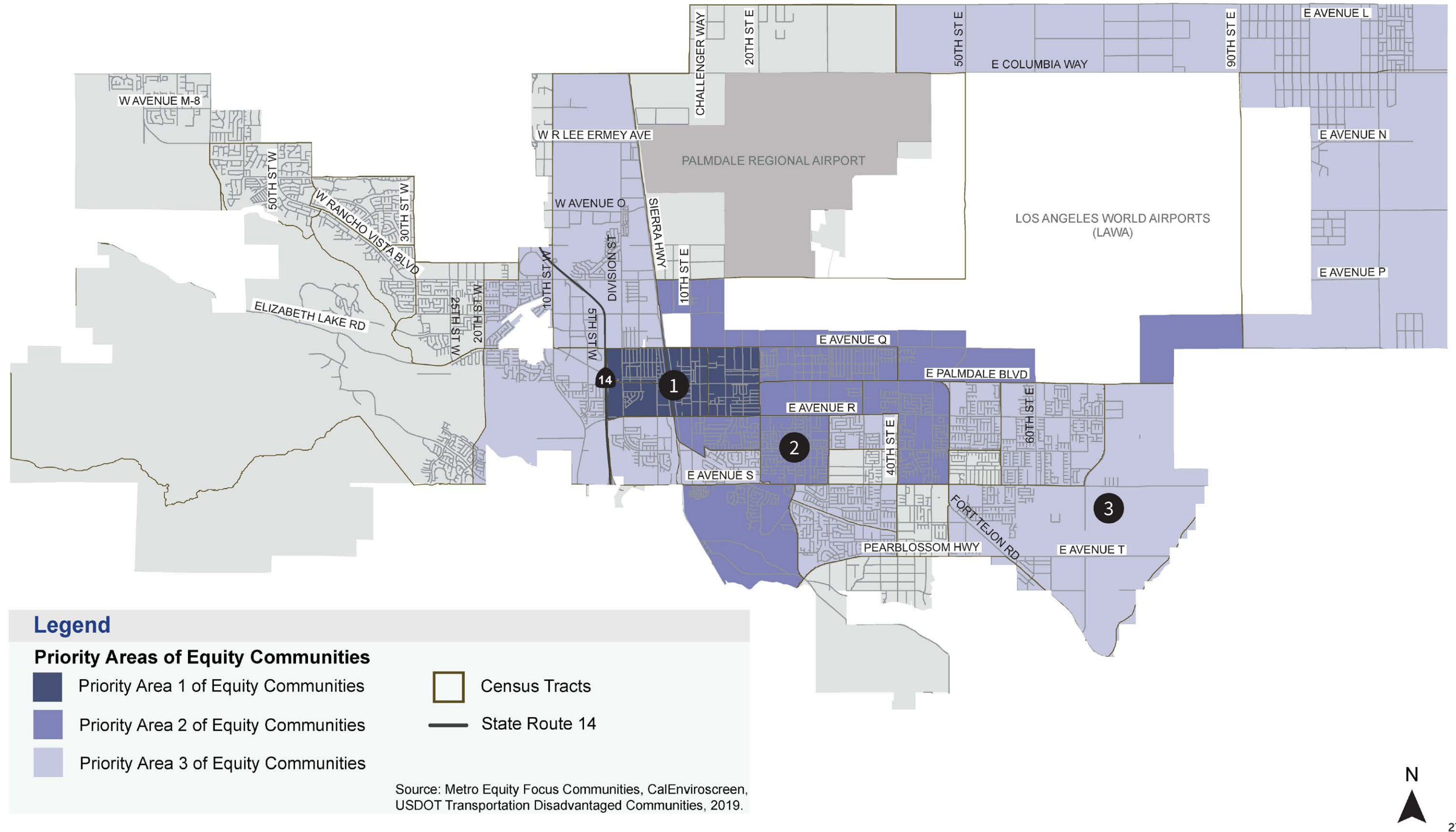
Figure 6 below shows pedestrian and bicycle collisions throughout the study period.



Equity

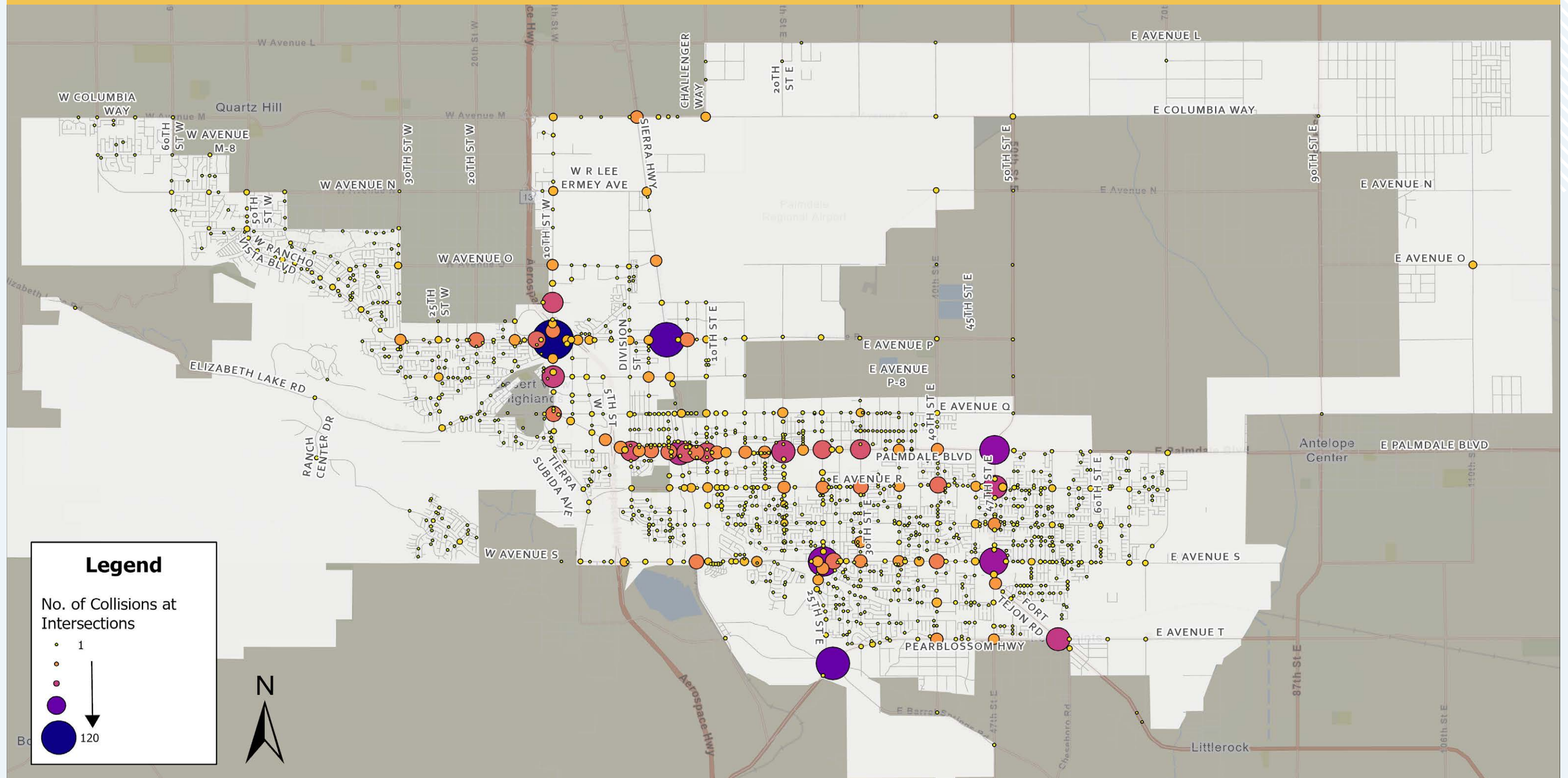
Equity Communities and Priority Areas Maps

The map below shows the extent of Priority Areas of equity communities within the City of Palmdale according to the federal, state, and regional definitions used. As can be seen, most census tracts in the City meet at least one equity definition. Priority Area 1 consists of four census tracts, primarily between East Avenue Q and East Avenue R, representing residents with the highest needs and the most transportation, environmental, and socioeconomic concerns. Priority Area 2 consists primarily of census tracts east of Sierra Highway. Priority Area 3 consists



4 - Analysis Results

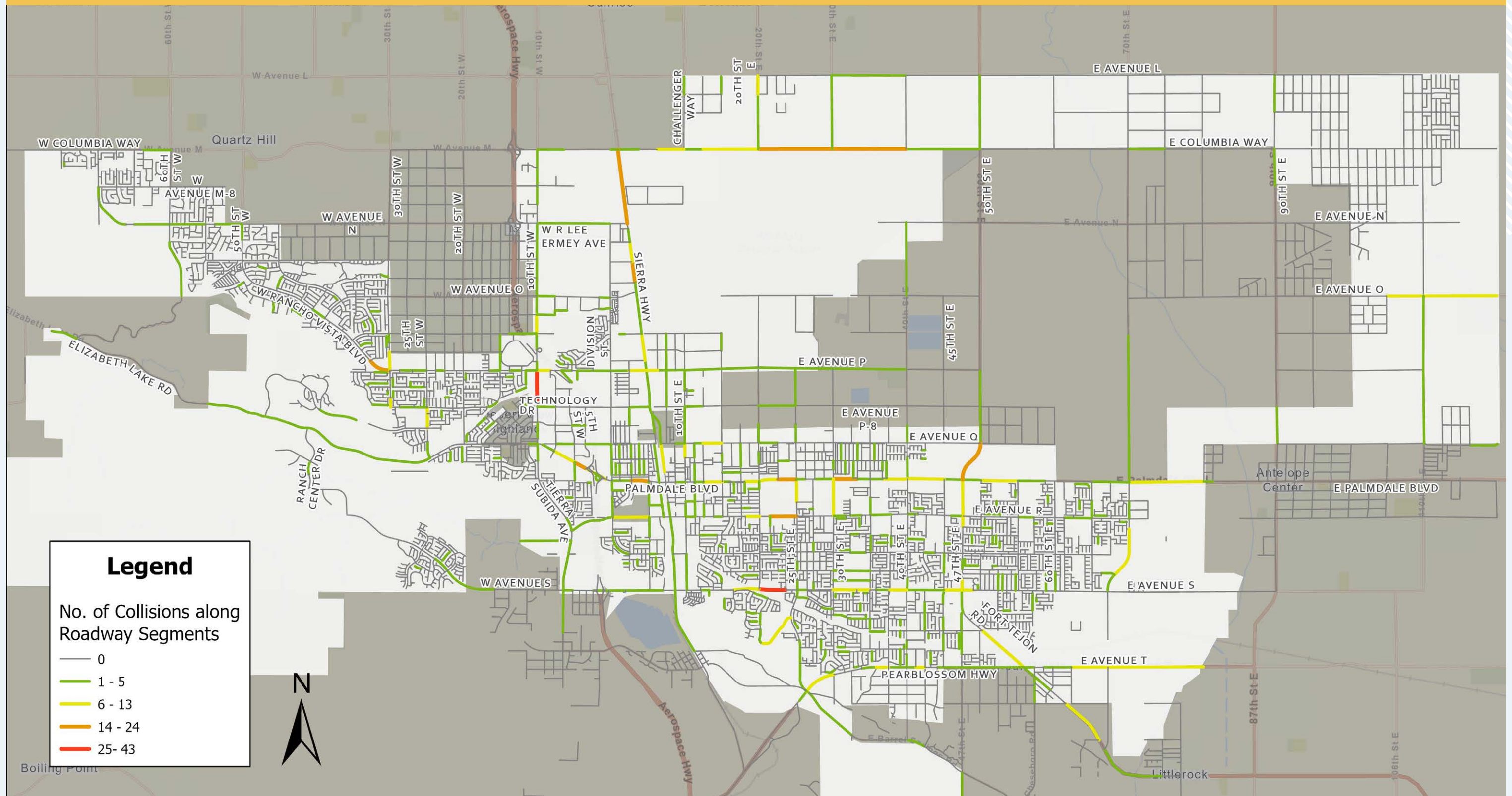
Figure 7 - Collision Network Screening Analysis Results: Intersections (2017-2021)



Collision Analysis Results

The collision analysis process derived the number of collisions per intersection and per roadway segment. **Figure 7** shows the number of collisions within 250 feet of each intersection within the study period (2017-2021).

Figure 8 - Collision Network Screening Analysis Results: Mid-block Segments (2017-2021)



Collision Analysis Results

Figure 8 shows the number of collisions along each roadway segment during the study period.



The collision analysis also identified the number of collisions per location across the City, as well as the number of different types of collisions and injury level. The analysis identified the Local Critical Crash Rate (CCR) differential, which denotes whether there are greater or fewer collisions than expected. Additionally, the Equivalent Property Damage Only (EPDO) factor, which shows the relative economic cost of the collisions, was identified at each location. Higher EPDO factors indicate a higher economic monetary cost. The charts below indicate the number of collisions for the top five locations for each location type, using data from 2017 to 2021.

Collision Analysis Results

Signalized Intersections

- 10th St W & W Rancho Vista Blvd – **120**
- Sierra Hwy & E Rancho Vista Blvd – **103**
- Pearblossom Hwy & Barrel Springs Rd – **97**
- 25th St E & E Avenue S – **86**
- 47th St E & E Avenue S – **80**

Unsignalized Intersections

- 50th St E & E Palmdale Blvd – **84**
- 26th St E & E Avenue S – **44**
- 11th St E & Palmdale Blvd – **34**
- 15th St E & Palmdale Blvd – **32**
- 25th St E & Olive Dr – **31**

Future Expressway

- 50th St E btwn E Palmdale Blvd & Avenue Q – **16**
- 50th St E btwn Avenue M & Avenue L – **3**

Regional

- 10th St W btwn Beechdale Dr & Avenue P – **31**
- Sierra Hwy btwn Avenue M & Avenue N – **24**
- W Palmdale Blvd btwn 5th St W & SR-14 SB Ramp – **22**
- E Columbia Way btwn 40th St E & 30th St E – **19**
- E Columbia Way btwn 20th St E & 30th St E – **15**

Crosstown

- E Avenue S btwn 20th St E & Halfmoon Dr – **43**
- Palmdale Blvd btwn 3rd St E & 5th St E – **22**
- E Avenue R btwn Hastings St & 25th St E – **20**
- W Rancho Vista Blvd btwn 30th St W & Seville Ave – **19**
- Palmdale Blvd btwn 25th St E & 22nd St E – **17**

Connector

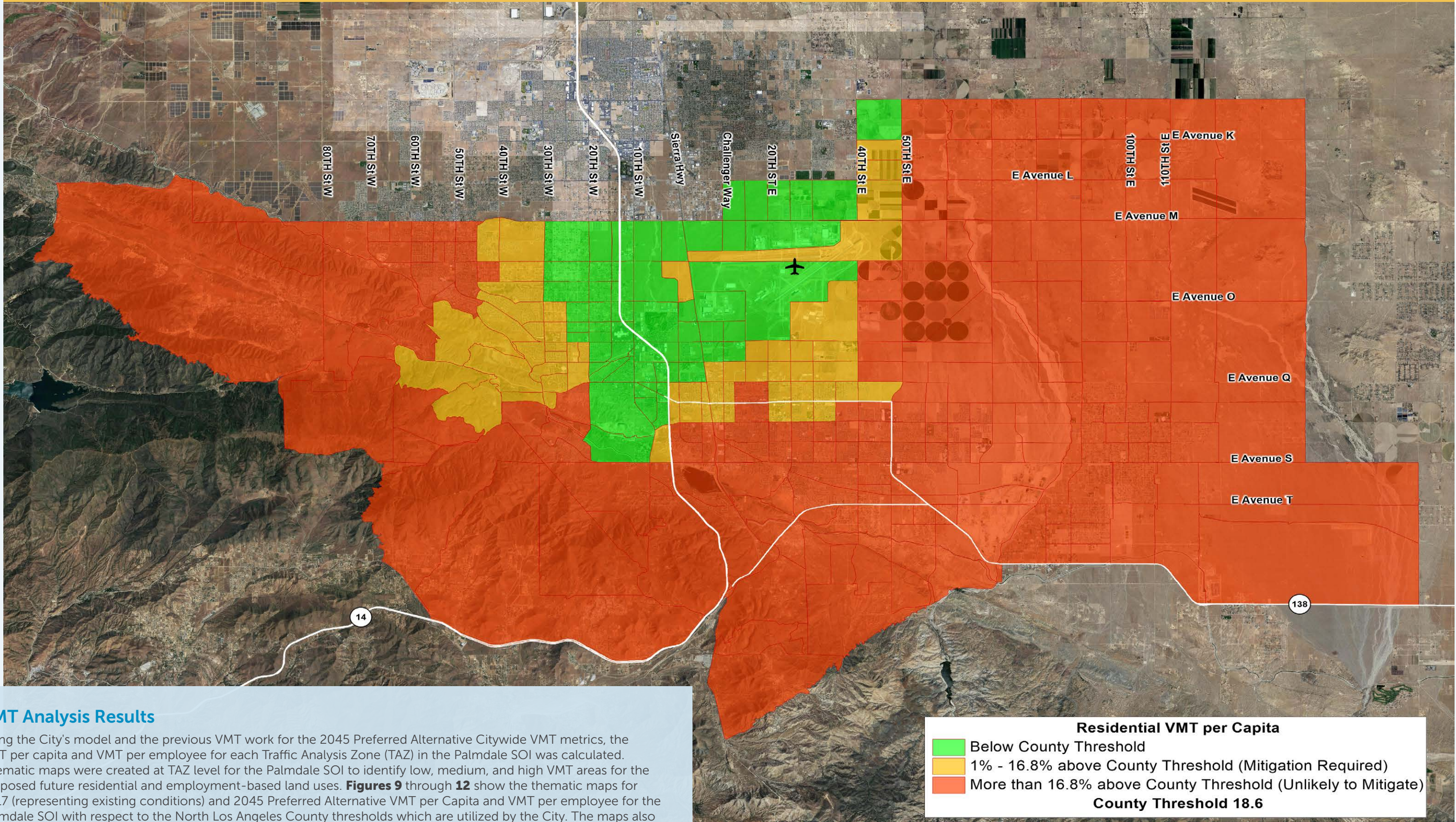
- 70th St E btwn Eddy Ln & Avenue R-12 – **11**
- E Palmdale Blvd btwn 80th St E & 70th St E – **8**
- Old Harold Rd btwn 25th St E & Firethorn St – **8**
- 47th St E btwn E Avenue S-8 & Stargazer Pl – **5**
- E Avenue R-8 btwn San Ysidro Way & Lemsford Ave – **4**

Local Streets

- 11th St E btwn E Avenue Q-4 & Hwy 138 – **5**
- 11th St E btwn Avenue R & Avenue Q-12 – **5**
- 4th St E btwn E Avenue Q-7 & Avenue Q-3 – **4**
- Jody Ln btwn Avenue Q-4 & St Andrews Way – **4**
- Firethorn Avenue btwn Shamrock Ave & Old Harold Rd – **4**

VMT

Figure 9: 2017 Residential VMT per Capita



VMT Analysis Results

Using the City's model and the previous VMT work for the 2045 Preferred Alternative Citywide VMT metrics, the VMT per capita and VMT per employee for each Traffic Analysis Zone (TAZ) in the Palmdale SOI was calculated. Thematic maps were created at TAZ level for the Palmdale SOI to identify low, medium, and high VMT areas for the proposed future residential and employment-based land uses. **Figures 9** through **12** show the thematic maps for 2017 (representing existing conditions) and 2045 Preferred Alternative VMT per Capita and VMT per employee for the Palmdale SOI with respect to the North Los Angeles County thresholds which are utilized by the City. The maps also identify future household and employment growth locations.

Figure 10: 2017 Home-Based Work VMT per Employee

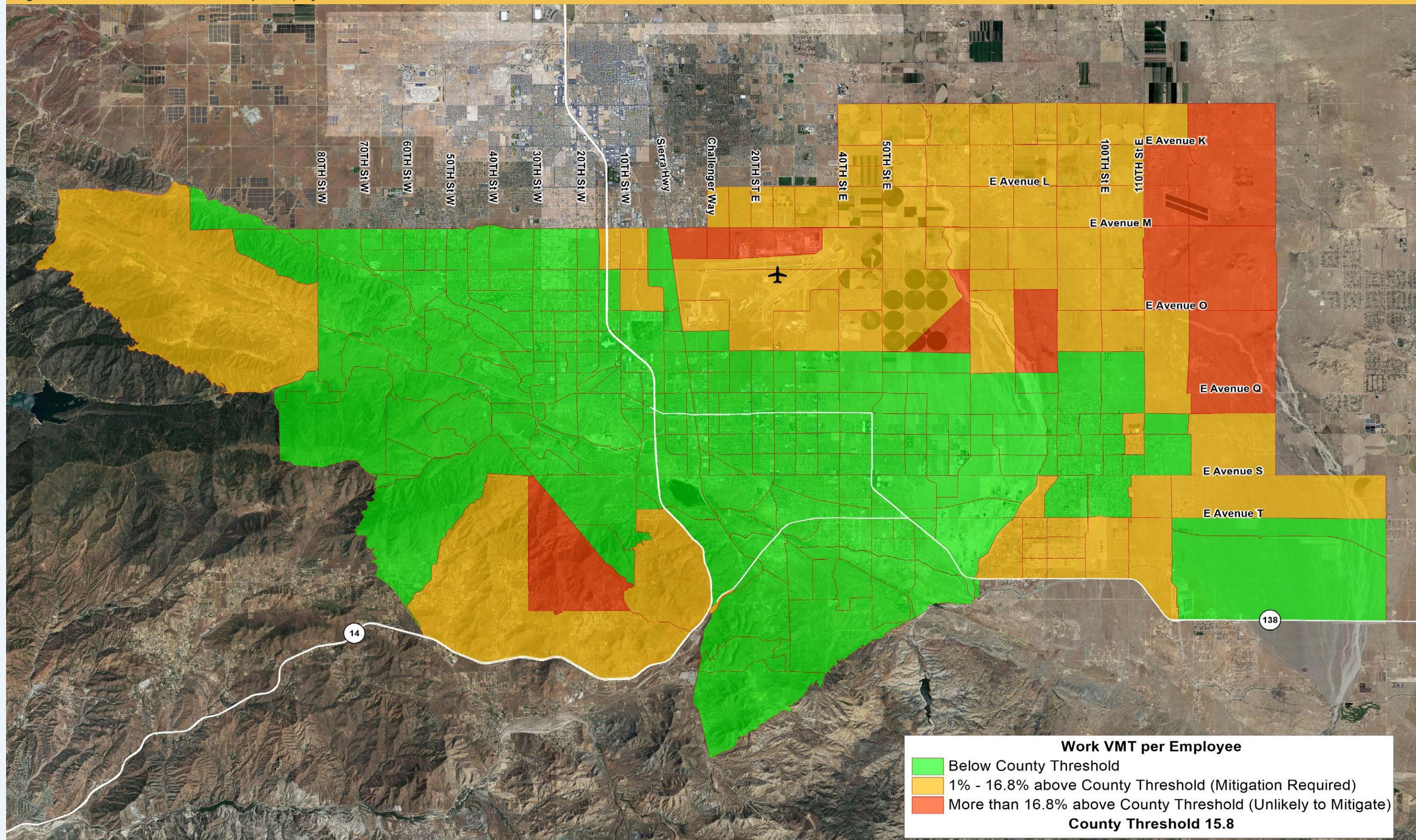


Figure 11: 2045 Preferred Plan Residential VMT per Capita

A comparison of **Figure 9** and **Figure 11** shows that the implementation of Palmdale's recently adopted General Plan will result in more areas of the City being at or below the required threshold for residential VMT per capita.

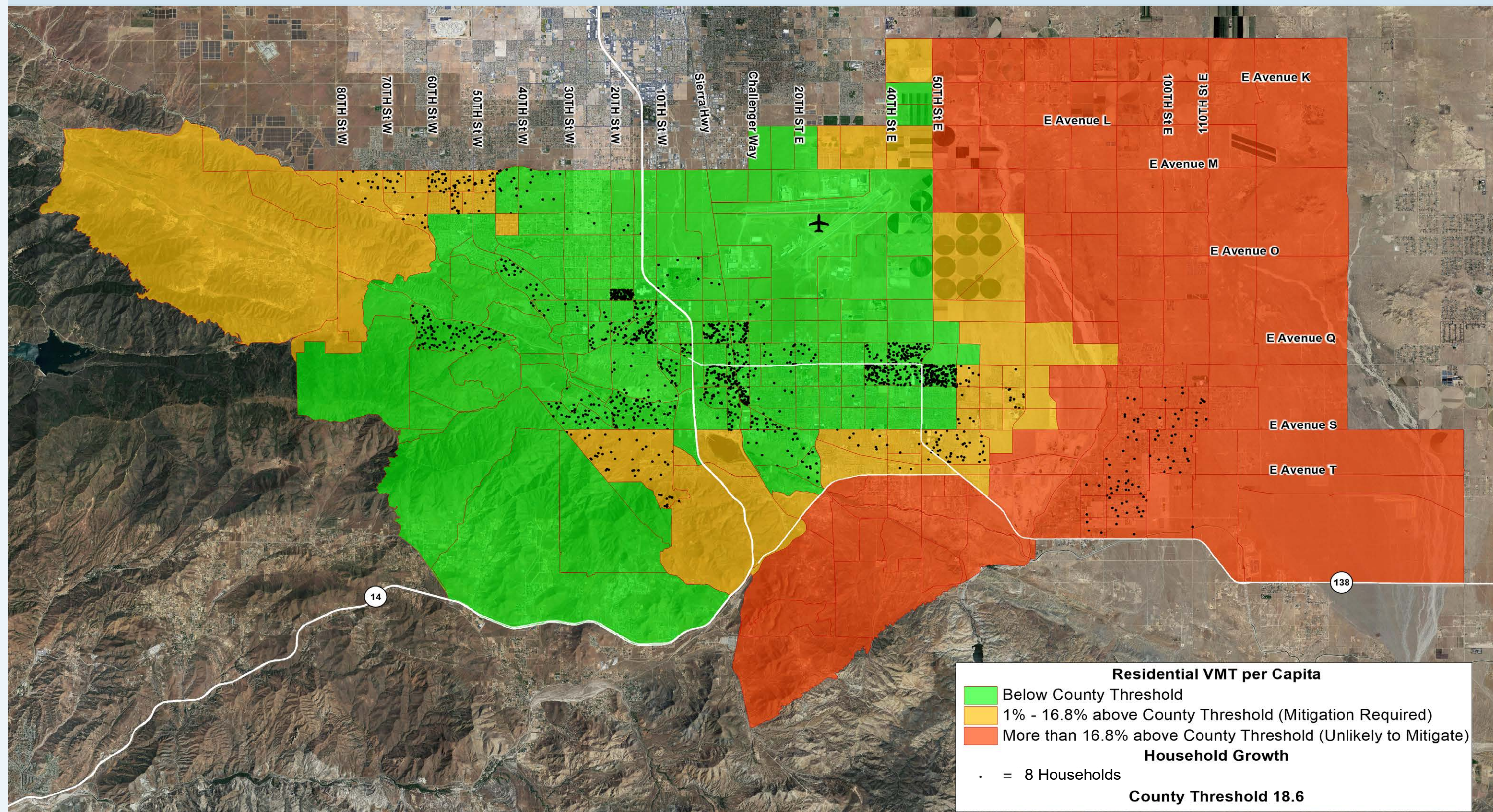
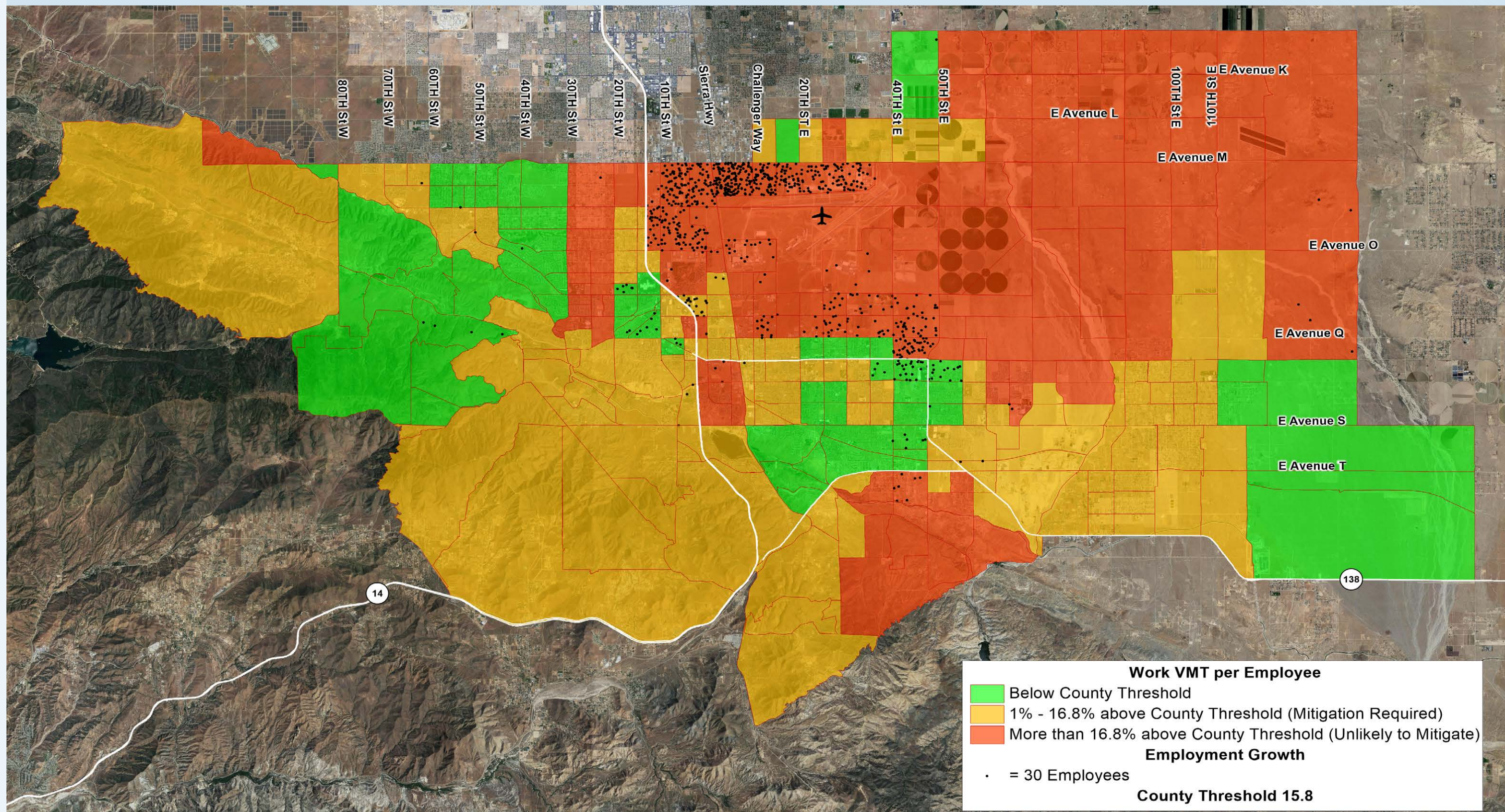


Figure 12: 2045 Preferred Plan Home-Based Work VMT per Employee

A comparison of **Figure 10** and **Figure 12** shows that the implementation of Palmdale's recently adopted General Plan will result in more areas of the City being at or below the required threshold for employment based VMT per capita.

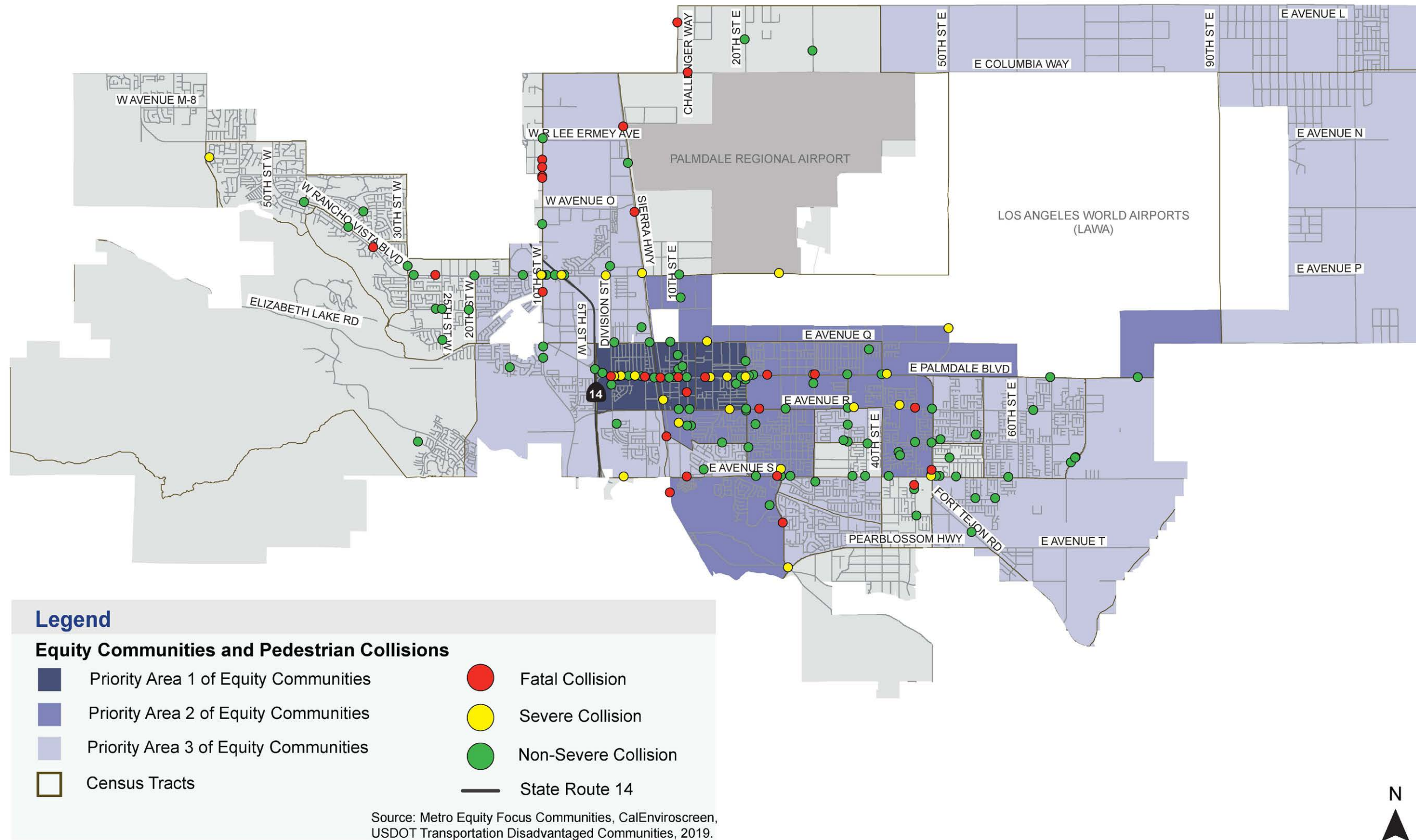


Equity Analysis Results

Safety Analysis for Equity Priority Areas

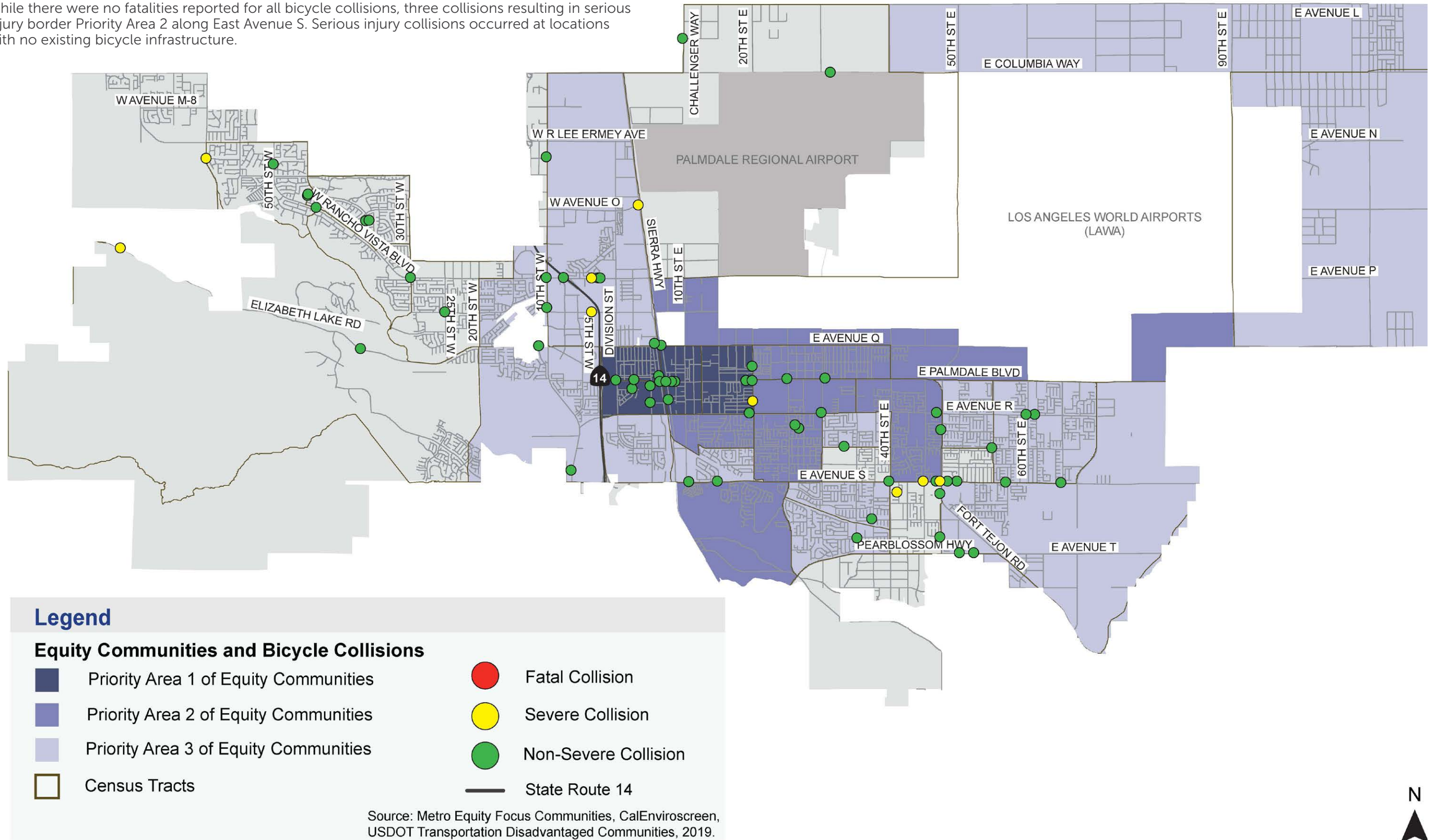
Pedestrian Collisions from 2017 through 2022

A majority of pedestrian collisions resulting in a fatality or serious injury occurred in Priority Areas 1 and 2 of equity communities. Fatal and serious injury collisions involving pedestrians in Priority Area 1 are located along East Palmdale Boulevard, between State Route 14 and 20th Street East. Fatal and serious injury collisions in Priority Area 2 are located along East Palmdale Boulevard, 47th Street East, and East Avenue S. Palmdale Boulevard between State Route 14 and 47th St East and 47th St East between Palmdale Boulevard and Fort Tejon Road is State Route 138 which is under Caltrans jurisdiction. The majority of pedestrian collisions occurred at night (78.6%). Multiple pedestrian collisions occurred at intersections with no streetlights within equity Priority Area 3.



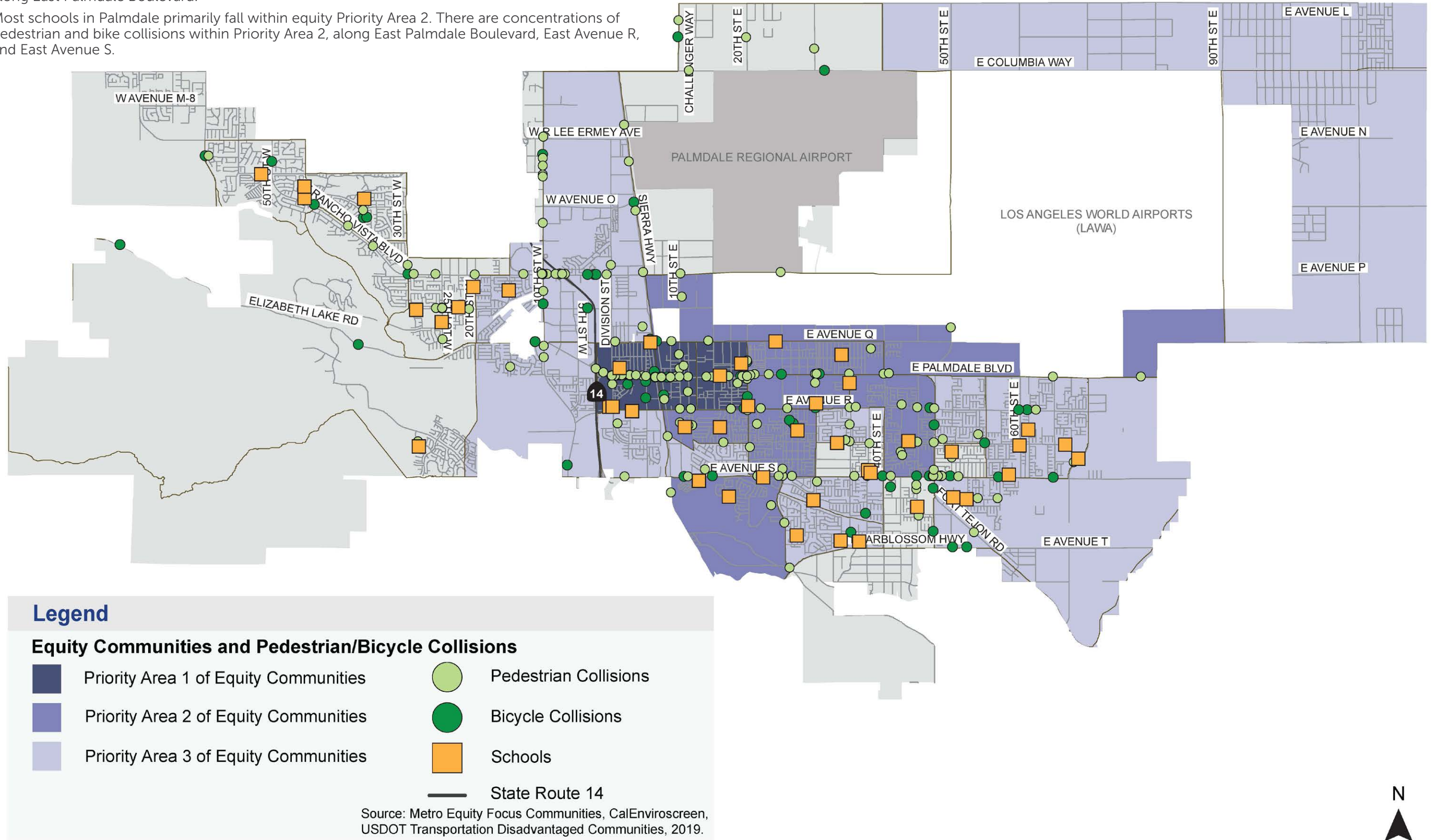
Bicycle Collisions (2017-2022)

- Concentrations of bicycle collisions occurred in equity Priority Area 1 east of State Route 14 along East Palmdale Boulevard.
- Twenty percent of all bicycle collisions included vehicle right-of-way violations.
- While there were no fatalities reported for all bicycle collisions, three collisions resulting in serious injury border Priority Area 2 along East Avenue S. Serious injury collisions occurred at locations with no existing bicycle infrastructure.



Schools

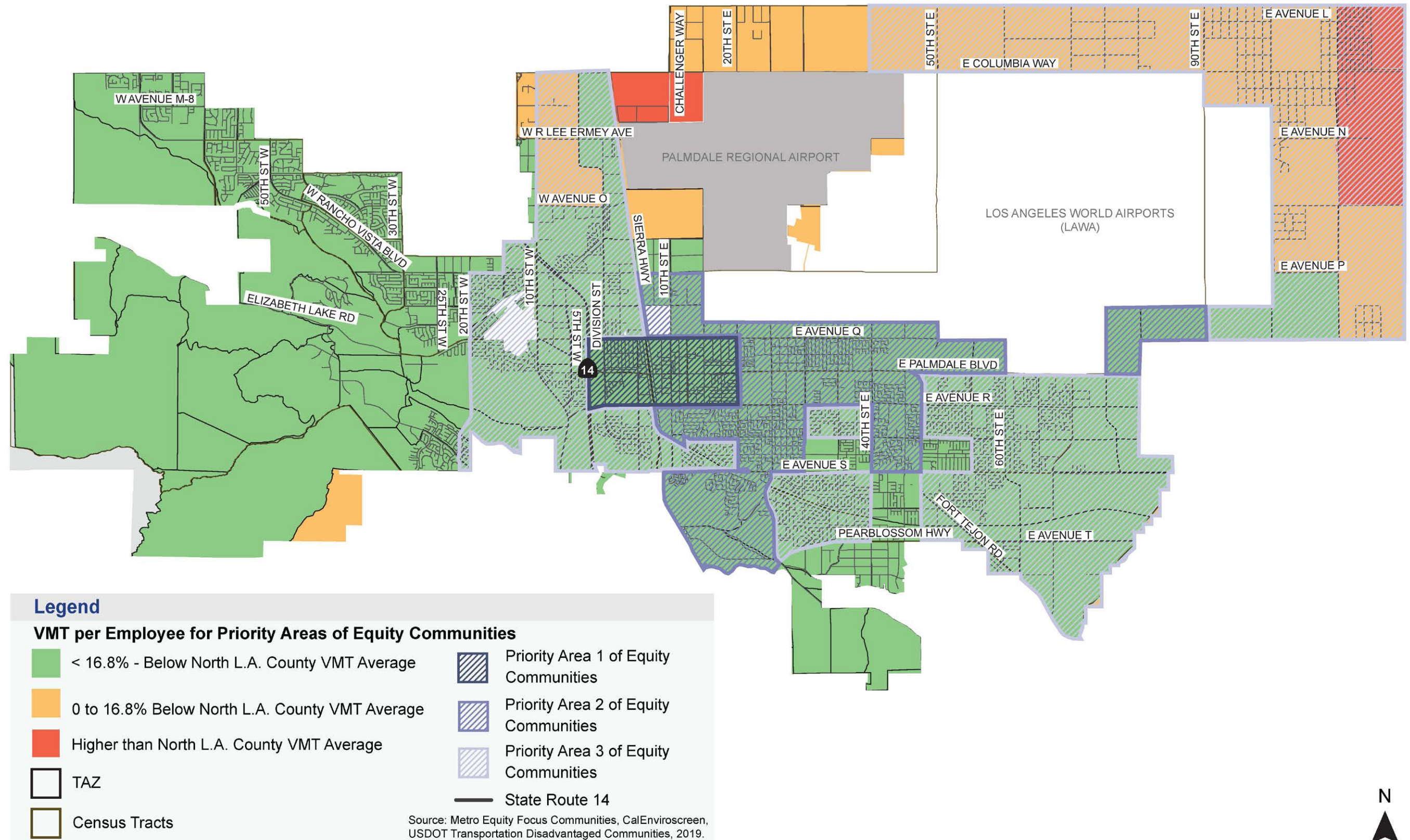
- A majority of pedestrian and bicycle collisions occur near schools. There is a concentration of pedestrian and bicycle collisions nearby schools located in Priority Area 1, east of State Route 14 along East Palmdale Boulevard.
- Most schools in Palmdale primarily fall within equity Priority Area 2. There are concentrations of pedestrian and bike collisions within Priority Area 2, along East Palmdale Boulevard, East Avenue R, and East Avenue S.



VMT Analysis for Equity Priority Areas

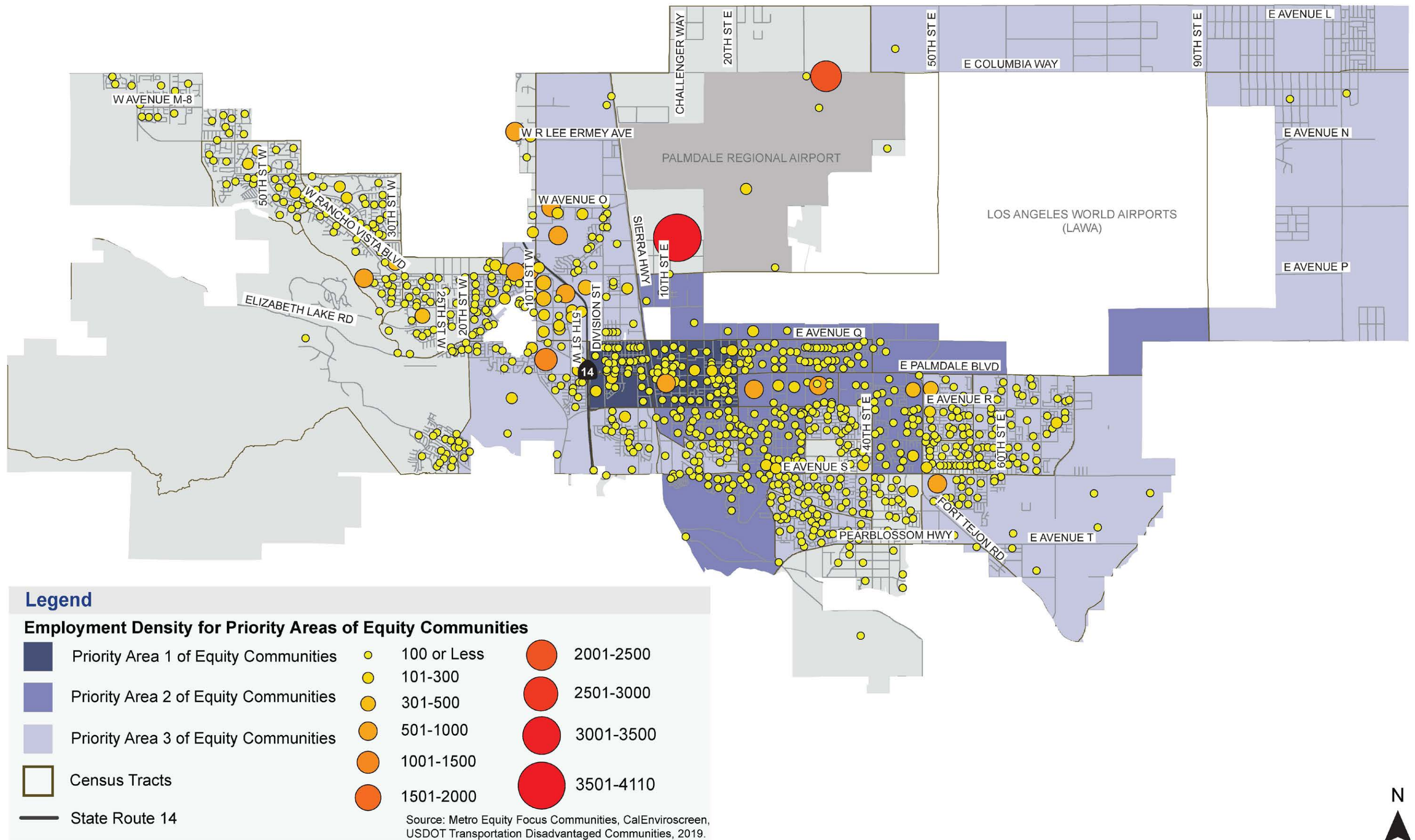
Employment-Related VMTs

- For census tracts in Priority Areas 1, 2 and most of 3, employment-related VMT is more than 16.8% below the North Los Angeles County VMT average, which meets California Environmental Quality Act (CEQA) thresholds. Since VMT levels in this area surpass the thresholds set by CEQA, major mitigation measures are not required.
- VMT is either 0 to 16.8% below the North Los Angeles County average or higher than the North Los Angeles County average in the north and northeast portions of Palmdale. Because this area of the City is near or on the city limits, it has limited access to alternative mobility options (such as public transit, walking, and biking), which forces residents to drive during commutes and leads to higher VMT levels.



Employment Density

- Job density is low to moderate (0 - 2,000 jobs) in Priority Areas 1, 2, and 3 within the City of Palmdale. This shows that the census tracts are not major employment centers and are primarily made up of land uses other than commercial or industrial. Furthermore, residents in the Equity Priority Areas are likely to commute outside of the tracts for work.



5 - Potential Funding Sources

Potential Funding Sources

Funding is an essential consideration in the planning and implementation of projects to achieve safety and VMT reduction goals. Much of the grant funding available right now has a specific focus on increasing equitable community development and addressing climate change goals. A list of specific grant opportunities is provided in Appendix A of the report.



Federal

Federal funding sources include a number of competitive grants awarded through the US Department of Transportation's (USDOT) Federal Highway Administration (FHWA) for improvements to surface roadways, including the expansion of pedestrian and bicycle infrastructure, and the Federal Transit Administration for expansions and improvements to transit infrastructure, service, and operations. Many of these grant programs were established by the 2015 Fixing America's Surface Transportation (FAST) Act and the 2021 Bipartisan Infrastructure Law (BIL) that together have allocated hundreds of billions of dollars for transportation improvements in the United States. Federal grant opportunities can be examined at: <https://www.grants.gov/>



State

State funding sources include a number of federal grant programs that are administered by the State of California to municipalities as well as funding programs that originated through State legislation. Most applicable transportation grant funding opportunities are administered via Caltrans or the California Transportation Commission (CTC), though the California Energy Commission and California Air Resources Board (CARB) offers several grant programs for EV charging infrastructure and incentives for zero-emission vehicles. The State of California has an especially high number of programs that target social equity, environmental justice, active transportation and transit improvements, and GHG reductions due to State legislation priorities. State grant opportunities can be examined at: <https://www.grants.ca.gov/>



Regional

Regional sources include the Southern California Association of Governments (SCAG) and the metropolitan planning organizations (MPOs) serving the City of Palmdale via their Sustainable Communities Program. The program provides direct technical assistance to SCAG member cities to complete sustainable planning and policy efforts in support of regional strategies. Additionally, the Los Angeles County Metropolitan Transportation Authority (LA Metro) provides funding via sales tax measures and propositions for transit and active transportation projects.



Local

Local funding sources for transportation projects can take the form of taxes, exactions, or local general revenues. Examples include dedications from the City's General Fund, City and County local gas tax revenues, and development impact fees that can be used to fund public infrastructure necessary to serve the community impacted by the development.

6 - Conclusion

The City of Palmdale's Sustainable Transportation Plan incorporates robust community and stakeholder engagement with findings from analyses of traffic safety, vehicle travel patterns, trip length, and equity considerations. These components were used to develop recommendations that seek to reduce collision severity, automobile dependency, and environmental impacts. The plan also aims to expand multi-modal transportation options and provide equitable access to all transportation modes and employment opportunities.

Recommendations take the form of infrastructure projects, policy, program recommendations and input from the community engagement process that will continue with the Social Pinpoint tool. Additional detail is provided in 3 separate reports on safety, VMT, and equity.

- The safety analysis determined collision patterns and their causes, focusing on intersection safety improvements with a toolbox of countermeasures and enforcement at high collision rate areas, along with education efforts that address impaired drivers and young drivers.
- The VMT analysis examined development alternatives that would best reduce trips and trip lengths and identified VMT reduction strategies to expand access to multi-modal and zero-emissions transportation options while also making the transportation system more efficient.
- The equity analysis examined how safety and VMT reduction recommendations should be considered through an equity lens and targeted toward identified priority areas.
- The community engagement process identified community desires for expanded multi-modal transportation options, traffic calming, pedestrian and bicycle safety improvements, increased lighting, and more shade trees, along with other areas for future focus.

Moving forward the City now has a set of countermeasures and programs, as well as funding opportunities that it can pursue to implement the goals and recommendations of the STP. Collaboration with state and partner agencies can facilitate the implementation of large-scale programs and policies. Next steps include incorporating findings from the plan analysis into future City policy-making and initiatives, as well as monitoring national and statewide transportation goals and priorities to guide the success of this plan and transportation improvement efforts overall in Palmdale.



Avenue R & 47th St E

