



URBAN DESIGN 4 HEALTH

2019 SAN JOAQUIN COUNTY HEALTH OUTCOME UPDATE & SMALL AREA FOCUS STUDIES

TASK 3: SOUTH STOCKTON PROMISE ZONE SUBAREA ANALYSIS

TASK 4: TRANSLATION OF HEALTH OUTCOME ANALYSIS INTO INVESTMENT GUIDANCE - DRAFT

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About this Report

This report was prepared by Urban Design 4 Health, Inc. (UD4H). UD4H's mission is to support clients with innovative and objective information and tools to achieve health, environmental, economic, and quality of life goals that are intrinsic in efforts to building new communities and to retrofit existing ones. Learn more at www.ud4h.com.

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The contents of this report are the responsibility of the authors and do not necessarily represent official views of SJCOG.

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1 Introduction

Urban Design 4 Health (UD4H) is under contract to the San Joaquin Council of Governments (SJCOG) to provide assistance related to its 2018 Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS) implementation efforts. In a pilot study completed in early 2018, UD4H applied its National Public Health Assessment Model (NPHAM) to San Joaquin County in order to analyze the predicted current conditions of estimated public health benefits (e.g., physical activity levels, body mass index, and general good health), as well as the built, natural, and social environment metrics used as inputs to calculate those estimated benefits.¹ The current analysis builds upon these pilot efforts, with a focus on the South Stockton Promise Zone (SSPZ) subarea and a comparison with the City of Stockton overall as well as San Joaquin County. The current analysis is not meant to replace previous analyses, but rather, it is intended to provide an overall assessment of a series of critical topic areas. This document is the draft report for *Task 3: Promise Zone Focused NPHAM 2.0 Sub-Area Analysis*, and *Task 4: Translation of Health Outcome Analysis into Investment Guidance*. It includes a description of methods and data used to develop the traffic safety and pedestrian/cyclist involved traffic crash analysis and summarizes the findings identifying the areas, intersections and roads most hazardous based on traffic crashes involving fatalities and severe injuries. This report reviews a series of methods used to identify traffic crash hotspots, specifically for those traffic collisions involving vehicles with pedestrians or cyclists. The document also examines an inventory of pedestrian and bicyclist infrastructure at 14 of the most dangerous traffic crash intersections in South Stockton to identify potential areas for upgrades or improvements in safety infrastructure. This report reviews transportation access in South Stockton including existing and planned bicycle and transit infrastructure. Lastly, an analysis on access to developed parks was performed to identify potential gaps in park access for South Stockton residents.

2 The Evidence

A growing body of evidence suggests that transportation and land use investments and policies can have broad-reaching implications for population health, access to economic opportunities, and climate change¹⁻⁶. Transportation systems link people with social and health promoting resources, such as employment, education, food, recreation, social services, and health care⁷⁻¹⁰. Transportation systems influence healthy behaviors such as walking and biking; the increase in physical activity and resulting health outcomes are well documented¹¹. Transportation systems can explain variation in air quality and

¹ [2018 RTP/SCS SJCOG – Public Health Analysis of Draft Scenarios](#), 2018.

noise; yet different travel modes may result in further differential personal exposure and traffic safety risk^{5,12-14}.

Long-range RTP are informed through modeling of travel demand and land use. There is increasing demand for these models to be linked to additional analyses to understand social and health impacts of planned land use and transportation policies and investments. This report provides an analysis of the estimated current and future conditions of health equity and other social equity goals to inform additional analyses in the RTP context.

3 Methods for Identifying Environmental Justice Areas

The equity analyses in this report rely upon comparisons of geographic areas flagged as areas of concern. The three geographic areas that are investigated in this report are: CalEnviroScreen defined disadvantaged communities, areas of concentrated minorities, and areas of concentrated poverty. Each is described in more detail below.

*CalEnviroScreen*² provides an index of disadvantaged communities. The 207 block groups within San Joaquin County that rank within the top quartile of all of California were flagged for analysis. See Figure 1 for a map showing the locations of these CBGs.

Concentration of Minorities are located using the American Community Survey (2015, 5-year estimate, *B03002* dataset) to identify census tracts where at least 75% of a census block group's population consists of races and ethnicities which are not non-Hispanic White. Within San Joaquin County 136 census block groups meet the threshold and are defined as areas of concentrated minority populations. See Figure 2 for a map showing the locations of these CBGs.

Concentrated Poverty locations are identified using the American Community Survey (2015, 5-year estimate, *S1701* dataset). Census tracts were used where 30% or more of the population is identified as "below federal poverty level." Thirty-one (31) census tracts in the county meet the 30% threshold, resulting in 89 block groups being defined as areas of concentrated poverty. See Figure 3 for a map showing the locations of these CBGs.

² <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30>

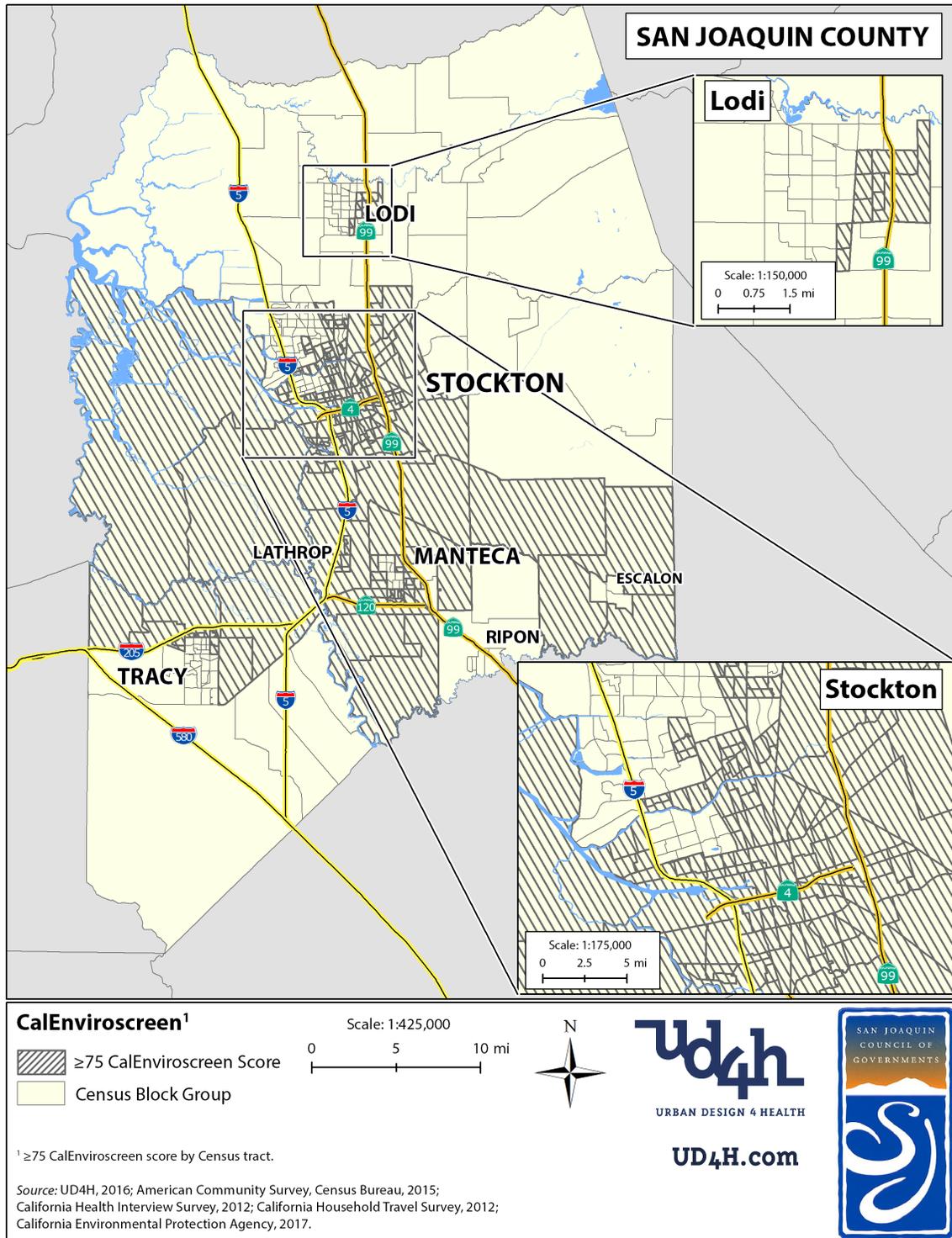


Figure 1. Census Block Groups Designated as Top Quartile in CalEnviroScreen Index

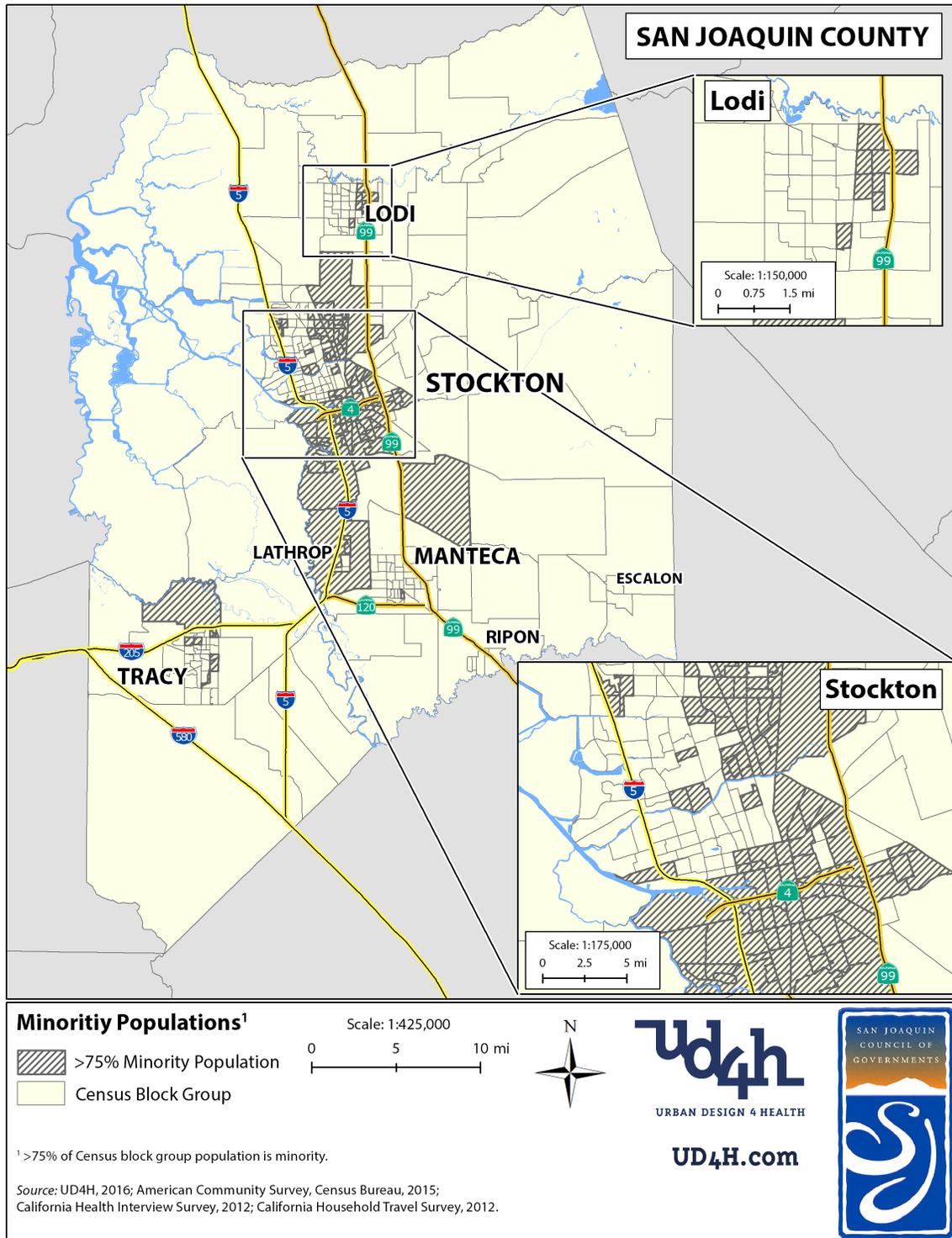


Figure 2. Census Block Groups Designated as Areas of Concentrated Minority Populations

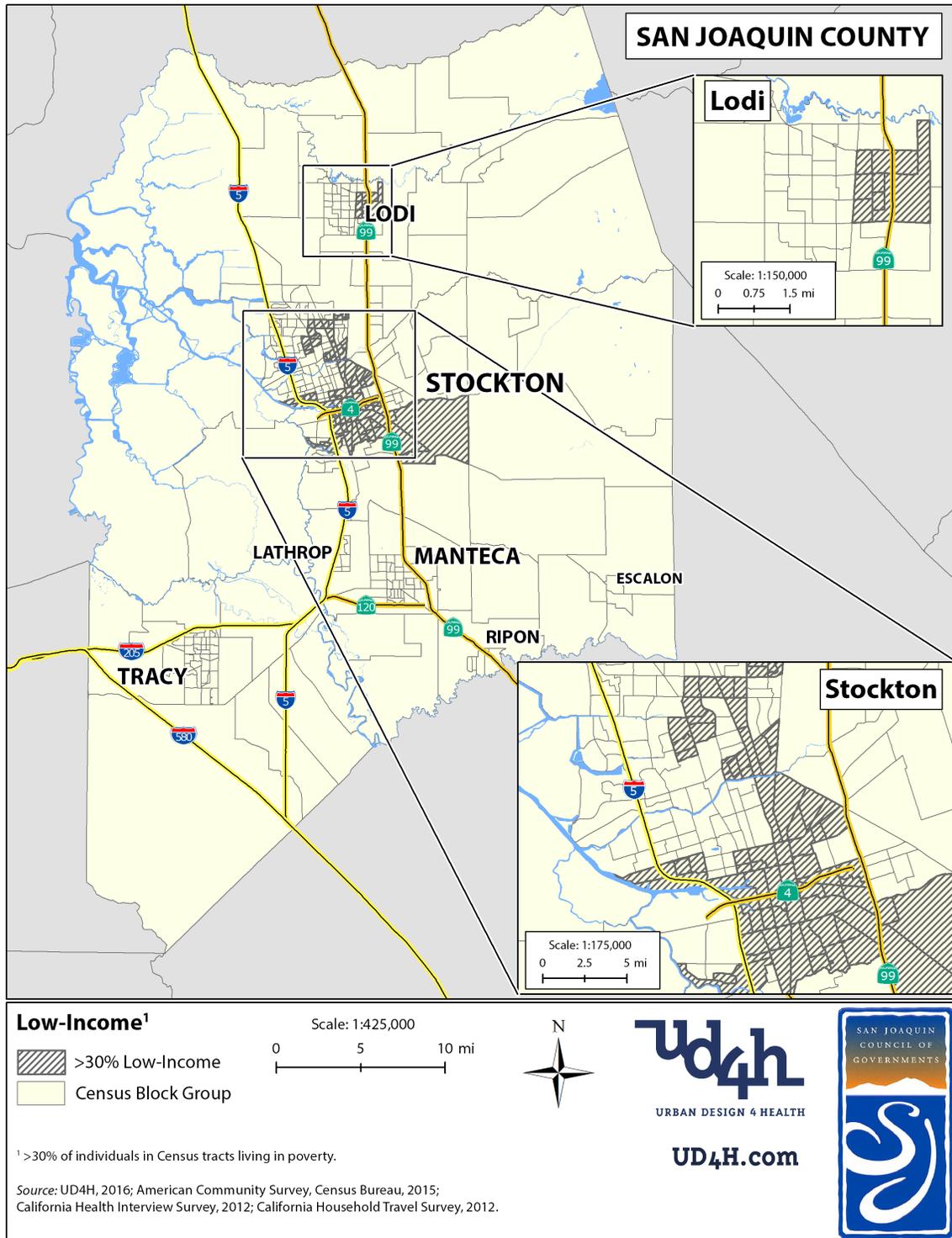


Figure 3. Census Block Groups Designated as Areas of Concentrated Poverty

3.1 South Stockton Promise Zone

The South Stockton Promise Zone (SSPZ) is a public, private and non-profit collaborative initiative with the principal aim of “empower[ing] residents to transform their community – to affect the root causes of intergenerational poverty through improvements in safety, education, housing, job creation, economic development and health.”³ SJCOG is a partner with the Reinvent South Stockton Coalition, facilitating a backbone working group interested in focused investments in the SSPZ. The SSPZ has three main objectives:

1. to create awareness and advocate for the strengths/needs of South Stockton,
2. align long-term strategies and resources to improve South Stockton, and
3. develop civic engagement structures that will provide South Stockton residents a voice in decision-making.

The SSPZ includes sections of Downtown Stockton, but mainly comprises areas south of the Downtown Core within the municipal limits. The borders are defined by Harding Way on the north, SR #99 on the east, Arch Road on the South and Interstate-5 on the west excluding Weston Ranch, including Conway, State Route 4 and Center Street (including the Madison neighborhood). The SPPZ contains a total of 53 census block groups with a total population of just under 77,000 people in 2015⁴ comprising just under a 1/3 of Stockton’s population.

Among the key environmental justice (EJ) indicators (CalEnviroScreen, concentration of minority populations and concentrated poverty) examined as part of this study, it is important to note that every block group within the SSPZ is included in one of the three EJ indicators (Table 1). The SSPZ has a much higher concentration of poverty at 83% in contrast to the City of Stockton at 42% and the county at 22.5%, as well as high concentrations of people of color at 96% in contrast to 57% for Stockton and 34% countywide respectively.

³ [South Stockton Promise Zone Plan](#), City of Stockton, 2016.

⁴ 2015 American Community Survey 5-Year Estimate, U.S. Census Bureau, 2015.

Table 1: Summary of block group level environmental justice indicators across the county and in Stockton and the SSPZ.

Environmental Justice Indicator	Countywide – Census block group count (%)	Stockton City – Census block group count (%)	South Stockton Promise Zone – Census block group count (%)
CalEnviroScreen	207 of 395 (52.4%)	104 of 169 (61.5%)	53 of 53 (100.0%)
Concentration of Minority Population	136 of 395 (34.4%)	97 of 169 (57.4%)	51 of 53 (96.2%)
Concentrated Poverty	89 of 395 (22.5%)	71 of 169 (42.0%)	44 of 53 (83.0%)
CalEnviroScreen or Concentration of Minority Population or Concentrated Poverty	234 of 395 (59.2%)	124 of 169 (73.4%)	53 of 53 (100.0%)

4 Traffic Safety

Safety is a key driver for change to existing roadways and intersections. Reducing fatalities and injuries on streets requires a systems approach that includes both plans and project design^{17,18}. Vision Zero is a Swedish initiative pioneered in 1994 to eliminate deaths or serious injuries on Sweden’s roads. Vision Zero has become a powerful organizing strategy, because its principles guide action at the national, regional, local, and project levels. It has been widely adopted in Europe and North America and includes a series of core principles outlined in Table 2.

Table 2. A summary of Vision Zero principles.

#	Vision Zero Principles
1	Traffic deaths and serious injuries are preventable.
2	No loss of life is acceptable on roadways.
3	Transportation systems must be designed to allow human error.
4	The first priority is eliminating collisions that result in death or serious injuries.

Source: Vision Zero Network, 2017.

There is a growing body of evidence and resources to help mitigate the risk for injury and fatalities across all modes of transportation, especially for vulnerable pedestrians or cyclists^{20,21}. Some of these interventions to reduce traffic injuries focus on the alteration of environmental factors such as traffic volume and speed^{22,23} and for cyclists, increased separation from vehicles²⁴. Pedestrians and cyclists are more likely to suffer injury or death in a collision. In fact, pedestrians and cyclists have been found to be 1.5 times more

likely than motorists to die on an average trip^{25,26}, and many life-altering injuries go unreported. Moreover, traffic injury risk across modes of transportation tends to be higher for low-income populations. People with lower incomes typically have lower levels of car ownership and rely on walking or biking for transport despite the fact that they often live in places where the active transportation network is less developed^{27,28}.

4.1 Implications of Autonomous Vehicles on Safety

As the use of autonomous vehicles increases, new traffic crash concerns will likely emerge. Although autonomous vehicles will eliminate human driving errors, which cause more than 94% of automobile crashes in the United States²⁹, safety will remain a priority for riders in vehicles or on motorcycles, pedestrians, and bicyclists. For example, pick-up and drop-off zones may be necessary to accommodate autonomous vehicle riders. If autonomous vehicles reduce the number of vehicles on the road, that may help reduce vehicle to vehicle crashes. However, the ease and productivity that is possible for riders will likely increase total vehicle miles traveled, meaning that there are still ample opportunities for collisions with pedestrians and bicyclists. Furthermore, while human *driving* errors are eliminated from traffic safety concerns, human error is still a factor for pedestrians and bicyclists operating within the transportation system. Infrastructure which separates bicyclists and pedestrians from autonomous vehicles may help combat such concerns.

4.2 Identification of Critical Areas for Traffic Safety

Several key considerations when examining traffic crash patterns include the level of residential or employment density of an area, the level of street connectivity and crossing opportunities (e.g., block length size, travel speeds and road functional classes which relate to traffic volume). A consideration for traffic crashes involving cyclists is the proximity to bicycle facilities, especially on-street facilities as they may concentrate cyclist traffic, but may not provide as much of a buffer from automobiles as multi-use or non-motorized pathways. Conducting analyses like this include knowing the location of crashes as well as information about involved modes, and the transportation network.

4.3 Traffic Crash Data

As part of the data inventory review for the SSPZ, data on fatal, severely injured and other injured traffic crashes were acquired to identify the most critical areas for targeted safety improvements. Uniform California traffic crash data were gathered by the Statewide Integrated Traffic Records System (SWITRS) who has collected data on all reported traffic crashes since 2001.⁵ The 2017 Bicycle Master Plan used the same data sources to assess citywide bicycle collision statistics and locations in Stockton over a

⁵ Statewide Integrated Traffic Records System (SWITRS), 2001-2017:
<http://iswitrs.chp.ca.gov/Reports/jsp/userLogin.jsp>

five-year span from 2008-2012. The analysis in the 2017 Bicycle Master Plan included a count of bicyclist injury collisions at each intersection, a count of the fatalities from collisions, the cause and type of the collisions, and demographics involved in bicycle collisions. The current analysis builds upon this analysis, as updated data and emerging analysis techniques. The killed or severely injured (KSI) index was used to identify the most severe traffic crash locations, and served as the basis for completing a high injury network (HIN) analysis to identify walkable sections with a higher incidence of severe and fatal crashes. Further, while the 2017 Bicycle Master Plan focused on only bicycle collisions for the entire City of Stockton, the current analysis examines active transportation more broadly with a focus on the South Stockton Promise Zone. The Transportation Injury Mapping System (TIMS), developed by the University of California Berkeley, compiles geocoded SWITRS data for a five year period between 2013-2017 (the latest year available).⁶ Using data compiled over a period of five years is a common approach for traffic crash analyses. The U.S. Department of Transportation (U.S. DOT) uses this approach in order to increase the analysis power and to detect trends.⁷

For each crash included in the SWITRS data set the following attributes are provided: date and time, x/y coordinates of the incident location, mode(s) involved, information about injury/death and whether alcohol was a factor or the collision was a hit-and-run. The latter two are not used in the analyses presented here since they are not built environment related.

4.4 Block Group Summarization

To analyze the spatial distribution patterns of traffic crashes across San Joaquin County, summaries of different types of crashes were calculated at the block group level. This examination provides a way to easily summarize fatal crashes, crashes with severe and non-severe injuries. The focus of this analysis is on the South Stockton Promise Zone (SSPZ), however, countywide and Stockton only summaries and descriptives are also provided for context.

Table 3 compares all traffic crashes (any traffic crash involving any mode which result in no injury, limited or severe injuries or death) and bike/pedestrian involved (injured or fatal) crashes in the SSPZ to countywide counts and to counts only within the City of Stockton. The percentage of traffic crashes that involved bike/pedestrians was slightly higher in the SSPZ compared to countywide and Stockton percentages. Pedestrian only crashes (a collision involving a vehicle and a pedestrian) were higher than bicycle only crashes (a collision involving a vehicle and a cyclist) across all geographical scales, and SSPZ had greater percentages than countywide and Stockton for both pedestrian and bicycle only.

⁶ Transportation Injury Mapping System (TIMS), University of California Berkeley, 2013-2017.

⁷ Guidebook for Developing Pedestrian & Bicycle Performance Measures, U.S. Department of Transportation, Federal Highway Administration, 2016.

Table 3. All traffic crashes vs. pedestrian/bike involved crashes causing both injury or fatalities over a 5-year period (2013-2017) at census block group level

Type of Crash	San Joaquin County – Census block group count (%)	Stockton– Census block group count (%)	South Stockton Promise Zone – Census block group count (%)
All traffic crashes ⁸	15,264 (100.0%)	7,537 (100.0%)	3,227 (100.0%)
Bike <i>or</i> Pedestrian Involved	1,504 (9.9%)	919 (12.2%)	435 (13.5%)
Bike <i>and</i> Pedestrian Involved	135 (0.9%)	81 (1.1%)	28 (0.9%)
Pedestrian Involved	736 (4.8%)	465 (6.2%)	241 (7.5%)
Bicycle Involved	633 (4.1%)	373 (4.9%)	166 (5.1%)

Source: Statewide Integrated Traffic Records System (SWITRS), 2013-2017.

Table 4 shows traffic crashes that occurred at an intersection and traffic crashes that occurred at non-intersections (located on a road segment and at least 35 ft. away from an intersection) in SSPZ compared to countywide and Stockton counts. Across the county, roughly a 33% of all traffic crashes occurred at each of the following location types: 1) intersections, 2) mid-segments (non-intersections) and 3) on freeways and ramps (non-walkable streets). The SSPZ had a greater percentage of traffic crashes occurring at intersections compared to the County and Stockton.

Table 4. Traffic crashes in intersections vs. traffic crashes at non-intersections causing both injury or fatalities over a 5-year period (2013-2017) at the census block group level

Location Type	San Joaquin County – Census block group count (%)	Stockton – Census block group count (%)	South Stockton Promise Zone – Census block group count (%)
Intersections	5,234 (34.3%)	2,988 (39.6%)	1,501 (46.5%)
Non-Intersections	4,859 (31.8%)	2,216 (29.4%)	637 (19.7%)
Non-Walkable Streets	5,171 (33.9%)	2,333 (31.0%)	1,089 (33.7%)

Source: Statewide Integrated Traffic Records System (SWITRS), 2013-2017.

Table 5 shows the count and percentage of all traffic crashes for local streets, minor arterials, and major arterial roads⁹ in the SSPZ compared to countywide and Stockton traffic

⁸ All motor vehicle involved traffic crashes including vehicle-to-vehicle collisions and pedestrian or cyclist involved collisions resulting in no injuries, injury or death.

crashes. Major arterials¹⁰ are municipal roads with the highest traffic capacity except for limited access roads, which include freeways or interstate highways. Minor arterials¹¹ are roads that carry more traffic volume than local roads, but less than major arterials. Local streets comprise nearly all remaining public streets in the SSPZ. These include local residential streets, side streets, and with cul-de-sacs and dead-ends. Within the SSPZ, the share of the total road network devoted to local roads is 84%, followed by 9.4% and 6.0% for major arterials and minor arterials respectively.

The percentages of all traffic crashes on these road types were lower in the SSPZ compared to countywide and Stockton percentages, but followed the same pattern, with local streets having the highest percentage and minor arterials having the lowest percentage. The lower percentages in the SSPZ on surface roads are due to a larger share of crashes occurring on freeways or state highways in the SSPZ.

Table 5. All traffic crashes by road functional class over a 5-year period (2013-2017) at the census block group level

Road Functional Class	Countywide – Census block group count (%)	Stockton– Census block group count (%)	South Stockton Promise Zone – Census block group count (%)
Local Street	2,787 (18.3%)	1,193 (15.8%)	468 (14.5%)
Minor Arterial	1,561 (10.2%)	553 (7.3%)	185 (5.7%)
Major Arterial	1,870 (12.3%)	1,073 (14.2%)	364 (11.3%)
Freeway or State Highway	9,046 (59.3%)	4,718 (62.6%)	2,210 (68.5%)
All traffic crashes	15,264 (100.0%)	7,537 (100.0%)	3,227 (100.0%)

Source: Statewide Integrated Traffic Records System (SWITRS), 2013-2017.

4.5 Traffic Crash Hotspots

An ESRI ArcGIS¹² analysis tool, Hotspot Analysis (Getis-Ord* Gi), was used to calculate the Getis-Ord Gi* statistic for crashes in each block group in the SSPZ. This is a spatial statistics method of detecting spatial autocorrelation or the degree of spatial clustering or dispersion in geographic space. The resulting score indicates where traffic crashes have the highest probability of clustering. Using this method, a two-level

⁹ Road functional classification system used by the City of Stockton.

¹⁰ Examples of major arterials in the SSPZ include Airport Way, Dr. Martin Luther King Jr. Blvd., El and Dorado St.

¹¹ Examples of minor arterials in the SSPZ include California St., Weber Ave, Main St. and E. Fremont St.

¹² Environmental Systems Research Institute (ESRI) ArcGIS Desktop v. 10.3, Redlands, CA.

analysis was performed to identify areas with high numbers of traffic crashes: 1) the point location of the traffic crash and 2) summed traffic crashes within census block groups. The resulting scores were used to create three classifications of hot spots based on the probabilistic confidence of a pattern of spatial clustering (99% confidence, 95% confidence, and 90% confidence). The highest scores were assigned by the tool at a 99% confidence classification, indicating the highest degree of certainty that crashes have occurred in this area as a result of a clustering pattern and are not random. Using this information, traffic safety engineers and planners should consider an intervention to improve safety or continued collisions are likely to occur.

Using the Getis Ord G_i^* test statistic (z-score) for identifying spatial clustering of crashes, Figure 4 shows traffic crash hotspots for all traffic crashes and Figure 5 shows the pedestrian or cyclist involved traffic crashes only. Hotspots for all traffic and non-motorized¹³ crashes are more clustered in the northwest corner of the SSPZ, in the core of Downtown Stockton where many of the most dangerous intersections for traffic crashes are located. Streets near the West 8th Street intersection and the West Side Freeway also showed significant clustering for all traffic crashes, but not for those non-motorized involved crashes. Compared to all traffic crashes, hotspots for non-motorized traffic crashes are more clustered in the western edge of the downtown area and show clusters south of the downtown area as well. A hotspot was also detected for non-motorized traffic crashes on Lincoln St. between W. Sonora St. and W. Scotts Ave. The hotspot analysis method at the traffic crash point location and census block group level provide useful summary statistics to describe the spatial clustering of traffic crashes, however, a more detailed analysis at the intersection level and within specific corridors along the network is required for more guidance on the key areas to focus on for traffic safety improvement. The sections that follow identify these locations within the SSPZ.

¹³ Pedestrian involved or bicyclist involved traffic collisions combined.

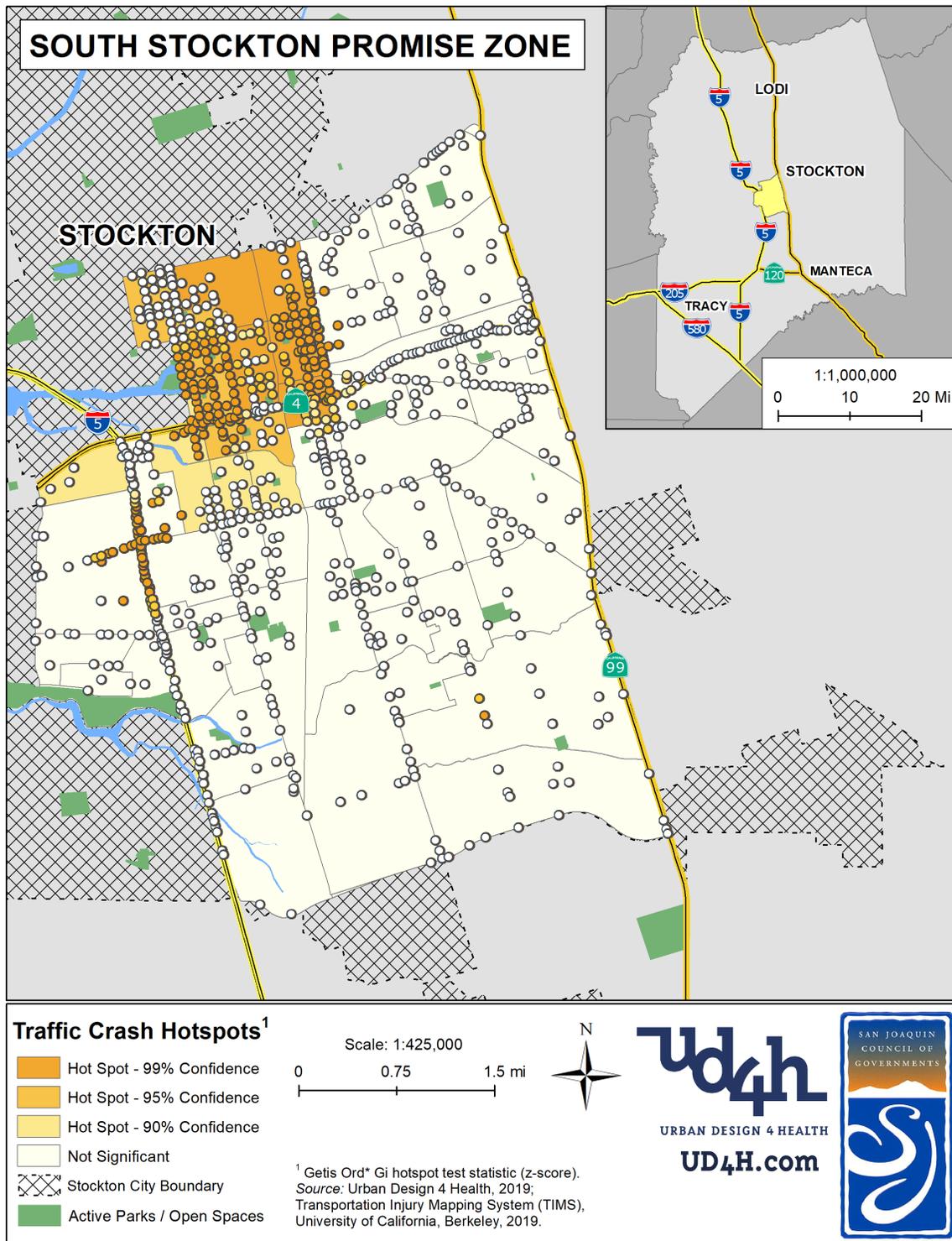


Figure 4: Traffic crash hotspots (all traffic crashes) for the SSPZ utilizing the Getis Ord Gi* test statistic (z-score) to identify traffic crash clustering.

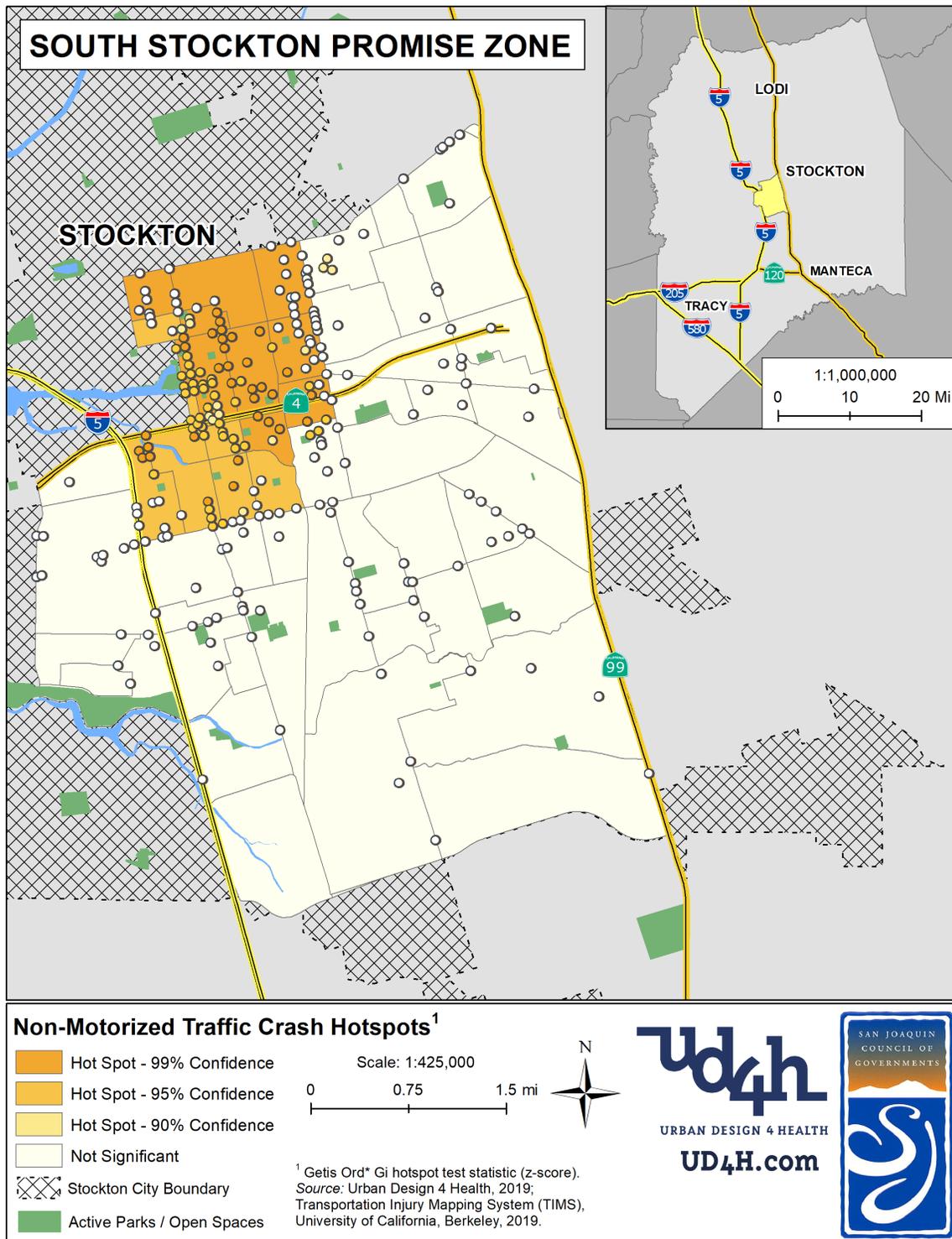


Figure 5. Non-motorized traffic crash hotspots for the SSPZ utilizing the Getis Ord G_i^* test statistic (z-score) to identify non-motorized traffic crash clustering.

4.6 Killed or Severely Injured Weighted Index

A killed or severely injured (KSI) index is used to identify the most severe traffic crash locations and has been implemented by many jurisdictions to characterize traffic safety and Vision Zero policies.¹⁴ Vision Zero policies promote the goal of achieving a road network with no fatalities or serious injuries involving road traffic. This method is used by a wide range of local and regional government agencies including the City of Los Angeles and the City of Sacramento in California, and the City of Philadelphia in Pennsylvania. Utilizing a KSI index along with a high injury network (discussed in the next section) supports analysis methods that seek to isolate and target investment and achieve goals associated with Vision Zero policies. The KSI index is especially useful to locate those intersections and street segments most dangerous to pedestrians and cyclists, and which make up the high injury network¹⁵. The formula used to calculate the KSI places a greater weight on fatalities or severe injuries among pedestrians and bicyclists compared to vehicle-vehicle crashes, helping to identify problematic intersections for active travel in particular. In addition, the KSI index also applies a higher weight to those traffic crashes that occur within environmental justice (EJ) communities. For the purposes of this study, an EJ community included any block group that met the CalEnviroScreen's highest percentile (75th) or concentrated poverty or concentrated population of people of color. The KSI index is calculated using the following formula¹⁶:

$$KSI^{17} = Fatality\ Count\ (x1.5)^* + Severe\ Injury\ Count + Target\ Community^{**}$$

*weighted higher for severity

** 1 if the location was in a target disadvantaged or EJ community, 0 if not

The sections that follow apply the KSI index for each traffic crash distinguishing between traffic crashes occurring at an intersection or a mid-segment (non-intersection) at least 35 feet from an intersection. The KSI values for each traffic crash that occurs within this threshold of the intersection are summed together at the intersection point level while mid-segment crashes are summed at the road segment (line level).

¹⁴ [Vision Zero Traffic Crash Analysis](#), City of Los Angeles, 2016.

¹⁵ [Vision Zero High Injury Network Methodology](#), City of Philadelphia, 2017.

¹⁶ [Vision Zero Analysis](#), City of Los Angeles, 2016.

¹⁷ Note that in some version of the formula traffic crashes are weighted higher for crashes involving children or seniors, however, these attributes were not available for this analysis.

4.6.1 Most Dangerous Intersections

Table 6 shows the top ten most dangerous intersections for all crash types in the SSPZ based on their KSI index. The average KSI index across the top ten most dangerous intersections was 4.0.

Table 7 shows the top ten most dangerous intersections but only for vehicle crashes involving bicyclists or pedestrians. The average KSI for the ten most dangerous intersections for pedestrian and cyclist involved crashes is 2.75). The average for the top ten most dangerous set of intersections for all traffic crashes is 4.0. This underscores the fact that when pedestrians and cyclists are involved in collisions with vehicles these crashes tend to result in higher rates of death and severe injuries because pedestrians and cyclists are more vulnerable than motorists. Three of the four intersections for non-motorized crashes with an above average KSI were also among the most dangerous for all traffic crashes.

Some intersections appear in the top ten most dangerous for non-motorized crashes, but do not appear when considering all traffic crashes. For example, E Washington St & S Airport Way intersection is among the top four most dangerous for non-motorized crashes, but does not appear in the top ten for all traffic crashes. Similarly, while Dr. M.L.K. Jr. Blvd & S Airport Way has the highest KSI (5.5), indicating that it is the most dangerous intersection for all traffic crashes, it is not in the top ten for non-motorized crashes. Nearly all of the top ten most dangerous intersections for all traffic crashes occur at major arterials, often with minor arterials as a cross street. However, many routes to destinations require crossing, or at some point traveling, on larger arterial roads which is where many of the severely injured or killed traffic crashes are occurring.

Table 6: Top ten most dangerous intersections for all traffic crashes (2013-2017) in the SSPZ using the KSI weighted index.

#	Intersection Name	Total Crashes	# Killed	# Injured	# Severely Injured	Killed or Severely Injured (KSI) Index
1	Dr. M.L.K. Jr. Blvd & S Airport Way	9	1	10	3	5.5
2	N Sierra Nevada St & E Lindsay St	3	0	4	4	5.0
3	Sierra Ln & John St	5	1	5	2	4.5
4	El Dorado St & E Sonora St	1	1	2	2	4.5
5	N Airport Way & Pinchot St	3	2	5	0	4.0
6	El Dorado St & W Ivy Ave	1	0	3	3	4.0
7	Weber Ave & N Filbert St	4	1	9	1	3.5
8	Dr. M.L.K. Jr. Blvd & Aurora St S	3	1	2	1	3.5
9	Dr. M.L.K. Jr. Blvd & S Stanislaus St	7	0	7	2	3.0
10	W Jefferson St & S Center St	3	0	6	2	3.0
	Total/Mean	39	7	53	20	4.0

Source: Statewide Integrated Traffic Records System (SWITRS), 2013-2017.

Table 7. Top ten most dangerous intersections for non-motorized traffic crashes (2013-2017) in the SSPZ using the KSI weighted index.

#	Intersection Name	Total Crashes	# Killed	# Injured	# Severely Injured	Killed or Severely Injured (KSI) Index
1	E Sonora St. & El Dorado St.	3	1	2	1	3.5
2	E Dr. Martin Luther King Jr. Blvd. & S Stanislaus St.	3	0	3	2	3.0
3	E Lindsay St & N Sierra Nevada St.	2	0	2	2	3.0
4	E Washington St. & S Airport Way	2	0	2	2	3.0
5	E 6 th St. & S El Dorado St.	3	1	2	0	2.5
6	S Lincoln St. & W Sonora St.	2	1	1	0	2.5
7	E Dr. Martin Luther King Jr. Blvd. & S American St.	2	1	1	0	2.5
8	N Wilson Way & E Oak St.	1	1	0	0	2.5
9	S El Dorado St & W 7 th ST	1	1	0	0	2.5
10	Pinchot St & N Airport Way	1	1	0	0	2.5
	Total/Mean	20	7	13	7	2.75

Source: Statewide Integrated Traffic Records System (SWITRS), 2013-2017.

4.6.2 High Injury Network Analysis

The KSI calculations identified the relative danger of intersections and roads where pedestrian and bicyclists were killed or severely injured. This was used as the basis for completing a high injury network analysis. The high injury network analysis identified sections of the walkable¹⁸ street network that had higher incidence of severe and fatal collisions.

The high injury network calculates the KSI for each road segment in the network. It accounts for both mid-segment crashes and each segment that intersects an intersection where traffic crashes occur. The length of road segments and the connectivity level of the network vary across the county depending on the type of street. When considering traffic crash counts, longer road segments (as a result of greater distances between intersections), such as in outlying areas, may result in higher crash counts than shorter segments. To overcome this, KSI values were normalized by the road segment length¹⁹ to isolate those road segments with the highest KSI density, based on the ratio of KSI divided by segment length.

In order to highlight the most dangerous intersections and corridors within the SSPZ on the high injury network map, it is necessary to choose a KSI threshold value. Applying the threshold shows the locations of the highest concentrations of people killed and severely injured traffic crashes. The threshold selected for San Joaquin County and Stockton is based on the number of local crashes and the variance in the data rather than a national or state standard. Figure 6 illustrates where walkable sections of the street network have a KSI density for all types of traffic crashes above 0.50,²⁰ which indicates segments along high injury corridors and intersections.

The most walkable sections of the street network based on highest connectivity levels in the region are located near the Downtown area and comprise some portion of the high injury network. The high injury network analysis shows that sections of the eastern Downtown and western sections of the Downtown have high KSI densities. The eastern edge of the Downtown also shows a clustering of traffic crashes. A key corridor on the high injury network is Airport Way extending from the northern boundary of the SSPZ at Harding Way to just south of the Crosstown Freeway (SR #4).

¹⁸ The street network with freeways, interchanges and ramps removed as pedestrians are not permitted to traverse these areas.

¹⁹ The KSI density was multiplied by 100 to yield a more understandable number.

²⁰ This threshold was chosen specifically for San Joaquin County and Stockton based on the number of traffic crashes over the 5-year period. This threshold may or may not be appropriate for other regions in California.

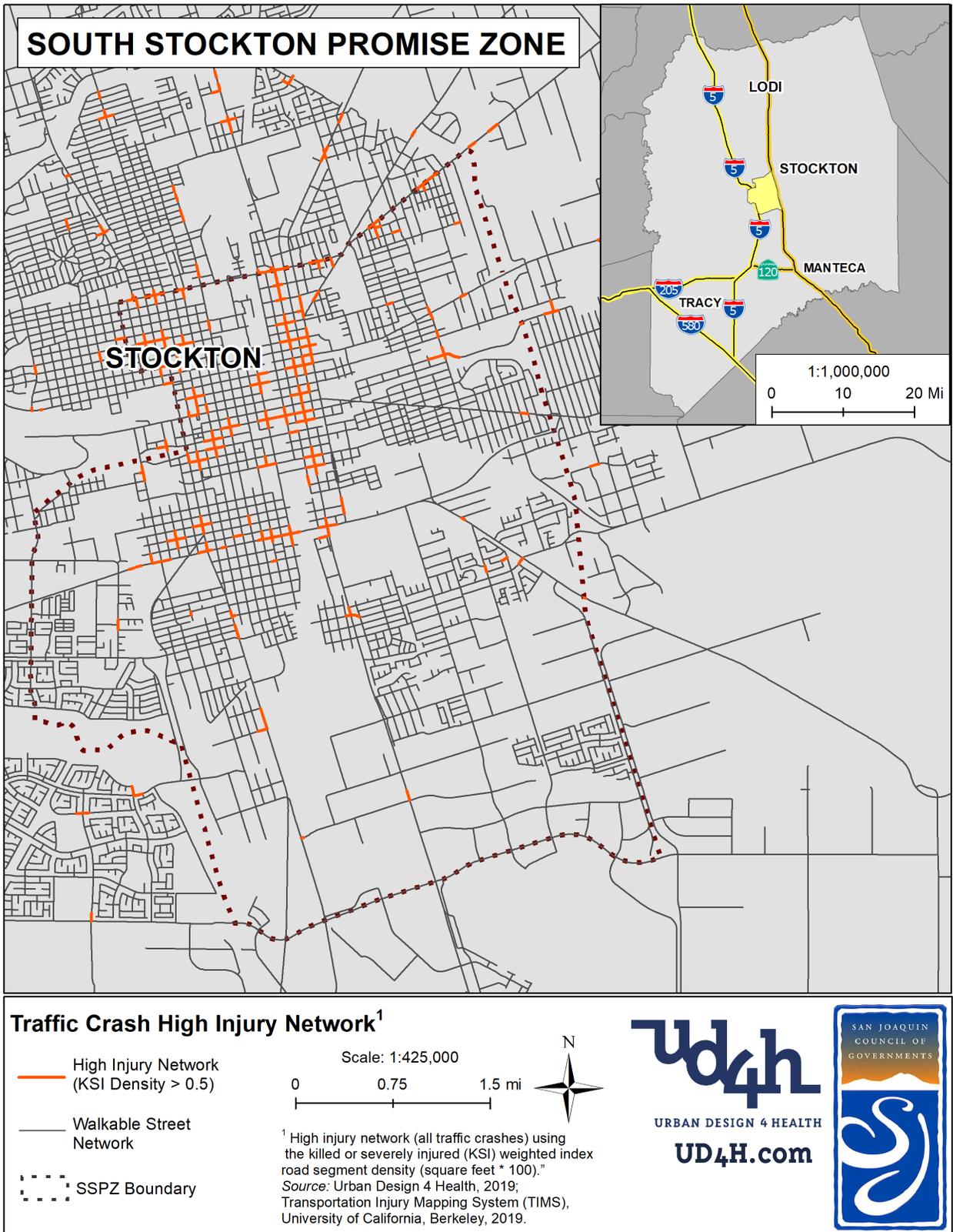


Figure 6. Traffic crash high injury network in the SSPZ using the KSI density.

In San Joaquin County, the high injury network accounted for only 0.8% of the walkable network, but 38.7% of fatal traffic accidents occurred on it (Table 8). In contrast, the high injury network accounted for 3.1% and 7.1% of the walkable network in Stockton and the SSPZ, and made up 62.6% and 76.5% of the fatal traffic crashes respectively.

Table 8. All types of traffic crashes on the walkable and high injury network in San Joaquin County, Stockton and the SSPZ.

Variable	Network Type	Countywide Network (%)	Stockton (%)	South Stockton Promise Zone (%)
Length (miles)	Walkable Network	3,812.7	918.0	257.5
	High Injury Network	30.2 (0.8%)	28.8 (3.1%)	18.3 (7.1%)
Killed in Traffic Crashes (count)	Walkable Network	638 (100%)	235 (100%)	98 (100%)
	High Injury Network	247 (38.7%)	147 (62.6%)	75 (76.5%)

Source: Statewide Integrated Traffic Records System (SWITRS), 2013-2017.

Figure 7 shows the high injury network with KSI densities above 0.50 for only pedestrian or cyclists involved traffic collisions. This map shows a similar pattern as Figure 6, however, with less intensity and identifies smaller corridors and segments of collisions involving pedestrian or cyclists who were killed or severely injured. In addition to the Airport Way corridor described above, the following are also on the high injury network: sections of Wilson Way, El Dorado St. and California St. in the western Downtown, Dr. Martin Luther King Jr. (E. Charter Way) east of California St. and Mariposa Road and E. 8th St.

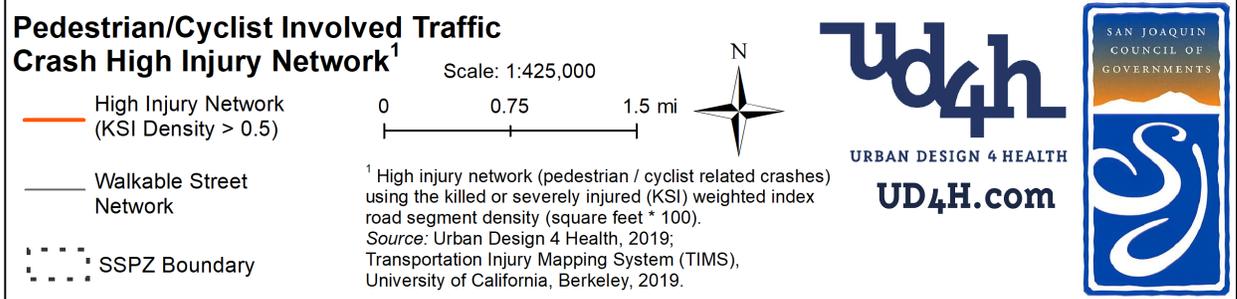
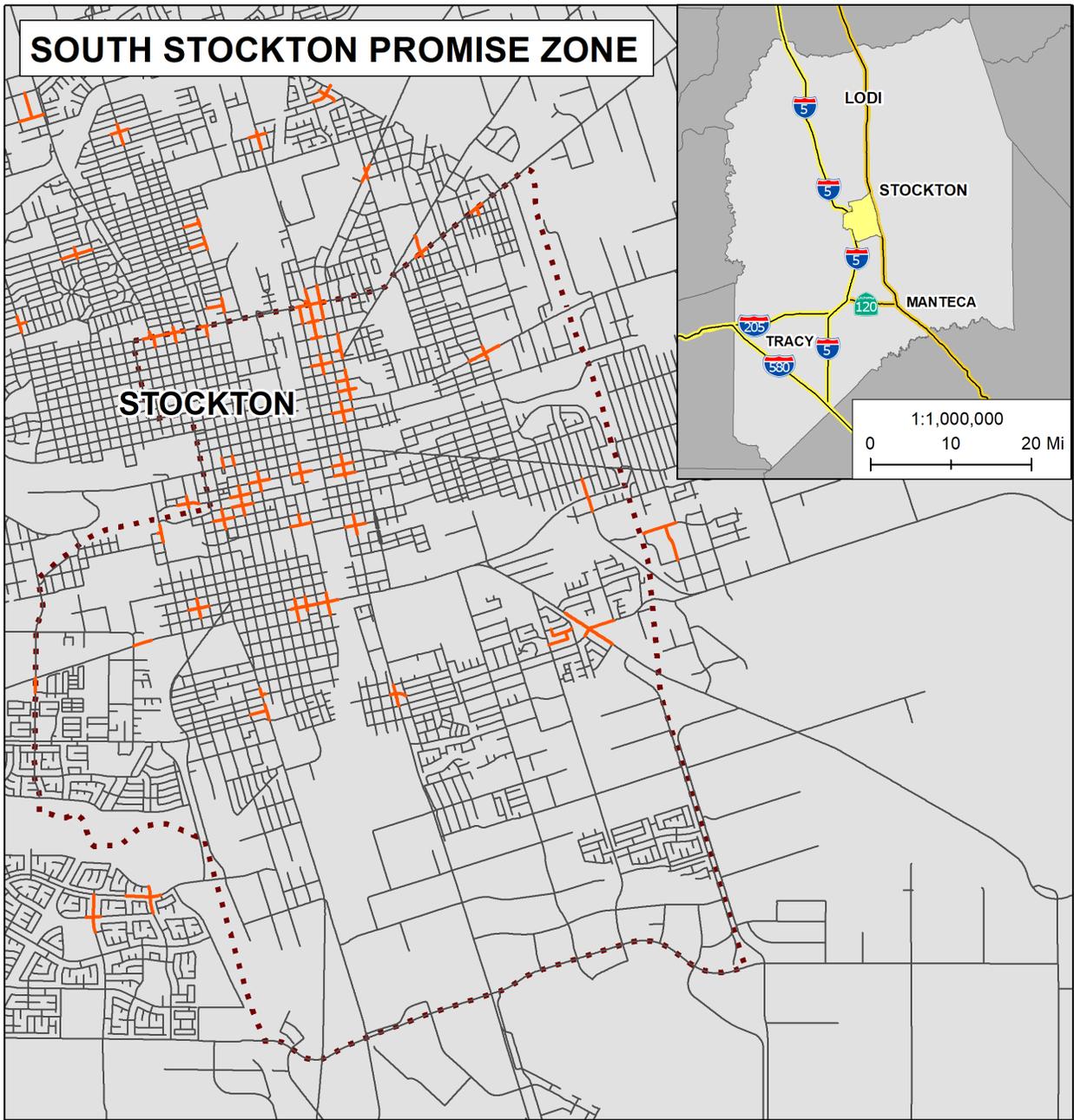


Figure 7. Pedestrian/Cyclist involved traffic crash high injury network in the SSPZ using the KSI density.

In San Joaquin County, the high injury network accounted for only 0.8% of the walkable network and made up 83.0% of pedestrian or cyclist involved fatal traffic accidents (Table 9). The high injury network accounted for 3.1% and 7.1% of the walkable network in Stockton and the SSPZ, however, these segments were overwhelmingly the locations of pedestrian or cyclist involved fatal traffic crashes, 92.6% and 93.3% respectively.

Table 9. Pedestrian and cyclist traffic crashes resulting in death on the walkable and high injury network in San Joaquin County, Stockton and the SSPZ.

Variable	Network Type	Countywide Network (%)	Stockton (%)	South Stockton Promise Zone (%)
Length (miles)	Walkable Network	3,812.7	918.0	257.5
	High Injury Network	30.2 (0.8%)	28.8 (3.1%)	18.3 (7.1%)
Killed in Traffic Crashes (count)	Walkable Network	176 (100%)	121 (100%)	45 (100%)
	High Injury Network	146 (83.0%)	112 (92.6%)	42 (93.3%)

Source: Statewide Integrated Traffic Records System (SWITRS), 2013-2017.

4.7 Summary

Pedestrians and bicyclists in the South Stockton Promise Zone (SSPZ) were exposed to high levels of traffic crashes in comparison to the City of Stockton and even more so to all of San Joaquin County as a whole. The SSPZ includes much of Downtown Stockton, where traffic crashes, in general, are more likely to occur. Although the Downtown area represents a highly walkable street network that could be utilized to promote more active travel, it also has many of the most dangerous intersections for pedestrians and bicyclists. Many non-motorized crashes with severe injuries or fatalities occur on minor arterials with local streets as cross streets. These road types are more common Downtown and area also where vehicles are more likely to come in contact with pedestrians and bicyclists. In fact, the analyses show interesting contrasts regarding clusters of all traffic crashes compared to non-motorized crashes, suggesting that pedestrians' and bicyclists' safety, in particular, is more at risk in certain areas of the SSPZ. The hotspot analyses demonstrate that non-motorized traffic crashes are more clustered in the western and southern edges of the Downtown area. The *most dangerous* corridors for pedestrians and cyclists are also in the southern edges of Downtown, and the eastern edge of Downtown. This is where all traffic crashes (including motorized and non-motorized) are more clustered.

The above analyses indicate a need to create safer infrastructure in the eastern and western edges of the Downtown. These locations are where vehicles and pedestrians/bicyclists are likely to come in contact and crashes are more severe. Select areas, including the western areas of Downtown, where non-motorized crashes are more likely, even if the resulting injuries were less severe warrant attention as well. Sections along Dr. Martin Luther King Jr. to the east and west of Airport Way also have a high number of pedestrian and cyclist involved in collisions with automobiles and may require infrastructure upgrades to improve safety. The results of these analyses may help to inform planners and decision-makers to help target areas where safety improvements are needed the most and encourage the development of Vision Zero policy goals to reduce collisions in the SSPZ and the region.

5 Infrastructure Conditions at High-Crash Intersections

UD4H conducted an inventory of intersection features at fourteen key high traffic crash sites involving pedestrians and cyclists based on the results of the analyses performed in Section 4.5. and 4.6 above. This information is useful to inform recommendations on potential countermeasures and traffic safety improvements. The inventory utilized satellite imagery and Google Streetview²¹ to inventory road infrastructure characteristics (lanes, turn lanes, functional class, street parking, and boulevards), traffic signalization, and pedestrian facility information (crosswalks, quality, etc.). These attributes were assembled in a spatial database format for these fourteen locations and linked with the traffic crash for use on other future studies. Table 23 in Appendix A provides the attribute index method used to conduct the data inventory. Table 24 in Appendix A shows the complete inventory of features for the fourteen key high traffic crash intersections in the SSPZ.

²¹ Google Streetview, Google, Inc., Mountain View, CA, 2018.

Table 10 lists the selected intersections and their relative locations and respective corridors. Figure 8 shows a map of most dangerous traffic crash intersections for pedestrian and cyclist involved collisions in the SSPZ. Injuries or deaths were reported at thirteen²² of the fourteen (92.9%) intersections for pedestrians and eight²³ of the fourteen (57.1%) intersections for cyclists.

Table 10. Inventory list of high pedestrian and cyclist involved traffic crash intersections.

#	Intersection Name	Relative Location	Corridor
1	El Dorado St. & E Sonora St.	Southwest Downtown	El Dorado/S San Joaquin/Lincoln
2	S San Joaquin & Washington St.	Southwest Downtown	El Dorado/S San Joaquin/Lincoln
3	S Lincoln St. & W Sonora St.	Southwest Downtown	El Dorado/S San Joaquin/Lincoln
4	E Lindsay St & N Sierra Nevada St.	East Downtown	North Airport Way
5	E Washington St. & S Airport Way	East Downtown	North Airport Way
6	N Wilson Way & E Oak St.	East Downtown	Wilson Way
7	Pinchot St & N Airport Way	Northwest	North Airport Way
8	E Harding Way & N Airport Way	Northwest	North Airport Way
9	E Dr. Martin Luther King Jr. Blvd. & S Stanislaus St.	South Central	Dr. Martin Luther King Jr. Blvd/ E Charter Way
10	E Dr. Martin Luther King Jr. Blvd. & S American St.	South Central	Dr. Martin Luther King Jr. Blvd/ E Charter Way
11	E Dr. Martin Luther King Jr. Blvd. & Aurora St.	South Central	Dr. Martin Luther King Jr. Blvd/ E Charter Way
12	S El Dorado St. & E 6 th St.	South Central	El Dorado
13	S El Dorado St & W 7 th St.	South Central	El Dorado
14	Mariposa Rd. & E. 8 th St.	Southeast	Mariposa Rd.

5.1 Traffic Volume

Pedestrians and cyclists have a higher probability of being involved in a traffic accident on busier roads that have limited walking and bicycling supportive infrastructure. Motor vehicle traffic volume along with speed limits, roadway functional class and the number of lanes are important factors when evaluating intersections and road segment safety for pedestrians and bicyclists. One of the most common measures of traffic volume is average annual daily traffic (AADT) which uses data collected by an automated traffic counters to capture how busy a road is. As part of the 2018 RTP development, forecasted traffic volumes are modeled for a “business as usual” scenario as well as other alternative scenarios including the adopted 2018 RTP preferred scenario. For each intersection, cross street AADT was generated by averaging the bi-directional volume counts on either side of the intersection.

²² Pedestrians were killed or injured at all intersections except E Lindsay St. & N. Sierra Nevada St.

²³ Cyclists were killed or injured at all intersections except the following: E. Sonora St & S. El Dorado St., E Washington St & S San Joaquin St., S. El Dorado St. & W. 7th St., Pinchot St. & N. Airport Way, E. Oak St. & N Wilson Way and Farmington Rd. & S. Mariposa Rd.

Table 11 shows the 2017 and forecasted 2037 averages for traffic volume per day on each of the cross streets at the most dangerous intersections identified in the section above.

Notably, many of these intersections are comprised of local streets that intersect with higher traffic volume (busier) main arterial roads, where pedestrians and bicyclists are likely to come into more frequent contact with motor vehicles traveling at moderate to high speeds. Traffic volume information is not available for streets with a local functional class. Several of the most dangerous intersections also include intersections where local roads intersect with other local roads. Even though these data are not available, and as noted above, other factors may be considered when examining dangerous intersections. For example, in the case of S. Lincoln St. and W. Sonora St. where traffic volume was not captured, the presence of the nearby Stockton Shelter for the Homeless and surrounding homeless encampments may have contributed to the number of pedestrian or bicyclist collisions at this intersection due to the fact that there are high concentrations of pedestrians and bicyclists congregating in close proximity to the public right-of-way.

Table 11. Current and forecasted traffic volume at the 14 most dangerous intersections

#	Intersection Name	Year				2017-2037	
		2017		2037		% Change	
		Cross Street 1*	Cross Street 2*	Cross Street* 1	Cross Street 2*	Cross Street 1	Cross Street 2
1	El Dorado ¹ St. & E Sonora St. ²	10,836	102	11,182	107	+3%	+5%
2	S San Joaquin ¹ & Washington St. ²	--	--	561	27,241	--	--
3	S Lincoln St. ¹ & W Sonora St. ²	--	--	--	--	--	--
4	E Lindsay St ¹ & N Sierra Nevada St. ²	--	--	--	--	--	--
5	E Washington St. ¹ & S Airport Way ²	--	--	7,644	8,607	--	--
6	N Wilson Way ¹ & E Oak St. ²	10,929	3,630	11,055	3,496	+1%	-4%
7	Pinchot St ¹ & N Airport Way ²	--	9,486	--	--	--	--
8	E Harding Way ¹ & N Airport Way ²	7,988	7,856	8,809	9,649	+10%	+23%
9	E Dr. Martin Luther King Jr. Blvd. ¹ & S Stanislaus St. ²	--	--	12,366	--	--	--
10	E Dr. Martin Luther King Jr. Blvd. ¹ & S American St. ²	--	--	12,347	--	--	--
11	E Dr. Martin Luther King Jr. Blvd. ¹ & Aurora St. ²	--	--	12,614	--	--	--
12	S El Dorado St. ¹ & E 6 th St. ²	18,031	918	8,925	457	-51%	-50%
13	S El Dorado St ¹ & W 7 th St. ²	17,680	427	9,019	189	-49%	-56%
14	Mariposa Rd. ¹ & E. 8 th St. ²	7,866	6,380	8,848	7,124	+12%	+12%

Source: 2018 Regional Transportation Plan, San Joaquin Council of Governments, 2017.

¹Cross Street 1.

²Cross Street 2.

*Traffic volume data was not modeled on many roads with a “local” functional class.

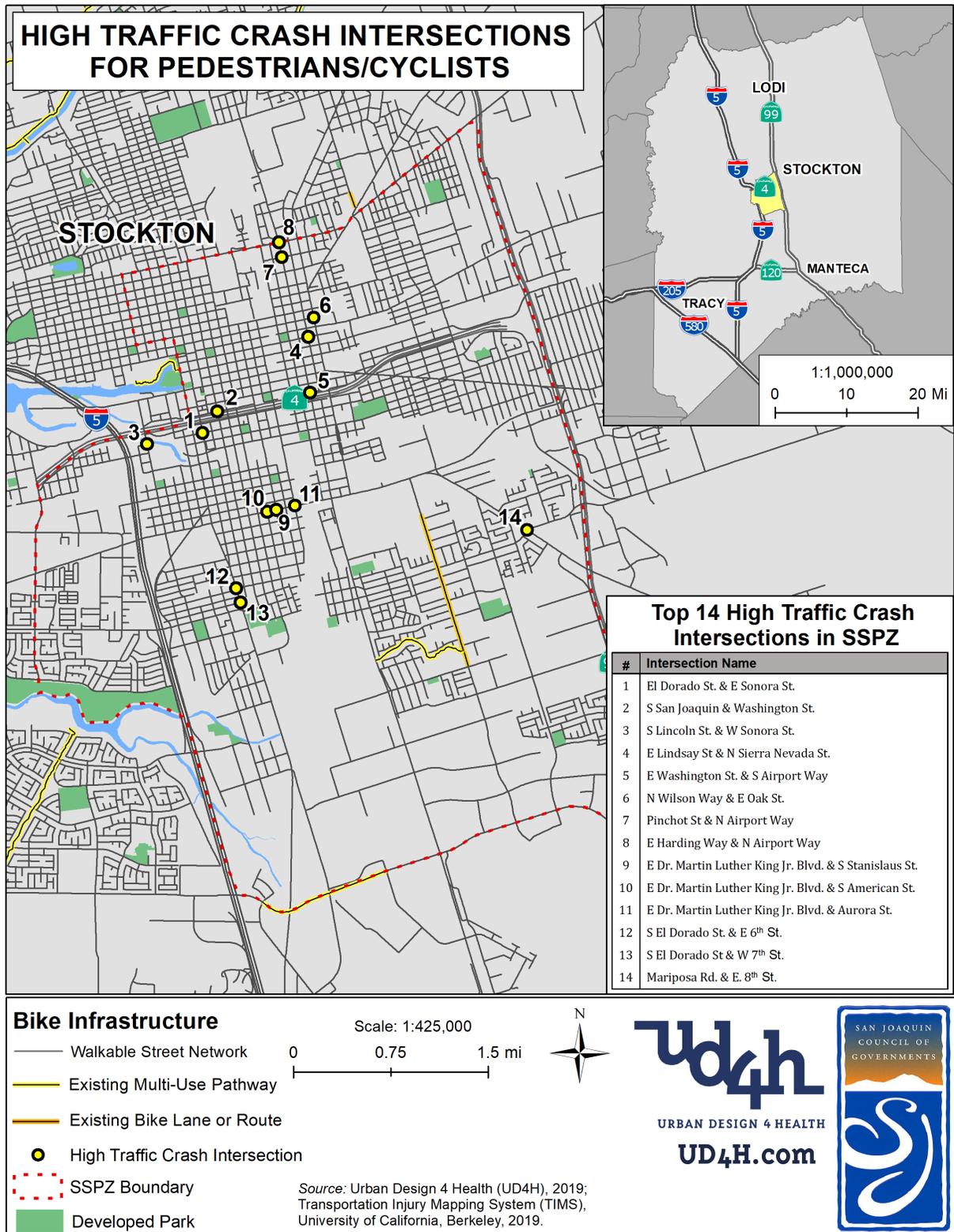


Figure 8: Most dangerous traffic crash intersections for pedestrian and cyclist involved collisions in the SSPZ.

Figure 9 shows the total counts of the intersections classified as three-way or four-way. A large majority (78.6%) of the intersections identified as high traffic crash sites were classified as four-way. This is to be expected as four-way intersections offer more crossing opportunities for collisions and typically have higher vehicle volumes moving at higher speeds.

Figure 9. Frequency by intersections by type: 1) 3-way (t-intersections), 2) 4-way.

5.2 Non-Motorized Infrastructure

Non-motorized infrastructure at the 14 high traffic crash sites is sparse. While approximately half (57.8%) of these intersections have crosswalks across at least one of the intersecting roads, less than a third (28.6%) have crosswalks on all four sides. The lack of crosswalks on all four sides of the street may increase the risk of conflicts between non-motorized and motorized travelers. Figure 10 shows the frequency of observed crosswalk quality by the following categories: 1) no crosswalk, 2) fair to poor quality²⁴ or good to excellent quality²⁵. Figure 11 shows some examples of crosswalk types of various qualities. None of the intersections have crosswalks with high-visibility²⁶ markings which helps improve crosswalk safety (Figure 12). Among the inventory of 14 intersections, a majority of their roads lacked crosswalks. While five primary roads (major or minor arterial roads) and seven secondary (local streets or minor

²⁴ “Fair to poor” quality indicates crosswalks that have completely missing sections or are considerably worn down which may reduce crosswalk visibility for drivers and/or cause pedestrians to walk outside of crosswalk areas.

²⁵ “Good to excellent” quality indicates crosswalks that have limited wear and are visible to motorists and pedestrians.

²⁶ High visibility crosswalks contain additional white markings, usually in bands in the center across the outside crosswalk lines that offer improved visibility.

arterials) had crosswalks. A majority of the crosswalks on primary roads (60%) and secondary roads (71.4%) were identified as being of “fair to poor” quality increasing risks for pedestrian-involved collisions.

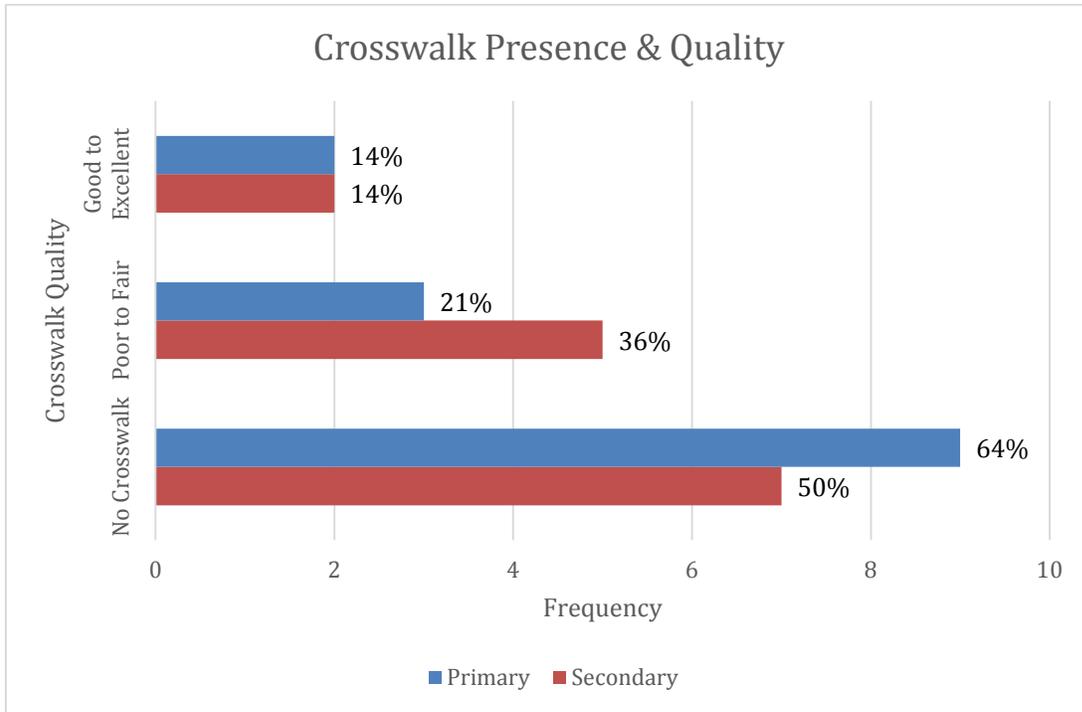


Figure 10. Frequency by crosswalk quality



Figure 11. Examples of crosswalk quality: A: “good to excellent” quality crosswalk, B: “fair to poor” quality crosswalk, C: no crosswalks

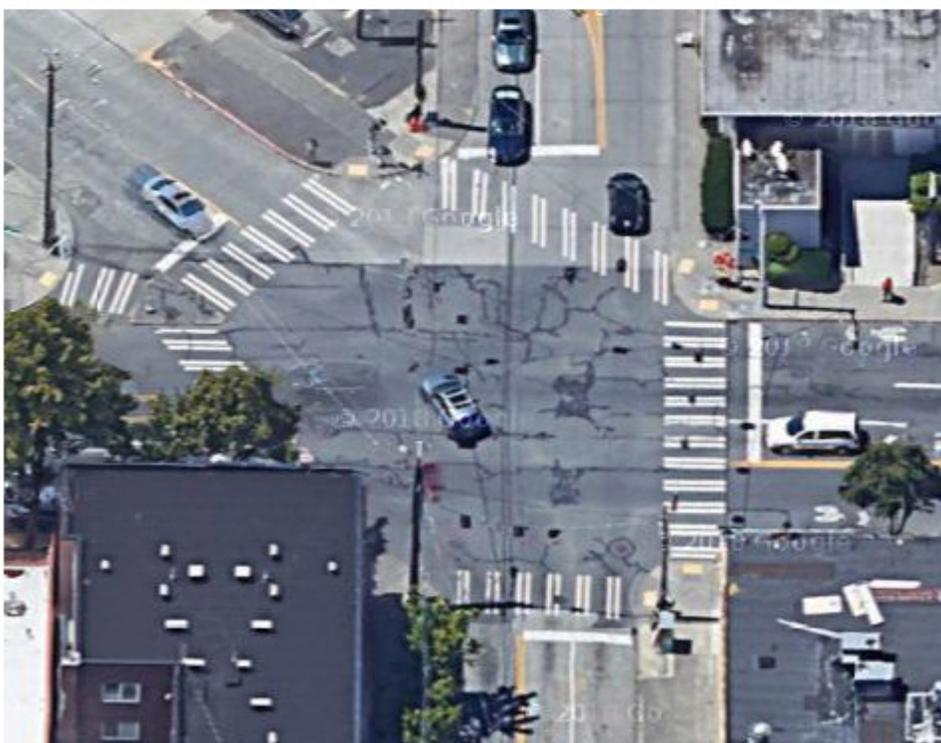


Figure 12. Two examples of high-visibility crosswalks using multiple stripped lines and color.

In addition, only 28.6% of these intersections had traffic signalization on all four sides. Although two (14.3%) of the intersections had a potential pedestrian refuge, these were not formal pedestrian refuge islands and, thus, may not offer any additional safety for people crossing the street.

None of the 14 intersections observed had pedestrian walk signals or countdown signals. These signals offer increased safety for pedestrians to judge crossing times, especially for elderly or disabled populations. Likewise, none of the intersections had intersecting shared bicycle lanes, marked signage or signalization for cyclists of any kind.

Intersections were given a score on a five-point scale from 0-100% based on the number of the presence or absence of street lighting and their location in order to be illuminating crosswalks (Figure 13). Percentage of illumination over crosswalks was determined for all sides based on the placement of street lights in close proximity to corners and aimed to emit light over crossing areas. It was not necessary to have four street lights covering a four-way intersection to receive a score of 100% illumination coverage. Over half (64.2%) of the intersections investigated had illumination covering 50% or less of their crossing pathways.

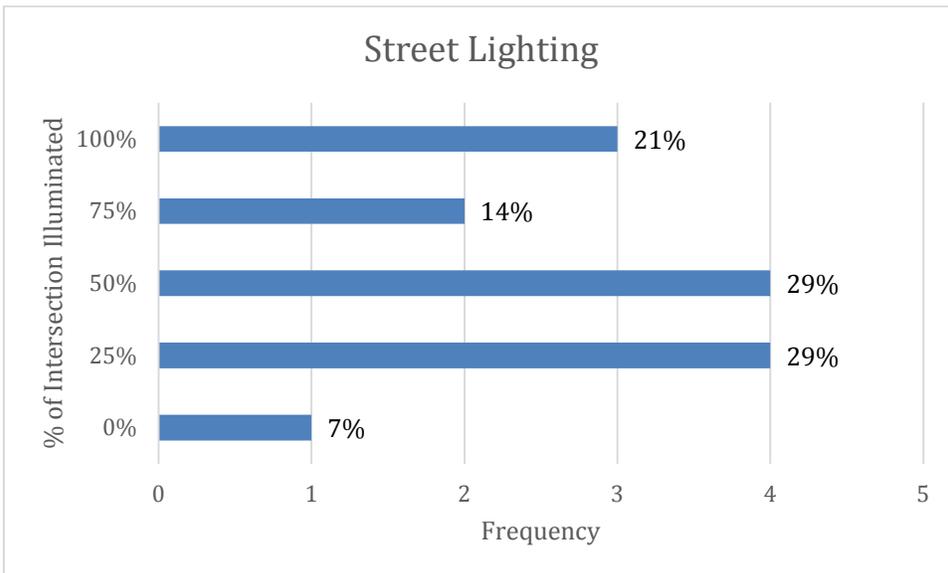


Figure 13. Frequency of Street Lighting Categories

5.3 Road Characteristics

The road characteristics at the 14 high traffic crash sites may also contribute to unsafe conditions for pedestrians and bicyclists. For example, only one of the intersections had a speed limit sign posted nearby. Figure 14 and Figure 15 show the count of lanes for primary and secondary roads, respectively. Most of the primary roads (57.1%) had at least six lanes of vehicle travel, and all of the primary roads had at least four lanes of

vehicle travel. Although multi-lane roads provide increased capacity for vehicles, they also provide the potential for increased danger for pedestrians who must cross further distances and are exposed to increased vehicle traffic. All but one of the secondary roads had four or more lanes of vehicle travel.

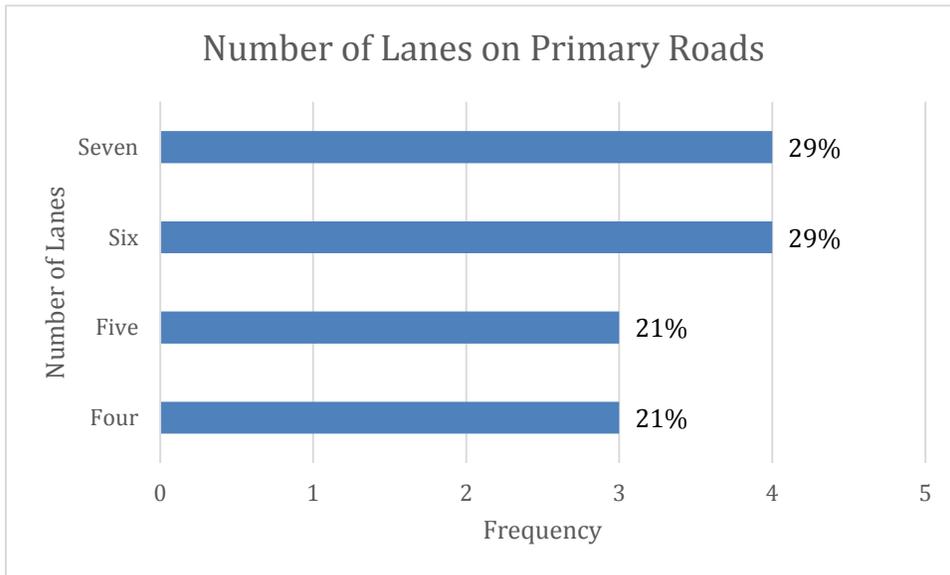


Figure 14. Frequency by Number of Lanes on Primary Roads

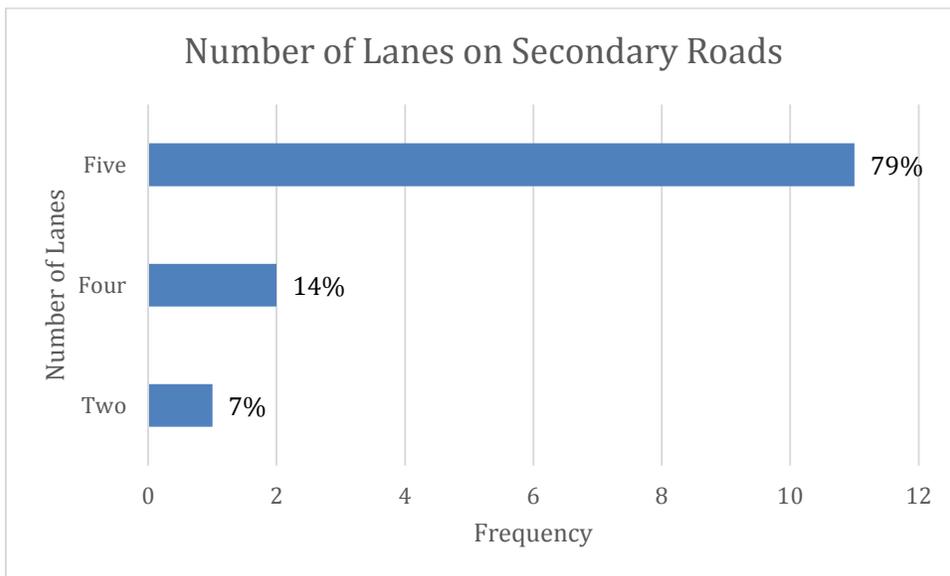


Figure 15. Frequency by Number of Lanes on Secondary Roads

Only one of the intersections, S. Lincoln St. & W. Sonora Ave, was located in close proximity to a homeless encampment or apparent area of people living in tents or recreational campers. The presence of homeless people or people without permanent

housing in this area may present a potential for increased pedestrian or cyclist involved collisions due to these higher concentrations than would normally be expected given the residential units in the area.

Table 12 provides an intersection infrastructure safety score based on features at the high traffic crash sites. This score reviews eight components of crossing safety and equally weights each component to provide a score out of eight. These features include crosswalk presence and quality, pedestrian and traffic signalization, bicycle facilities and vehicle lane configuration. Lower scores indicate more dangerous intersections that lack active transportation-supportive crossing infrastructure while higher scores have more supportive features. The components that comprise the score indicate features that are supportive for pedestrians and cyclists with the exception of the number of lanes and left turn lanes. The greater number of vehicle traffic and parking lanes denotes increased crossing lengths for pedestrians and cyclists resulting in potentially increased opportunities to be hit. Four intersections had intersection scores receiving a five or greater. The remaining ten intersections received scores of less than or equal to three, indicating that there is an absence of supportive infrastructure features that may contribute to safety for pedestrians and cyclists.

Table 12: Intersection infrastructure summary and safety score of top 14 dangerous sites.

#	Intersection	Street Lighting ²⁷	Traffic Signal	# of vehicle lanes ²⁸	Crosswalk Present ²⁹	Crosswalk Quality ³⁰	Pedestrian Signal	Bicycling Facilities	Intersection Safety Score
1	S El Dorado St. & E 6th St.	100%	Yes	0.75	Both Ways	Good to Excellent	Both Ways	None	5.5/7
2	Mariposa Rd. & E. 8th St.	100%	Yes	0.5	Both Ways	Good to Excellent	Both Ways	None	5.5/7
3	E Harding Way & N Airport Way	100%	Yes	0.5	Both Ways	Fair to Poor	Both Ways	None	5/7
4	S San Joaquin & Washington St.	75%	Yes	0.75	Both Ways	Fair to Poor	Both Ways	None	5/7
5	E Dr. Martin Luther King Jr. Blvd. & S Stanislaus St.	50%	No	0.75	One Way	Fair to Poor	None	None	2.25/7
6	S Lincoln St. & W Sonora St.	25%	No	1.0	One Way	Fair to Poor	None	None	2/7
7	N Wilson Way & E Oak St.	50%	No	0.75	One Way	Fair to Poor	None	None	2/7
8	E Dr. Martin Luther King Jr. Blvd. & S American St.	50%	No	0.75	One Way	Fair to Poor	None	None	2/7
9	E Sonora St. & El Dorado St.	75%	No	1.0	None	None	None	None	1.75/7
10	E Dr. Martin Luther King Jr. Blvd. & Aurora St.	50%	No	0.75	None	None	None	None	1.25/7
11	E Lindsay St & N Sierra Nevada St.	25%	No	1.0	None	None	None	None	1.25/7
12	S El Dorado St & W 7 th St.	25%	No	0.75	None	None	None	None	1/7
13	Pinchot St & N Airport Way	25%	No	0.75	None	None	None	None	1/7
14	E Washington St. & S Airport Way	0%	No	0.75	None	None	None	None	0.75/7

²⁷ Street lighting is an important feature for crosswalks to provide increased illumination for pedestrians, cyclists as well as drivers in vehicles.

²⁸ Number of vehicle traffic lanes that a pedestrian or cyclist must cross to traverse a street including movement and parking lanes. Each cross street is evaluated out of 0.5 for a total score of 1.0 where 3-4 vehicle lanes are assigned a safer score of 0.5 and 5-7 vehicle lanes are assigned a more dangerous score of 0.25.

²⁹ Crosswalks are evaluated for both sides of the street (0.5 for each side).

³⁰ Crosswalk quality is evaluated for both sides of the street (Poor to fair = 0.25; Good to excellent = 0.5).

5.4 Recommended Countermeasures

Opportunities exist to improve the safety at the 14 most dangerous sites in the SSPZ. The best improvements for a given intersection must consider more details about the crashes experienced there, including the exact modes, time of day and other individual circumstances that caused the collision. The analyses presented here and the ranking of the most dangerous locations combined pedestrian and bicyclist involved crashes. It did not consider whether the crashes happened during the day or night. The presence of adequate street lighting for crosswalks is important for visibility at night and an overall important safety factor for travel at that time. The type of improvements that should be considered for these intersections is included below. Suggested improvements should be evaluated in the context of the individual collisions that occurred at each intersection and may not apply to each intersection in the same way or necessarily at all.

None of the intersections evaluated included any type of bicycle facilities. The decision to invest in bicycle facilities should be applied first to those intersections where collisions occurred between vehicles and bicycles occurred. In addition, crosswalks and pedestrian signals were lacking and typically not present for both directions of travel. The five lowest (most dangerous) scoring intersections had little to minimal street lighting, traffic signals, crosswalks, and pedestrian signals. Among the 14 most dangerous sites, intersections achieved higher safety scores due to more street lighting, the presence of crosswalks, and pedestrian signals at both road segments. These features may help to counteract potentially dangerous conditions for pedestrians and cyclists. Investing in active transportation infrastructure to improve safety at these intersections as well as others in the SSPZ will help to reduce traffic collisions.

6 Assessment of Population & Land Use Characteristics

6.1 Forecasted Population Change (2015-2035)

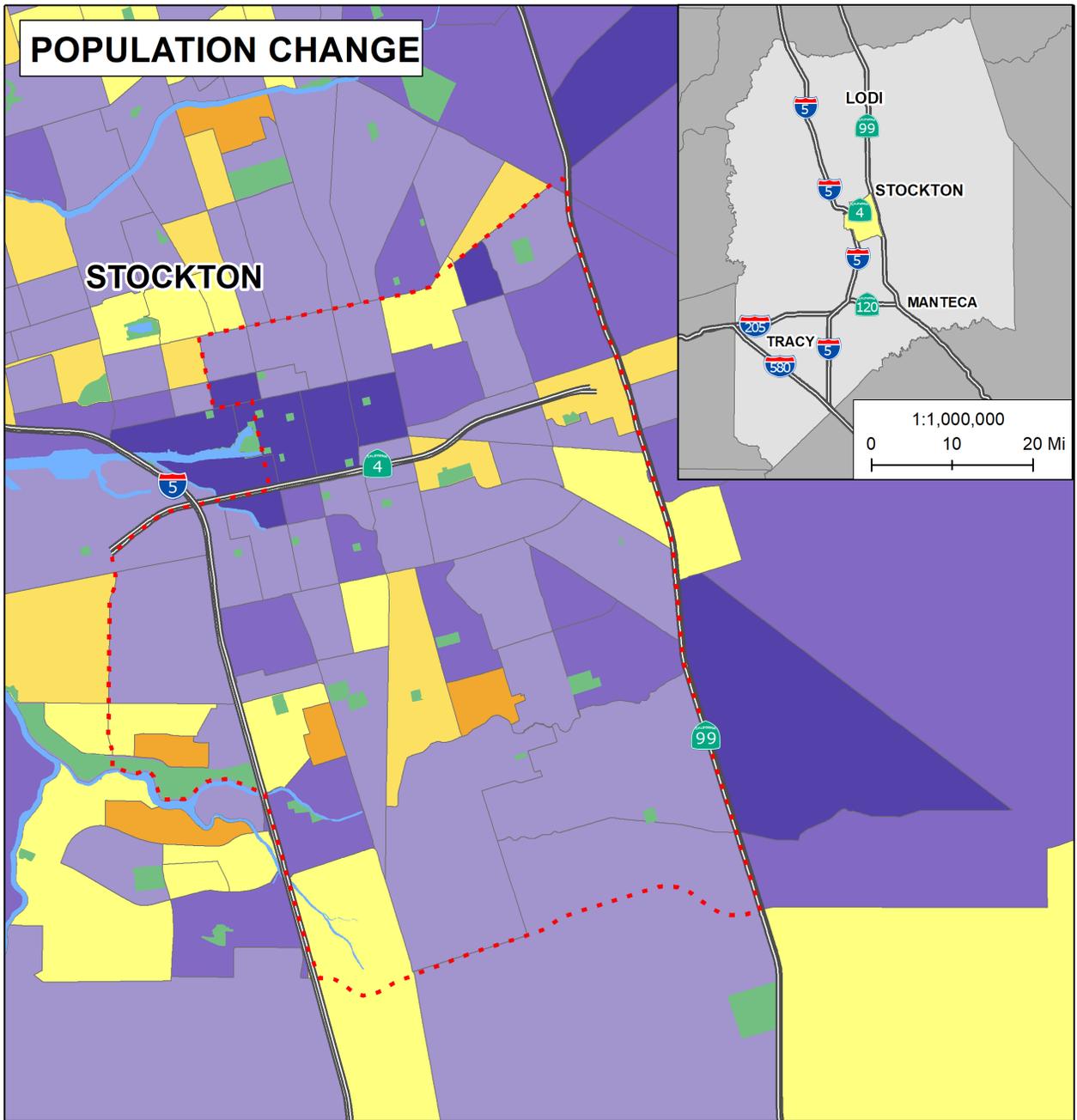
In preparation for the 2018 SJCOG RTP/SCS analysis, population forecasts were developed for the multiple scenarios for the 2035 build-out horizon. These changes were extensively documented in previous reports at the county level.³¹ Table 13 provides summaries for changes in the population for SSPZ compared to San Joaquin County and the City of Stockton. Compared to San Joaquin County (19%) and the City of Stockton (12%), the SSPZ had the greatest percentage change in population (21%) relative to its size. Figure 16 shows a choropleth map showing areas of anticipated positive population growth in purple and negative contraction in yellow/orange. Areas with the greatest percent population changes (+0.8% - +2.5%) SSPZ are concentrated in the downtown core and in a small pocket of the northeast corner as well as two urbanizing block groups east of Hwy #99. The majority of SSPZ block groups are forecasted to increase in population slightly between +0.0% and +0.3%. A few select areas along Airport Way and El Dorado are expected to experience minimal growth or slightly negative population change, however, this is contrasted with small increases in population in close proximity to these areas in near Kennedy and Taft Mosswood.

³¹ [2018 RTP/SCS SJCOG – Public Health Analysis of Draft Scenarios](#), 2018.

Table 13. Descriptive summary of forecasted change in population between 2015 and 2035

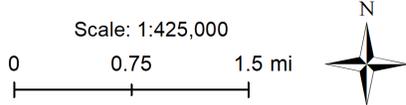
Geographic Area	# of Block Groups	Population (2015)	Population (2035)	Mean Population Change (% change)	Standard Deviation	Minimum Population Change	Maximum Population Change	Population Change (2015-2035)
San Joaquin County	395 (100%) of 395	708,554	875,517	+423 (+19.0%)	2,348	-1135	+37,157	+166,963 (23.6%)
Stockton	206 (51.2%) of 395	297,509	312,608	+168 (+12.0%)	649	-816	+5,044	+34,612 (11.6%)
SSPZ	53 (13.4%) of 395	76,814	88,765	+225 (+21.0%)	373	-725	+1,297	+11,951 (15.6%)

Source: San Joaquin Council of Governments, 2017.



**Percent Population Change¹
(2015 - 2035)**

- +0.8% - +2.5%
- +0.3% - +0.8%
- 0.0% - +0.3%
- 0.0% - -0.1%
- 0.1% - -0.2%
- 0.2% - -0.5%



 SSPZ Boundary Developed Park



¹Total predicted population change between 2015 and 2035 for Scenario 2A.
Source: UD4H, 2016; American Community Survey; Census Bureau, 2015.

Figure 16. Percent Population Change in SPPZ

6.2 Employment Density

Employment density, measured as jobs in all employment sectors per acre of unprotected land, indirectly impacts human and environmental health as it facilitates easy access to available jobs. People living in compact neighborhoods that have a mix of residences, services, and employment opportunities tend to drive less than those living in lower density neighborhoods and, instead, use more active forms of commuting such as walking, bicycling, and public transit. As a result of more active commuting and less vehicle miles traveled, fuel consumption and greenhouse gas emissions decrease at the same time that physical activity levels increase and sedentary time decrease during daily commutes³³. NPHAM utilizes employment density to predict human health outcomes (body mass index, overweight, obesity) and health behaviors (walking for utilitarian transportation, walking for leisure, cycling for utilitarian transportation, recreational physical activity, and sedentary driving time). In addition to physical and environmental health benefits, employment density can improve important social determinants of health as it improves access to jobs and reduces travel costs associated with dispersion for vulnerable populations³³.

Table 14 provides summaries for employment density in SSPZ compared to San Joaquin County and the City of Stockton. On average, the employment density was greater in SSPZ (4.7 jobs per acre) than Stockton (3.2 jobs per acre) overall and nearly double the density of San Joaquin County (2.4 jobs per acre). Figure 17 shows that employment density in the SSPZ is greatest in the heart of the downtown core where it reaches nearly 90 jobs per acre, the highest in the county). Employment density levels are highest near the Downtown and decrease for areas further away with the exception of pockets of higher density in North Stockton. Despite large business parks, light industrial and large distribution centers, employment density is lowest in the southern sections of the SSPZ due to the land area required supporting these facilities. While this area located further from the downtown core will continue to be an important employment center for the Central Valley, it will be important to increase density over time and improve access in order to improve health.

Table 14. Summary of Employment Density

Geographic Area	Mean Employment Density (Jobs/Acre)	Standard Deviation	Minimum	Maximum	Total
San Joaquin County	2.4	5.6	0.0	89.3	952.6
City of Stockton	3.2	7.4	0.0	89.3	648.1
SSPZ	4.7	12.5	0.2	89.3	247.0

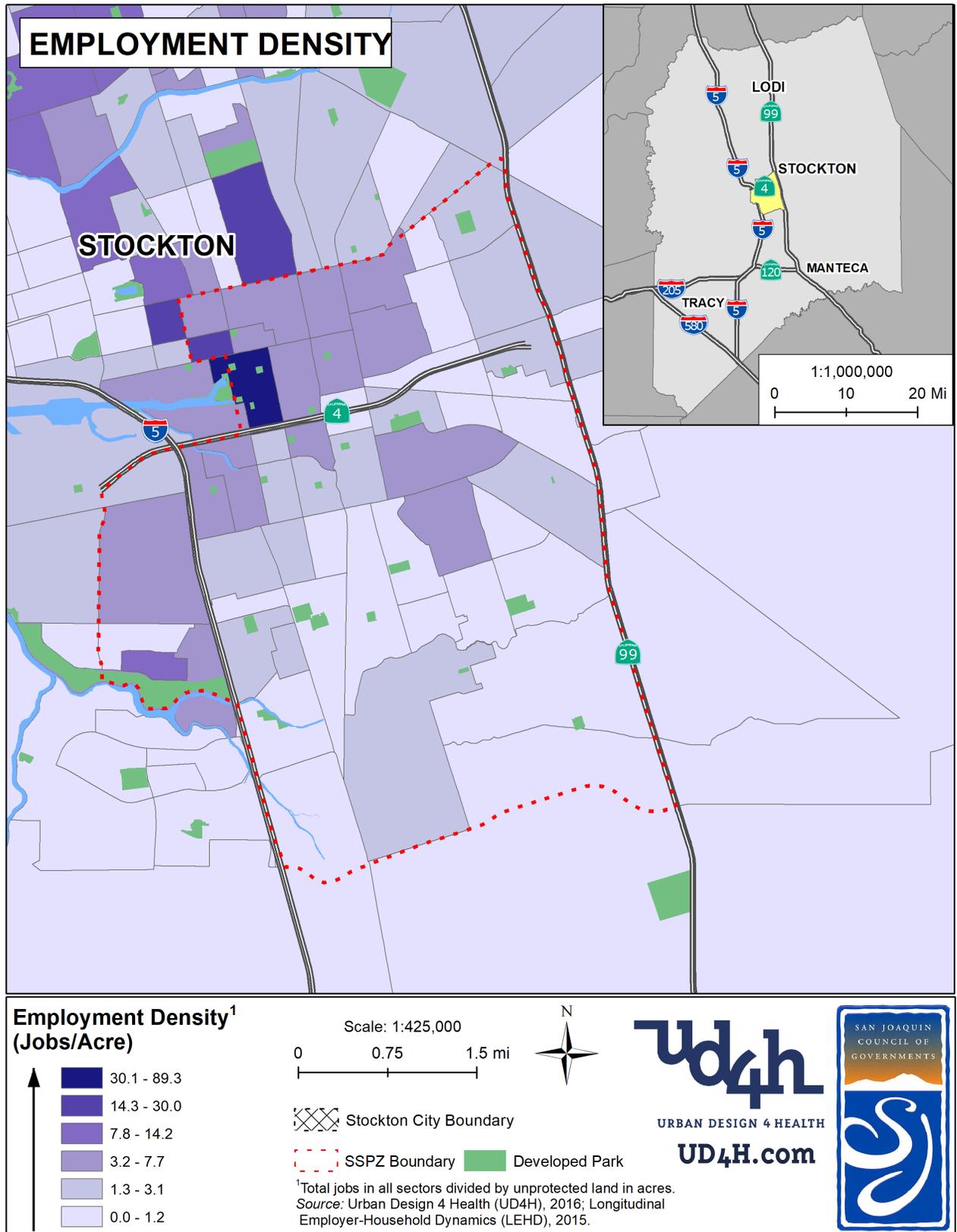


Figure 17. Employment Density in SPPZ

7 Transportation Access

The ability to access multi-modal transportation facilities for utilitarian and leisure purposes is an important factor when considering the economic vitality and health and welfare of communities in the SSPZ. Improving transportation options is crucial, especially for concentrated areas of low-income and people of color who may have reduced access to private automobiles. In addition to offering opportunities to access different modes of transport, the quality and coverage of those transportation networks, especially public transit and non-motorized travel, must be considered. The sections that follow review bicycle infrastructure and public transit facilities evaluating planned and existing networks to identify gaps and potential areas for future investment.

7.1 Bicycle Infrastructure

Cities that have invested in bicycle infrastructure have higher rates of bicycle commuters compared to those with fewer bicycle facilities^{34,35}. Bicycle infrastructure primarily includes bike paths, bike lanes, cycle tracks, but also can include sidewalks where bicycling is permitted, bike racks/storage, and specialized traffic signs and signals. Access to safe, connected bicycle networks and infrastructure can help combat perceived barriers to cycling and promote more utilitarian and recreational bicycling. For example, the presence of bicycle lanes with physical barriers between bicyclists and motor vehicle traffic has been shown to increase individuals' use of bike infrastructure.^{35,36} On-street bicycle facilities and sidewalks are examples of traffic-calming measures which can help reduce collision frequencies and severities. Beyond the health benefits associated with increased levels of physical activity with access to bicycle infrastructure³⁷, bicycling infrastructure costs less to construct and implement compared to automobile infrastructure. Creating safer and more convenient infrastructure for cycling also improves mobility for all populations, reducing the need for automobile infrastructure and associated costs.

In late 2017, the City of Stockton completed their 2017 Bicycle Master Plan update to guide the goals, vision and implementation strategy for cycling in the municipality.³² As part of this plan update, a series of data inventories were undertaken across the municipality to inform planning efforts for existing and planned bicycle infrastructure. In addition, several analyses were performed on level of traffic stress, traffic crashes, citywide connectivity and others as part of the master planning process.

This section reviews existing and planning bicycle facilities in the SSPZ, provides high level summaries of available infrastructure by type as well as gaps in the infrastructure. Table 15 shows that there are 2.19 miles of existing bicycle infrastructure in the SSPZ and 52.5 miles of planned infrastructure, for a total of 54.7 miles. The existing facilities complete only 4.0% of the total planned network by total length. While some multi-use

³² [City of Stockton Bicycle Master Plan](#), City of Stockton, 2017.

pathways (Class I) exist in the Weston Ranch neighborhood outside of the SSPZ, there are no existing multi-use trails within the SSPZ however three west-east trails are planned. Existing infrastructure does not include bike routes, but there are 3.9 miles of planned bike routes. No bikeways, and only 1.2 mile of bike lanes and 1.0 miles of multi-use pathways currently exist in the SSPZ. However, planned bicycle infrastructure includes the addition of 17.3 miles of bikeways, 26.4 miles of bike lanes and 4.9miles of multi-use pathways.

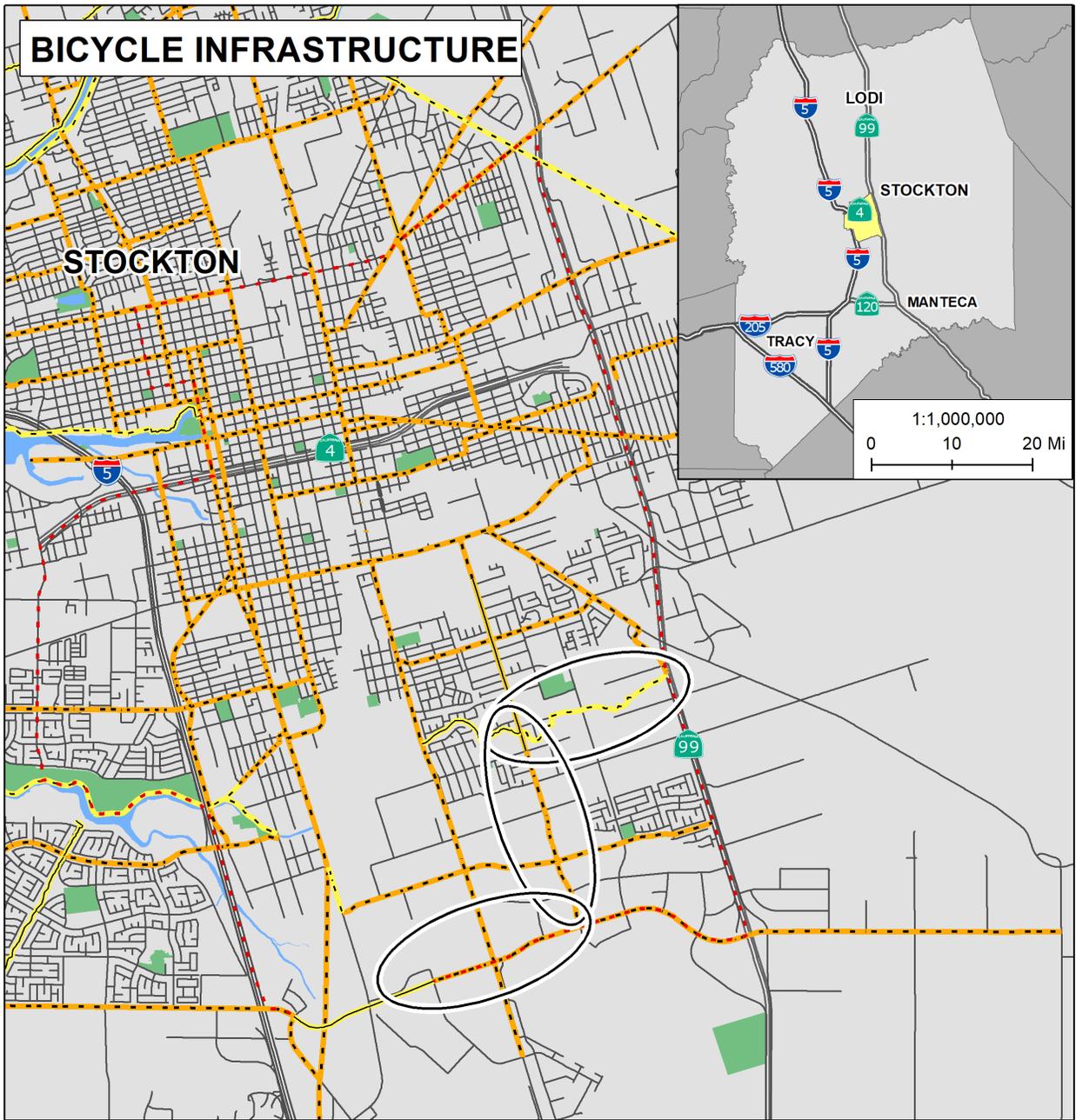
Table 15. Summary of planned and existing bicycle infrastructure in the SSPZ.

Type of Bicycle Infrastructure	Implementation Period			Network Completeness	
	Existing	Planned	Combined	% of Existing	% of Planned
Length of Existing Multi-Use Pathways - Class I (Miles)	1.0	4.9	5.9	17.2%	82.8%
Length of Existing Bike Lanes - Class II (Miles)	1.2	26.4	27.6	4.3%	95.7%
Length of Existing Bike Routes - Class III (Miles)	0.0	3.9	3.9	0.0%	100.0%
Length of Bikeways – Class IV (Miles)	0.0	17.3	17.3	0.0%	100.0%
Length of Total Infrastructure (Miles)	2.19	52.5	54.7	4.0%	96.0%

Source: City of Stockton, 2017; San Joaquin Council of Governments, 2016.

Figure 18 shows existing and planned multi-use pathways and bike lanes (or routes) in Stockton. Overall, existing bicycle facilities in the SSPZ are limited in contrast to the rest of the City. The analysis identified three gaps in the SSPZ bicycle infrastructure where shorter segments of infrastructure are needed to complete these portions of network (Table 16). Three of the gaps are identified west of SR #99 near and along E Fremont St., while others are on the eastern edge of downtown Stockton on or near Airport Way. Planned bike lanes or routes have already been identified to fill in each of the identified gaps. Given the limited existing infrastructure, filling in these gaps first may or may not be a priority for the City of Stockton if they are embarking on larger projects to add larger sections to the network.

There is a planned multi-use pathway along Arch Airport Road, but overall there are fewer planned or existing multi-use pathways in the southeast corner of the SSPZ compared to the northeast corner.



Bike Infrastructure

Scale: 1:425,000

0 0.75 1.5 mi

— Walkable Street Network

— Existing Multi-Use Pathway

- - - Planned Multi-Use Pathway

— Existing Bike Lane or Route

- - - Planned Bike Lane or Route

□ Bicycle Infrastructure Gap

⋯ SSPZ Boundary

■ Developed Park

Source: Urban Design 4 Health (UD4H), 2019.

ud4h
URBAN DESIGN 4 HEALTH
UD4H.com

SAN JOAQUIN
COUNCIL OF
GOVERNMENTS

Figure 18. Existing and planned bicycle infrastructure in Stockton with smaller gaps in the network identified in white.

Table 16. Identified gaps in on-street bicycle infrastructure in the SSPZ.

#	Infrastructure Type	Identified Gaps		
		Road Name	Start of Gap	End of Gap
1	Bike Lane	S Airport Way	E Miner Ave	E Weber Ave
2	Bike Lane	S Airport Way	E Main St.	E Anderson St
3	Bike Route	E 8 th St	S Airport Way	Bieghle St
4	Bike Route	E Fremont St	N Filber St	N Broadway Ave
5	Bike Route	N Filbert Street	Roosevelt St	E Fremont St
6	Bike Route	S Golden Gate Ave	E Main St	E Dr. Martin Luther King Jr. Blvd.

7.2 Transit Infrastructure

Public transit offers a host of health, economic, and social benefits for communities. Transit service can improve levels of physical activity related health as pedestrians walk or bicycle to and from the stations/stops.³⁸ Increased levels of transit access and walkability are associated with increased physical activity and reduced levels of chronic disease.³⁹ In fact, transit riders are more likely to meet the physical activity recommendations in the United States⁴⁰, as 29% of transit users walked more than 30 minutes per day on their daily commute trip (with a median of 19 minutes per day).³⁸ These health benefits may impact a greater proportion of low-income populations, who are more likely to be transit users, walk to transit, and spend at least 30 minutes on their trip walking to transit.³⁸ As a result of health improvements from increased physical activity, transit use can help reduce healthcare costs in a community over time. Public transit can also improve access to jobs, education, and other social activities, while also supporting businesses, as it helps to connect destinations and bring consumers to the area.

Table 17 describes access to public transit in San Joaquin County, the City of Stockton, and the SSPZ. Approximately 40% of the rail counts in the entire county (n=5) and all of the rail counts in the City of Stockton (n=2) are located in the SSPZ. Nearly all of the bus rapid transit (BRT) Stops in San Joaquin County (n=89) are in the City of Stockton (n=87), with nearly two-thirds of these located in the SSPZ (n=54). All but one (87.5%) of the other express bus routes in the county operates in the SSPZ, but only about one-third of other express stops in the county are in the SSPZ. All of the regular bus routes in the county (n=29) are in the City of Stockton and majority of these are in the SSPZ (n=21). Although majority of the regular bus stops in San Joaquin County (n=652) are in the City of Stockton (n=565), fewer than half of these are in the SSPZ (n=246). Overall, regular and/or express transit stops are often located in north Stockton rather than in the SSPZ.

Table 17. Count of Transit Routes and Stops in San Joaquin County, City of Stockton, and SSPZ

Transit Stop Type	San Joaquin County	City of Stockton	SSPZ	SSPZ % of County	SSPZ % of City
Rail Count	5	2	2	40.0%	100%
BRT Stops	89	87	54	60.1%	62.1%
Other Express Route Count	8	8	7	87.5%	87.5%
Other Express Stops	193	138	66	34.2%	47.8%
Regular Bus Route Count	29	29	21	72.4%	72.4%
Regular Bus Stops	652	565	246	37.7%	43.5%
Total Transit Routes	38	38	28	73.7%	73.7%
Total Transit Stops	944	790	360	38.1%	45.6%

Source: San Joaquin Regional Transit District, 2018.

Figure 19 shows the level of transit service at the census block group level across Stockton using aggregated frequencies of transit service per square mile. This measure calculated the frequency of transit service for each transit route³³ for the evening peak period (4:00PM-7:00PM weekdays) using transit schedule information.³⁴ This service frequency was then aggregated for all transit routes within 0.25 miles of each block group. This metric expresses values as service frequency per hour of transit service. This aggregated frequency was then converted into a density measure using the block group area as the denominator. Higher values indicate areas with not only an increased number of transit routes, but increased density of transit service frequency. The most frequent service operates in Downtown Stockton near the Downtown Transit Center and to areas in the northwest. Much less frequent transit service is available to South Stockton residents. Frequency of transit service is lowest in the far northeast and southern areas of the SSPZ, with especially low service on the southwest and eastern boundary.

³³These routes consist of bus service only including BRT and other express bus service.

³⁴ Transit schedule information provided by General Transit Feed Specification (GTFS) data.

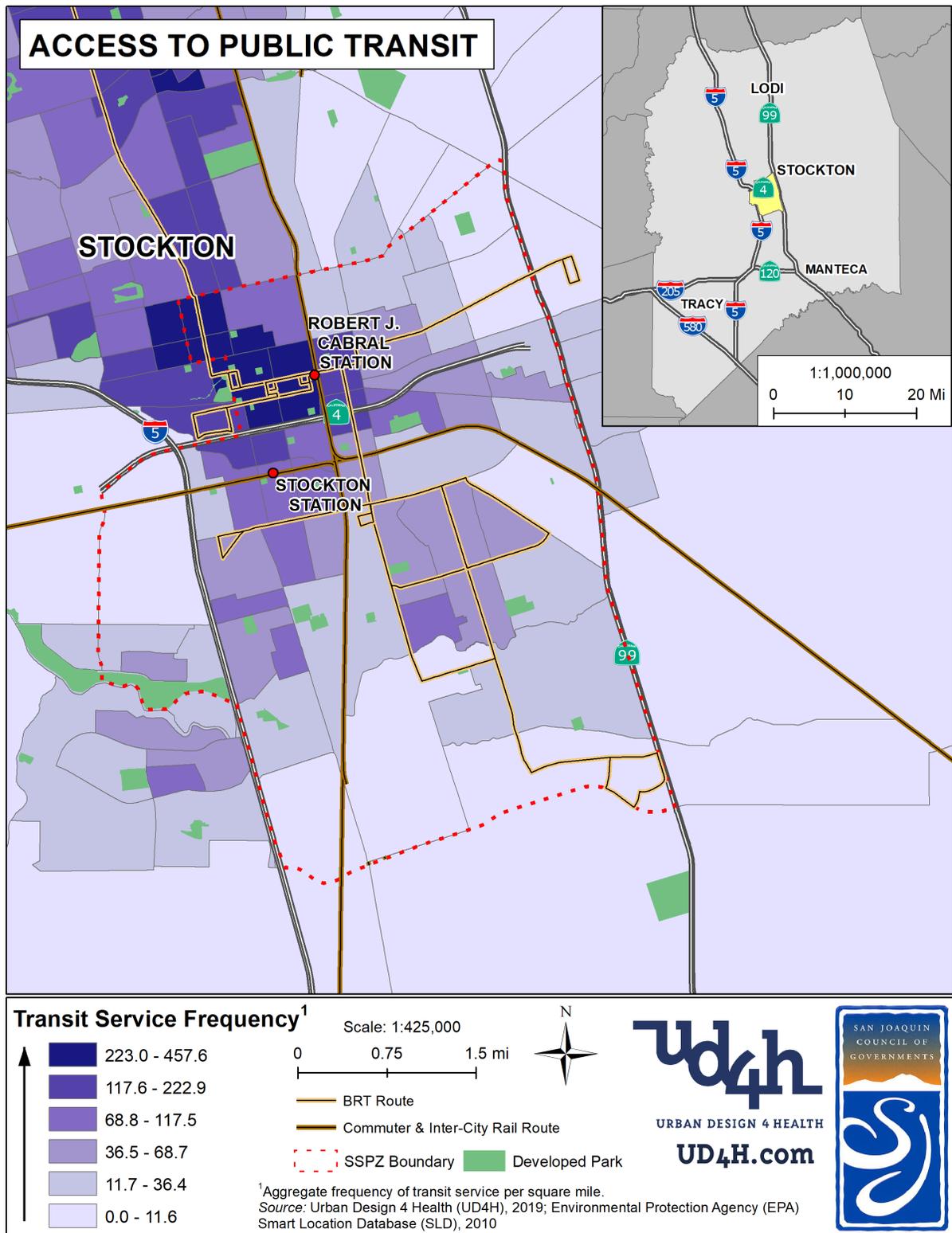


Figure 19. Aggregated transit service frequency per square mile by census block group in Stockton.

8 Green Infrastructure

Under the right circumstances, vacant parcels of land and underdeveloped spaces can be utilized for green spaces in the community to improve community health and well-being. Increased green space is associated with improved general health⁴¹, increased physical activity⁴², reduced likelihood of being overweight^{43,44}, increased social interaction⁴⁵ and improved perceptions of mutual trust and willingness to help others.⁴⁶ Furthermore, green space can function as an escape from life stress, reduce depression, and improve ability to cope with major issues⁴⁷⁻⁴⁹. Thus, in denser, urban environments private yard space may be limited, it is especially important to make green infrastructure part of the streetscape and ensure convenient access to public parks and other natural settings and destinations.

Green spaces, such as urban parks and street trees, can also be incorporated into active transportation networks, further increasing health-related benefits from walking and biking space⁵⁰ and helping to reduce vehicular collisions in a community.³⁷⁻³⁹ Tree canopy, in particular, has an association with better overall health, lower prevalence of overweight and obesity and better social cohesion, reduced type 2 diabetes, high blood pressure, and asthma in communities.⁵¹ In addition, green infrastructure may also improve air quality⁵² and reduce asthma among children.⁵³

Table 18 describes the number of small and large parks and the area of parkland within the SSPZ. There are more small parks (n=20) than large parks (n=13), but the large parks cover 129.8 acres of land while the small parks cover only 56.4 acres of land.

Table 18. Summary of city-maintained parks in SSPZ

Park Characteristic	Parks in the SSPZ
Number of Small Parks ³⁵ (< 5 acres) ³⁶	20
Number of Large Parks ³⁷ (≥ 5 acres) ³⁸	13
Total Parkland Area (acres)	186.2
Area of Parkland - Small Parks (acres)	56.4
Area of Parkland - Large Parks (acres)	129.8

Source: San Joaquin Council of Governments, 2016.

8.1 Access to Developed Parks

Developed parks offer places to play, exercise, socialize and interact with nature, and can function as an important respite from daily stress. Parks and open space have been associated with a number of positive physical and mental health outcomes, in addition to

³⁵ Comprises neighborhood parks and civic plazas.

³⁶ Represents the majority of small parks with a few exceptions that are above this size threshold.

³⁷ Includes all community parks.

³⁸ Represents the majority of large parks with a few exceptions that are below this size threshold.

social ones. For example, access to nearby parks and open space has been associated with increased physical activity⁵⁴, especially among youth in urban environments, which reduces one’s risk for cardiometabolic diseases, coronary heart disease, cardiovascular disease, cancers, mental health, musculoskeletal disorders and all-cause mortality. Park access has also been shown to help improve sleep quality, cognition, physical function and perceived quality of life. Further research shows that sufficient physical activity can also reduce progression of chronic diseases such as osteoarthritis, hypertension, and Type 2 diabetes.⁵⁵ Access to parks can benefit mental health, as they offer opportunities to interact with nature and socialize with others in the community. Importantly, the size, quality of amenities and facilities, availability of recreational opportunities and programming and safety are all important factors to consider in the design of parks, as these influence the utilization and health impact of the space.

The majority of the residential parcels in the SSPZ (n=15,450) are classified as single-family residential (95.2%) with only a small share (4.8%) being multi-family residential parcels. Table 19 summarizes residential access to developed parks within 1 km (approximately a ten-minute walk) and 2 km (approximately a 20-minute walk). This table provides a means of estimating the percentage of residents without access to parks (within a 10- or 20- minute walk) and identifying other gaps in park access in the SSPZ.

Among single family dwellings, 72.3% of SSPZ residents had access to a park within a 10 minute walk. This number increased to 91.5% of single family residents with park access within a 20 minute walk. Approximately 90% of SSPZ residents living in multi-family residential units had access to a park within a 10 minute walk which increased to 98.5% being within a 20 minute walk of a park.

Table 19. Summary of residential parcel access by type to developed parks in SSPZ

Count of Residential Parcel by Type	Total in SSPZ
Number of Residential Parcels in SSPZ	15,450 (100.0%)
Number of Single Family (SF) Residential Parcels in SSPZ	14,703 (95.2%)
Number of Multi-Family (MF) Residential Parcels in SSPZ	747 (4.8%)
<i>Count of Residential Parcel with Park Access</i>	<i>Within Buffer - SSPZ Only</i>
Number of Residential Parcels within 1km of Developed Parks	11,174 (72.3%)
Number of SF Parcels within 1km of Developed Parks	10,504 (68.0%)
Number of MF Parcels within 1km of Developed Parks	670 (4.3%)
Number of Residential Parcels within 2km of Developed Parks	14,873 (96.3%)
Number of SF Parcels within 2km of Developed Parks	14,137 (91.5%)
Number of MF Parcels within 2km of Developed Parks	736 (4.8%)

Source: San Joaquin Council of Governments, 2016.

This next sections looks at person counts, rather than housing unit counts. Table 20 describes access to developed parks within 1 km and 2 km in terms of the total population

living in the SSPZ (n= 76,814).³⁹ Nearly 66% of the SSPZ population is located within 1 km of parks, while over 66,000 inhabitants (86.3%) are located within 2 km of a developed park. The multi-family residential population within 1 km of developed parks comprised about 15,000 people. This is less than half the total single family residential population of approximately 36,000 people. However, this is to be expected due to the fact that there are far fewer multi-family residential parcels making up less than 5% of all residential parcels as described in Table 19. A large majority of SSPZ residents have access to at least one park within a 10 minute walk. There are, however, still about 10% of SSPZ residents, about 8,000 people, with no park access within 2km.

Table 20. Population Access to Developed Parks within Defined Buffer and within SSPZ Boundary

Count of Population by Type and Distance	Within Defined Buffer and in SSPZ
SF Population within 1km of Developed Parks	35,693 (70.8%)
MF Population within 1km of Developed Parks	14,752 (29.2%)
Total Population within 1km of Developed Parks	50,445 (65.7%)
Total Population not within 1km of Developed Parks	26,369 (34.3%)
SF Population within 2km of Developed Parks	49,775 (75.1%)
MF Population within 2km of Developed Parks	16,494 (24.9%)
Total Population within 2km of Developed Parks	66,270 (86.3%)
Total Population not within 2km of Developed Parks	10,544 (13.7%)
Total Population in the SSPZ	76,814 (100%)

Source: San Joaquin Council of Governments, 2016.

Figure 20 shows areas of the SSPZ that have access to a developed park within 10 minutes (1 km) and 20 minutes (2 km) by foot. This map also shows areas with access to an undeveloped park within 10 minutes (1 km) by foot, as well as vacant parcels of land. Nearly all of the downtown area has access to parks with a 1km walk due to a large number of small parks in this area and the highly connected road network that allows for greater accessibility by foot.

³⁹ 2015 5-Year Estimate (2011-2015), American Community Survey, U.S. Census Bureau, 2016.

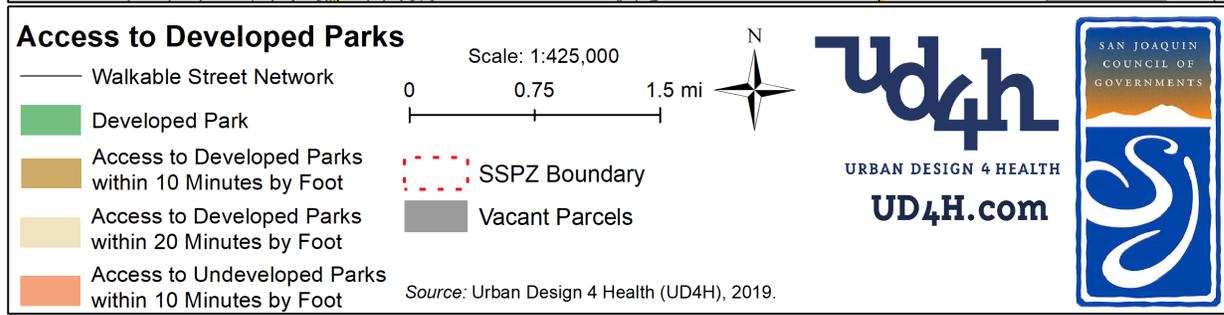
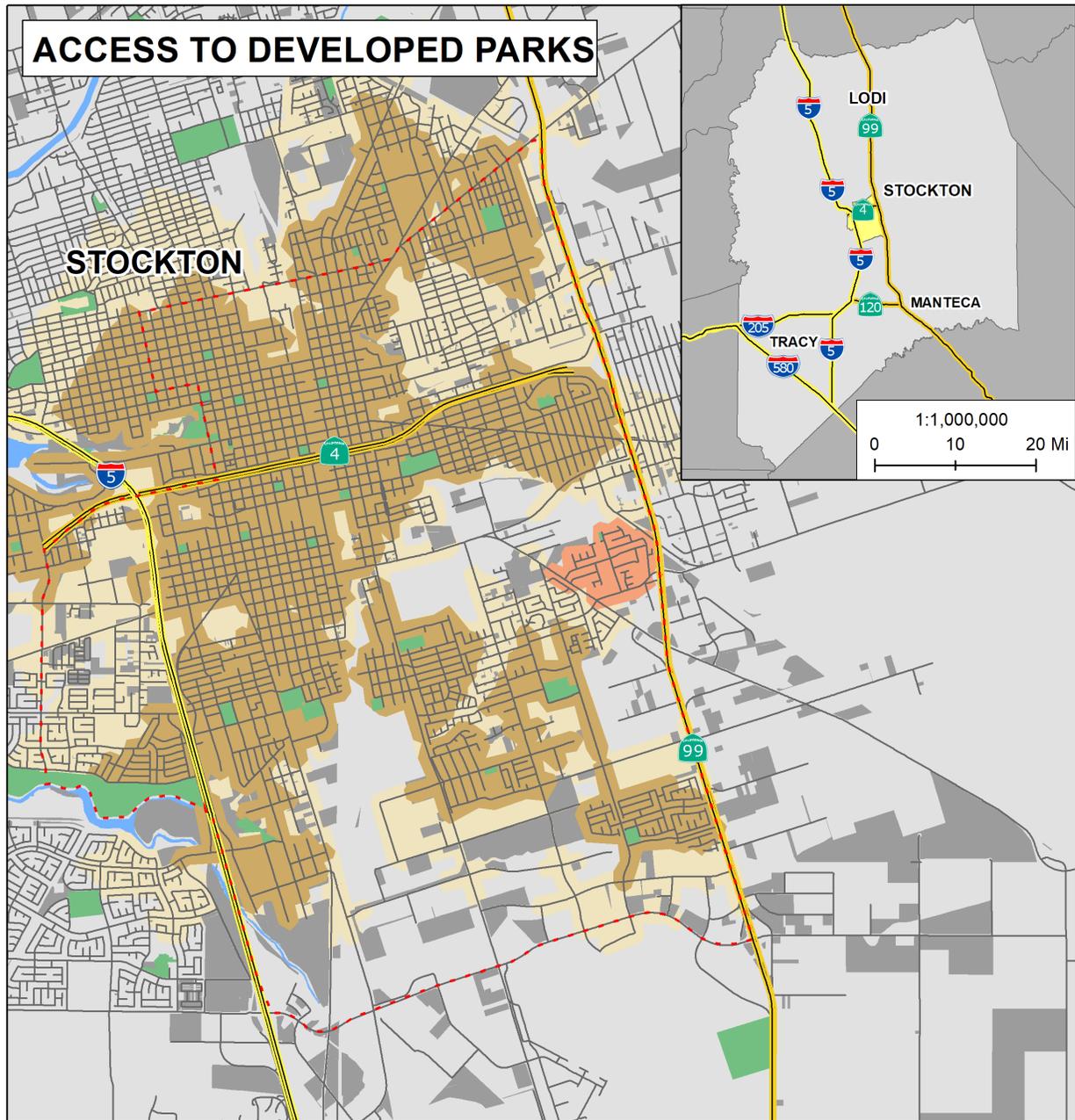


Figure 20. Access to developed parks within 1km (10 minute walk) and 2km (20 minute walk) in the SSPZ.

The map shows two distinctive large gaps in park access within 10 minutes: 1) a smaller area in the northeast of the SSPZ near E. Fremont St. and N. Filbert St. and 2) northeast Kennedy near Mariposa Road. This is especially true for the area surrounding Missassi Park, an undeveloped park. Missassi Park could be developed, closing this gap by giving surrounding areas access to a developed park within 10 minutes instead of more than 20 minutes.

Vacant parcels are shown on this map to present land that could be considered for future parks. Importantly, there are several vacant parcels of land scattered in the south eastern corner, which could be acquired for redevelopment as well. It is important to note that other gaps in the south of the SSPZ surround industrial areas such as the South Stockton Union Pacific Yard, the East Stockton BNSF Yard and other light industrial and distribution centers in South Stockton. Many of these industrial areas have lower connectivity with low residential populations that may not be the highest priority areas for increased access to parkland.

9 Economic Opportunity Zones

“Opportunity Zones” are designated areas in economically-distressed communities where new private sector investment, under certain conditions, may be eligible for tax incentives. Communities qualify to be part of the Opportunity Zone program if they have been nominated by the state and that nomination has been certified by the U.S. Internal Revenue Service (IRS).⁴⁰ First designated in 2018 as part of the Tax Cuts and Jobs Act of 2017,⁴¹ the Opportunity Zone program aims to put private sector capital into investments and allows investors to defer on capital gains taxes. The program is designed to spur economic investment in low-income communities by providing these tax benefits to investors if they hold “Qualified Opportunity Fund” investments for a specified period of time. The longer the investment is held and tax is deferred the greater the tax benefit to the investor.⁴² California may designate up to 25% of its total statewide census tracts as meeting the low-income requirements to be eligible to be federally identified as Opportunity Zones. Due to the high number of concentrated low-income areas in the SSPZ, the majority of census tracts in the SSPZ are currently classified as Opportunity Zones.

9.1 Catalytic Investment Opportunities

The City of Stockton has identified nineteen census tracts that have been designated as Opportunity Zones, of which thirteen (68.4%) are located in the SSPZ. The City of

⁴⁰ [Opportunity Zone Overview](#), Internal Revenue Service, 2018.

⁴¹ [Tax Cuts and Jobs Act of 2017](#), U.S. Congress, 2017.

⁴² [Opportunity Zone Overview](#), Internal Revenue Service, 2018.

Stockton Economic Development Department has worked to develop a guide to encourage and target investments.⁴³

Figure 21 shows a map of parcels identified as “Catalytic Investment Opportunities” within Stockton’s Economic Opportunity Zones in the SSPZ. These Catalytic Investment Opportunities offer a range in investment types from large scale business parks, parcels suitable for light and heavy industry to residential real estate development in strategic centers in the Downtown and Stockton waterfront.⁴⁴

Catalytic Investment Opportunity parcels in the SSPZ are concentrated in several areas in the SSPZ including the Airport Way Corridor, Windstone Village in Kennedy, as well as University Park, Liberty Square and the Open Window Project in Downtown Stockton. The City of Stockton has identified a total of 109 parcels designated as Catalytic Investment Opportunities within the Opportunity Zones, of which the majority (71 of 109 or 65%) are located in the SSPZ. Several larger sets of designated parcels such as the Airpark 599 Business Park, North Shore and Southpoint are located just outside of the SSPZ.

⁴³ [Opportunity Zones Prospectus](#), City of Stockton, 2019.

⁴⁴ [Opportunity Zones](#), City of Stockton, 2019.

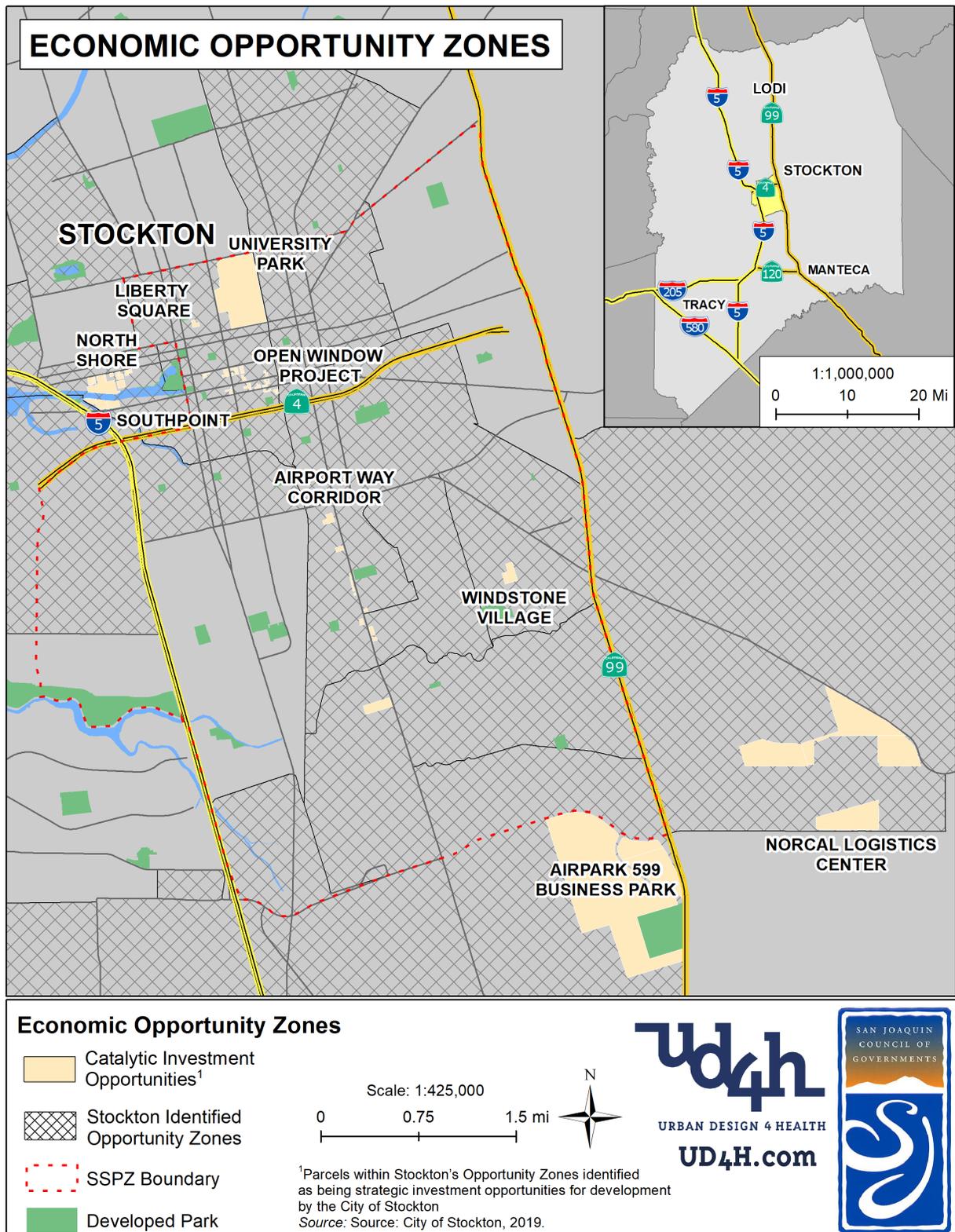


Figure 21: Map showing "Catalytic Investment Opportunity" parcels within the SSPZ that provide incentives for private investment in these economic opportunity zones.

10 Identification of Target Subareas for Investment Priorities

Multiple criteria were used to select the following three sub-areas for investment: Subarea A, Subarea B and Subarea C. The selected areas represent neighborhoods within the SSPZ which overlap with areas of high traffic crashes, reduced public transportation access, limited bicycle facilities, high population growth, decreased access to developed parks, and are economic opportunity zones.⁴⁵ Table 21 provides a summary of the elements contained in this analysis as they align with each of the identified subareas.

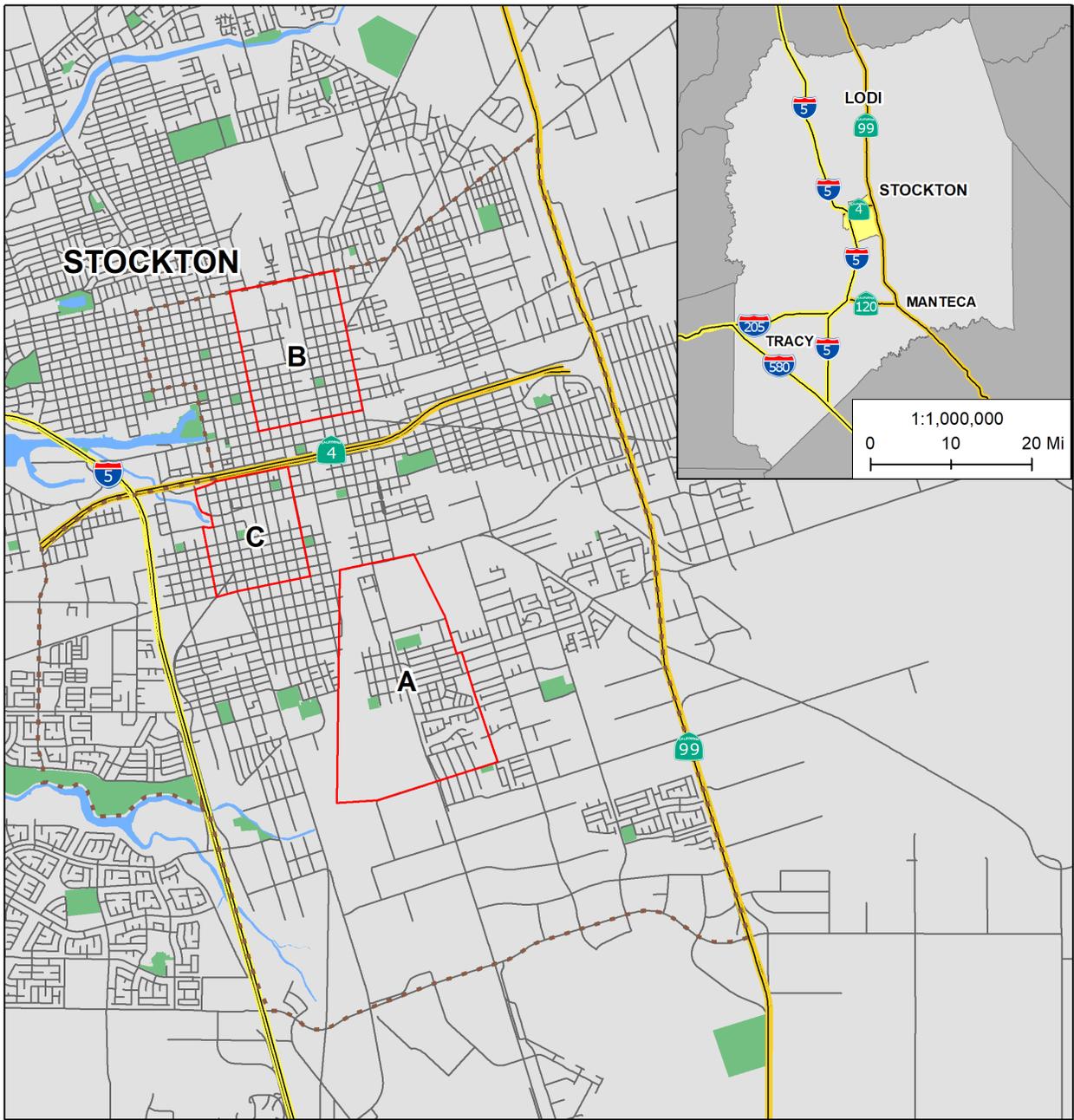
These selected subareas comprise one or more key commercial corridors along a major arterial, and also encompass surrounding residential areas. The boundaries of the subareas are meant to align with larger arterials and collector roads, in addition to major industrial facilities and natural features such as rivers. All subarea boundaries are within City of Stockton jurisdiction. The eastern edge of Subarea A shares a nearby boundary with the western edges of Kennedy. These identified subareas are locations to prioritize for future RTP planning efforts and alternative future growth scenarios. The sections that follow describe the findings of each of the analyses presented above for these locations.

Figure 22 shows the selected areas within the SSPZ context. Subarea A is bounded by Charter Way/Dr. Martin Luther King Jr. (north), with the Union Pacific Stockton Yard (west), Ralph Avenue (south), and the eastern border being the north side entrance of Stockton Dirt Track, and continuing south on Schribner St and then Bieghle St. connecting with Ralph Ave. Subarea B is bounded by Weber Ave. (south), Wilson Way (east), E. Harding Way (north) and California St. (west). Subarea C is near the El Dorado Corridor, bounded by Lafayette St. (north), just south of the Crosstown Fwy (SR #4), California St. (east), Madison St. (west), and Charter Way/Dr. Martin Luther King Jr. (south).

⁴⁵ Although these areas overlap with many of the selection criteria identified, it is important to note there is not a perfect spatial alignment with all areas of the neighborhood boundaries

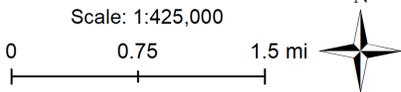
Table 21. Summary of the spatial overlap of analysis elements with the three targeted subareas within the SSPZ.

Element of Analysis	Subarea A	Subarea B	Subarea C
Traffic Safety	<ul style="list-style-type: none"> Traffic hotspots within boundaries not statistically significant Boundaries are surrounded by 3 of the 14 key high traffic crash sites 	<ul style="list-style-type: none"> One of the highest concentrations of traffic hotspots for all traffic crashes and for non-motorized traffic crashes only 4 of the 14 key high traffic crash sites within boundaries 	<ul style="list-style-type: none"> Traffic crashes tend to cluster, but to a slightly lesser extent than Subarea B 3 of the 14 key high traffic crash sites within boundaries Boundary also surrounded by another of the 14 key high traffic crash sites
Infrastructure Conditions	1 nearby high traffic crash intersections shows low (<3/7) intersection safety scores	25% (1 of 4) of the high crash intersections showed a moderate (5/7) intersection safety score, while the remaining 75% (3 of 4) exhibited low (<3/7) intersection safety scores	3 high traffic crash intersections indicated low (<3/7) intersection safety scores
Population Growth	The forecasted population changes for 2035 estimate that some areas will have slight increases; while some areas are expected to experience minimal growth or slightly negative population change	The greatest percent of RTP forecasted population changes for 2035 (+0.8% - +2.5%) in the SSPZ	Slight increases (between +0.0% and +0.3%) of RTP forecasted population changes for 2035
Land Use Characteristics	Low employment density	Relatively high employment density	Moderate-low employment density
Transportation Access & Infrastructure	<ul style="list-style-type: none"> Includes one of the three identified gaps in bicycle infrastructure Two gaps surround the borders Low frequency of transit service 	<ul style="list-style-type: none"> Frequency of transit service is relatively high 	<ul style="list-style-type: none"> Frequency of transit service is relatively high
Green Infrastructure	<ul style="list-style-type: none"> Two parks within the area boundaries, Some parcels that require a ≥20 minute walk to a park 2 large areas of vacant parcels and is less connected to park facilities than Subarea B and Subarea C 	<ul style="list-style-type: none"> One park within boundaries, and three nearby Parcels in the northeast corner require a 20 minute walk to reach the nearest developed park 	<ul style="list-style-type: none"> Four developed parks within Subarea C boundaries All parcels are within a 10 minute walk to a park
Economic Opportunity Zones	<ul style="list-style-type: none"> Located within an Opportunity Zone Identified Catalytic Investment Opportunities: Airport Way Corridor 	<ul style="list-style-type: none"> Located within an Opportunity Zone Identified Catalytic Investment Opportunities: University Park, Open Window Project 	<ul style="list-style-type: none"> Located within an Opportunity Zone Identified Catalytic Investment Opportunities: None



South Stockton Promise Zone Subarea

- Subarea Boundary
- SSPZ Boundary



Source: Urban Design 4 Health (UD4H), 2019.

Figure 22: Map showing the Subarea A, Subarea B and Subarea C boundaries in the SSPZ.

10.1 Traffic Safety

Subarea B is entirely within the area of the SSPZ. It has the greatest number of traffic hotspots for all traffic crashes and for non-motorized traffic crashes only. Traffic crashes tended to cluster along key arterials near the eastern edge of at the Subarea B boundary. Although to a slightly lesser extent than for Subarea B, a similar trend was identified for traffic crashes within the Subarea C boundary. In contrast to Subarea B and Subarea C, traffic hotspots (all traffic crashes and pedestrian and cyclist involved traffic crashes) within the Subarea A boundaries were not statistically significant according to the Getis Ord Gi* test statistic used to identify spatial clustering.

Several sections of the street network for Subarea B, Subarea C, and Subarea A have high KSI density values for all types of traffic crashes (above 0.50) (Figure 6). This indicates that these areas all have segments of high injury corridors and intersections with regard to crashes among all modes. Similarly, for all three subareas, there are portions of the street network with high rates of pedestrian/cyclist involved traffic crashes which result in injuries.

As described in Section 5, several of the fourteen key high traffic crash sites selected for an inventory of intersection features were in or near Subareas B and C. Four of these locations are within the Subarea B boundaries (Table 22). Three of the most dangerous intersections are within Subarea C boundaries. One other intersection, E Dr. Martin Luther King Jr. Blvd. & Aurora St., is just east of Subarea C boundaries and near the northwest border of Subarea A boundaries. Three of the most dangerous intersections surround the Subarea A boundaries. Table 22 lists the fourteen intersections along with the spatial relation to each of the three investment areas. Section 5 describes the infrastructure at these sites in more detail.

Table 22. Most dangerous intersections' spatial relation to Subarea B, Subarea C, and Subarea A

#	Intersection Name	Spatial Relation to Targeted Subareas	Approximate Distance (mi.) ⁴⁶
1	El Dorado St. & E Sonora St.	Subarea C	0.0 (within boundary)
2	E Lindsay St & N Sierra Nevada St.	Subarea B	0.0 (within boundary)
3	N Wilson Way & E Oak St.	Subarea B	0.0 (within boundary)
4	Pinchot St & N Airport Way	Subarea B	0.0 (within boundary)
5	E Harding Way & N Airport Way	Subarea B	0.0 (within boundary)
6	E Dr. Martin Luther King Jr. Blvd. & S Stanislaus St.	Subarea C	0.0 (within boundary)
7	E Dr. Martin Luther King Jr. Blvd. & S American St.	Subarea C	0.0 (within boundary)
8	E Dr. Martin Luther King Jr. Blvd. & Aurora St.	East of Subarea C	< 0.10
9	S San Joaquin & Washington St.	North of Subarea C	< 0.25
10	S Lincoln St. & W Sonora St.	West of Subarea	< 0.25

⁴⁶ Rank order based on proximity (closest to farthest away) of subareas to high crash intersections.

		C	
11	E Washington St. & S Airport Way	South of Subarea B	< 0.25
12	S El Dorado St. & E 6 th St.	South of Subarea A	< 0.5
13	S El Dorado St & W 7 th St.	South of Subarea A	< 0.5
14	Mariposa Rd. & E. 8 th St.	East of Subarea A	< 1.0

10.2 Infrastructure Conditions at High-Crash Intersections

Intersection safety scores varied by subarea based on individual circumstances for each high crash intersection. However, the overall scores were overwhelmingly low (<3/7) for each of the subareas examined. No high crash intersections were located within Subarea A, however, a nearby identified intersection (E. Dr. M.L.K. Jr. Blvd. & Aurora St.) located one block outside of the Subarea A boundaries yielded an intersection safety score of only 1.25/7. Similarly, high crash intersections in Subarea C showed three high crash intersections with low scores ranging from 2.25/7 to as low as 1.75/7. Subarea B contained the most high crash locations among the three subareas (n=4). Intersection safety scores for high crash intersections in Subarea B ranged from a moderate score (5/7) for one intersection (E Harding Way & N Airport Way) to low scores (2/7 to 1/7) for the other three high crash intersections in the area.

10.3 Assessment of Population Growth & Current Land Use Characteristics

The greatest percent of RTP forecasted population changes for 2035 in the subareas (a range of between +0.8% to +2.5% by block group according to Figure 16) are concentrated in Subarea B. Subarea C shows slight increases (up to +0.3%). Subarea A has some areas with slight increases (+0.3% to +0.8%), but also has areas expected to experience slightly negative (-0.5% to -0.1%) population change. Compared to Subarea C and Subarea A, current employment density was greatest within Subarea B (a range of between 3.2 to 7.7 jobs/acre by block group according to Figure 17). Subarea A indicated mainly low employment density (< 3.1 jobs/acre). Subarea C's employment density ranged from 1.3 to 7.7 jobs/acre.

10.4 Transportation Access & Infrastructure

One of the three identified gaps in bicycle infrastructure is along the east border of Subarea A, and the other two gaps surround its borders (see Section 7 for details). Subarea B and Subarea C only have planned bicycle infrastructure, but no bike lanes or multi-use pathways currently exist. Likewise, the frequency of transit service per square mile in Subarea A is low to moderate (a range of 11.7-117.5 hourly aggregated service

frequency per square mile), but is relatively high for Subarea B (a range of 117.6-457.6) and Subarea C (a range of 68.8-222.9). This is to be expected given the proximity of Subarea B and Subarea C to Stockton's Central Business District and that Subarea A is located further from Downtown Stockton.

While the Subarea C area includes the Amtrak station, biking and walking are somewhat challenging in the area and may be hampered by poorer street connectivity through the existing and former industrial areas in this neighborhood. Areas immediately adjacent and slightly above the mainly dry riverbed of eastern sections of the Mormon Slough east of S. Center St. were previously identified as a potential multi-use pathway corridor for pedestrians and bicyclists, however, these plans have since been abandoned. However, there are several planned bike lanes or routes in Subarea B and Subarea C boundaries.

10.5 Green Infrastructure

A majority of the parcels within the Subarea A, Subarea B and Subarea C boundaries have access to developed parks within 10 minutes by foot. However, while most of Subarea A has access to the two parks within the area boundaries, the southern borders and some southeastern sections of Subarea A have parcels that require a 20 minute or more walk. Subarea A has two large areas of vacant parcels and is less connected than Subarea B and Subarea C, which might make developed parks less accessible to surrounding communities. There is one park within the Subarea B boundaries, and three nearby. While a majority of the parcels in Subarea B have access to a developed park within 10 minutes by foot, those in the northeast corner require a 20 minute walk to reach the nearest developed park. Four developed parks are within Subarea C boundaries, and all parcels are within a 10 minute walk.

10.6 Economic Opportunity Zones

City of Stockton identified Opportunity Zones are located within the boundaries of Subareas A, B, and C. Subarea A has been identified as a strategic corridor for economic investment. It has many Catalytic Investment Opportunity parcels located along or adjacent to Subarea A between Charter Way/Dr. Martin Luther King Jr. Blvd and Ralph Ave. The principal Catalytic Investment Opportunity parcel located in the Subarea B neighborhood is University Park which encompasses the areas around the Stanislaus State Stockton Campus. Although Subarea C is within Stockton's Economic Opportunity Zone, there has yet to be any Catalytic Investment Opportunity parcels identified within the area.

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12 Appendix A: High Traffic Intersections Infrastructure Inventory

Table 23 outlines the attribute index scheme used for the data inventory of intersection infrastructure features in the SSPZ. Table 24 provides the inventory of non-motorized infrastructure features and road characteristics for the 14 most dangerous intersections in the SSPZ for pedestrian and cyclist involved traffic crashes.

Table 23. Attribute index for the inventory of infrastructure features for the 14 most dangerous intersections in the SSPZ.

Variable	Description	Values
CR1_ROAD_TYPE	Primary road type	1: Major Arterial; 2: Minor Arterial; 3: Local Street
CR1_N_LANES	# of lanes on primary road	Count of lanes
CR1_ON_STREET_PRK	On street parking on primary road	1: Yes; 0: No
CR1_STOP_SIGN	Stop signs on primary road	1: Yes; 0: No
CR1_BLVD	Boulevard/median on primary road	1: Yes; 0: No
CR2_ROAD_TYPE	Secondary road type	1: Major Arterial; 2: Minor Arterial; 3: Local Street
CR2_N_LANES	# of lanes on secondary road	Count of lanes
CR2_ON_STREET_PRK	On street parking on primary road	1: Yes; 0: No
CR2_STOP_SIGN	Stop signs present on secondary road	1: Yes; 0: No
CR2_BLVD	Boulevard/median on secondary road	1: Yes; 0: No
PED_REFUGE	Pedestrian refuge present	1: Yes; 0: No
ST_LIGHTING	Percent of intersection illuminated by street lighting	0: 0%; 1: 25%; 2: 50%; 3: 75%; 4: 100%
INT_TYPE	Intersection type	1: 3-way; 2: 4-way; 3: >4 ways
SPEED	Posted speed	Numeric value of posted speed
TRAF_SIGNAL	Traffic signalization present	1: Yes; 0: No
LEFT_TURN	Left turn lane present	1: Yes; 0: No
CYC_PRESENT	Bike facilities present	1: Yes; 0: No
CYC_TYPE	Bike facility type	1: Bike Route; 2: Bike Lane; 3: Buffered Path
CYC_SHARED_RD_SGN	Bike shared road signs present	1: Yes; 0: No
CYC_MRK_SIGN	Marked signs on the road	1: Yes; 0: No
PED_CR1_CRWLK	Crosswalk present on primary road	1: Yes; 0: No
PED_CR1_CRWLK_TYPE	Crosswalk type on primary road	1: Regular; 2: High-visibility
PED_CR1_CRWLK_QITY	Crosswalk quality on primary road	1: Good to Excellent; 2: Fair to Poor
PED_CR1_CRWLK_SIG	Crosswalk signal present on primary road	1: Yes; 0: No
CYC_CR1_SIG	Bike signal present on primary road	1: Yes; 0: No
PED_CR2_CRWLK	Crosswalk present on secondary road	1: Yes; 0: No
PED_CR2_TYPE	Crosswalk type on secondary road	1: Regular; 2: High-visibility
PED_CR2_CRWLK_QITY	Crosswalk quality on secondary road	1: Good to Excellent; 2: Fair to Poor
PED_CR2_CRWLK_SIG	Crosswalk signal present on secondary road	1: Yes; 0: No
CYC_CR2_SIG	Bike signal present on secondary road	1: Yes; 0: No
HOMELESS_ENCMP	Homeless encampment present	1: Yes; 0: No

Table 24. Inventory of intersection infrastructure features for the 14 most dangerous intersections in the SSPZ.

Variable	E Sonora St. & El Dorado St.	S San Joaquin & Washington St.	S Lincoln St. & W Sonora St.	E Lindsay St & N Sierra Nevada St.	E Washington St. & S Airport Way	N Wilson Way & E Oak St.	Pinchot St & N Airport Way	E Harding Way & N Airport Way	E Dr. Martin Luther King Jr. Blvd. & S Stanislaus St.	E Dr. Martin Luther King Jr. Blvd. & S American St.	E Dr. Martin Luther King Jr. Blvd. & Aurora St.	S El Dorado St. & E 6th St.	S El Dorado St & W 7th St.	Mariposa Rd. & E. 8th St.
CR1_ROAD_TYPE	1	2	2	2	1	2	2	2	1	1	1	2	2	2
CR1_N_LANES	4	6	4	4	6	6	6	7	7	7	7	5	7	5
CR1_ON_STREET_PRK	0	1	0	1	1	0	1	1	1	1	1	0	1	0
CR1_STOP_SIGN	0	0	1	0	0	0	0	0	0	0	0	0	0	0
CR1_BLVD	0	0	0	0	0	0	0	0	1	1	1	0	0	0
CR2_ROAD_TYPE	3	2	3	3	3	3	3	2	3	3	3	3	3	2
CR2_N_LANES	4	4	2	4	4	4	4	5	4	4	4	4	4	5
CR2_ON_STREET_PRK	1	1	0	1	1	1	1	0	1	1	1	1	1	0
CR2_STOP_SIGN	1	0	1	1	1	1	1	0	1	1	1	0	1	0
CR2_BLVD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PED_REFUGE	0	0	0	0	0	1	0	0	0	0	0	1	0	0
ST_LIGHTING	3	3	1	1	0	2	1	4	2	2	2	2	4	1
INT_TYPE	2	2	1	2	2	2	2	2	2	2	2	1	2	1
SPEED	0	0	0	0	0	0	0	0	0	0	0	0	0	25
TRAF_SIGNAL	0	1	0	0	0	0	0	1	0	0	0	0	1	0
LEFT_TURN	0	0	0	0	0	1	0	1	1	1	1	0	1	1
CYC_PRESENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CYC_TYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CYC_SHARED_RD_SGN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CYC_MRK_SIGN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PED_CR1_CRWLK	0	1	1	0	0	0	0	1	0	0	0	0	1	0
PED_CR1_CRWLK_TYPE	0	1	1	0	0	0	0	1	0	0	0	0	1	0
PED_CR1_CRWLK_QTTY	0	1	1	0	0	0	0	1	0	0	0	0	2	0

PED_CR1_CRWLK_SIG	0	1	0	0	0	0	0	1	0	0	0	1	0	1
CYC_CR1_SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PED_CR2_CRWLK	0	1	0	0	0	1	0	1	1	1	0	1	0	1
PED_CR2_TYPE	0	1	0	0	0	1	0	1	1	1	0	1	0	1
PED_CR2_CRWLK_QLTY	0	1	0	0	0	1	0	1	2	1	0	1	0	2
PED_CR2_CRWLK_SIG	0	1	0	0	0	0	0	1	0	0	0	1	0	1
CYC_CR2_SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HOMELESS_ENCMP	0	0	1	0	0	0	0	0	0	0	0	0	0	0

