Active 101 Existing Conditions Analysis

FINAL MEMORANDUM

TOOLE DESIGN GROUP

JANUARY 31, 2025

Overview

Background and Context

The US 101 San Mateo County Crossings Improvement Implementation ("Active 101") Plan will inventory and prioritize infrastructure projects that improve mobility and enhance access for pedestrians, bicyclists, and transit users within a quarter mile of US Highway 101 in San Mateo County. The project team will develop conceptual designs for the highest priority projects, including crossings, gaps in the existing network, intersections, and connector routes.

Projects will be selected from the area within a quarter-mile of US 101. However, the conditions that influence bicycle and pedestrian activity are not confined to the quarter mile area. To understand the full context, this Technical Memorandum documents the existing bicycle and pedestrian conditions within a mile of the US 101 (referred to throughout as the "study area"). Data analyzed in this memorandum includes:

- Existing Bicycle and Pedestrian Crossings
- Existing Bicycle Facilities and Activity
- Existing Pedestrian Focus Areas and Activity
- Key Bicycle and Pedestrian Destinations and Short Trip Generators
- Bicycle and Pedestrian Safety and Comfort
- Equity Considerations

Analysis Parameters and Limitations

Active 101 will build on existing planning and foundational documents previously completed that identify critical needs for bicyclists, pedestrians, and transit users; given the wealth of data and analysis conducted in and around the US 101 corridor in support of these existing plans, this analysis does not generate any new data. Rather, this memorandum consolidates the readily available data related to bicycle and pedestrian conditions and behaviors around US 101. This memo includes data from the 2021 C/CAG Comprehensive Bicycle and Pedestrian Plan, the 2024 C/CAG San Mateo County Local Roadway Safety Plan (LRSP), the US 101 Express Lanes Study Equity Study, and the US 101 Mobility Action Plan. The team also incorporated open data from Caltrans, Open Streets Map (OSM), and partner agencies like the Metropolitan Transportation Commission (for example, Equity Priority Communities [EPCs])

Key Findings

The following are key findings related to existing bicycle and pedestrian conditions within a mile of US 101:

- Existing Crossings and Facilities
    - In total, there are twenty-five (25) US 101 crossings in the study area. Of those, three (3) are vehicular crossings only. Figure 2 shows the other 22 crossings that provide either bicycle pedestrian access, or both. These include:
        - Eight (8) crossings with pedestrian facilities only (i.e., sidewalks but no bike lanes)
        - Two (2) crossings with bicycle facilities only (i.e., bike lanes but no sidewalks)
        - Five (5) crossings with bicycle and pedestrian facilities (i.e., bike lanes and sidewalks)
        - Three (3) at-grade shared us paths
        - Four (4) grade-separated overcrossings (i.e., “pedestrian overcrossing”)
    - According to the 2021 C/CAG Bicycle and Pedestrian Plan, even in cities with a high concentration of bikeways, there continue to be prominent network gaps. In addition, while there are over 450 miles of bikeways across San Mateo County, there are only two miles of Class IV protected bike lanes. There is a clear need for gap closure projects that provide safe and comfortable access to destinations for people using bicycles.
- Bicycle and Pedestrian Activity and Trip Generators
    - Due to development patterns, most short trip generators are concentrated on the west side of US 101. As a result, the burden of crossing US 101 falls largely on the few neighborhoods east of US 101, including neighborhoods in San Mateo, Foster City, and East Palo Alto. Residents of these neighborhoods likely need to cross US 101 to reach key services like schools, transit, and grocery stores. Safe and comfortable crossings for people living east of US 101 are essential to their health, mobility, and quality of life. This both confirms and illustrates the need for safe and comfortable highway crossings for non-vehicular modes.
- Bicycle and Pedestrian Safety and Comfort
    - In San Mateo County at large, people walking and bicycling are disproportionately involved in severe and fatal crashes. Between 2018 and 2022, pedestrians were involved in 13% of all injury crashes across the county but 23% of fatal/severe injury crashes. Similarly, bicyclists were involved in 13% of all injury crashes but 20% of fatal/severe injury crashes.[1] This indicates a need for investments that protect vulnerable road users throughout San Mateo County.
    - 12.6% of San Mateo County’s Bicycle High Injury Network (HIN) and 14.4% of San Mateo County’s Pedestrian HIN fall within a quarter mile of US 101, even though the study area only accounts for 3% of the County’s land area. There is a clear need for bicycle and pedestrian safety projects that address the concentration of collisions near US 101.
    - More than half of the streets in the study area (52%) are classified as having a high level of bicycle stress. Residential streets with lower volume and speeds in San Mateo County often do not form a complete, connected network. As a result, bicyclists need to use high stress arterial and collector streets to get where they need to go, including across US 101.
    - 19 of the 25 US 101 crossings (76%) are classified as having a high level of bicycle stress (LTS score 3 or 4) and nine of the 25 US 101 crossings (36%) are on either a high-injury bicycle or

[1] 2024 C/CAG San Mateo County Local Roadway Safety Plan (LRSP)

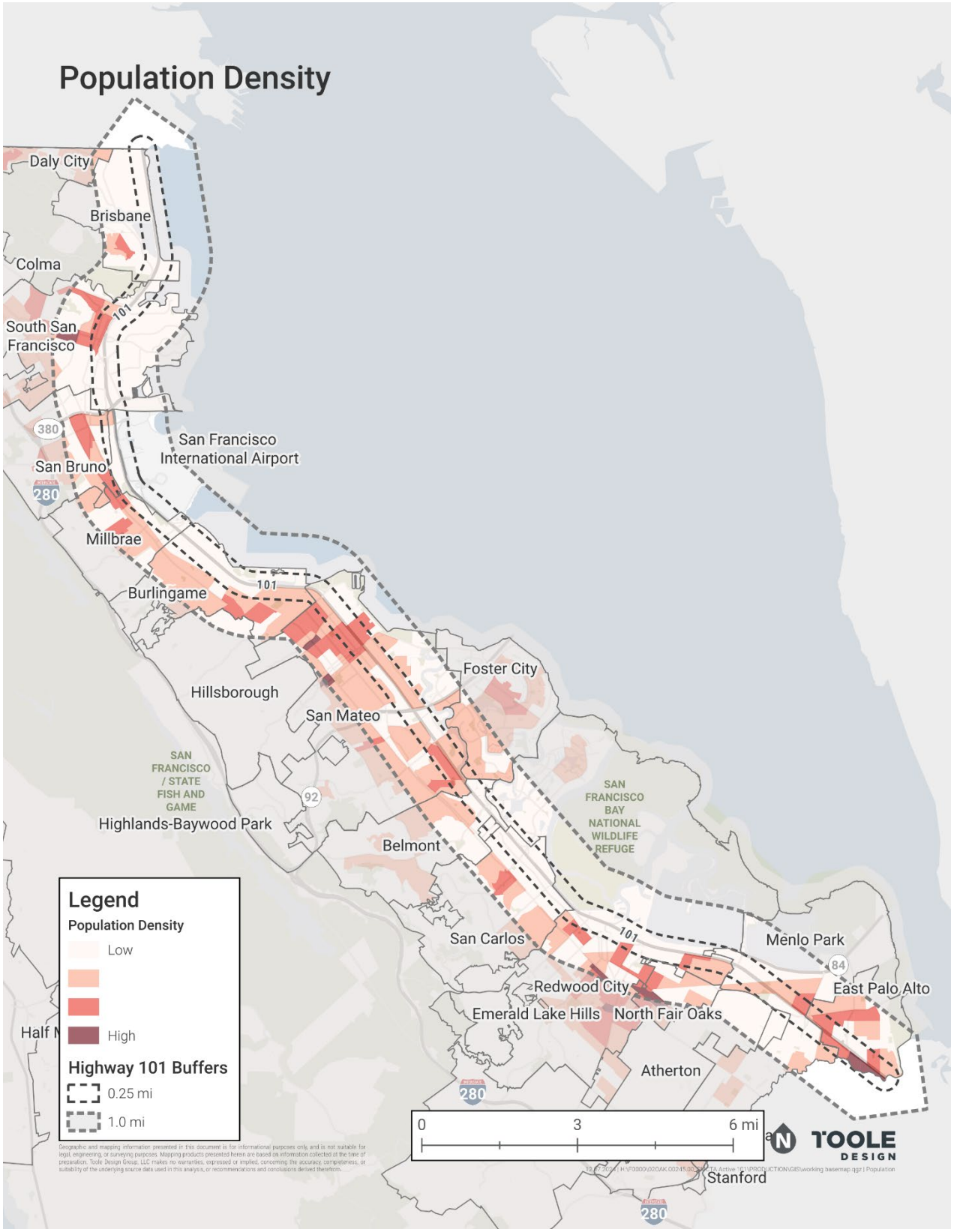
pedestrian routes. Two crossings—Grand Avenue in San Francisco and Hillsdale Boulevard in San Mateo—are located on both the bicycle and pedestrian high-injury segments. Improving safety at these high-injury crossings would significantly enhance health, mobility, and quality of life for residents living near US 101. This is especially critical for those on the east side of the highway, who must cross it to reach key destinations.
    - There is a strong correlation between the bicycle and pedestrian high injury networks, and areas with a density of short trip generators, including critical community destinations like schools and transit centers.
- Equity Considerations
    - Proximity to highways has a profound impact on community health and well-being, with the negative effects of US 101 disproportionately impacting Equity Priority Communities (EPCs) in San Mateo County.
    - Census data reveals that households without access to vehicles are concentrated within Equity Priority Communities (EPCs) in the study area. Consequently, residents of EPCs around US 101 are more likely to rely on transit and may need to walk or bike to essential destinations out of necessity, even when the infrastructure lacks safety or comfort.
    - Within the study area, 45% of the Bicycle and Pedestrian High Injury Network (HIN) is concentrated in Equity Priority Communities (EPCs), exceeding the countywide rate of 36.3%. Despite accounting for only 7.5% of the county's total land area, EPCs contain 12.6% of the county's bicycle HIN and 14.4% of the pedestrian HIN. These disproportionate concentrations highlight the need to prioritize safe and comfortable active transportation investments in EPCs.
    - Five of the seven separated bicycle and pedestrian crossings (shared use paths or grade separated overcrossings) are in or connect directly to Transportation Based Priority Populations. Four of the seven protected crossings connect to Equity Priority Communities.
    - Of the 25 US 101 crossings, there are only three that have no bicycle or pedestrian access, and all three are located within EPCs. These crossings (including I-380/North Access Road in South San Francisco, Seaport Boulevard in Redwood City, and University Avenue in East Palo Alto) all have the highest level of bicycle stress (4). Seaport Boulevard and University Avenue are also on the bicycle High Injury Network (HIN). (Note: improvements at University Avenue are underway. In late 2023, construction began on the US 101 / University Avenue Interchange Improvements project which will add a grade-separated overcrossing over US 101, just north of University Avenue)
    - The concentration of EPCs east of US 101 means that EPC residents have a greater need to cross US 101 for critical trips, including access to food, recreation, and jobs. To improve transportation equity in San Mateo County it will be critical to invest in crossing enhancements and additions that serve EPC residents, especially those without access to vehicles.

Study Area Context

US Route 101 (US 101) is a vital north-south highway spanning 26 miles through San Mateo County, from Palo Alto at the southern border to the City and County of San Francisco at the northern border. Serving as a critical regional and local corridor, US 101 connects thousands of Bay Area residents daily to jobs, goods, services, and recreational opportunities. The highway traverses San Mateo County's most urbanized areas and provides access to key regional destinations, including San Francisco International Airport (SFO). While most residential and commercial activity is concentrated west of US 101, the areas to the east (on the Bay side) feature limited residential and commercial development but include a significant amount of recreational and open space. Through San Mateo County, US 101 typically consists of eight lanes (four in each direction) and includes approximately 30 access points (exits and onramps) connecting 10 local cities.

Figure 1 shows the study area which includes the area within one mile of the US 101 centerline (i.e., a mile to the west and a mile to the east). The map also shows the quarter mile buffer around the US 101 centerline – this is the area from which projects will be identified for prioritization and conceptual design. Figure 1 also illustrates population density for census tracts in the study area, showing that the population along the corridor is concentrated on the west side of the highway. Exceptions include East Palo Alto, Foster City, and the Redwood Shores neighborhood in Redwood City, all of which are located on the east side of US 101.

Figure 1: Active 101 Study Area and Population Density (Census ACS, 2022)



Analysis

Existing Bicycle and Pedestrian Activity

Existing Bicycle and Pedestrian Crossings

There are a total of 25 US 101 crossings in the study area. Table 1 provides a detailed summary of these crossings, including their location and crossing type. It also presents the performance of these crossings across various metrics, as evaluated in this memo, including indicators related to equity, safety, comfort, and access.

Three of the 25 crossings are exclusively vehicular. Figure 2 maps the remaining 22 crossings that provide either bicycle access, pedestrian access, or both. These include:

- Eight (8) crossings with pedestrian facilities only (i.e., sidewalks but no bike lanes)
- Two (2) crossings with bicycle facilities only (i.e., bike lanes but no sidewalks)
- Five (5) crossings with bicycle and pedestrian facilities (i.e., bike lanes and sidewalks)
- Three (3) at-grade shared-use paths
- Four (4) grade-separated overcrossings (i.e., “pedestrian overcrossing”)

Figure 2: US 101 Bicycle and Pedestrian Crossings

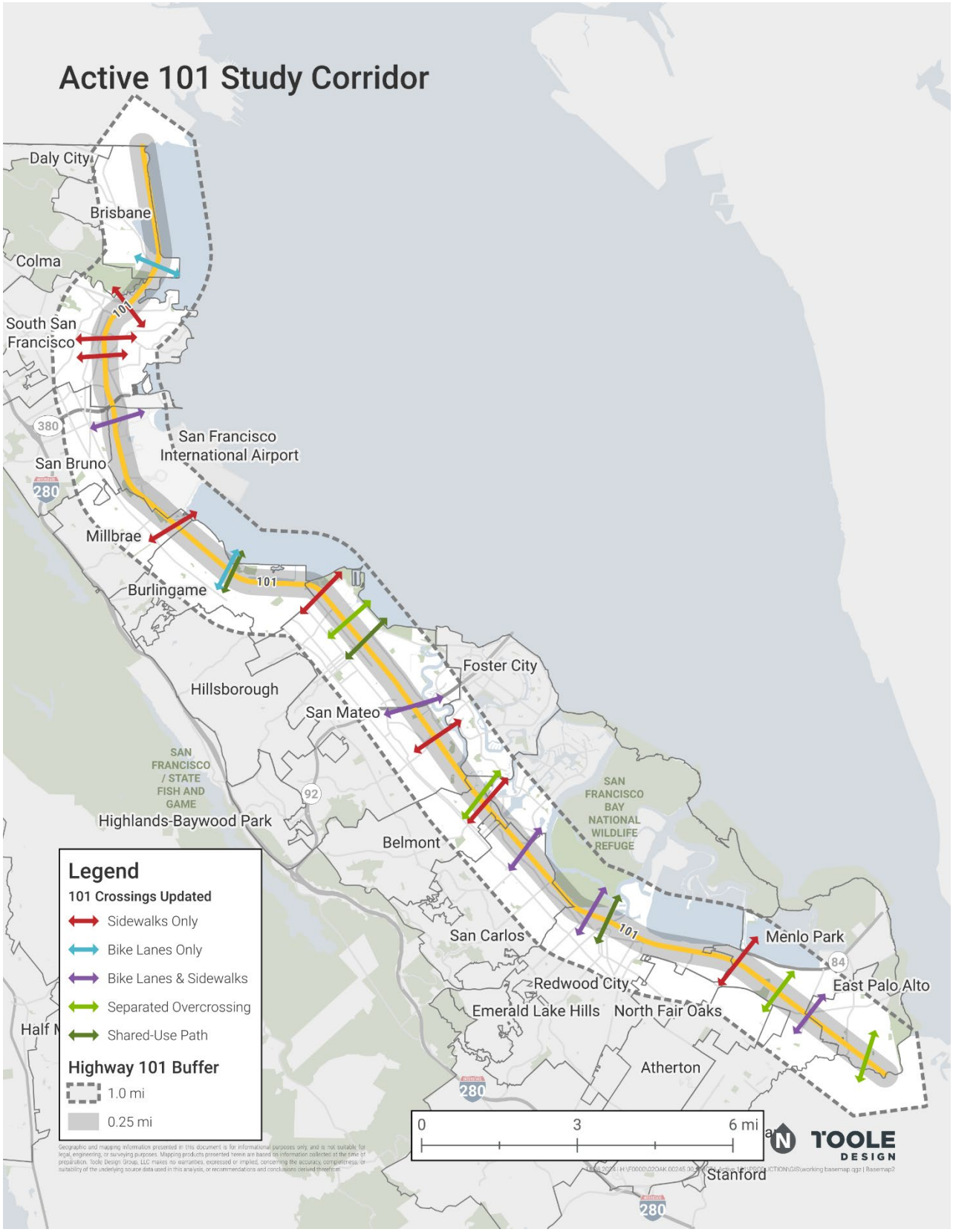


Table 1: Existing US 101 Crossings (Count = 25)

			Equity Factors		Safety and Comfort Factors			Access and Connectivity Factors
Crossing	City	Crossing Type	Transportation Based Priority Population	Equity Priority Community (EPC)	Bike Level of Traffic Stress (LTS)	Pedestrian High Injury Network (HIN)	Bicycle High Injury Network (HIN)	Does the crossing connect directly to a Ped Focus Area?
Sierra Point Parkway	Brisbane	Bicycle Only	No	No	3	No	No	No
Oyster Point Boulevard	South San Francisco	Pedestrian Only	No	Yes	4	No	No	No
Grand Avenue	South San Francisco	Pedestrian Only	Yes	Yes	4	Yes	Yes	Yes
Airport Boulevard	South San Francisco	Pedestrian Only	No	Yes	4	Yes	No	No
380/N Access Road	South San Francisco	No bicycle or pedestrian crossing	No	Yes	4	No	No	Yes
San Bruno Avenue	San Bruno	Pedestrian and Bicycle	Yes	No	4	Yes	No	Yes
Millbrae Avenue	Millbrae	Pedestrian Only	Yes	No	4	Yes	No	Yes
Broadway	Burlingame	Bicycle Only	Yes	No	4	No	No	Yes
Bayside Crossing	Burlingame	Pedestrian and Bicycle (Class I Shared Use Path)	Yes	No	2	No	No	Yes
Peninsula Avenue	San Mateo	Pedestrian Only	Yes	Yes	4	No	No	No
Monte Diablo Crossing	San Mateo	Pedestrian and Bicycle (Separated Overcrossing)	Yes	Yes	1	No	No	No
Third Avenue Bridge	San Mateo	Pedestrian and Bicycle (Class I Shared Use Path)	Yes	Yes	4	No	No	No
Fashion Island Boulevard	San Mateo	Pedestrian and Bicycle	Yes	No	4	No	No	Yes
East Hillsdale Boulevard	San Mateo/ Foster City	Pedestrian Only	Yes	No	4	Yes*	Yes	Yes
O'Neill Crossing	Belmont	Pedestrian and Bicycle (Separated Overcrossing)	No	No	2	No	No	Yes
Ralston Avenue	Belmont	Pedestrian Only	No	No	4	No	No	Yes
Holly Street	San Carlos	Pedestrian and Bicycle	No	No	4	No	Yes	No
Whipple Avenue	Redwood City	Pedestrian and Bicycle	No	No	4	No	No	Yes

			Equity Factors		Safety and Comfort Factors			Access and Connectivity Factors
Crossing	City	Crossing Type	Transportation Based Priority Population	Equity Priority Community (EPC)	Bike Level of Traffic Stress (LTS)	Pedestrian High Injury Network (HIN)	Bicycle High Injury Network (HIN)	Does the crossing connect directly to a Ped Focus Area?
Unnamed underpass from Convention Way to Bair Island Road	Redwood City	Pedestrian and Bicycle (Class I Shared Use Path)	No	No	0	No	No	Yes
Seaport Boulevard	Redwood City	No bicycle or pedestrian crossing	Yes	Yes	4	No	Yes	Yes
Marsh Road	Menlo Park	Pedestrian Only**	Yes	Yes	4	No	No	No
Unnamed overpass from Newbridge Street to Ringwood Avenue	Menlo Park	Pedestrian and Bicycle (Separated Overcrossing)	Yes	Yes	2	No	No	No
Willow Road	East Palo Alto	Pedestrian and Bicycle	No	Yes	4	No	Yes	No
University Avenue	East Palo Alto	No bicycle or pedestrian crossing	Yes	Yes	4	No	Yes	No
Clarke Crossing	East Palo Alto	Pedestrian and Bicycle (Separated Overcrossing)	Yes	Yes	2	No	No	No
		Total Count	15 = YES	13 = YES	19 = LTS ≥ 3	5 = YES	6 = YES	13 = YES
		Total Percent	60%	52%	76%	20%	24%	52%

*All segments of Hillsdale Boulevard approaching US 101, including the east and west segments, are on the Pedestrian High Injury Network. The actual segment that crosses US 101 is not on the pedestrian HIN, but it was classified as a “yes” because a person walking cannot cross on foot without traversing high-injury sections of Hillsdale.

Existing Bicycle Facilities

The 2021 C/CAG Comprehensive Bicycle and Pedestrian Plan provides an inventory of existing and proposed bicycle facilities in San Mateo County. Existing facilities are primarily Class III Bike Routes and Class II Bike lanes which, depending on the surrounding traffic context, may not be comfortable for riders of all ages and abilities. Figure 3 shows that as of 2021, there were 455 miles of designated bikeways built in San Mateo County: 116 miles of multi-use paths (Class I), 165 miles of bike lanes (Class II), 172 miles of signed bike routes (Class III), and just two miles of separated bike lanes (Class IV).[2] According to the 2021 C/CAG Bicycle and Pedestrian Plan, even in cities with a high concentration of bikeways, there continue to be prominent network gaps.

[2] 2021 C/CAG Comprehensive Bicycle and Pedestrian Plan

Figure 3: Existing Bicycle Facilities (C/CAG Bicycle and Pedestrian Plan, 2021)

Existing Bicycle Activity

Figure 4 shows an estimate of bicycle activity along the corridor, based on data from Replica. Replica is an activity-based travel demand model that uses big data sources to calculate multimodal travel activity. Replica's bicycle activity data for the study corridor is designated as having a "medium" level of confidence. Given the data confidence level, the Replica data has been applied as a high-level indicator only and should not be the basis for decision-making.

Figure 4 shows the number of bicycle trips originating in each census tract along the corridor during the Fall of 2023, normalized for the size of the census tracts. In short, this map shows which parts of the corridor are currently generating the most bike trips. At a high-level, the data suggests that bike trips are concentrated in the south and central segments of the corridor. Due to development and population patterns, trips typically originate on the west side of US 101, but there are a few key bike trip generators on the east side of US 101. also overlays existing bicycle and pedestrian crossings with bicycle activity. While no consistent pattern emerges, in some areas, the absence of bicycle crossings appears to correlate with lower bicycle activity. For instance, in South San Francisco, there is minimal bicycle activity within a mile of US 101, and there are no bicycle crossings available in the area.

The existing bicycle activity data indicates that there is demand, and need, for infrastructure projects that improve bicyclists' safety and comfort along the corridor, including crossing US 101. Additional US 101 crossings may induce demand for bicycle trips where ridership is currently low, such as in South San Francisco.

Potential Bicycle Activity

Understanding existing bicycle activity can help identify areas with existing demand for bicycle facilities. However, existing demand is not the only important factor when determining the need for bicycle infrastructure. Areas with low bicycle activity may suggest that the lack of facilities, or the poor quality of existing facilities, acts as a deterrent. It is important to assess the potential for increased bicycle ridership if safe and comfortable facilities are installed. To estimate the potential for increased bicycle ridership by converting vehicle trips to non-vehicular modes, short vehicle trips were assessed across the project area. Figure 5 shows the concentration of short vehicle trips along the corridor, based on Streetlight data. The density of short vehicle trips, those under two miles, was evaluated for each block group. The concentration of short trip density, like bicycle activity, is primarily found along the west side of US 101 in the south and central segments of the corridor. However, there are areas where low levels of bike activity coincide with high short trip density, such as San Bruno, Hillsborough, parts of San Mateo, and San Carlos. The low levels of bike activity in these areas, combined with the high density of short trips, suggest that the existing infrastructure may not be sufficient to support or encourage cycling. This indicates a greater need for improved and increased crossing opportunities in these areas.

Figure 4: Existing US 101 Crossings and Bicycle Activity (Replica, Fall 2023)

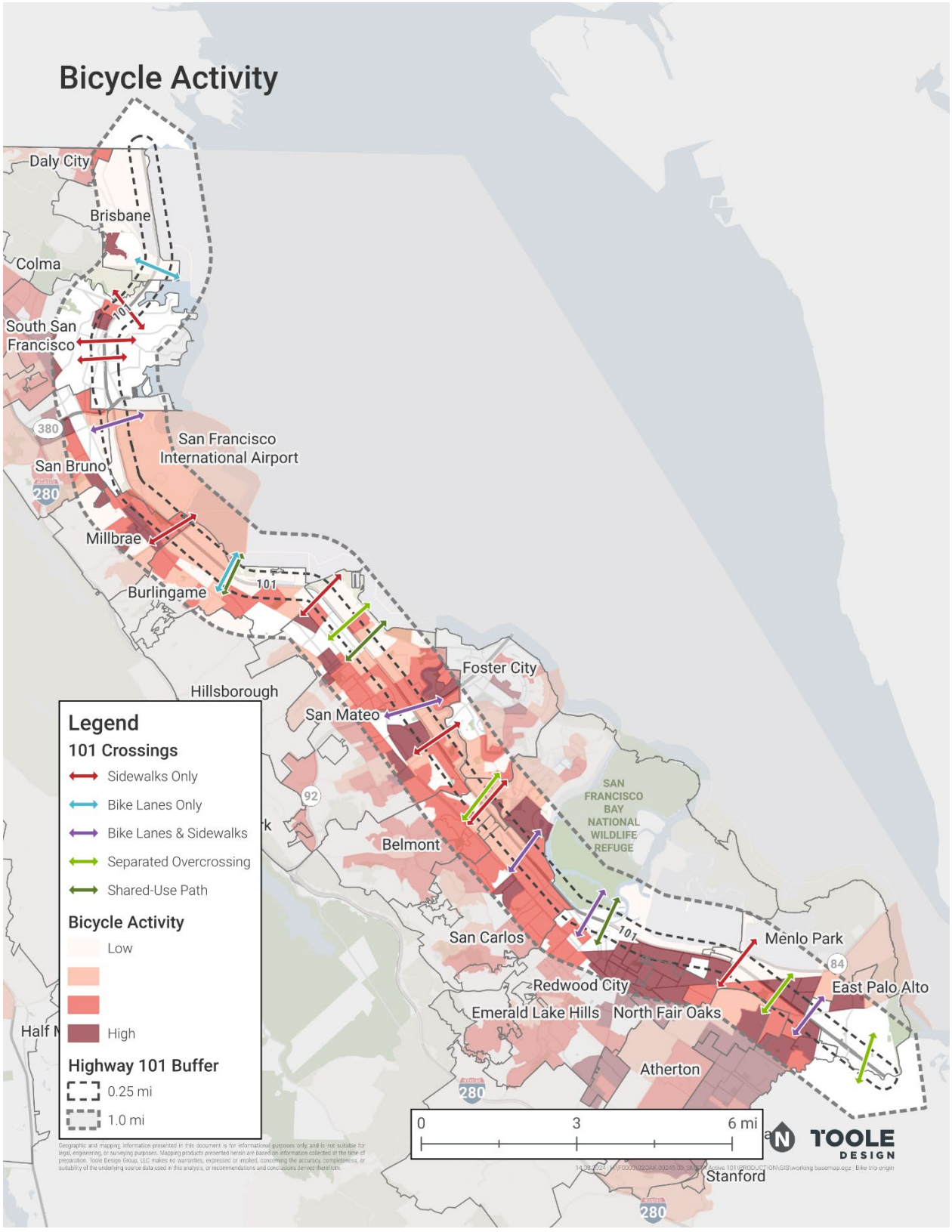
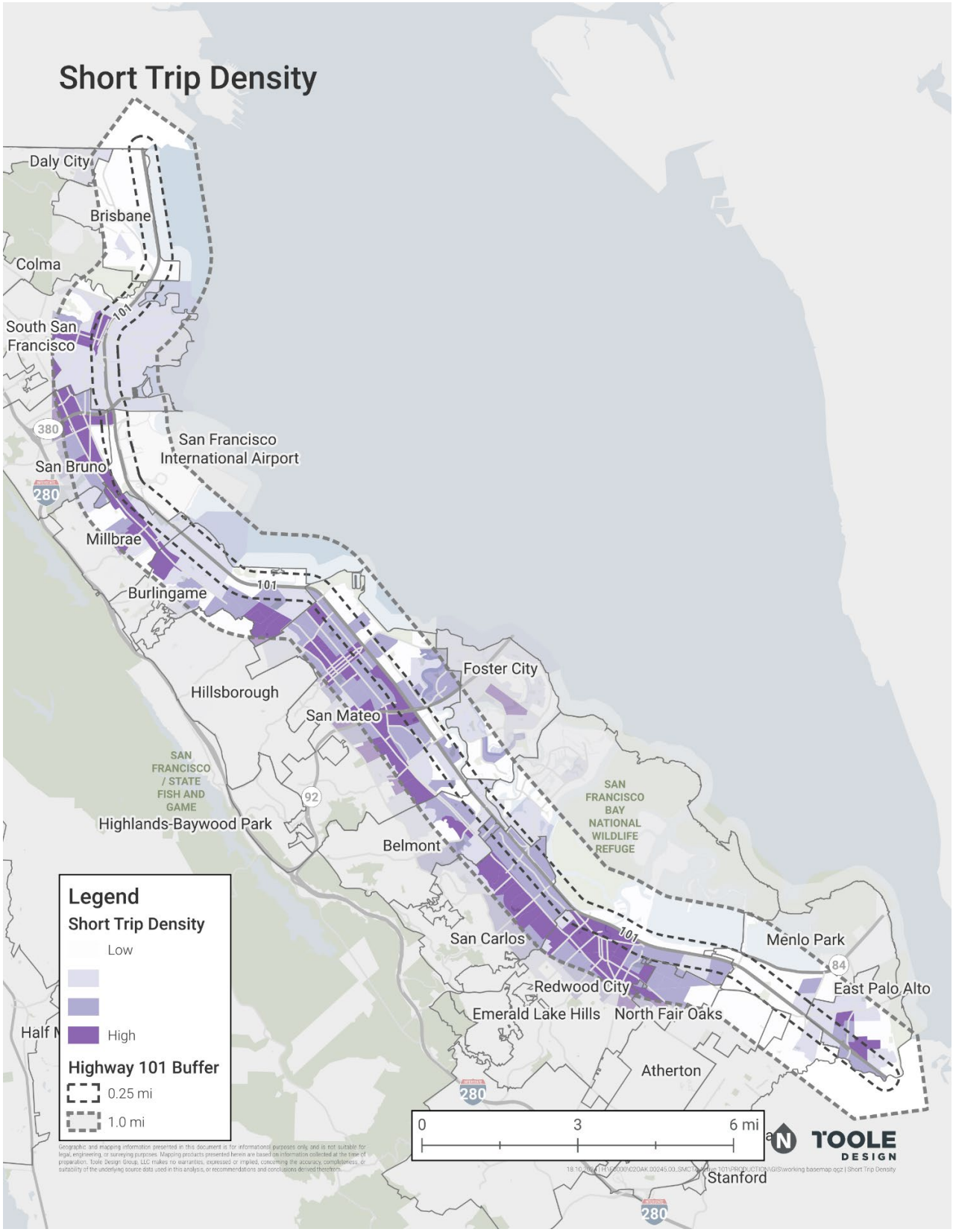


Figure 5: Short Trip Density Map (Streetlight Data, June 2022-May 2023)



Existing Pedestrian Activity and Focus Areas

In the 2021 C/CAG Comprehensive Bicycle and Pedestrian Plan Plan, Pedestrian Focus Areas were defined as regionally significant areas within the county that are likely to have the highest walking activity. They were identified using a combination of demographic metrics (population and job density); built environment metrics (density of commercial and entertainment destinations, transit accessibility, road network density); safety metrics (high crash locations); and San Mateo County policy metrics (Priority Development Areas and Equity Focus Areas). Figure 6 shows the metrics that were utilized to identify Pedestrian Focus Areas. The Pedestrian Focus Areas are not just an estimate of areas of high-pedestrian activity – they also represent policy priorities for the County. Figure 7 shows existing US 101 crossings, overlaid over the 2021 Pedestrian Focus Areas.

Figure 6: Graphic from C/CAG 2021 Bicycle and Pedestrian Master Plan detailing Pedestrian Focus Area Metrics

Pedestrian Focus Area Metrics		
Demographic Metrics	**Built Environment Metrics**	**San Mateo County-Specific Metrics**
Population density	Density of commercial and entertainment destinations	Priority Development Areas[7]
Employment density	Transit accessibility[8]	Equity Focus Areas
	Road network density[9]	
	High crash locations	

[6] **The full documentation on the PIE is available for download from Portland State University:** https://pdms.trec.pdx.edu/media/project_files/NITC_RR_1028_Transferability_Forecasting_of_PIE_For_Modeling.pdf
[7] **Designated by the Metropolitan Transportation Commission**
[8] **High frequency transit within ½ mile buffer of the stop**
[9] **Road network density is determined as the total miles of roadway per square miles and serves as a proxy for pedestrian connectivity**

To supplement the C/CAG Pedestrian Focus Areas, we also reviewed pedestrian activity estimates from Replica. Figure 8 shows Replica's estimates for existing pedestrian activity. For the purposes of this memo, pedestrian activity includes those using mobility aids, like wheelchairs. Replica's model suggests that pedestrian activity along the corridor follows similar patterns to bicycle activity. Pedestrian activity is concentrated in the central portion of the study area, including in the downtown and commercial areas of Millbrae, Burlingame, San Mateo, San Carlos, Redwood City, and North Fair Oaks. The existing crossings along the US 101 study area are fairly evenly distributed, but they do not seem to be concentrated in areas with the highest levels of pedestrian activity. This distribution indicates that the crossing locations may not align with the actual demand for pedestrian access, potentially leaving high-traffic areas underserved.

The Pedestrian Focus Areas generally validate the Replica Data. Both assume that pedestrian activity is largely concentrated on the west side of US 101 in cities like San Bruno, Burlingame, San Mateo, Belmont, Redwood City, and North Fair Oaks. Of the 20 pedestrian crossings, only 10 (50%) provide access directly to a Pedestrian Focus Area. This might indicate that additional crossings, concentrated in Pedestrian Focus Areas, are needed. It may also suggest that there are opportunities to improve the connections between Pedestrian Focus Areas and key pedestrian crossings.

Figure 7: Pedestrian Focus Areas (C/CAG Bicycle and Pedestrian Plan, 2021)

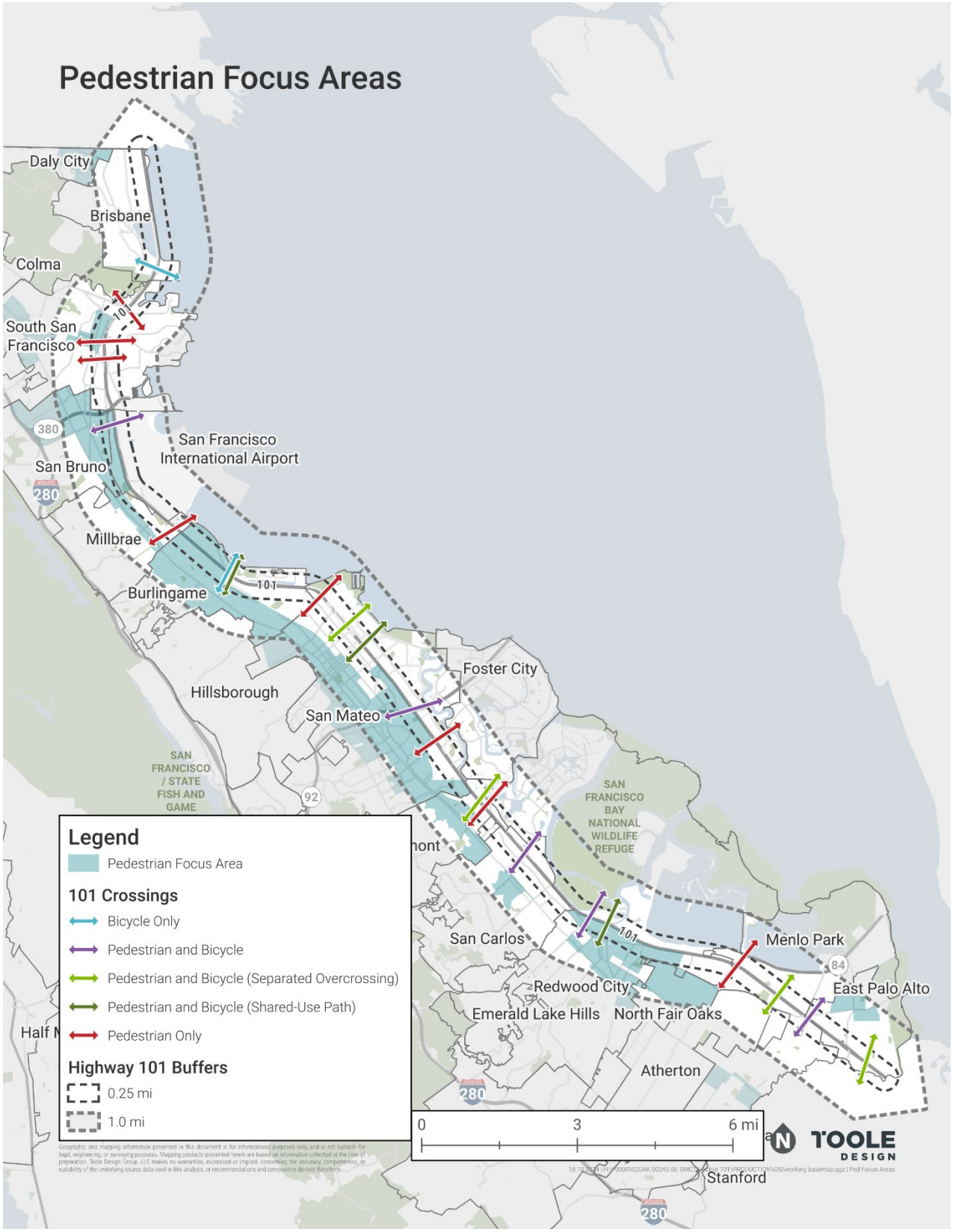
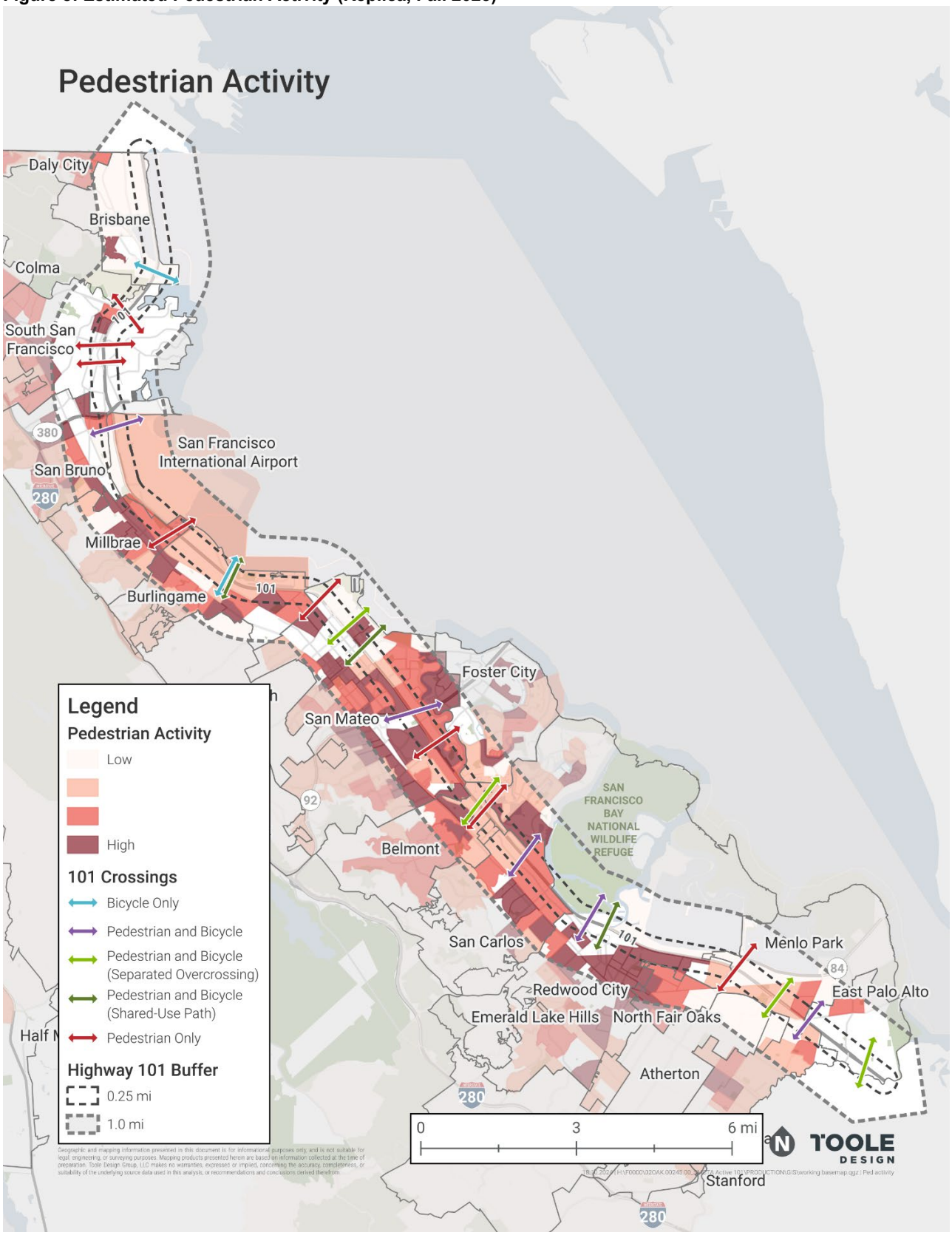


Figure 8: Estimated Pedestrian Activity (Replica, Fall 2023)



Bicycle and Pedestrian Destinations

Key Destinations and Short Trip Generators

Bicycle and pedestrian activity are closely connected to the proximity and concentration of key destinations. As the Pedestrian Focus Areas methodology shows, active travel is typically associated with areas of high population and employment density, as well as areas with a high concentration of commercial, recreational, and transit destinations. Figure 9 maps "short trip generators" – destinations that can generate clusters of pedestrian and bicyclist activity for trips that are typically less than half a mile. For the purposes of this analysis, short trip generators include transit centers and mobility hubs[3] (which account for Caltrain and BART stations), schools, parks, community centers, grocery stores, shops, and libraries.[4]

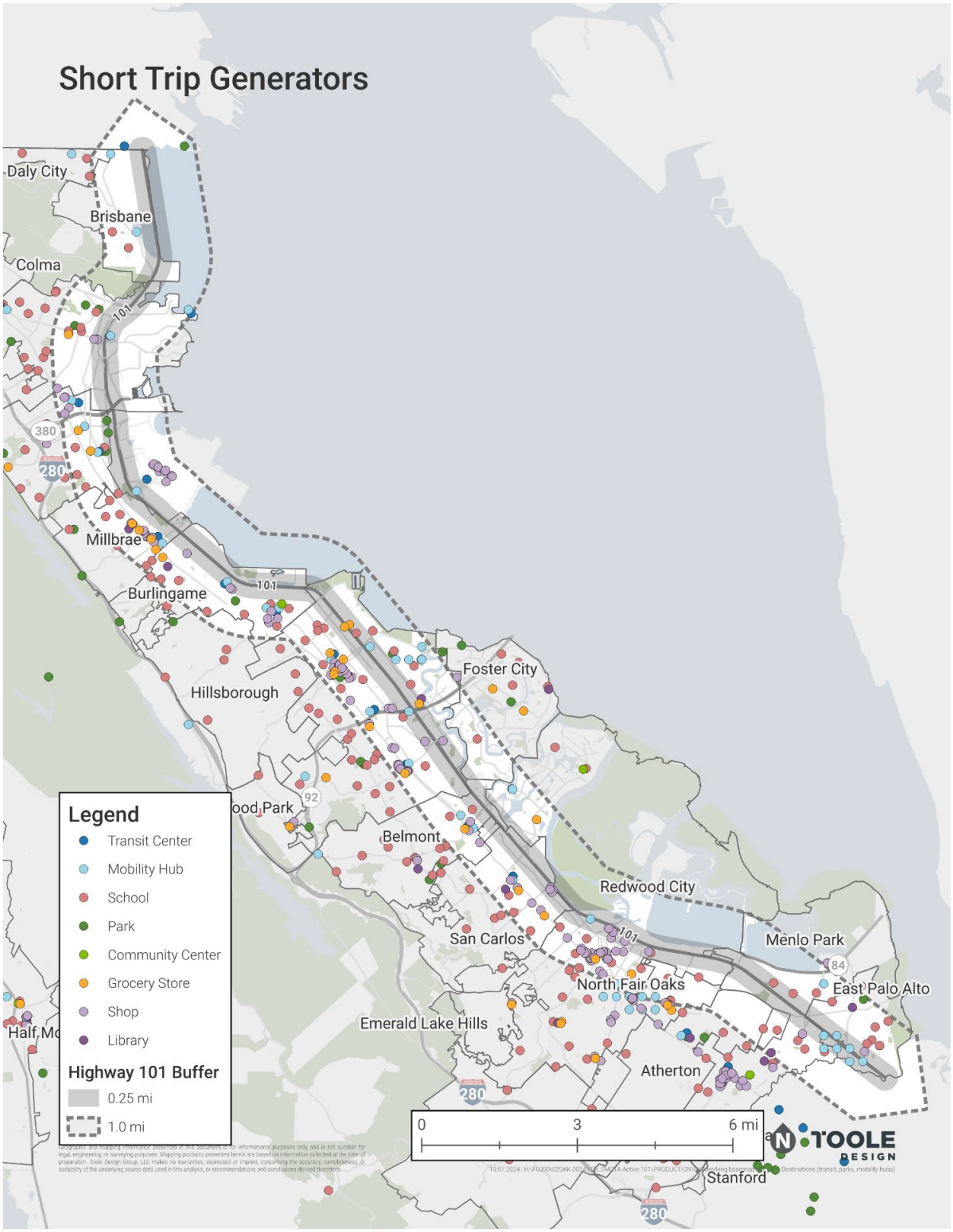
Due to development patterns, most short trip generators are concentrated on the west side of US 101. As a result, the burden of crossing US 101 falls largely on the few neighborhoods east of US 101, including neighborhoods in San Mateo, Foster City, and East Palo Alto. Residents of these neighborhoods likely need to cross 101 to reach key services like schools, transit, and grocery stores. Safe and comfortable crossings for people living east of US 101 are essential to their health, mobility, and quality of life.

Although activity is concentrated on the west side of US 101, Figure 9shows that there are clusters of short trip generators on the east side of the highway. The east side of US 101 is home to a high concentration of recreational destinations, including the Bay Trail, Bair Island, and Seal Point Park, which draw visitors from across San Mateo County and the Bay Area. Access to these world-class open space amenities, such as the Bay Trail, should not be limited to those with cars. Safe and comfortable bicycle and pedestrian crossings are essential to ensure that these shoreline amenities are accessible to all San Mateo County residents, regardless of where they live or how they travel.

[3] Mobility Hub data is provided by the Bay Area Metropolitan Transportation Commission (MTC). MTC defined Mobility Hubs as community anchors that enable travelers of all abilities to access multiple travel options - including shared scooters, bicycles and cars, and transit.

[4] Sources: Mobility hubs (MTC); Transit Centers (Caltrans); Schools (San Mateo County); Parks, Community Centers, Libraries, Grocery Stores, and Shops (Open Street Map [OMS])

Figure 9: Short Trip Generators (Multiple Sources) [*See Figures 11 and 12 for a heat map of short trip generators]*



Employment Centers

Employment centers are an important destination type, as they attract a significant number of people daily and create opportunities for walking and bicycling commute trips. To identify the employment centers along the US 101 corridor, we analyzed job density data published by the Center for Economic Studies at the U.S. Census Bureau. Using 2020 data, we calculated the number of jobs per acre for each block. To distinguish high job density areas from other areas, we applied a cut-off threshold based on best practices and a literature review.[5] Figure 10 shows that there are employment centers in most cities along the corridor, with major employment centers concentrated in South San Francisco, Burlingame, San Mateo, San Carlos, Foster City, and Redwood City.

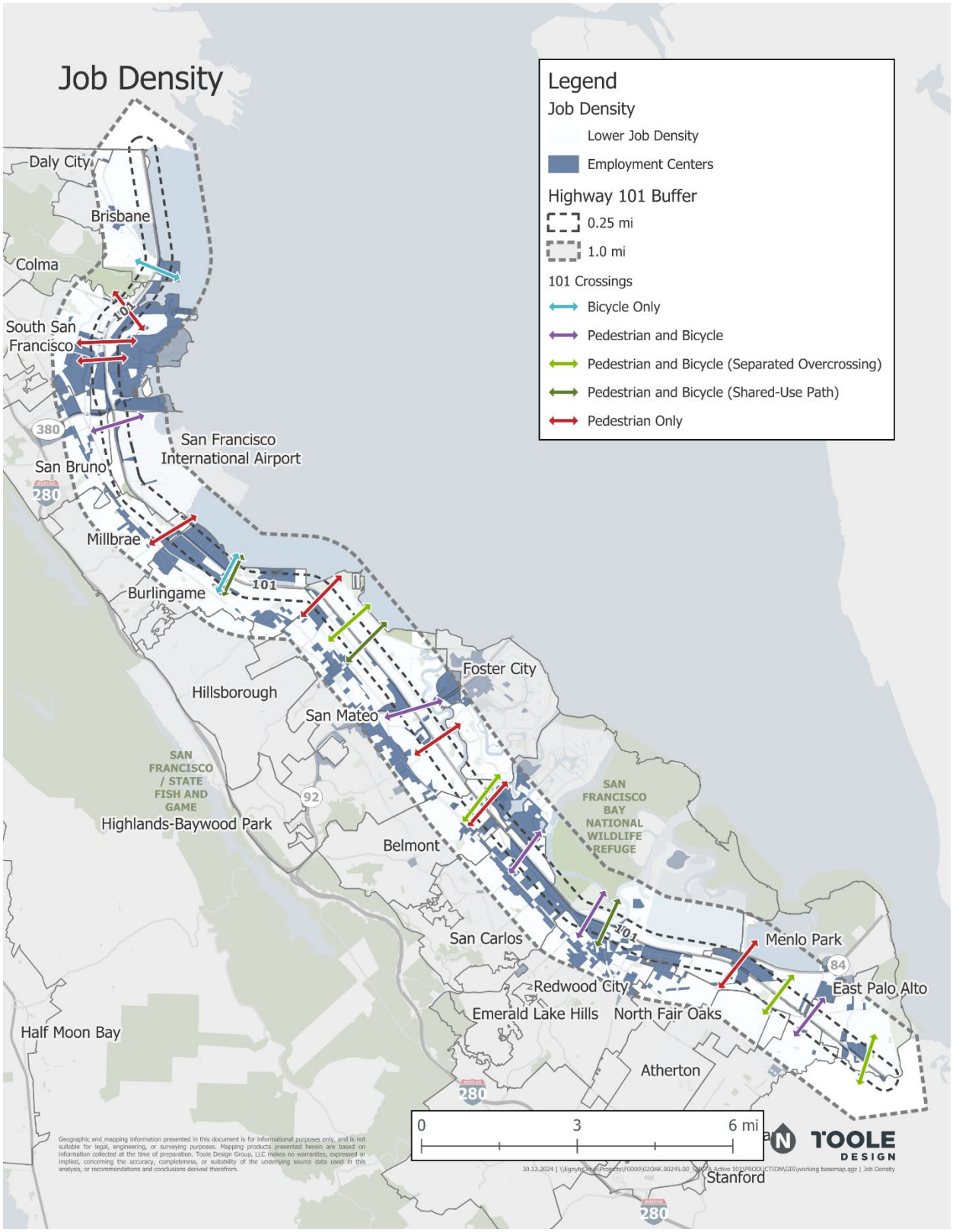
To understand the relationship between job centers and US 101 crossing opportunities, the project team overlaid the existing bicycle and pedestrian crossings on the employment center data. Closer analysis is required to understand the specific start and end points of each crossing, and their proximity to key employment destinations on each side of US 101. However, at a high level, Figure 10 illustrates that there are existing bike and/or pedestrian crossing opportunities to employment centers in South San Francisco, San Mateo, Belmont, San Carlos, Redwood City, and Menlo Park. These crossings need to be evaluated on a case-by-case basis to understand the safety and comfort conditions. Existing crossings might need improvements or upgrades to encourage people to use the crossings to bicycle or walk to work. For example, existing crossings at Marsh Road in Menlo Park and Fashion Island Boulevard in San Mateo have a Level of Traffic Stress [LTS] scores of 4, which is the least comfortable condition.

Figure 10 shows that in South San Francisco, Burlingame, San Mateo, Foster City, Belmont, and Menlo Park, and Burlingame, there are employment centers on the east side of 101. Strategically placed crossings could improve connections to and from these bayside employment hubs. In Belmont, Millbrae, and Burlingame, crossings are situated at the periphery of employment centers. This limits opportunities for employees to walk or bike to work, to lunch, or to other amenities like parks, retail areas, and residential neighborhoods.

As many companies transition back to in-office work, there is a growing need to create environments where employees can conveniently access their workplaces and other daily destinations. Encouraging bicycle and pedestrian commute trips to employment centers will require both investing in new crossings, and enhancing existing crossings to maximize safety, comfort, and convenience. It will also require ensuring safe and comfortable connections between existing residential and employment centers and the crossings that traverse US 101.

[5] Giuliano and Small's (1991) "ten jobs per acre" threshold was used. (SCAG) https://hub.scag.ca.gov/datasets/5a9796e44aba46f1b217af1b211ce2ac_1/about

Figure 10: Job Density overlaid with Pedestrian and Bicycle Crossings over 101 (Longitudinal Employer-Household Dynamics, 2020)



Bicycle and Pedestrian Safety and Comfort

The bicycle and pedestrian activity and destination data demonstrate clear demand for bicycle and pedestrian connections across US 101 throughout the study corridor. To better serve existing users, and to encourage San Mateo County residents to convert some of their short vehicular trips to bicycle and pedestrian trips, it is essential that bicycle and pedestrian facilities are safe and comfortable for people of all ages and abilities.

In San Mateo County at large, people walking and bicycling are disproportionately involved in severe and fatal crashes. According to the 2024 C/CAG San Mateo County Local Roadway Safety Plan (LRSP), between 2018 and 2022, pedestrians were involved in 13% of all injury crashes across the county but 23% of fatal/severe injury crashes. Similarly, bicyclists were involved in 13% of all injury crashes but 20% of fatal/severe injury crashes.[6] Nationwide, crashes involving a vehicle and bicyclist, or vehicle and pedestrian are more likely to result in a severe injury or fatality, because people walking and bicycling have no protection from impact. To protect these vulnerable road users, systemic safety principles require that we separate users in time and space.[7] Protected facilities that separate people walking and biking from cars are likely to reduce both the regularity and severity of bicycle and pedestrian collisions.[8]

Bicycle High Injury Network

The 2024 C/CAG San Mateo County Local Roadway Safety Plan (LRSP) created a High Injury Network (HIN) for bicyclists, pedestrians, and all modes. The bicyclist HIN represents where fatal and serious crashes involving bicyclists are concentrated. 12.6% of San Mateo County's Bicycle High Injury network falls within a quarter mile of US 101, even though the study area only accounts for 3% of the County's land area. Table 1 shows that six of the 25 US 101 crossings are on the bicycle HIN (24%). This indicates demand and need for investment in safe bicycle infrastructure within the vicinity of (and crossing) US 101.

Figure 11 shows the bicycle HIN overlaid with short trip density. A strong correlation is expected between the High Injury Network (HIN) and areas with a high density of short trip generators or increased bicycle activity. Increased bicycle activity often leads to greater exposure to vehicle conflicts, which can result in more collisions if infrastructure improvements are not made. This pattern is true in San Mateo, Redwood City, and Atherton, including Seaport Boulevard in Redwood City which is a key US 101 crossing.

When a street appears on the HIN despite relatively low concentration of destinations, it may indicate that the street is an important (or the only) connection between locations and that riders are using the street out of necessity despite exposure to traffic or lack of designated bicycle facilities. This pattern is observed along the following routes that cross US 101:

- Grand Avenue (South San Francisco)
- Hillsdale Boulevard (San Mateo/ Foster City) – also on the Pedestrian HIN
- Holly Street (San Carlos)
- Willow Road (Menlo Park)

[6] 2024 C/CAG San Mateo County Local Roadway Safety Plan (LRSP)

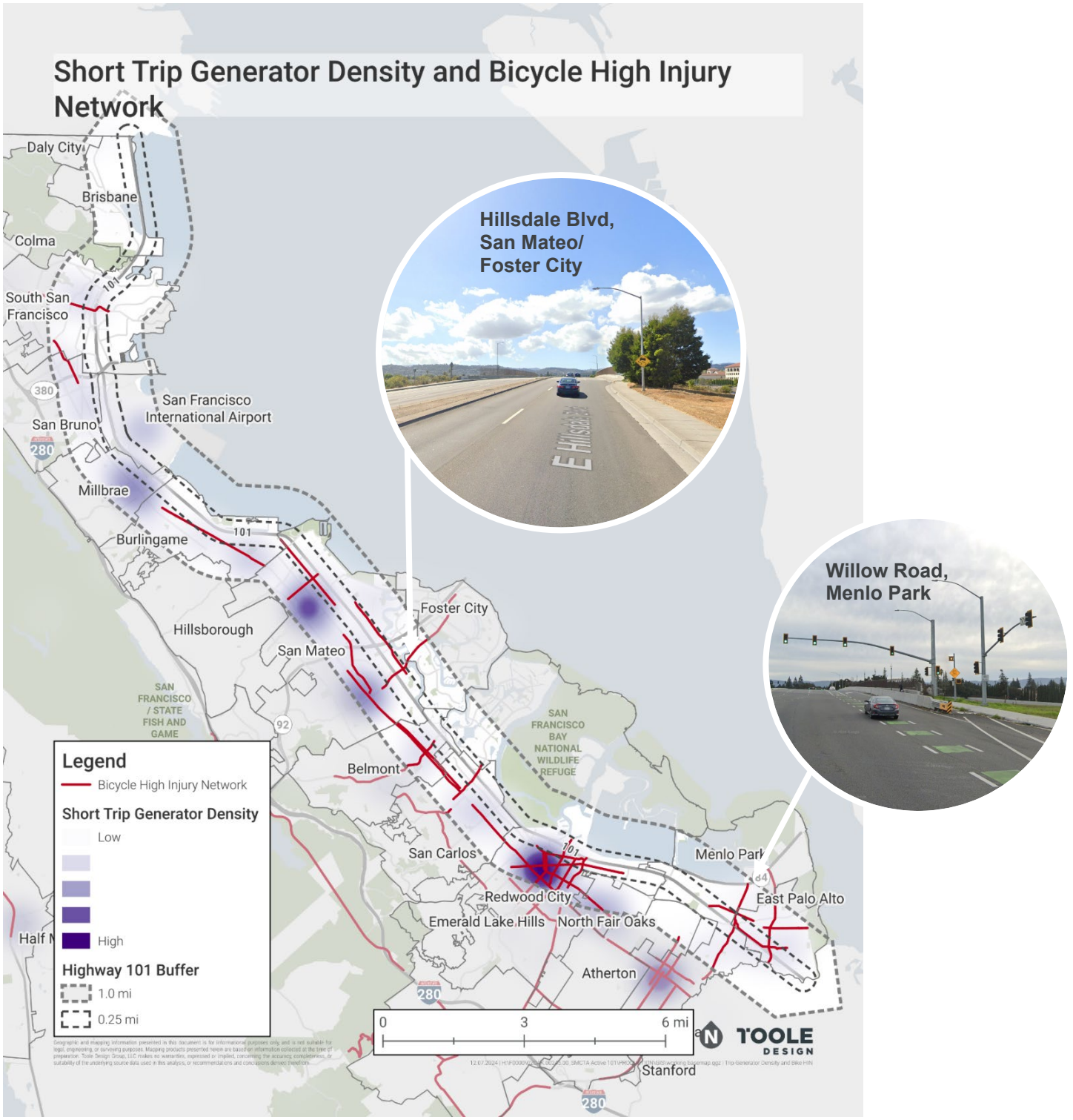
[7] https://visionzeronetwork.org/resources/demystifying-the-safe-system-approach/

[8] According the FHWA, converting traditional bicycle lanes to protected lanes can reduce crashes up to 53% (https://highways.dot.gov/safety/proven-safety-countermeasures/bicycle-lanes)

Willow Road in Menlo Park provides an interesting example as segments include Class IV protected bicycle facilities, but facilities leading up to the crossing are not fully protected, leaving bicyclists exposed (see the callout bubble on Figure 11).

Figure 11: Bicycle High Injury Network (C/CAG Local Roadway Safety Plan [LRSP], 2024)

This heat map is generated using the short trip generators shown in Figure 9.



Pedestrian High Injury Network

14.4% of San Mateo County's Pedestrian High Injury Network (HIN) falls within a quarter mile of US 101. Table 1 also shows that five of the 25 US 101 crossings are on the Pedestrian HIN. Most of those high injury segments lie west of US 101, with some notable exceptions in Foster City and East Palo Alto. The Pedestrian HIN map Figure 12 shows the association between exposure and collisions. Cities with a high concentration of short trip generators also have clusters of high pedestrian collisions. This is true in San Bruno, Millbrae, San Mateo, and Redwood City. In these areas, there is evidence of both *demand and need* for safer pedestrian routes, including crossing US 101.

Areas with a low density of short trip generators and high pedestrian injury rates may have significant safety challenges and warrant closer analysis. This pattern is observed in parts of South San Francisco, San Bruno, and East Palo Alto, including the following segments that fall within a quarter mile of US 101:

- Grand Avenue (South San Francisco) – also on the Bicycle HIN
- Hillsdale Boulevard (San Mateo/ Foster City) – also on the Bicycle HIN
- Brittan Avenue (San Carlos)
- Pulgas Avenue (East Palo Alto)
- Bay Road (East Palo Alto)

Combined Bicycle and Pedestrian High Injury Networks

Of the 25 US 101 crossings, two crossings are on both the bicycle and pedestrian High Injury Networks – Grand Avenue in South San Francisco and Hillsdale Boulevard in San Mateo/Foster City. Figure 13 shows that there are also key connector and parallel routes* within a quarter mile of US 101 that are on both the bicycle and pedestrian HINs:

- Huntington Avenue, where it crosses from South San Francisco into San Bruno. In South San Francisco, the Centennial Way Trail provides a fully separated parallel option but ends at the border of San Bruno.
- Humboldt Street and Monte Diablo Avenue in San Mateo, both of which are key connectors to the Monte Diablo separated overcrossing.
- A cluster of streets in Redwood City, including Veterans Boulevard, El Camino Real, Broadway, and Middlefield Road
- East Bayshore Boulevard in East Palo Alto, which runs parallel and directly adjacent to US 101.

**It should be noted that the Active 101 plan is not limited to crossings of US 101. The plan will inventory, evaluate, and prioritize key connector and parallel routes to address bicycle and pedestrian safety and comfort throughout the US 101 corridor.*

Figure 12: Pedestrian High Injury Network (San Mateo County Local Roadway Safety Plan [LRSP], 2024)

This heat map is generated using the short trip generators shown in Figure 9.

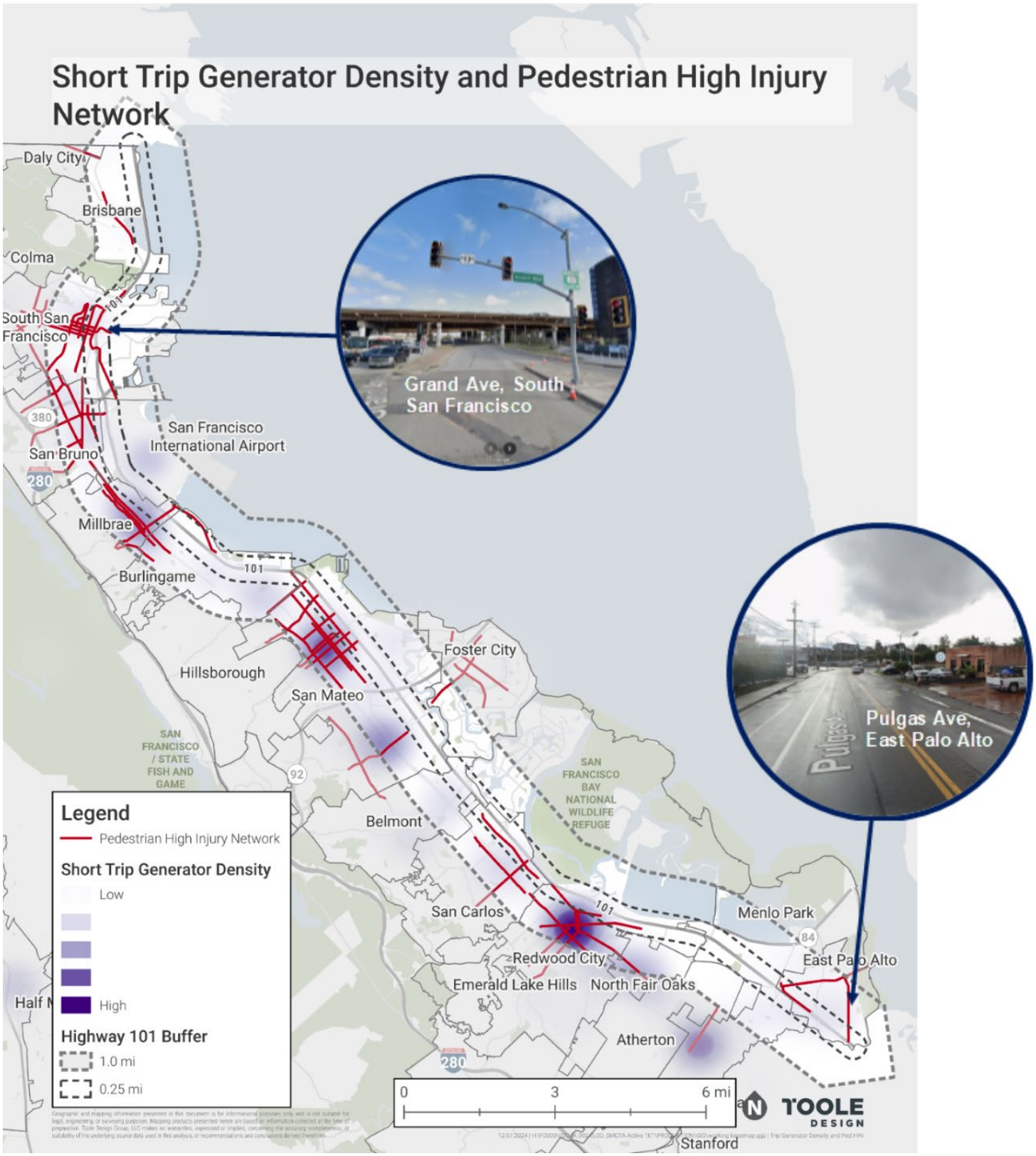
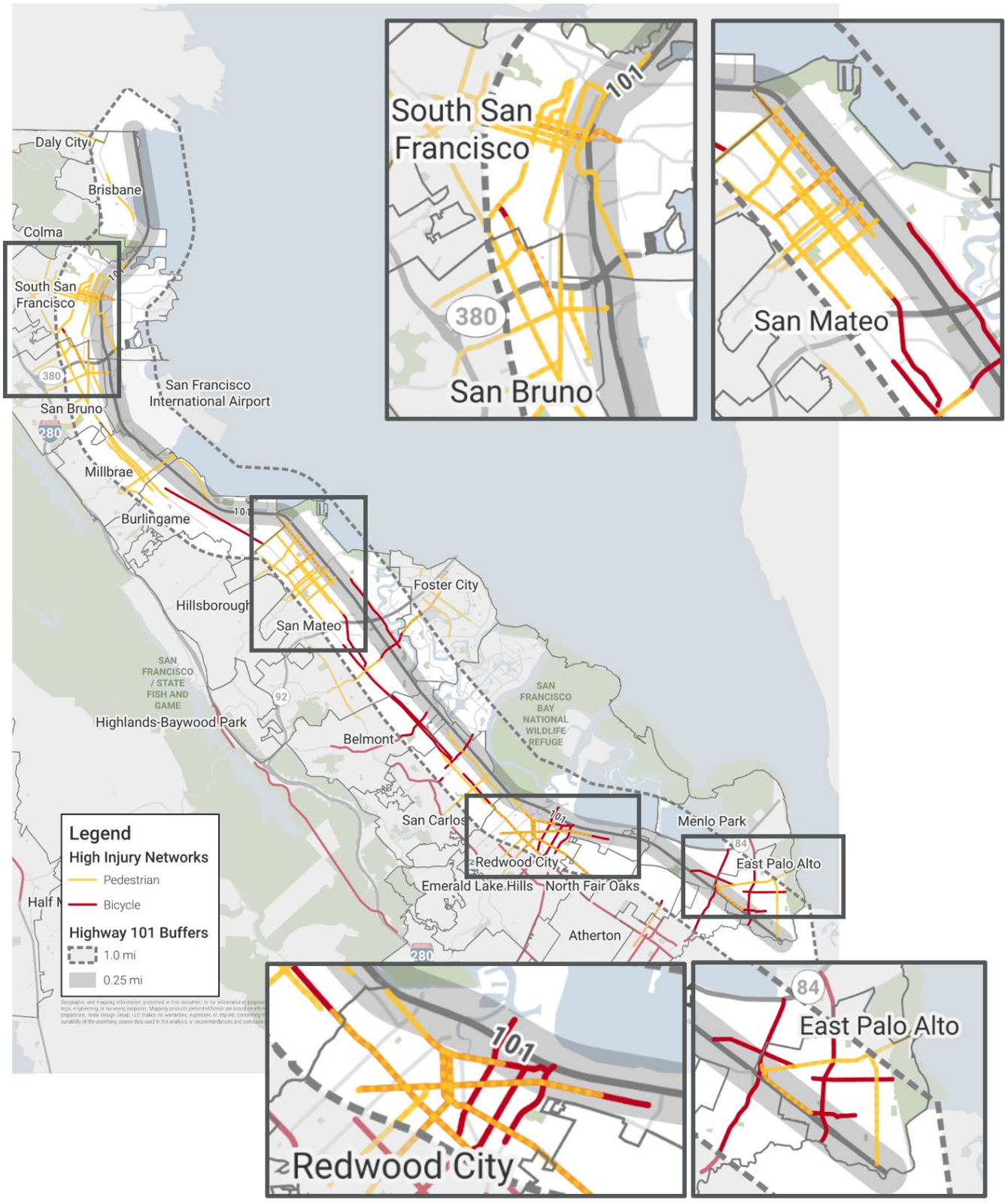


Figure 13: Bicycle and Pedestrian High Injury Networks (Overlay)



Bicycle Level of Traffic Stress

A history of collisions indicates a safety concern for people walking and bicycling but is not the only deterrent to using active modes. Comfort, or the lack of comfort (stress) is a critical determinant of whether people of all ages and abilities choose to walk or bicycle. Bicycle Level of Traffic Stress (LTS) is a rating given to a road segment to indicate how stressful it feels for the average bicyclist. The higher the level of traffic stress, the more uncomfortable a roadway is likely to be and the likelihood for cyclists to utilize the roadway is reduced. LTS is an index that combines factors related to interactions with other modes of travel, traffic controls, and geographic features. It assumes that a person's level of comfort on a bicycle increases as separation from vehicular traffic increases and as traffic volumes and/or speeds decrease.

Figure 14 shows Bicycle LTS for the roadways along the US 101 corridor, as calculated for the 2021 C/CAG Comprehensive Bicycle and Pedestrian Plan. LTS analysis shows that within a quarter mile of US 101, 52% of streets are considered high stress. Focusing specifically on US 101 crossings:

- Eighteen of the 25 crossings (72%) have an LTS score of 4 – the highest stress classification.
- All seven crossings that have traditional bike lanes (Class II or III) have an LTS score of 3 or 4, indicating that they are likely high stress for people biking.
- Typically, separated bicycle and pedestrian crossings have lower levels of bicycle stress (scores of 1 or 2). The Third Avenue Bridge in San Mateo is an exception with a bicycle LTS score of 4. This is likely because, despite physical separation from cars, the path runs directly between six high-speed, high-volume vehicular lanes (see callout bubble in Figure 14).
- The 3 crossings that have no bicycle or pedestrian access, all have an LTS score of 4 (including I-380/North Access Road in South San Francisco, Seaport Boulevard in Redwood City, and University Avenue in East Palo Alto). All of these crossings are located within Equity Priority Communities.

The data shows that although there are low stress residential roadways throughout the corridor, the most critical connections – including several key crossings of US 101 – are classified as "high stress". Given that there are limited crossing opportunities throughout the corridors, bicycle and pedestrian activity is concentrated in a few locations, resulting in a higher potential for conflict and higher stress. This indicates that there is a need for more modal separation and higher levels of protection at existing crossings that serve multiple modes.

The 2021 C/CAG Comprehensive Bicycle and Pedestrian Plan also found that residential streets in San Mateo County do not form a complete, connected network. People biking must use high stress arterials and collectors to get where they need to go.[9] The C/CAG Bicycle and Pedestrian Plan recommended further volume and speed studies for high-speed arterials but indicated that facilities with protection from vehicles (Class I paths and Class IV separated bike lanes) may be needed to create an all ages and abilities network.

[9] 2021 C/CAG Comprehensive Bicycle and Pedestrian Plan

Figure 14: Bicycle Level of Traffic Stress (C/CAG Bicycle and Pedestrian Plan, 2021)

Equity Considerations

In the United States, the negative externalities of highway construction – including pollution, noise, displacement, and physical disconnection from important amenities – have disproportionately impacted low-income communities and communities of color. According to the San Mateo US 101 Express Lanes Equity Study, the US 101 corridor "has played a critical role in imposing and maintaining racial and socioeconomic segregation in San Mateo County".[10] The following analysis explores some of the equity impacts of US 101, as they relate to walking and bicycling in San Mateo County.

Equity Priority Communities

The Metropolitan Transportation Commission's (MTC) Plan Bay Area 2050 identifies Equity Priority Communities (EPCs) census tracts that have a significant concentration of people who qualify as people of color, low incomes, limited English proficiency, zero-vehicle households, seniors 75 and over, people with disabilities, single-parent families, and those who are severely rent-burdened.[11] Identifying EPCs is a policy and decision-making tool and the MTC notes that funding and investment should be directed towards these neighborhoods to enable more equitable access to transportation, housing, and services. While both C/CAG and SamTrans have created custom county-specific equity analyses, this effort focuses on potentially larger projects that will need to leverage external regional and state opportunities. For this reason, county-specific sources were not evaluated.

Figure 15 shows the most recent MTC Equity Priority Communities[12] along the US 101 Corridor. EPCs along the corridor are concentrated in North Fair Oaks, East Palo Alto, and the eastern neighborhoods of South San Francisco, San Mateo, and Redwood City. In San Mateo County, Equity Priority Communities are disproportionately clustered around US 101 – although EPCs make up just 7.5% of the county's total land area, they cover 33.7% of the land within a quarter mile of US 101. According to the 2021 US 101 Mobility Action Plan, asthma rates are especially high at highway interchanges along US 101 where congestion tends to build up, meaning health impacts associated with auto congestion and air pollution disproportionately impact San Mateo's low-income residents and communities of color.

The San Mateo US 101 Express Lanes Equity Study found that EPCs along the US 101 corridor are experiencing multiple transportation inequities including high levels of bicycle and pedestrian fatalities or serious injuries, limited bicycle infrastructure, high transportation and housing costs, limited access to high-quality transit, and limited tree cover (an important factor for safe and comfortable active transportation on the peninsula).[13] Data from the county LRSP shows that although EPCs account for just 7.5% of the county's total land area, 12.6% of the county's bicycle High Injury Network and 14.4% of the county's pedestrian HIN are concentrated in Equity Priority Communities (Figure 15).

The concentration of EPCs east of US 101 means that EPC residents have a greater need to cross US 101 for critical trips, including access to food, recreation, and jobs. Table 1, which summarizes the existing US 101 crossings, shows that roughly half of all bicycle and pedestrian crossings in the study area are in EPCs (10 out of 22). These include four of the seven separated facilities (shared-use paths or grade-separated overcrossings). Notably, there are only three US 101 crossings that do not have any bicycle or pedestrian facilities and all three

[10] San Mateo US 101 Express Lanes Equity Study, Page 1

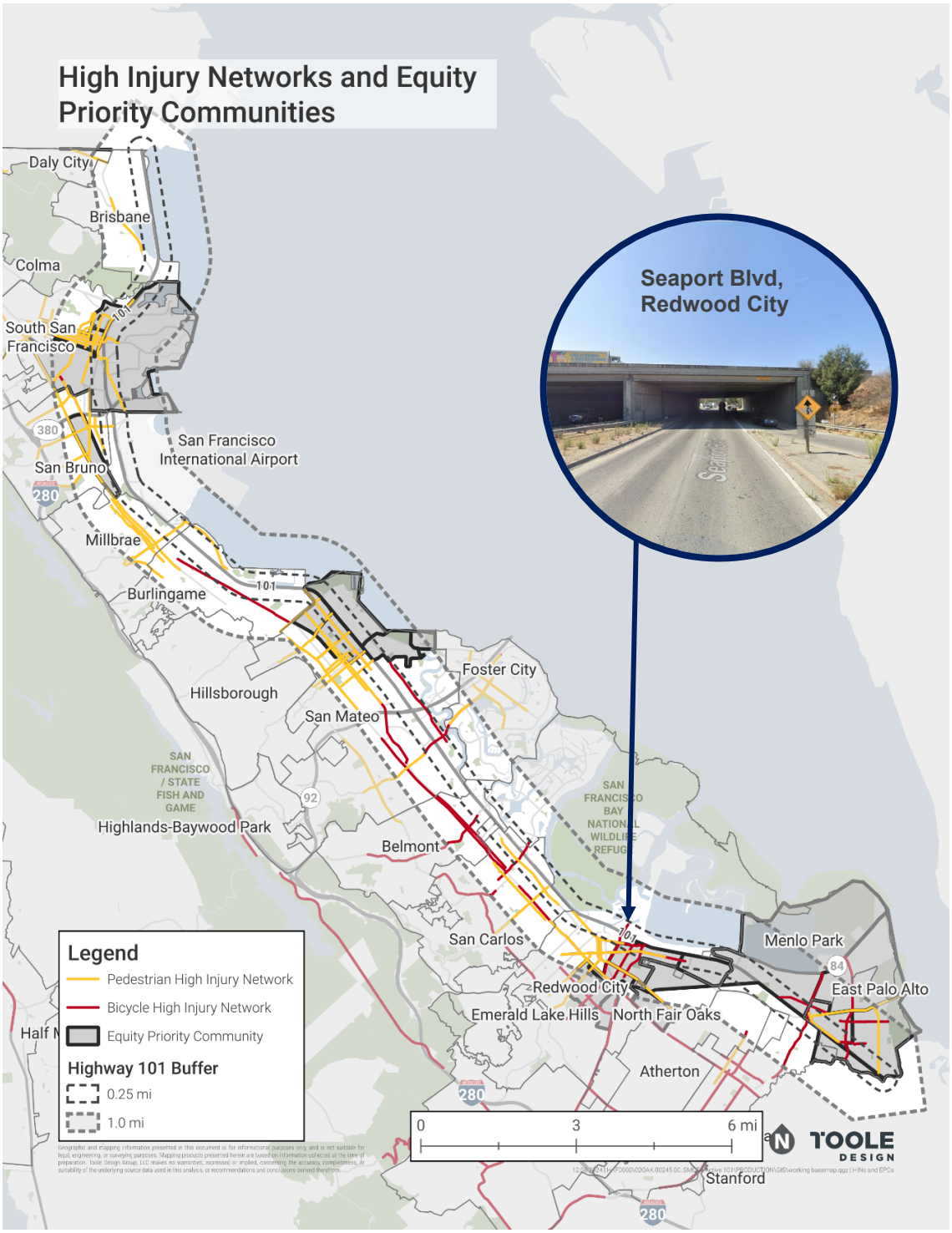
[11] https://bayareametro.github.io/Spatial-Analysis-Mapping-Projects/Project-Documentation/Equity-Priority-Communities/

[12] At the time of publication (August 2024), MTC was in the process of updating the EPC boundaries, but new boundaries were not available for this analysis.

[13] San Mateo US 101 Express Lanes Equity Study, Page 3

are in EPCs (I-380/North Access Road in South San Francisco, Seaport Boulevard in Redwood City, and University Avenue in East Palo Alto). However, improvements at University Avenue are underway. In late 2023, construction began on the *US 101 / University Avenue Interchange Improvements* project which will add a grade-separated overcrossing over US 101, just north of University Avenue.

Figure 15: Equity Priority Communities and Bicycle High Injury Network

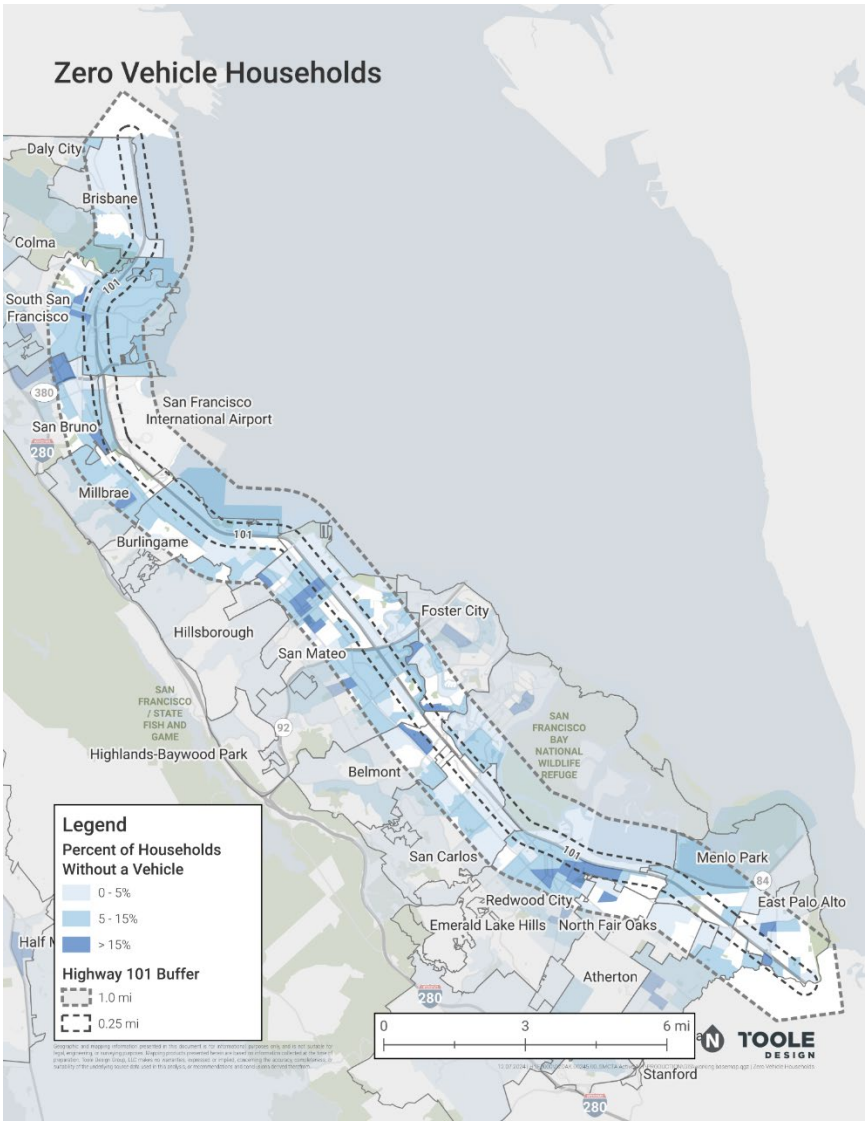


Zero Vehicle Households

The percentage of households without access to a vehicle is a key indicator of transportation insecurity. Zero vehicle households are more reliant on walking, biking, and transit. The San Mateo US 101 Express Lanes Equity Study found that people in EPCs around US 101 are more likely to depend on transit (5% compared to 3% countywide).[14] Lack of a vehicle is one of the factors that determines an Equity Priority Community (EPC), and in San Mateo County, EPCs are clustered within the study area (Figure 16). Thus, disadvantaged communities in the study area are more likely to be reliant on transit, bike, and pedestrian access to reach key destinations. As documented throughout this memorandum, there are limited safe and comfortable opportunities to cross US 101 for people walking and bicycling (including those walking to transit stops). The burden of traversing high-collision crossings is concentrated not only among people living in EPCs, but particularly those residents who do not have access to a car. EPC residents without cars may walk or bicycle to critical destinations out of necessity, even if the infrastructure does not provide safe or comfortable passage.

To improve transportation equity in San Mateo County it will be critical to invest in crossing enhancements and additions that serve EPC residents, particularly those without vehicles.

Figure 16: Zero Vehicle Households (Census ACS 2022)



[14] San Mateo US 101 Express Lanes Equity Study, Page 3

Caltrans Transportation Equity Index (EQI)

The Caltrans Transportation Equity Index (EQI) is a new (2024) dataset for analyzing transportation equity in California communities. The index identifies "transportation-based priority populations": low-income or Indigenous communities that have higher-than-average exposure to vehicle traffic and collisions, and lower-than-average access to key destinations. **Error! Reference source not found.** shows the results of the Caltrans EQI in the study area. If a census block meets either the low-income household[15] or Tribal Land criteria, the block is indicated on the map under "demographic overlay" and included for further analysis with the remaining three indicators:

1. **Access to Destinations:** Census blocks that meet the demographic overlay criteria and have the greatest gaps in multimodal access to destinations.
2. **Traffic Exposure:** Census blocks that meet the demographic overlay criteria and are the most burdened through high exposure to traffic and crashes.
3. **Transportation-Based Priority Populations:** Census blocks that meet the demographic overlay criteria and have both the lowest access to destinations and the highest exposure to traffic and collisions.

More detail on the index methodology is available on the Caltrans EQI website.

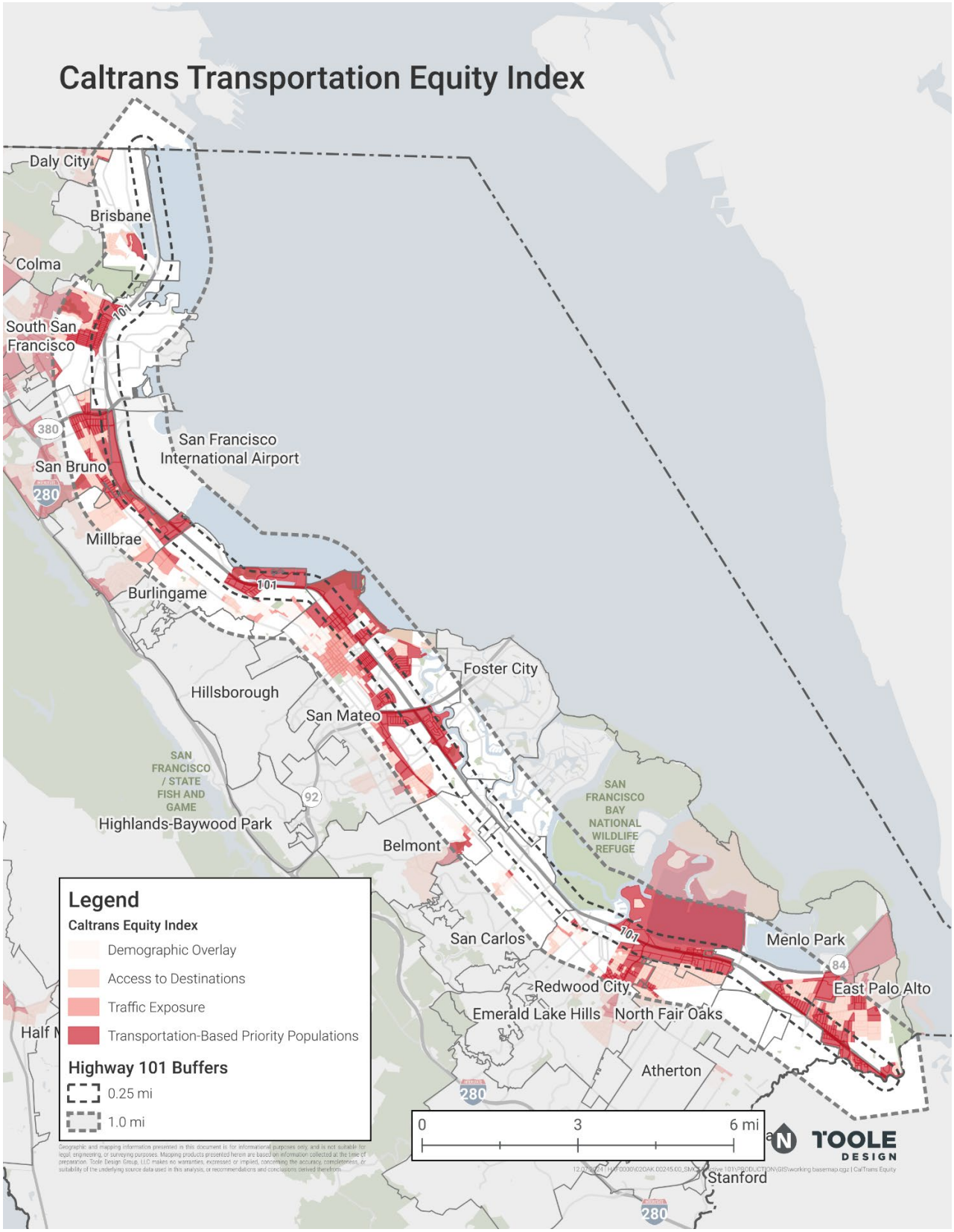
There is a significant overlap between Equity Priority Communities and Transportation Based Priority Populations. The benefit of including the EQI in this analysis is that it provides a transportation-specific measure of inequities along the US 101 corridor, in addition to more specifically identifying the challenges for each community. For example, downtown San Mateo is classified as having high traffic exposure but does not have challenges related to access to destinations. Communities east of US 101 – particularly North Fair Oaks and East Palo Alto – are especially burdened by a lack of multimodal access to destinations. In those same communities, proximity to US 101 adds the burden of traffic exposure and acts as a barrier to key destinations west of the highway.

The summary of crossings in Table 1 shows that fifteen of the existing 25 US 101 crossings are in, or directly connected to, a Transportation Based Priority Population (60%). Of those, five are fully separated facilities (shared-use paths or overcrossings). Seaport Boulevard in Redwood City and University Avenue in East Palo Alto, which do not currently have any bicycle or pedestrian facilities, are in TBPP-designated areas, as well as EPCs.

Throughout the corridor, the burdens of exposure to traffic are highest within a quarter mile of the highway, indicating that there is a need for new or enhanced crossings within a quarter mile of US 101.

[15] "A Census block group was designated as a 'low-income' community if either 1) its median household income was at or below 80% of the statewide median household income, OR 2) its median household income was at or below the 2021 county low-income limits established by the California Department of Housing and Community Development. If either criterion was met, the block group was identified as a low-income community and screened for inclusion for the Demographic Overlay." – See Caltrans Storymap for more details.

Figure 17: Caltrans Transportation Equity Index (EQI), 2024



Conclusion and Next Steps

In San Mateo County, US 101 functions as an important local and regional connector, but also creates significant challenges for bicycle, pedestrian, and transit mobility and access along the 26-mile corridor. The highway creates a physical barrier between neighborhoods and key community destinations on both sides of the highway. Crossing US 101 as a pedestrian or bicyclist typically requires using high-stress and high-collision streets, except for a few separated bicycle and pedestrian bridges. Even at the most protected crossings, accessing them usually involves navigating high-speed, high-volume arterials and connector streets. These burdens are disproportionately felt by communities on the east side of the highway, and among equity priority communities throughout the corridor.

The Active 101 project team will build on this initial assessment of pedestrian and bicycle conditions to develop a methodology for prioritizing projects that have the greatest chance of improving mobility and access for pedestrians, bicyclists, and transit users at crossings and intersections within a quarter mile of US 101. Key data from this memorandum will be integrated into a prioritization methodology that considers safety, comfort, connectivity, and equity. The prioritization may also consider qualitative factors like regional significance and project readiness. Once projects are prioritized, the project team will conduct community engagement to get input and calibrate the prioritized list, and will then develop conceptual designs for the top priority projects.