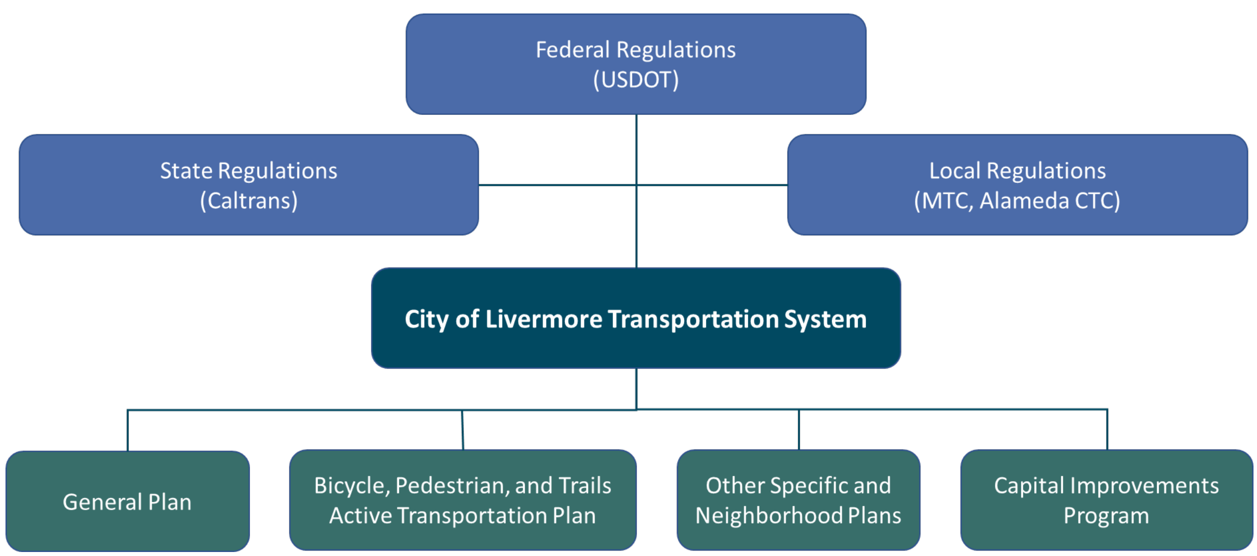
7. Circulation

This chapter describes the regulatory framework and existing circulation system in Livermore. It describes and illustrates the mobility network and provides guidelines that will support and complement existing and planned development.

7.1 REGULATORY FRAMEWORK

The 2003-2025 Livermore General Plan, along with a variety of regional, state and federal plans, legislation, and policy directives, provide guidelines for the safe operation of streets and transportation facilities in Livermore. While the City has primary responsibility for the maintenance and operation of transportation facilities within the city, City staff also works on a continual basis with responsible regional, state, and federal agencies including the Alameda County Transportation Commission (Alameda CTC), the Metropolitan Transportation Commission (MTC), the California Department of Transportation (Caltrans), the Federal Highway Administration (FHWA), and others, to maintain, improve, and balance the competing transportation needs of the community and the region as shown in Figure 7-1.

FIGURE 7- 1 REGULATORY FRAMEWORK



7.1.1 FEDERAL AGENCIES AND REGULATIONS

Federal Highway Administration

The Federal Highway Administration (FHWA) is an agency within the U.S. Department of Transportation that supports State and local governments in the design, construction, and maintenance of the Nation's highway system through the Federal Aid Highway Program. Federal funding for roads, bridges, and mass transit is provided through the Infrastructure Investment and Jobs Act (IIJA), also known as the "Bipartisan Infrastructure Law".

Americans with Disabilities Act

The Americans with Disabilities Act of 1990 (ADA) provides comprehensive rights and protections to individuals with disabilities. The goal of the ADA is to assure equality of opportunity, full participation, independent living and economic self-sufficiency. To implement this goal, the United States Access Board has created accessibility guidelines for public rights-of-way. The guidelines address various issues, including roadway design practices, slope and terrain issues, pedestrian access to streets, sidewalks, curb ramps, street furnishings, pedestrian signals, parking, and other components of public rights-of-way.

7.1.2 STATE REGULATIONS

California Department of Transportation (Caltrans)

Caltrans is the primary state agency responsible for transportation issues. One of its duties is the construction and maintenance of the state highway system. Caltrans has established standards for roadway traffic flow and developed procedures to determine if State-controlled facilities require improvements. For projects that may physically affect facilities or require access to a state highway, Caltrans requires encroachment permits before such activity may be undertaken. For projects that would not physically affect facilities but may influence traffic flow and levels of services at such facilities, Caltrans may recommend measures to mitigate the traffic impacts of such projects[1].

Additionally, the following Caltrans procedures and directives are relevant to transportation improvements in Livermore:

- **Level of Service Target.** Caltrans maintains a target level of service at the transition between the level of service (LOS) C and LOS D for all of its facilities. Where an existing facility is operating at less than the LOS C/D threshold, the existing measure of effectiveness should be maintained.
- **Caltrans Project Development Procedures Manual.** This manual outlines pertinent statutory requirements, planning policies, and implementing procedures regarding transportation facilities. It is continually and incrementally updated to reflect changes in policy and procedures. For example, the most recent revision incorporates the Complete Streets policy from Deputy Directive 64-R1, which is detailed below.

[1] California Department of Transportation (Caltrans). (2002). *Guide for the Preparation of Traffic Impact Studies.* Retrieved from https://nacto.org/docs/usdg/guide_preparation_traffic_impact_studies_caltrans.pdf

- **Caltrans Deputy Directive 64 (2001).** This directive requires Caltrans to consider the needs of non-motorized travelers, including pedestrians, bicyclists, and persons with disabilities, in all programming, planning, maintenance, construction, operations, and project development activities and products. This includes incorporation of the best available standards in all of the Department’s practices.
- **Caltrans Deputy Directive 64-R1 (2014).** This directive requires Caltrans to provide for the needs of travelers of all ages and abilities in all planning, programming, design, construction, operations, and maintenance activities and products on the state highway system. Caltrans supports bicycle, pedestrian, and transit travel with a focus on “complete streets” that begins early in system planning and continues through project construction and maintenance and operations.
- **Caltrans Director’s Policy 22 (2001).** This policy establishes support for balancing transportation needs with community goals. Caltrans seeks to involve and integrate community goals in the planning, design, construction, and maintenance and operations processes, including accommodating the needs of bicyclists and pedestrians.
- **Environmental Assessment Review and Comment.** Caltrans, as a responsible agency under the California Environmental Quality Act (CEQA), is available for early consultation on a project to provide guidance on applicable transportation analysis methodologies or other transportation related issues and is responsible for reviewing the traffic impact study for errors and omissions pertaining to the state highway facilities. Caltrans published the Guide for the Preparation of Traffic Impact Studies (December 2002), which established the Measures of Effectiveness as described under “Level of Service Target” above. The Measures of Effectiveness is used to determine significant impact on state facilities. The Guide also mandates that the traffic analysis includes mitigation measures to lessen the potential project impacts on state facilities and the project’s fair share responsibility for the impacts. However, the ultimate mitigation measures and their implementations are to be determined upon consultation between Caltrans, the City and the project proponent.

California Complete Streets Act

The term “Complete Streets” refers to a balanced, multimodal transportation network that meets the needs of all users of streets-- including bicyclists, children, and persons with disabilities, motorists, movers of commercial goods, pedestrians, public transportation, and seniors. A “Complete Street” is one that provides safe and convenient travel in a manner that is suitable to the local context.

The California Complete Streets Act mandates any substantive revision of the circulation element of a city or county’s general plan to identify how they will safely accommodate the circulation of all users of the roadway including transit riders, pedestrians, bicyclists, individuals with disabilities, and seniors as well as motorists. A key goal of the General Plan update is to review and, where necessary, modify the City’s current circulation network plan and policies to ensure that “complete streets” are provided.

Provision of safe mobility for all users, including motorists, bicyclists, pedestrians and transit riders, contributes to the Caltrans’s vision: "improving mobility across California". The successful long-term implementation of this policy is intended to result in more options for people to go from one place to another, less traffic congestion and greenhouse gas emissions, more walkable communities (with healthier, more active people), and fewer barriers for older adults, children, and people with disabilities.

Economically, complete streets can help revitalize communities, and they can give families the option to lower transportation costs by using transit, walking or bicycling rather than driving to reach their destinations. Caltrans is actively engaged in implementing its complete streets policy in all planning, programming, design, construction, operations, and maintenance activities and products on the State Highway System[2].

Vehicle Miles Traveled and Transportation Performance Metrics

The California legislature passed Senate Bill (SB) 743 in 2013 that requires changes to the California Environmental Quality Act (CEQA) regarding the analysis of transportation impacts. Traffic impact criteria and transportation performance standards in most cities have typically focused on motor vehicle level of service (LOS) as the primary criterion. LOS is an analysis methodology that assesses the performance of roadways based on average motor vehicle delay at intersections. The use of motor vehicle delay to analyze traffic impacts for CEQA purposes was originally based on the assumption that reducing delay to automobiles would thus reduce the pollution caused by idling gasoline intersections. However, the longtime emphasis on reducing automobile delay when evaluating environmental impacts under CEQA had the effect of often resulting in wide intersections with high levels of traffic capacity that ultimately serve as barriers to walking and bicycling and conflicting with quality of life and urban design goals. That emphasis on traffic capacity ultimately came to be viewed as contributing to increased rates of motor vehicle travel throughout the state, which ultimately produces higher levels of air pollution due to the total volume of motor vehicle travel, when expressed on a "vehicle miles traveled" (VMT) basis.

SB 743 requires the Governor's Office of Planning and Research (OPR) to amend the CEQA Guidelines to provide a revised method to LOS for evaluating transportation impacts. The City of Livermore is currently developing VMT thresholds and standards to comply with SB 743. Preliminary guidelines from OPR in 2014 recommended that VMT be the primary transportation performance metric for evaluating environmental impacts statewide. The most recent Guidelines and Technical Advisory documents were issued by OPR in December 2018[3] . Key recommendations described in the OPR guidelines include:

- VMT is to be the primary performance metric for evaluating transportation impacts across California. Implementation can be phased in over time, up until a statewide deadline of July 1, 2020 for local jurisdictions to update their impact thresholds.
- Land use development near transit or in VMT-efficient areas should be presumed to cause a less than significant transportation impact.
- Transit, active transportation, and rehabilitation projects that do not add motor vehicle capacity should also be presumed to cause a less than significant impact.

[2] Caltrans. (2021). Complete Streets. California Department of Transportation. Retrieved from https://dot.ca.gov/-/media/dot-media/programs/sustainability/documents/dp-37-complete-streets-a11y.pdf

[3] Office of Planning and Research (2018). Transportation Impacts (SB 743) Retrieved From https://opr.ca.gov/ceqa/sb-743/

- Consistent with CEQA requirements that grants discretion to cities to identify locally applicable impact thresholds: OPR's guidelines do not require a specific methodology for measuring VMT and identifying impact thresholds, but instead defer to local jurisdictions to identify methodologies and thresholds applicable to each local setting.
- The OPR guidelines describe recommended methodologies for cities to consider when updating their transportation impact thresholds. OPR recommends that VMT be quantified on a "per capita" (per resident) basis for residential projects, and on a "per employee" for office development. For retail projects, OPR recommends that VMT be evaluated based on the "net change' in VMT (not a rate) since retail projects typically redistribute traffic within a market area rather than resulting in net new VMT (thus a net increase in VMT could be considered potentially significant). OPR provides several recommendations for mixed-use projects, including evaluating each use separately or evaluating mixed-use projects based on the appropriate methodology for the predominant land use.
- VMT impact thresholds are to be based on comparing "projects" under CEQA with area-wide averages, with project impacts evaluated under a "per capita" or "per employee" methodology considered potentially significant if project VMT exceeds the selected threshold. Establishing VMT impact thresholds that are 15 percent below existing rates has been suggested, but not required, in order to help meet statewide greenhouse gas (GHG) reduction goals. Cities can choose whether to base their VMT impacts thresholds on regional, countywide, sub-regional or citywide averages.

Caltrans - Context Sensitive Street Design

Caltrans promotes "Context Sensitive Solutions" as an approach to plan, design, construct, maintain, and operate its transportation system. These solutions use innovative and inclusive approaches that integrate and balance community, aesthetic, historic, and environmental values with transportation safety, maintenance, and performance goals. Context sensitive solutions are reached through a collaborative, interdisciplinary approach involving all stakeholders. Context sensitive solutions meet transportation goals in harmony with community goals and natural environments. They require careful, imaginative, and early planning, and continuous community involvement.

7.1.3 REGIONAL REGULATIONS

Plan Bay Area 2050

Plan Bay Area 2050 is the region's long range strategic plan focused on the interrelated elements of housing, economy, transportation and environment. The plan has adopted a set of 35 strategies to weather uncertain future conditions and advance equity. It meets all federal and state requirements for the Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). The plan focuses on the importance of availability of transportation choices and its interrelatedness with housing and employment. It also recognizes the impact of transportation sector on climate change, being the largest contributor (over 40 percent) of California's greenhouse gas emissions. Following strategies have been adopted as a part of this plan that will have an impact on the Livermore Transportation Network:

- **Maintain and optimize the existing transportation system**: As a part of this strategy, the plan proposes investments along the I-580 corridor which includes various interchange improvements and provision of express lanes.
- **Create healthy and safe streets:** The Plan envisions a well-connected network with 10,000 new miles of protected bike lanes and off-street paths, with emphases on connections to transit and investments in Equity Priority Communities. The strategy also focuses on the advancement of a regional Vision Zero Policy.
- **Build a next-generation transit network:** The plan identifies funding to implement new rail service (Valley Link) between the Dublin/Pleasanton BART station and San Joaquin Valley/Lathrop.

Alameda Countywide Transportation Plan, 2020

The plan establishes near-term projects, programs, and strategic priorities, details a 30-year transportation vision and guides the decision-making of the Alameda CTC. The Countywide Transportation Plan (CTP) is updated every four years to accommodate changing conditions and new demands placed on the transportation system. The following list of projects are identified as the 10-year priority projects that are significant for the City of Livermore.

1. I-580/First Street Interchange Modernization
2. I-580/ Vasco Road Interchange Modernization
3. Iron-Horse Regional Trail Improvements
4. Valley Link Rail Project – San Joaquin Valley to Dublin BART Station

Alameda Countywide Active Transportation Plan, 2019

The Alameda Countywide Active Transportation Plan provides a vision, goals, and priorities to improve walking and biking throughout the 15 diverse jurisdictions in Alameda County. The Countywide ATP was developed to establish countywide priorities that further local agencies' efforts. The plan further provides resources and recommendations that could be used by local jurisdictions.

Alameda Countywide Multimodal Arterial Plan, 2016

The Alameda Countywide Multimodal Arterial Plan intends to address the needs and mobility for all modes using complete streets concepts. The plan provides a framework for designing, prioritizing and implementing improvements in the context of the surrounding land use to address the needs of all modes on the county's arterial roadways. It provided a basis for the integrated management of major arterial corridors and identified a priority list of short- and long-term improvements and strategies.

7.1.4 LOCAL REGULATIONS

Livermore 2003-2025 General Plan

The City of Livermore 2003-2025 General Plan was adopted in 2004 and the Circulation Element was last amended in 2014. The purpose of the circulation element is to identify the anticipated circulation needs, indicate the location and extent of the existing and proposed circulation network, and provide policies and priorities for circulation system improvements. The plan also highlights the importance of the goods movement system by identifying major truck routes and rail corridors. The plan proposed several roadways and intersection improvements, many of which are completed.

TABLE 7- 1 LIVERMORE 2003-2025 GENERAL PLAN GOALS RELEVANT TO CIRCULATION ELEMENT

Goal	Description
CIR-1	Provide safe, efficient, comfortable, and convenient mobility for all users.
CIR-2	Promote multi-modal transportation.
CIR-3	Identify and develop a circulation system consistent with the Land Use Element.
CIR-4	Provide a local roadway system for the safe, efficient, and convenient movement of vehicular traffic.
CIR-5	Maintain relatively free-flowing traffic, except where the City has identified intersections or areas of the City that are exempt from the Citywide standard.
CIR-6	Protect neighborhood quality and community character through circulation planning.
CIR-7	Develop a Downtown circulation system that is pedestrian-oriented and supports Downtown as a destination.
CIR-8	Ensure a well-coordinated regional transportation system that serves Livermore and the surrounding region
CIR-9	Support and protect safe and efficient aviation operations at the Municipal Airport.
CIR-10	Provide adequate safe and convenient short-and long-term vehicle and bicycle parking for all land uses in the City.
CIR-11	Support goods movement within the City.

Source: City of Livermore, 2003-2025 Livermore General Plan.

Livermore Design Standards and Guidelines, 2004

The Livermore Design Standards and Guidelines is a policy document and an implementation tool developed to preserve, protect, and promote the public health, safety, and general welfare, as allowed by State law. The guidelines address the need to provide adequate automobile circulation in the community, while ensuring the City's transportation corridors are well designed and convey a positive image of the city through attractive landscaping and appropriate pedestrian components.

Livermore Bicycle, Pedestrian, and Trails Active Transportation Plan, 2018

The Active Transportation Plan (ATP), adopted in 2018, carries the vision of a vibrant community where people can comfortably walk, bicycle, and access trails for transportation and recreation forward with a strategy to realize a safer, more comfortable active transportation environment with a thriving walking and bicycling culture.

The Plan identifies challenges and recommends implementation strategies to improve walking, biking, and trails in Livermore. The ATP proposes enhancements to the existing network to close gaps and increase safety, comfort, connectivity. The ATP prioritizes network and programmatic improvements, explores options for project phasing, and identifies funding opportunities.

Livermore Bicycle, Pedestrian, & Trails Active Transportation Plan (Design Guidelines), 2018

This document presents design guidelines and best practices recommended for the City of Livermore to use for pedestrian, bicycle, and equestrian facilities, to be used in conjunction with the City's Design Standards and Guidelines. This document follows the design standards and guidelines of national best practice documents, as well as California-specific guidance.

Neighborhood Traffic Calming Program, 2002

The program intends to utilize traffic calming devices to address neighborhood traffic issues. The program mainly focuses on local and collector streets. The recommended traffic calming tools included in the program are:

Enforcement and Monitoring

- **Targeted Speed Enforcement:** Police presence to monitor speeds and issue formal or courtesy citations.
- **Speed Monitoring Radar Trailer:** Mobile trailer mounted radar display that informs drivers of their speed.

Constrictions and Narrowing

- **Median:** Raised island in the center of the roadway with one-way traffic on each side.
- **Entry Island:** A raised island in the center of a two-way street adjacent to an intersection at the perimeter of a neighborhood that identifies the entrance.
- **Choker:** Raised islands built to narrow the roadway. The islands are detached from the curb line, allowing bike lanes to continue behind the choker.
- **Neckdown or Curb Extension:** Segments of roadway narrowing where roadway edges or curbs are extended toward the center of the roadway.

Horizontal Alignment Changes

- **Traffic Circle:** Traffic circles are raised circular medians in an intersection with counterclockwise traffic flow. Vehicles must change their travel path to maneuver around the circle and are typically controlled by "Yield on Entry" on all approaches.
- **Chicane:** A curved street alignment can be designed into new developments or retrofitted in existing rights-of-way. The curvilinear alignment requires additional maneuvering and reduces drivers' line-of-sight.

Signing and Striping

- **Speed Limit Sign:** Signs that define the legal driving speed under normal conditions.
- **Neighborhood Speed Watch Signs:** The purpose of the program is to increase motorist awareness of the 25 MPH speed limit on local streets and reduce speeds in our neighborhoods.
- **Roadway Striping:** Striping is done to reduce the driver's perceived width of the roadway. By doing this, the drivers tend to reduce speed.

Pavement Texture and Color

- **Textured crosswalks or intersections:** Crosswalks or intersections can be textured using special pavers or decorative concrete. Such treatment draws drivers attention and alerts them about the area being traversed has some special identity such as downtown with high pedestrian traffic.
- **Colored pavement in crosswalks or bike lanes:** Similar to the textured crosswalk, colored pavement and bike lanes draws drivers attention to the area and encourages them to use extra caution.

Vertical Deflection

- **Speed Lumps:** Speed lumps are similar to speed humps, except they are divided into three lumps with one foot of space between each lump. The space between the lumps is specifically designed to accommodate the axle width of fire vehicles. All other vehicles with smaller axle widths have to go over the humps from at least one side of the vehicle. Speed lumps are typically 12 to 14 feet long and three inches high.

The program highlights the need for neighborhood participation and consensus-building exercise. The program was implemented from 2002 until it was suspended in 2009, due to funding constraints and limited resources. The Traffic Calming Program was revived in 2020 with a focus on locations with high cut through traffic, accident, and speed locations from a citywide perspective, using a data driven analysis approach and a streamlined implementation process.

Arroyo Vista Neighborhood Plan, 2007

The Arroyo Vista Neighborhood Plan, adopted in 2007, is intended to promote and guide orderly growth, address potential compatibility issues with surrounding industrial and commercial land uses, and is a prerequisite to residential development on the Site. The plan proposes the following circulation improvements:

- Widening of Las Positas Road from two to four lanes
- Bike Lanes on Las Positas Road
- Main access to the site on Arroyo Vista Road and Bennett Drive
- Minimal access points and parking on-street parking in safe, specific areas along Las Positas

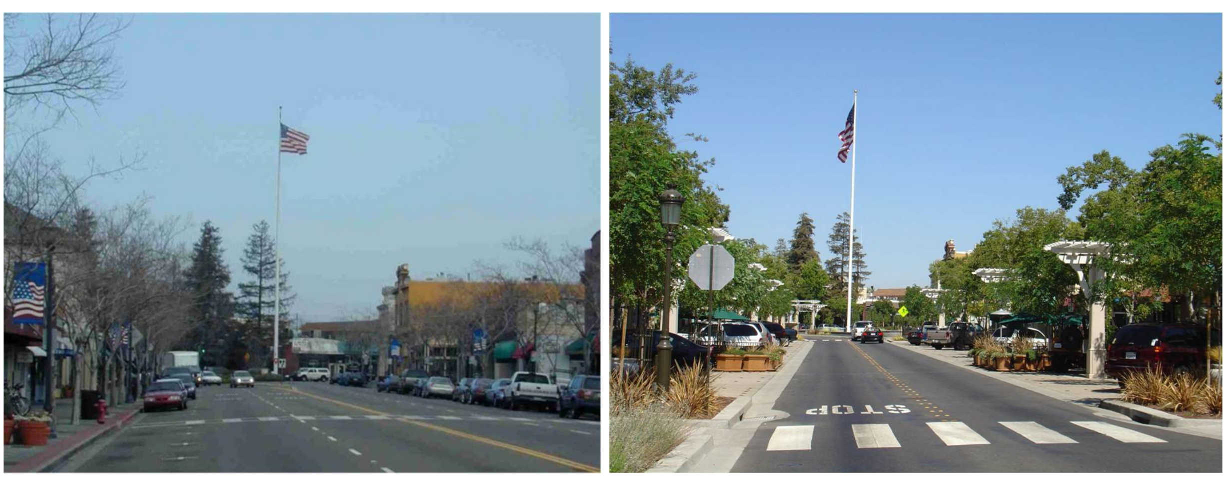
Downtown Specific Plan, 2004

The City of Livermore Downtown Specific Plan, adopted in 2004, last updated in April 2021, provides land use policies and development standards that implement the community's vision for downtown revitalization. The Plan implemented First Street streetscape and road-diet improvements to push commute traffic out of the downtown and back to the freeway. This resulted in reduced traffic speeds and revitalization of downtown streets for residents and visitors seeking an active and pedestrian friendly destination. It also proposed new downtown streets to reduce the block size and focused on the provision of pedestrian connections.

FIGURE 7- 2 DOWNTOWN TRANSIT GATEWAY DISTRICT

The Plan identifies the Downtown Transit Gateway District, shown in Figure 7-2, centered along the east First Street, as a potential area for Transit-Oriented Development (TOD) due to its proximity with the ACE/LAVTA stations.

FIGURE 7- 3 FIRST STREET BEFORE AND AFTER STREETSCAPE PROJECT



The Plan was later amended to include the findings from the 2014 Downtown Parking Management Study. The study concluded that the parking garage is underutilized.

El Charro Specific Plan, 2007

Adopted in 2007, El Charro Specific Plan area is a vital regional retail destination located in the west of the city south of I-580. The plan proposed significant circulation improvements such as Jack London Boulevard extension, north/south collector streets connecting Jack London Boulevard to Freisman Road and the Arroyo Trail connection.

Isabel Neighborhood Specific Plan, 2020

The 2020 Isabel Neighborhood Specific Plan proposes development of 4,095 new multi-family housing units and approximately 2.1 million square feet of net new office, business park, and commercial development (including a neighborhood commercial center). It envisions three new neighborhood parks, pedestrian and bike facilities, and infrastructure improvements. Most changes are focused near the future Valley Link rail station, which would be located in the median of I-580, just east of Isabel Avenue.

South Livermore Valley Specific Plan, 1997

The South Livermore Valley Specific Plan, adopted in 1997 and amended in 2020, provides framework for future growth and development within an approximately 1,891-acre unincorporated area along the City of Livermore's southern boundary. The Plan provides polices and regulations aimed at preserving vineyards and wineries in the South Livermore Valley. The Plan proposed eastward extension of Concannon Boulevard to Tesla Road, the re-alignment and extension of Wetmore Road to create a new signalized intersection with Vallecitos Road, and the relocation and signalization of the East Vineyard and Vallecitos Road intersection.

East Avenue Corridor Study

The City is conducting the East Avenue Corridor Study to enhance mobility and safety for all modes of transportation. The study focuses on East Avenue between South Livermore Avenue and South Vasco Road. This segment is identified as a priority corridor in Livermore Bicycle, Pedestrian and Trails Active Transportation Plan (ATP). The study will evaluate existing conditions, identify issues, and provide alternatives to mitigate traffic-related issues with the help of extensive community participation.

Parking Standards and Management

The City of Livermore has set the minimum off-street parking requirements under Livermore Development Code (LDC) – Chapter 4.04, based on the zoning district and type of land-use. The code further provides the dimension and other standards related to the provision of parking in Livermore.

7.2 EXISTING CONDITIONS

7.2.1 REGIONAL AND LOCAL CONTEXT

Located on the east side of the San Francisco Bay Area, Livermore is a city in eastern Alameda County. Livermore is well connected to all modes of transportation from regional rail services, airports, state routes and more, including ACE train station. I-580 and SR-84 provides regional access to the other major cities and towns in the Bay Area. Livermore is home to a number of growing businesses and two national laboratories. Like most suburban cities across the nation, Livermore can be characterized as having relatively low density and prevalence of automobile travel compared to the other travel modes.

7.2.2 TRAVEL MODE TO WORK

According to American Community Survey (ACS) 2019, Livermore has a population of 89,699, including 47,008 employed residents. The majority of the employed residents (77 percent) drove alone to work, whereas alternative modes of transportation accounted for approximately 12.5 percent of commute trips. East Alameda County is a subdivision of Alameda County defined by the U.S. Census Bureau that includes Livermore, Pleasanton, Dublin, and the unincorporated portion of East Alameda, and sometimes referred to as the Tri-Valley.

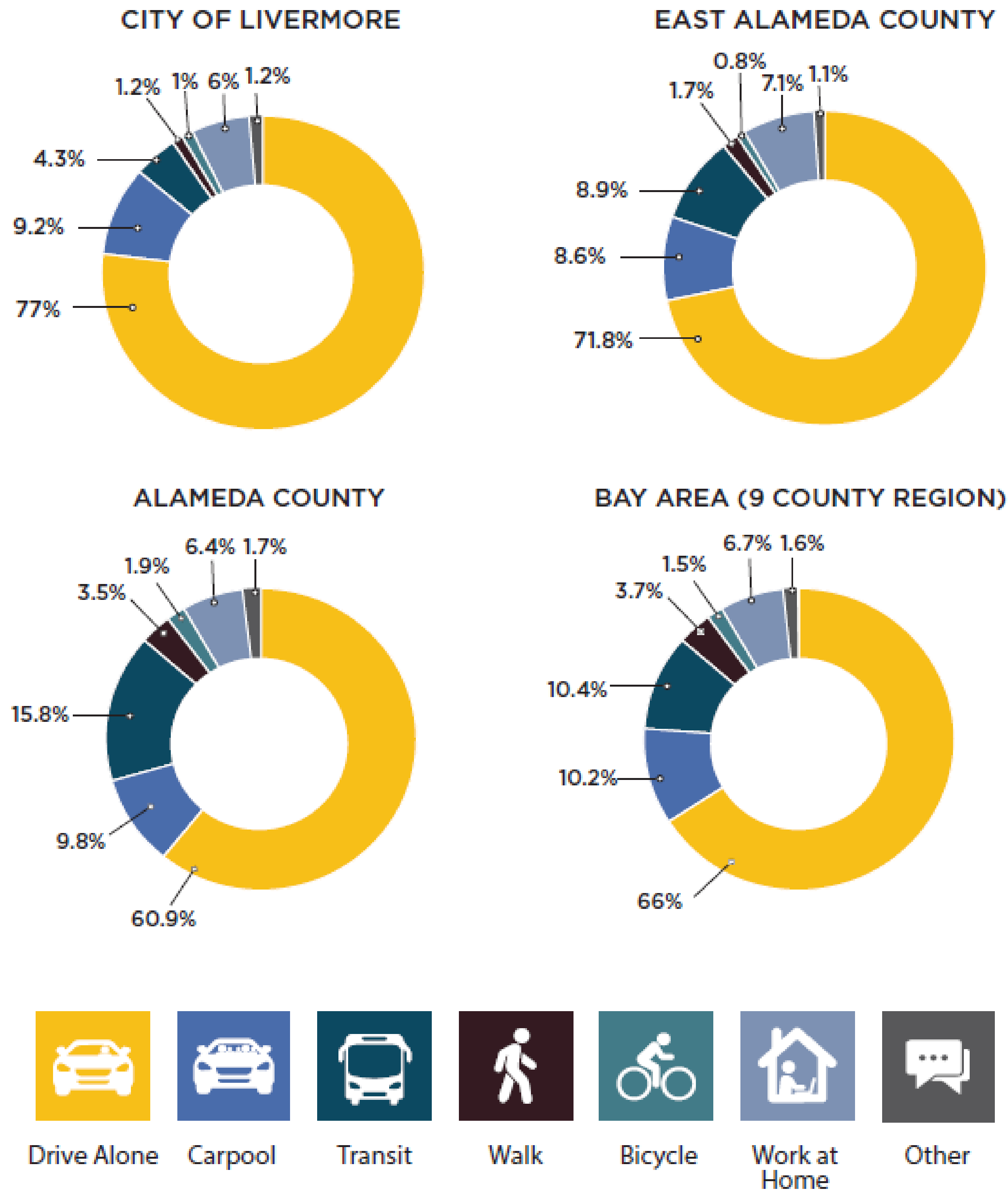
Table 7-2 and Figure 7-4 provides an overview of Livermore commute pattern mode split data in comparison with Alameda County and Bay Area (9 County Region). Livermore had a higher carpool rate and a lower transit use and walking/biking trips compared to Alameda County.

TABLE 7- 2 TRAVEL MODE TO WORK - 2019

Jurisdiction	City of Livermore	East Alameda County	Alameda County	Bay Area (9 County Region)
Workers 16 and Over	47,008	119,972	781,901	3,864,037
Drive Alone	77.0%	71.8%	60.9%	66.0%
Carpool	9.2%	8.6%	9.8%	10.2%
Transit	4.3%	8.9%	15.8%	10.4%
Walk	1.2%	1.7%	3.5%	3.7%
Bicycle	1.0%	0.8%	1.9%	1.5%
Work at Home	6.0%	7.1%	6.4%	6.7%
Other	1.2%	1.1%	1.7%	1.6%

[1]Population includes 16 years of age or older
Source: U.S. Census Bureau, 2014-19 American Community Survey 5- Year Estimates.

FIGURE 7- 4 TRAVEL MODE TO WORK -2019



7.2.3 TRAVEL TIME TO WORK

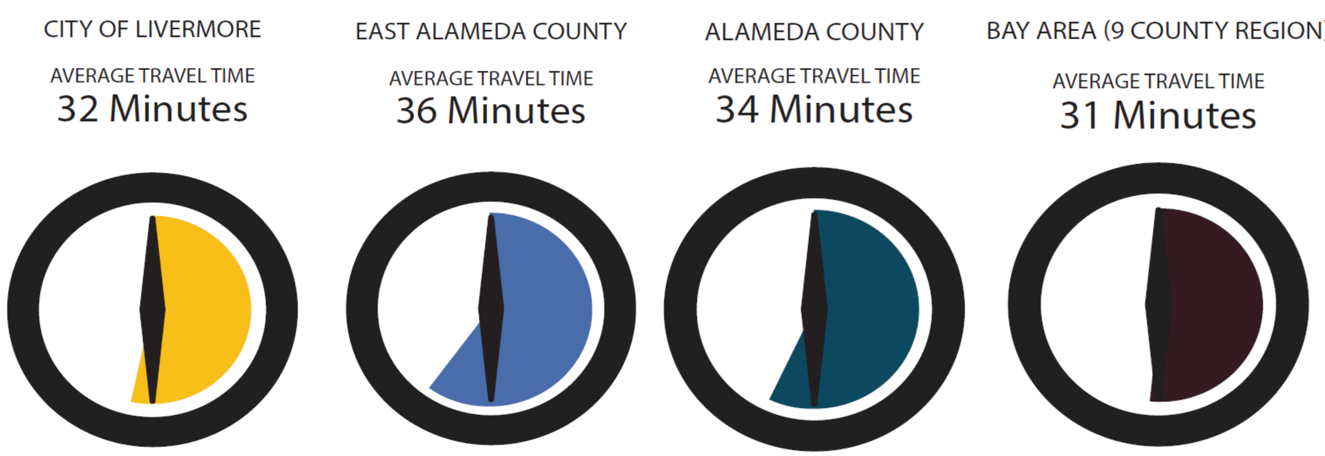
Given Livermore's higher percentage of residents who work in place of residence, the mean travel time to work is comparatively lower than the East Alameda County and Alameda County as shown in Table 7-3 and Figure 7-5. Higher travel time typically results in higher travel time costs which represents the additional dollar amount spent during a trip.

TABLE 7- 3 TRAVEL TIME TO WORK-2019

	City of Livermore	East Alameda County	Alameda County	Bay Area (9 County Region)
Employed Residents[1]	47,008	119,972	781,901	3,864,037
Total Workers 16 years and over who did not work at home	44,170	111,448	731,500	3,835,421
Mean Travel Time to Work (mins)	32.9	36.1	34.3	31
Less than 15 minutes	26%	23%	16%	21%
15 to 29 minutes	29%	26%	30%	31%
30 to 44 minutes	16%	15%	22%	22%
More than 45 Minutes	30%	37%	32%	28%

[1]Population includes 16 years of age or older

FIGURE 7- 5 MEAN TRAVEL TIME TO WORK – 2019

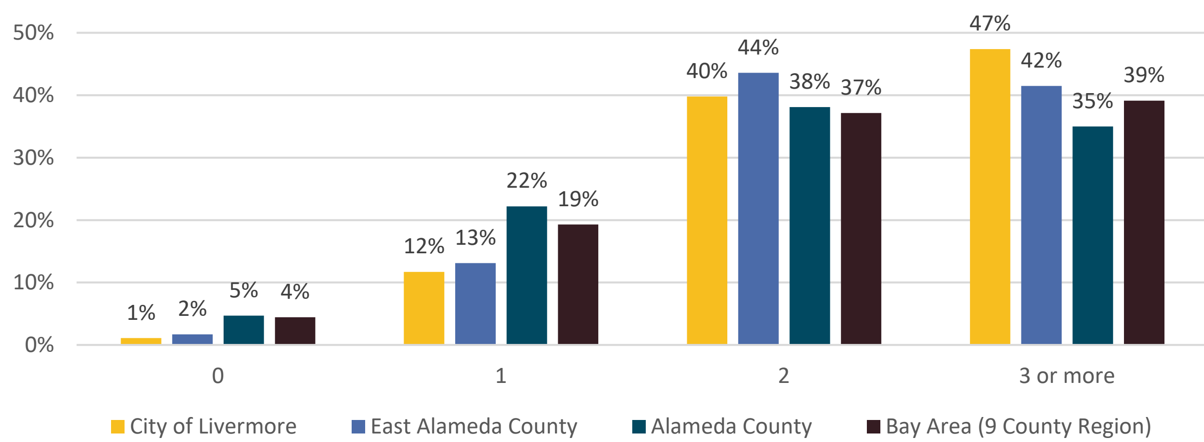


Source: U.S. Census Bureau, 2014-19 American Community Survey 5- Year Estimates

7.2.4 VEHICLE OWNERSHIP

Compared to the Bay Area, Alameda County, and East Alameda County, Livermore residents own more vehicles per person as shown in Figure 7-6. The higher percentage of vehicle ownership is an indicator of auto-dependency.

FIGURE 7- 6 VEHICLE OWNERSHIP -2019



Source: U.S. Census Bureau, 2014-19 American Community Survey 5- Year Estimates

7.2.5 ROADWAY SYSTEM

The City of Livermore owns and maintains approximately 310 centerline miles of paved streets. Many of the major streets in central Livermore, including Livermore Avenue, First Street, East Stanley Boulevard, Holmes Street, Murrieta Boulevard, and East Avenue converge in the Downtown. Streets in Downtown follow a traditional grid pattern, but the Downtown and the "lettered" streets northwest of it are not oriented on a north south axis. The major streets and collectors in other areas of the City are on north-south or east-west axis, so these streets intersect with the Downtown grid at a diagonal. Many local neighborhood streets are curvilinear.

7.2.5.1 Functional Classification

Livermore's street network is classified into freeway, highway, major street, collector street and local street. Figure 7-7 maps the street network by functional classification, Figure 7-8 shows the total miles of each street classification within the City limits, and Table 7-4 describes the general characteristics of each of the street classifications in the city. Like many other cities across the nation, Livermore's road classification is based on the function and character of the street. The road classification divides the traffic flow into a hierarchical system that progresses based on the type and size of traffic volume. The existing classification system considers all types of users including vehicles, pedestrians, bicyclists, persons with disabilities, motorists, movers of commercial goods, transit users and operators, emergency responders, seniors, children, youth, and families. The goal of the City of Livermore transportation system is to balance the needs of all users and create safe and efficient travel through a comprehensive and integrated transportation network.

TABLE 7- 4 ROADWAY CLASSIFICATION AND DESIGN CHARACTERISTICS

Functional Class	Description	Travel Lanes	Speed Limits	Traffic Volumes
Freeways	Freeways are State-designated, high-speed, high-capacity routes serving Statewide and interregional transportation needs. The only freeway in Livermore is I-580, which bisects the City as it traverses east-west through the northern portion of town. Direct access to the freeway is limited to the ramps located on Airway Blvd., Isabel Ave., Livermore Ave., First St., and Vasco Rd.	6 to 8	65-70 mph	50,000 to 250,000 vehicle per day
Highways	Highways are State-designated, relatively high-speed, high-capacity routes serving needs for interregional through traffic movement and the interconnection of the Countywide road system. The only highway in Livermore is State Route (SR) 84. Highways also connect major streets with freeway interchanges. Direct access is limited to major streets via signal-controlled intersections. Access points to adjacent land uses, such as driveways, are prohibited, as is roadside parking.	4 to 6	45-55 mph	20,000 to 50,000 vehicles per day
Major Street	Major streets are local medium-speed, high-capacity routes for intracity, cross-town travel and providing access to freeways, highways, and the subregional road system via interchanges and signal-controlled intersections. These streets may include bike facilities and typically have sidewalks in each direction. Bus routes typically utilize major streets as a way to traverse through town with stops located at intersections with collector streets and near employment centers. Sidewalks with accessible ramps provide access for pedestrians of all abilities to traverse major streets and connect neighborhoods (Reso. 2014-183). The frequency of direct access to abutting properties is limited to essential driveway locations away from intersections to avoid interference with the through traffic flow of these streets. New single-family homes may not front on major streets. Roadside parking is generally prohibited.	4 to 6 lanes	30-45 mph	20,000 to 50,000 vehicles per day
Collector Street	Collector streets are relatively low-speed, medium-capacity streets that facilitate movement between local and major streets. Collector streets provide for multimodal circulation between neighborhoods, as well as divert through moving traffic from local streets. These streets typically include bike facilities and sidewalks in each direction which are used by local pedestrians and bicyclists for recreation purposes, to run errands, or to commute to/from school or work. Accessible ramps provide access for pedestrians of all ages and abilities to traverse collector streets and create an interconnected sidewalk network between neighborhoods. When there is a bus route on an adjacent major street, a bus stop is typically situated near the collector/major street intersection to allow for convenient neighborhood access (Reso. 2014-183). Direct vehicular access to abutting properties (driveway spacing) is sometimes limited. Prohibitions on curbside parking vary with roadway widths and traffic conditions.	2 to 4 lanes	25 -40 mph	5,000 to 20,000 vehicles per day

Functional Class	Description	Travel Lanes	Speed Limits	Traffic Volumes
Local Streets	Local streets are low-speed, low-capacity streets (up to 5,000 vehicles per day) that provide for multimodal circulation with direct access to abutting land uses. Local streets are typically two lanes wide with sidewalks in each direction. Due to the lower traffic speeds, local streets and sidewalks are used by people of all ages and abilities to walk or bike for recreation and are the start and end location of many pedestrian or bicyclist commutes to and from school or work. Accessible ramps provide access for pedestrians of all ages and abilities to traverse local streets within neighborhoods and connect to sidewalks on collector streets. Street design standards and layouts are typically used to discourage cut-through traffic, avoid high travel speeds, and amounts of traffic, and minimize neighborhood noise and safety impacts. Curbside parking is usually permitted.	2 lanes	25 mph	Less than 5,000 vehicle per day
OTHER REGIONAL ROADS				
Intercounty Routes	Intercounty routes are medium-speed, medium-capacity rural roads on the City's urban edge that are components of the subregional road system. Generally, these routes are owned and operated by Alameda County and connect to Contra Costa or San Joaquin County roadways. These roads do not have curbs or gutters but typically include bicycle facilities used for commute and recreational purposes.	2 lanes	Varies	up to 20,000 vehicles per day
Special Rural Routes	Special rural routes include highways, major streets, and intercounty routes that pass through or by areas designated as having special rural features that warrant protection and enhancement measures in the roadway design. Special rural routes are designated entering and traveling through City-identified vineyard lands. These routes are to incorporate special road design standards that serve to protect and complement the "wine county" character of these lands, including width restrictions, landscaping features, and special signs. Special rural routes are developed at two-lane rural standards (no curbs, gutters, or sidewalks), but do include combined bike, pedestrian, and equestrian trails, which are typically separated from the roadway and provide commute and recreation opportunities. To protect the rural and agricultural character of the vineyard lands south of the City, all roads in this area are to remain two lanes. These roads are designated to have two paved travel lanes with paved left turn lanes, where required.	2 lanes	Varies	Not defined

Source: City of Livermore 2003-2025 General Plan, Chapter – 5 Circulation Element

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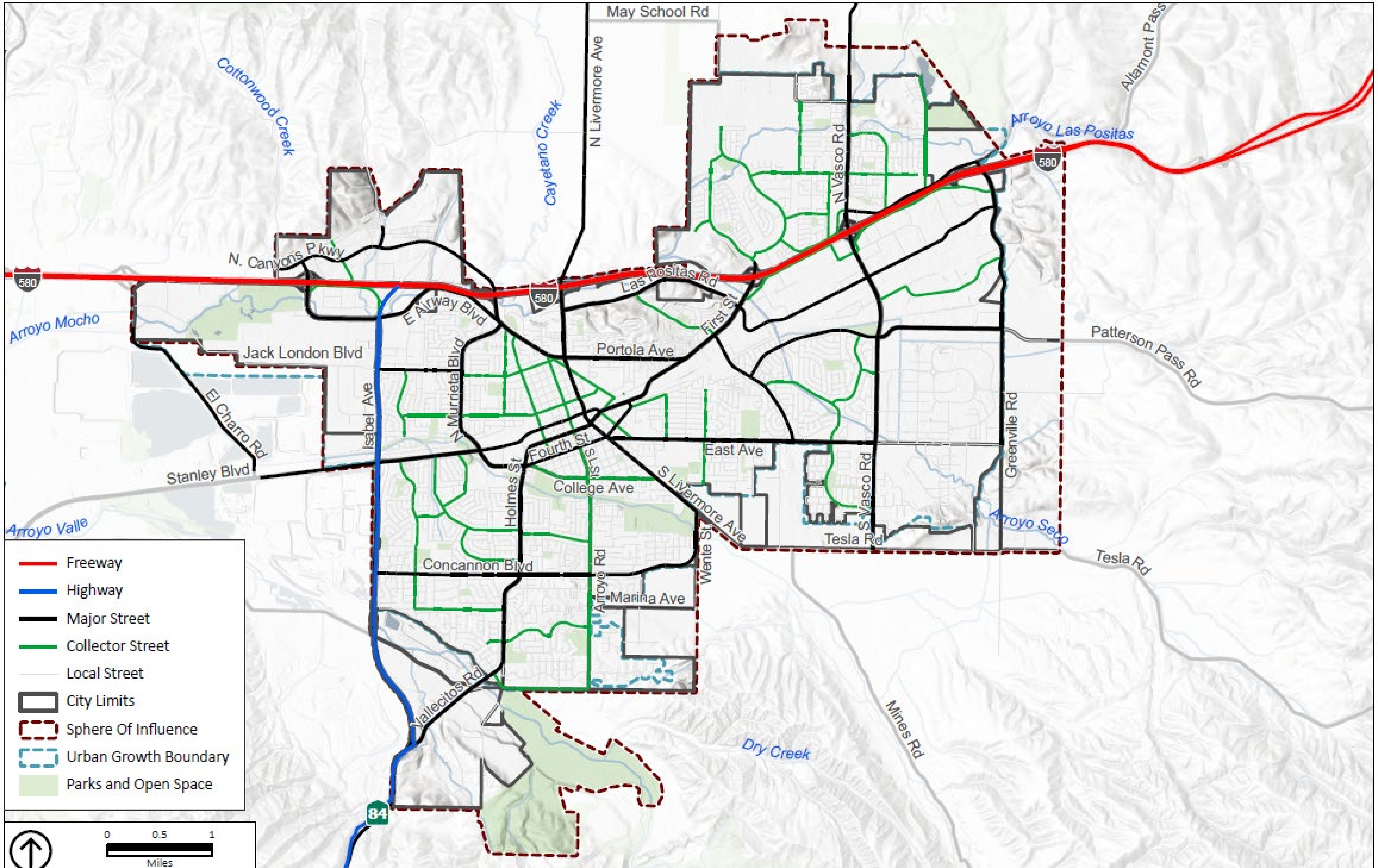
FIGURE 7-7 FUNCTIONAL CLASSIFICATION



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

CIRCULATION

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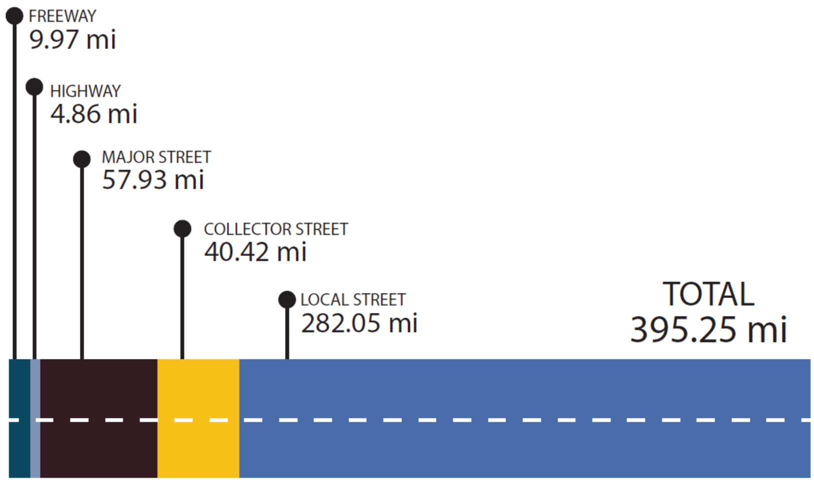
FIGURE 7- 8 STREET NETWORK BASED ON FUNCTIONAL CLASSIFICATION (MILES)



Source: City of Livermore GIS Database, 2021

7.2.5.2 TRAFFIC VOLUMES

The City of Livermore regularly collects daily traffic counts on several major streets across the city to monitor traffic growth and accordingly plan for the future improvements. Table 7-5 summarizes the Average Daily Traffic (ADT) Volumes on key street segments.

TABLE 7- 5 AVERAGE DAILY TRAFFIC VOLUMES

Roadway	Limits	ADT - 2012/13	ADT - 2016	Percentage Change	Number of Travel Lanes
First Street	West of S Livermore Avenue	15,613	9,294	-40%	2
Vasco Road	North of Dalton Avenue	30,713	24,341	-21%	2
Vallecitos Road	North of Isabel Avenue	18,084	16,207	-10%	2
Airway Blvd	West of Isabel Avenue	9,635	8,964	-7%	2
Concannon Blvd	East of Isabel Avenue	14,107	13,505	-4%	4
First Street	North of Portola Avenue	36,135	34,813	-4%	6
Las Positas Road	West of First Street	11,125	10,730	-4%	4
First Street	Between N and P Street	10,939	10,689	-2%	2
Collier Canyon Road	North of Portola Avenue	7,015	6,897	-2%	4
Arroyo Road	North of Concannon Blvd	7,183	7,089	-1%	2
Livermore Avenue	South of I-580	31,346	30,975	-1%	4
Stanley Blvd	West of Murrieta Blvd	29,739	29,527	-1%	4
Murrieta Blvd	North of Stanley Blvd	17,744	17,621	-1%	4
Holmes Street	North of Mocho Street	24,364	24,352	0%	4
First Street	South of Inman Street	23,478	23,677	1%	4
Las Positas Road	East of North Livermore Avenue	15,577	15,801	1%	3
College Avenue	East of L Street	6,235	6,327	1%	2
Mines Road	South of First Street	20,718	21,371	3%	4
Railroad Avenue	East of P Street	19,265	19,922	3%	4

Roadway	Limits	ADT - 2012/13	ADT - 2016	Percentage Change	Number of Travel Lanes
East Avenue	West of Mines Road	16,919	17,842	5%	4
Holmes Street	South of Concannon Blvd	16,830	17,751	5%	4
Airway Blvd	South of North Canyons Pkwy	23,820	25,125	5%	4
Isabel Avenue	South of Portola Avenue	18,278	19,334	6%	4
Concannon Blvd	South of S Livermore Avenue	15,041	15,923	6%	2
Portola Avenue	East of North Livermore Avenue	11,343	12,061	6%	4
Livermore Avenue	South of Chestnut Street	17,596	18,833	7%	4
Concannon Blvd	West of Epson Street	12,017	12,871	7%	4
East Avenue	West of Research Avenue	10,276	11,032	7%	4
Mines Road	North of East Avenue	8,485	9,125	8%	4
Airway Blvd	East of Isabel Avenue	8,076	8,686	8%	2
Arroyo Road	North of Wetmore Road	5,629	6,066	8%	2
East Avenue	West of Jensen Street	19,706	21,269	8%	4
Concannon Blvd	East of Arroyo Road	14,824	16,655	12%	2
P Street	South of Chestnut Street	10,618	12,297	16%	4
Greenville Road	North of Southfront Road	11,774	13,944	18%	4
Chestnut Street	East of P Street	4,750	5,640	19%	2
Portola Avenue	East of Murrieta Blvd	18,295	21,747	19%	4
Northfront Road	East of Vasco Road	10,591	12,593	19%	4
Murrieta Blvd	West of Holmes Street	13,736	16,358	19%	4
Livermore Avenue	South of Concannon Blvd	15,543	18,836	21%	2
Brisa Street	East of Vasco Road	6,196	7,661	24%	4
Las Positas Road	West of Vasco Road	10,042	12,560	25%	4
North Canyons Pkwy	East of Airway Blvd	14,011	19,723	41%	4
Jack London Blvd	East of El Charro Road	12,660	19,007	50%	4
Jack London Blvd	West of Isabel Avenue	7,086	11,411	61%	4
Portola Avenue	East of Isabel Avenue	6,948	14,692	111%	4

Source: City of Livermore GIS Database, 2021

The ADT volume is primarily used to monitor and plan for vehicular traffic on the roadway. Typically, a four-lane road with left-turn lanes can carry up to 36,800 vehicles per day (vpd)[4]. Factors such as signal timing, number of driveways and posted speed limit can impact the capacity of a roadway. Based on Table 7-5, roadways near new development like Jack London Boulevard and Portola Avenue have shown a significant increase in traffic volumes. Most major roadways are currently operating below their capacity; the roadways listed below are currently at or near capacity:

- Vasco Road- North of Dalton Avenue
- Livermore Avenue- South of Concannon Blvd
- Concannon Blvd-East of Arroyo Road
- Vallecitos Road- North of Isabel Avenue

[4] Simplified Highway Capacity Calculation Method for the Highway Performance Monitoring System, FHWA, October 2017

Generally, most roadways experienced an increase in traffic, but some locations showed reductions associated with the realignment of SR 84 from First Street to I-580 and Isabel Avenue and the associated lane reduction in the downtown area.

7.2.5.3 TRAFFIC OPERATIONS ANALYSIS

Level of Service Methodology

Level of Service (LOS) is a qualitative measure that describes operational conditions as they relate to the traffic stream and perceptions by motorists and passengers. LOS generally describes these conditions in terms of such factors like speed, travel time, delays, freedom to maneuver, traffic interruptions, comfort, convenience and safety. The operational LOS are given letter designations from A to F, with A representing the free-flow operating conditions and F representing the severely congested flow with high delays. Typically, LOS C/D is considered as an ideal condition as it represents stable flow and efficient use of transportation facilities.

City of Livermore Notable Impact Criteria

According to the City's adopted 2003-2025 General Plan (Circulation Element, amended 2014), the intersection LOS standard for signalized intersections is mid-level D (up to 45 seconds of average vehicle delay), except in the Downtown area and near freeway interchanges where LOS E is acceptable. The intersection standard for all-way stop-controlled intersections is mid-level E (up to 45 seconds of average vehicle delay). The intersection standard for one-way or two-way stop-controlled intersections is up to 90 seconds of average delay for the critical movement.

A signalized or all-way stop-controlled intersection already operating at an unacceptable LOS would experience a notable impact if the addition of project traffic would increase average delay by five seconds or more, and project traffic increases the overall volume to capacity (v/c) value by 0.03 or more, or increases the critical v/c value by 0.05 or more. A one-way or side-street stop-controlled intersection operating at an unacceptable LOS would experience a notable impact if the project increases the critical v/c value by 0.05 or more.

Signalized Intersections

The study intersections under traffic signal control were analyzed using the Highway Capacity Manual (HCM) 6th Operations Methodology for signalized intersections, where applicable. This methodology determines LOS based on average control delay per vehicle for the overall intersection during peak hour intersection operating conditions. The relationship between LOS and control delay is summarized in Table 7-6.

TABLE 7- 6 SIGNALIZED INTERSECTION LOS CRITERIA

Level of Service	Description	Delay in Seconds
A	Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short signal cycle lengths may also contribute to low delay.	< 10.0
B	Progression is good, signal cycle lengths are short, or both. More vehicles stop than with LOS A,causing higher levels of average delay.	> 10.0 to 20.0
C	Higher congestion may result from fair progression, longer signal cycle lengths, or both. Individualcycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.0 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long signal cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual signal cycle failures are noticeable.	> 35.0 to 55.0
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long signal cycle lengths, and high V/C ratios. Individual signal cycle failures are frequent occurrences.	> 55.0 to 80.0
F	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual signal cycle failures. Poor progression and long signal cycle lengths may also becontributing factors to such delay levels.	> 80.0

Source: 2010 Highway Capacity Manual

Unsignalized Intersections

The study intersections under stop control (unsignalized) were analyzed using the HCM 6th Operations Methodology for unsignalized intersections). LOS ratings for stop-sign controlled intersections are based on the average control delay expressed in seconds per vehicle. At the side street, controlled intersections or two-way stop sign intersections, the control delay is calculated for each movement, not for the intersection as a whole. For approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. Table 7-7 shows the relationship between LOS and control delay.

TABLE 7- 7 UNSIGNALIZED INTERSECTION LOS CRITERIA

Level of Service	Description	Delay in Seconds
A	Little or no delays	≤ 10.0
B	Short traffic delays	> 10.0 to 15.0
C	Average traffic delays	> 15.0 to 25.0
D	Long traffic delays	> 25.0 to 35.0
E	Very long traffic delays	> 35.0 to 50.0
F	Extreme traffic, delays where intersection capacity exceeded	> 50.0

Source: 2010 Highway Capacity Manual

Table 7-8 summarizes the intersection LOS at major signalized and unsignalized intersections. Of the 125 intersections evaluated, most intersections operate within the city standards, but 21 intersections are operating below desired operating standards set by the City in at least one of the peak hours.

TABLE 7- 8 INTERSECTION LEVEL OF SERVICE ANALYSIS - EXISTING CONDITIONS

#	Intersection	Control	Peak Hour	Operating Standard	Delay	LOS
1	Bluebell Drive & Springtown Boulevard	Signal	AM	LOS D (45.0 sec)	16.2	B
			PM		16.2	B
2	Brisa Street & National Drive	Signal	AM	LOS D (45.0 sec)	15.7	B
			PM		12.4	B
3	N. Canyons Parkway & Independence Drive	Signal	AM	LOS D (45.0 sec)	42.6	D
			PM		**46.5**	**D**
4	N. Canyons Parkway & Triad Drive	Signal	AM	LOS D (45.0 sec)	5.6	A
			PM		8.6	A
5	Concannon Boulevard & Arroyo Road	Signal	AM	LOS D (45.0 sec)	36.1	D
			PM		35.6	D
6	Concannon Boulevard & El Padro Drive	Signal	AM	LOS D (45.0 sec)	14	B
			PM		5.6	A
7	Concannon Boulevard & Murdell Lane	Signal	AM	LOS D (45.0 sec)	12.8	B
			PM		17.9	B
8	East Avenue & Charlotte Way	Signal	AM	LOS D (45.0 sec)	18.4	B
			PM		13.6	B
9	East Avenue & Dolores Street	Signal	AM	LOS D (45.0 sec)	13	B
			PM		11.1	B
10	East Avenue & Hillcrest Avenue	Signal	AM	LOS D (45.0 sec)	10.1	B
			PM		9.8	A
11	East Avenue & Loyola Way	Signal	AM	LOS D (45.0 sec)	6.1	A
			PM		7.5	A
12	East Avenue & Maple Street	Signal	AM	LOS D (45.0 sec)	5.2	A
			PM		7	A
13	East Avenue & Mines Road	Signal	AM	LOS D (45.0 sec)	11.2	B
			PM		14.4	B
14	First Street & Inman Street	Signal	AM	LOS D (45.0 sec)	**57.7**	**E**
			PM		**58.9**	**E**
15	First Street & L Street	Signal	AM	LOS D (45.0 sec)	15.9	B
			PM		18.9	B
16	First Street & Las Positas Road	Signal	AM	LOS D (45.0 sec)	**109**	**F**
			PM		34.2	C
17	First Street & Livermore Avenue	Signal	AM	LOS D (45.0 sec)	19	B
			PM		18.1	B
18	First Street & Lowes Driveway	Signal	AM	LOS D (45.0 sec)	9.1	A
			PM		11.9	B
19	First Street & Mines Road	Signal	AM	LOS D (45.0 sec)	43.9	D
			PM		**63.2**	**E**

#	Intersection	Control	Peak Hour	Operating Standard	Delay	LOS
20	First Street & Old First Street	Signal	AM	LOS D (45.0 sec)	17.1	B
			PM		20	C
21	First Street & P Street	Signal	AM	LOS D (45.0 sec)	15.2	B
			PM		15.1	B
22	First Street & Portola Avenue	Signal	AM	LOS D (45.0 sec)	19.3	B
			PM		19.4	B
23	First Street & Railroad Avenue-Maple Street	Signal	AM	LOS D (45.0 sec)	27.4	C
			PM		**49.5**	**D**
24	First Street & Southfront Road	Signal	AM	LOS D (45.0 sec)	12.7	B
			PM		17.6	B
25	Fourth Street & L Street	Signal	AM	LOS D (45.0 sec)	16.5	B
			PM		16.7	B
26	Fourth Street & Livermore Avenue- East Avenue	Signal	AM	LOS D (45.0 sec)	28.2	C
			PM		15.9	B
27	Fourth Street & P Street	Signal	AM	LOS D (45.0 sec)	24.8	C
			PM		12	B
28	Greenville Road & Las Positas Road	Signal	AM	LOS D (45.0 sec)	8.9	A
			PM		15.8	B
29	Greenville Road & National Drive	Signal	AM	LOS D (45.0 sec)	11.4	B
			PM		13.4	B
30	Greenville Road & Northfront Road	Signal	AM	LOS D (45.0 sec)	12.8	B
			PM		13.9	B
31	Greenville Road & Patterson Pass Road	Signal	AM	LOS D (45.0 sec)	31.5	C
			PM		23.6	C
32	Greenville Road & Southfront Road	Signal	AM	LOS D (45.0 sec)	14.4	B
			PM		**51.7**	**D**
33	Holmes Street & Alden Lane	Signal	AM	LOS D (45.0 sec)	4.3	A
			PM		4	A
34	Holmes Street & Catalina Drive	Signal	AM	LOS D (45.0 sec)	13	B
			PM		9.6	A
35	Holmes Street & Concannon Boulevard	Signal	AM	LOS D (45.0 sec)	57.5	E
			PM		43.9	D
36	Holmes Street & First Street-S Street	Signal	AM	LOS D (45.0 sec)	3.7	A
			PM		9.3	A
37	Holmes Street & Fourth Street-Murrieta Boulevard	Signal	AM	LOS D (45.0 sec)	47.5	D
			PM		47.7	D
38	Holmes Street & Lexington Way	Signal	AM	LOS D (45.0 sec)	16.1	B
			PM		10.3	B
39	Holmes Street & Mocho Street	Signal	AM	LOS D (45.0 sec)	25.7	C
			PM		6.4	A
40	Holmes Street & Vancouver Way-El Caminito	Signal	AM	LOS D (45.0 sec)	14.2	B
			PM		6.7	A

#	Intersection	Control	Peak Hour	Operating Standard	Delay	LOS
41	Holmes Street & Wetmore Road	Signal	AM	LOS D (45.0 sec)	15.6	B
			PM		10.1	B
42	Jack London Boulevard & Arlington Road	Signal	AM	LOS D (45.0 sec)	25	C
			PM		23.8	C
43	Jack London Boulevard & Hagemann Drive	Signal	AM	LOS D (45.0 sec)	6.8	A
			PM		6	A
44	Jack London Boulevard & Livermore Outlets Drive	Signal	AM	LOS D (45.0 sec)	24.3	C
			PM		21.6	C
45	Jack London Boulevard & Shops Street	Signal	AM	LOS D (45.0 sec)	41.2	D
			PM		**92.5**	**F**
46	Jack London Boulevard & Wolf House Drive	Signal	AM	LOS D (45.0 sec)	4.8	A
			PM		4.1	A
47	L Street & Second Street	Signal	AM	LOS D (45.0 sec)	12	B
			PM		11.5	B
48	Las Positas Road & Mines Road	Signal	AM	LOS D (45.0 sec)	20.5	C
			PM		22.5	C
49	Las Positas Road & Hilliker Place	Signal	AM	LOS D (45.0 sec)	8.3	A
			PM		9.1	A
50	Livermore Avenue & Arroyo Plaza	Signal	AM	LOS D (45.0 sec)	8.8	A
			PM		11.7	B
51	Livermore Avenue & Chestnut Street	Signal	AM	LOS D (45.0 sec)	13.1	B
			PM		13	B
52	Livermore Avenue & Concannon Boulevard	Signal	AM	LOS D (45.0 sec)	41.8	D
			PM		37.7	D
53	Livermore Avenue & Cromwell Way	Signal	AM	LOS D (45.0 sec)	5.3	A
			PM		6.1	A
54	Livermore Avenue & Junction Avenue	Signal	AM	LOS D (45.0 sec)	23.6	C
			PM		12.9	B
55	Livermore Avenue & Las Positas Road	Signal	AM	LOS D (45.0 sec)	41.3	D
			PM		**45.6**	**D**
56	Livermore Avenue & Portola Avenue	Signal	AM	LOS D (45.0 sec)	39.4	D
			PM		**51.1**	**D**
57	Mines Road & Charlotte Wy-Audry Street	Signal	AM	LOS D (45.0 sec)	10.8	B
			PM		11.2	B
58	Mines Road & Patterson Pass Road	Signal	AM	LOS D (45.0 sec)	27.7	C
			PM		35.9	D
59	Murrieta Boulevard & Fenton Street	Signal	AM	LOS D (45.0 sec)	3.2	A
			PM		4.2	A
60	Murrieta Boulevard & Jack London Blvd-Pine Street	Signal	AM	LOS D (45.0 sec)	**86.8**	**F**
			PM		**107.8**	**F**
61	Murrieta Boulevard & Olivina Avenue	Signal	AM	LOS D (45.0 sec)	18	B
			PM		14	B

CIRCULATION

#	Intersection	Control	Peak Hour	Operating Standard	Delay	LOS
62	North Canyons Parkway & Collier Canyon Road	Signal	AM	LOS D (45.0 sec)	38.2	D
			PM		**51.6**	**D**
63	North Canyons Parkway & Airway Boulevard	Signal	AM	LOS D (45.0 sec)	117.9	F
			PM		29.1	C
64	North Canyons Parkway & Constitution Drive	Signal	AM	LOS D (45.0 sec)	14.6	B
			PM		27.5	C
65	P Street & Olivina Avenue-Chestnut Avenue	Signal	AM	LOS D (45.0 sec)	11.6	B
			PM		12.3	B
66	Portola Avenue & Isabel Avenue	Signal	AM	LOS D (45.0 sec)	26	C
			PM		24.7	C
67	Portola Avenue & L Street	Signal	AM	LOS D (45.0 sec)	18.5	B
			PM		22.1	C
68	Portola Avenue & Montage Drive	Signal	AM	LOS D (45.0 sec)	6.8	A
			PM		6	A
69	Portola Avenue & Murrieta Boulevard	Signal	AM	LOS D (45.0 sec)	24.2	C
			PM		28.9	C
70	Portola Avenue & P Street	Signal	AM	LOS D (45.0 sec)	9.2	A
			PM		9.7	A
71	Portola Avenue & Tranquility Circle	Signal	AM	LOS D (45.0 sec)	10.5	B
			PM		11.1	B
72	Railroad Avenue & L Street	Signal	AM	LOS D (45.0 sec)	27.8	C
			PM		30	C
73	Railroad Avenue & Livermore Ave	Signal	AM	LOS D (45.0 sec)	**48.9**	**D**
			PM		**60**	**E**
74	Railroad Avenue & P Street	Signal	AM	LOS D (45.0 sec)	23.5	C
			PM		34.6	C
75	Railroad Avenue & Parking Structure	Signal	AM	LOS D (45.0 sec)	7.6	A
			PM		9.3	A
76	Stanley Boulevard & El Caminito	Signal	AM	LOS D (45.0 sec)	20.9	C
			PM		6.5	A
77	Stanley Boulevard & Fenton Street	Signal	AM	LOS D (45.0 sec)	30.9	C
			PM		23.7	C
78	Stanley Boulevard & Isabel Avenue	Signal	AM	LOS D (45.0 sec)	26.6	C
			PM		24.5	C
79	Stanley Boulevard & Murdell Lane	Signal	AM	LOS D (45.0 sec)	13.3	B
			PM		17.6	B
80	Stanley Boulevard & Murrietta Boulevard	Signal	AM	LOS D (45.0 sec)	43.4	D
			PM		42.6	D
81	Stanley Boulevard & Wall Street	Signal	AM	LOS D (45.0 sec)	43.3	D
			PM		11.4	B
82	Stanley Boulevard-Railroad Avenue & S Street	Signal	AM	LOS D (45.0 sec)	39.4	D
			PM		**45.7**	**D**
83	Vallecitos Road & Vineyard Avenue	Signal	AM	LOS D (45.0 sec)	9.9	A
			PM		9.1	A
84	Vasco Road & Brisa Street	Signal	AM	LOS D (45.0 sec)	23.6	C
			PM		28.3	C

#	Intersection	Control	Peak Hour	Operating Standard	Delay	LOS
85	Vasco Road & Dalton Avenue	Signal	AM	LOS D (45.0 sec)	**100.6**	**F**
			PM		**85.6**	**F**
86	Vasco Road & Daphne Drive-W Gate Drive	Signal	AM	LOS D (45.0 sec)	27.1	C
			PM		**228.5**	**F**
87	Vasco Road & East Avenue	Signal	AM	LOS D (45.0 sec)	39.1	D
			PM		42.5	D
88	Vasco Road & Garaventa Ranch Road	Signal	AM	LOS D (45.0 sec)	47.5	D
			PM		42.2	D
89	Vasco Road & Industrial Way	Signal	AM	LOS D (45.0 sec)	40.5	D
			PM		44.6	D
90	Vasco Road & Las Positas Road	Signal	AM	LOS D (45.0 sec)	37.9	D
			PM		37.9	D
91	Vasco Road & Northfront Road	Signal	AM	LOS D (45.0 sec)	31.7	C
			PM		33.9	C
92	Vasco Road & Patterson Pass Road	Signal	AM	LOS D (45.0 sec)	**59.3**	**E**
			PM		**54.3**	**D**
93	Vasco Road & Scenic Avenue	Signal	AM	LOS D (45.0 sec)	**74**	**E**
			PM		42.1	D
94	Mines Road & Technology Drive	Signal	AM	LOS D (45.0 sec)	4	A
			PM		4.6	A
95	Vasco Road & Tesla Road	Signal	AM	LOS D (45.0 sec)	37.2	D
			PM		24.7	C
96	Arroyo Road & Wetmore Road	AWSC	AM	Less than 90.0 sec	8.4	A
			PM		11.1	B
97	Broadmoor Street & Scenic Avenue	AWSC	AM	Less than 90.0 sec	17.3	C
			PM		12.7	B
98	Central Avenue & Scenic Avenue	AWSC	AM	Less than 90.0 sec	12	B
			PM		9.2	A
99	Chestnut Street & L Street	AWSC	AM	Less than 90.0 sec	11.8	B
			PM		12.4	B
100	College Street & L Street	AWSC	AM	Less than 90.0 sec	14.7	B
			PM		23.6	C
101	Fourth Street & Inman Street	AWSC	AM	Less than 90.0 sec	17	C
			PM		14.4	B
102	Livermore Avenue & Second Street	AWSC	AM	Less than 90.0 sec	11.8	B
			PM		12.7	B
103	Maple Street & Fourth Street	AWSC	AM	Less than 90.0 sec	16.8	C
			PM		13.2	B
104	Pine Street & L Street	AWSC	AM	Less than 90.0 sec	10.8	B
			PM		10.6	B
105	Pine Street & P Street	AWSC	AM	Less than 90.0 sec	11.3	B
			PM		11.7	B
106	Pine Street & Rincon Avenue	AWSC	AM	Less than 90.0 sec	7.9	A
			PM		7.5	A

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#	Intersection	Control	Peak Hour	Operating Standard	Delay	LOS
107	Northfront Road & I-580 WB Ramps	TWSC	AM	Less than 90.0 sec	35.5	E
			PM		30.6	D
108	Southfront Road & I-580 EB Ramps	AWSC	AM	Less than 90.0 sec	15.6	C
			PM		**265.2**	**F**
109	Sunflower Court & Bluebell Drive	AWSC	AM	Less than 90.0 sec	15.9	C
			PM		19.8	C
110	Vasco Road & Preston Avenue	TWSC	AM	Less than 90.0 sec	20.6	C
			PM		**76.6**	**F**
111	Airway Boulevard & I-580 WB Ramps	Signal	AM	LOS D	5.5	A
			PM		10.3	B
112	Airway Boulevard & Kitty Hawk Road-I-580 EB Ramps	Signal	AM	LOS D	22.2	C
			PM		20.6	C
113	First Street & I-580 EB Ramps	Signal	AM	LOS D	21.3	C
			PM		**57.3**	**E**
114	First Street & I-580 WB Ramps	Signal	AM	LOS D	7.8	A
			PM		5.9	A
115	Livermore Avenue & I-580 EB Ramps	Signal	AM	LOS D	13.2	B
			PM		29.6	C
116	Livermore Avenue & I-580 WB Ramps	Signal	AM	LOS D	26.6	C
			PM		24.5	C
117	Isabel Avenue & I-580 EB Ramps	Signal	AM	LOS D	11.4	B
			PM		10.8	B
118	Isabel Avenue & I-580 WB Ramps	Signal	AM	LOS D	14.6	B
			PM		13.9	B
119	Isabel Avenue & Airway Boulevard	Signal	AM	LOS D	27.8	C
			PM		34	C
120	Isabel Avenue & Concannon Boulevard	Signal	AM	LOS D	32.7	C
			PM		21	C
121	Isabel Avenue & Jack London Boulevard	Signal	AM	LOS D	**57.7**	**E**
			PM		38.2	D
122	Isabel Avenue & Stanley Blvd Connector	Signal	AM	LOS D	24.9	C
			PM		23.1	C
123	Isabel Avenue & Vallecitos Road	Signal	AM	LOS D	14.1	B
			PM		8.4	A
124	Isabel Avenue & Vineyard Avenue	Signal	AM	LOS D	21.2	C
			PM		24	C
125	Jack London Boulevard & El Charro Road	Signal	AM	LOS D	27.5	C
			PM		37.2	D

Notes: AWSC – All-Way Stop Control; TWSC – Two Way Stop Control
Delay is measured in average seconds per vehicle
Bold represents intersections operating below operating standards.

7.2.5.4 VEHICLE MILES TRAVELED

A common indicator used to quantify the amount of motor vehicle use in a specified area is vehicle miles traveled (VMT). One VMT is defined as any type of motor vehicle being driven a distance of one mile. Many factors affect VMT including the average distance residents commute to work, school, and shopping, as well as the proportion of trips that are made by non-automobile modes. Areas that have a diverse land use mix and ample facilities for non-automobile modes, including transit, tend to generate lower VMT than auto-oriented suburban areas farther from metropolitan centers.

In 2013, SB 743 was signed into law, starting a process that disallows the use of LOS as a metric for evaluating the impacts of new development projects under the California Environmental Quality Act (CEQA). Projects must instead be evaluated based on the number of vehicle miles they are likely to generate. The City of Livermore is currently working on developing VMT thresholds and standards to comply with SB 743.

The Alameda CTC has developed tools listed below to assist local agencies to develop VMT thresholds and implement SB 743.

- *Alameda County VMT Reduction Calculator Tool:* The tool can be used in evaluating transportation effects of land use projects under CEQA and allows application of VMT reduction strategies.
- *VMT Mapping Resources:* Alameda CTC has developed maps and tables that display estimates of VMT per Capita and per Employee at the Traffic Analysis Zone (TAZ) level and planning area level in Alameda County.

Table 7-9 shows the VMT comparison by City of Livermore, East Alameda County, and Alameda County for the years 2020[5] and 2040. The Alameda CTC modeled the VMT data by interpolating 2015 baseline conditions to 2020 and 2040. Therefore, the 2020 data does not represent transportation patterns that resulted from the Covid-19 pandemic and it is possible that the 2020 per capita VMT could be lower given many residents worked from home during this timeframe. This current regional model does not reflect local investments in alternative transportation in Livermore, such as the City's 2018 Bicycle, Pedestrian, & Trails Active Transportation Plan, or future transit improvements such as the Valley Link rail project.

Based on the Alameda CTC data, the average Livermore resident drives more miles per capita per day than the average Bay Area resident, while the average person who works in Livermore travels fewer miles per capita per day than the average Bay Area worker.

[5] Alameda Countywide Transportation Model was developed in 2015 (prior to the Covid-19 pandemic). The Year 2020 refers to the forecast horizon year for the model. More information can be found here: https://www.alamedactc.org/wp-content/uploads/2018/12/AlamedaCTC_ModelDocumentation_FinalReport_20151109-2.pdf

TABLE 7-9 AVERAGE VEHICLE MILES TRAVELED PER DAY, 2020 AND 2040

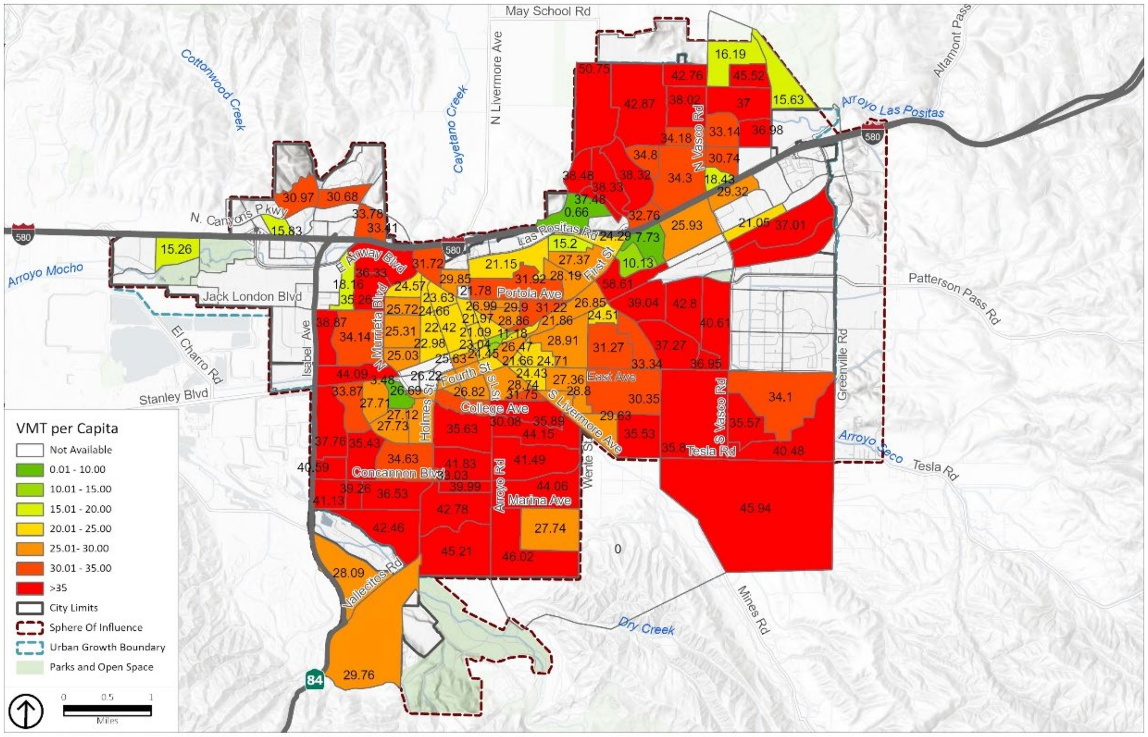
	City of Livermore	East Alameda County	Alameda County	Bay Area (9 County Region)
VMT per Capita 2020	33.7	30.5	19.4	19.8
VMT per Capita 2040	32.3	28.5	17.6	19.1
VMT per Employee 2020	16.3	15.2	15.9	18.1
VMT per Employee 2040	16.2	15.9	16.2	18.2

Source: Alameda Countywide Travel Model, Plan Bay Area 2040 version, May 2019

Figures 7-9 and 7-10 show the estimates of VMT per Capita (residential uses only) and VMT per Employee (employment uses only) for each traffic analysis zone (TAZ) in Livermore. TAZs with zero values (white) did not have population or jobs in the 2020 model. These TAZ estimates are consistent with Plan Bay Area 2040; updated population and employment projections based on Plan Bay Area 2050 are not yet available. The countywide travel demand model will soon be updated to reflect the changes in the newly adopted Plan Bay Area 2050. It is anticipated that the planned Valley Link rail and other improvements will result in lower citywide VMT estimates.

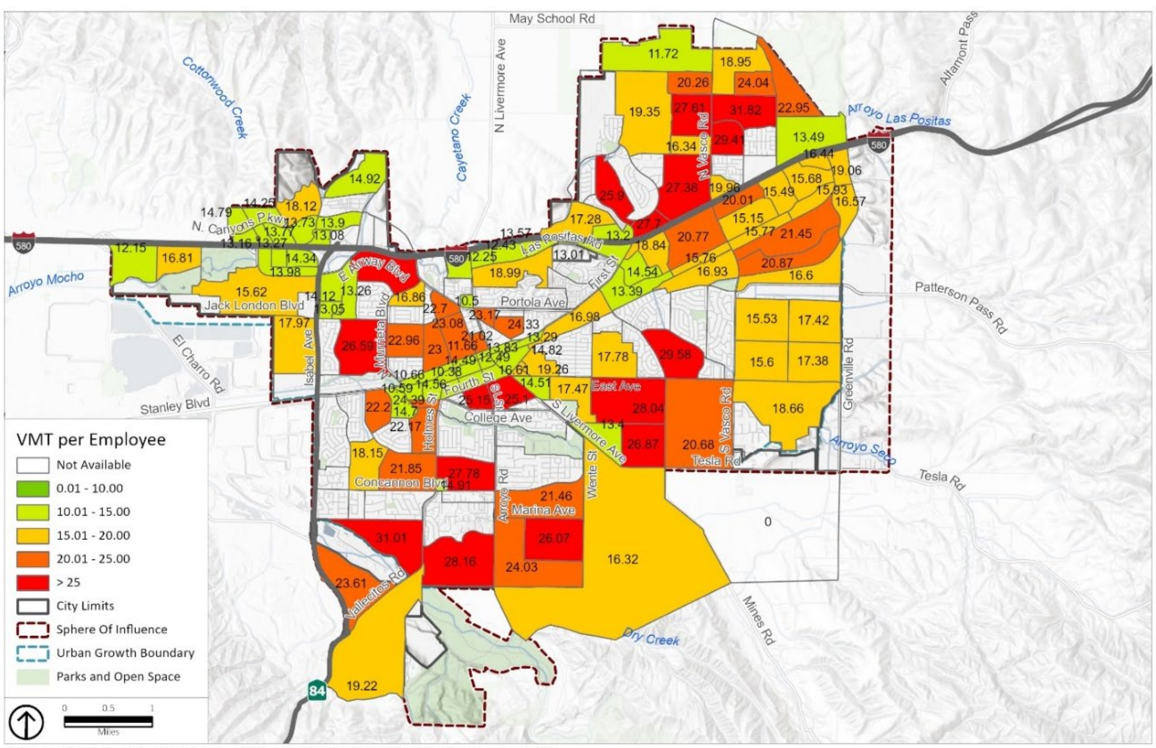
The Alameda CTC developed a Countywide Transportation Demand Management (TDM) strategy that provides background information and recommended strategies that could be adopted by the partner agencies. The TDM program intends to address the growing travel demand and meeting per capita VMT reduction goals by encouraging people to use alternative modes of transportation than driving a single-occupancy vehicle (SOV).

FIGURE 7- 9 2020 VEHICLE MILES TRAVELED PER CAPITA BY TAZ



Source: Alameda Countywide Travel Model, Plan Bay Area 2040 version, May 2019

FIGURE 7- 10 2020 VEHICLE MILES TRAVELED PER EMPLOYEE BY TAZ



Source: Alameda Countywide Travel Model, Plan Bay Area 2040 version, May 2019

7.2.5.5 GOODS MOVEMENT

Truck Routes

Commercial trucks are authorized to use Caltrans state legal truck routes, consistent with the California Vehicle Code, except where specific restrictions have been adopted. In Livermore, I-580 and Isabel Avenue (SR-84) are identified as the major state truck routes. In addition, the City of Livermore designated East Stanley Boulevard west of Isabel Avenue as a truck route. The City also identified roadways for local deliveries within Livermore as shown in Figure 7-11.

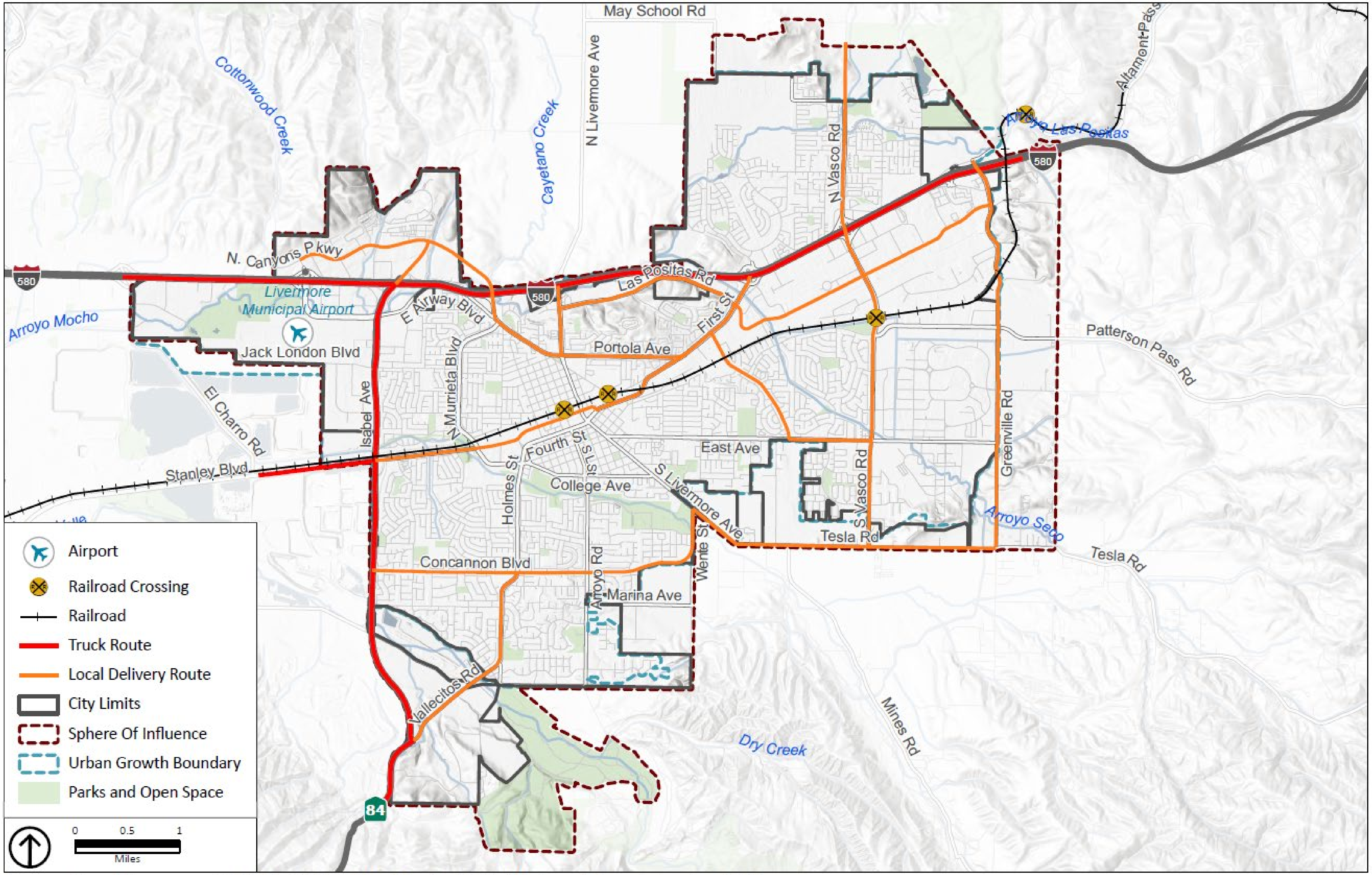
Rail Movements

Livermore has a rich and complex history of railroads running in and around the city. Rail freight through Livermore is served by the Union Pacific Railroad which is a Class I carrier that runs through Niles Junction and connects to the Port of Oakland. There were two sets of railroad tracks that ran through the valley. Both came through the Altamont pass, Livermore, Pleasanton, and Niles Canyon. They are commonly referred to as the SP (Southern Pacific) line and the WP (Western Pacific) line, although both railroads are now part of the Union Pacific. There are three major at-grade railroad crossings within the Livermore City Limits, and one immediately east of the city on Altamont Pass Road, as shown in Figure 7-11.

Air Transportation

The Livermore Municipal Airport (Airport) is the only airport in the Tri-Valley area and is owned and operated by the City of Livermore Public Works Department. The location and availability of services at the Airport have assisted in facilitating the economic growth of the Tri-Valley area. The average annual aircraft operations are estimated around 200,000. The airport has no scheduled airline service but provides local connections to all the major cities in the Northern California and regional connections through private charter flights.

FIGURE 7- 11 GOODS MOVEMENT



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

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7.2.5.6 PLANNED ROADWAY IMPROVEMENTS

Table 7-10 and Figure 7-12 show the planned roadway improvements for Livermore. These improvements were identified through various planning studies listed in the regulatory section of this chapter such as new and upcoming communities like El Charro and Isabel Neighborhood. The implementation of these projects will require coordinated efforts from the City of Livermore and other regional agencies.

TABLE 7- 10 PLANNED ROADWAY IMPROVEMENTS

Map Id	Project Name	Project Description
S1	Traffic Signal Installation at Greenville Road/Patterson Pass Road	This project will install traffic signals at the highest priority intersections based on the current Traffic Signal Priority List.
S2	Traffic Signal Installation at Greenville Road/Altamont Pass Road	Install a traffic signal at the intersection of Greenville Road and Altamont Pass Road. Restripe Greenville Road to provide two northbound lanes from Southfront Road to Altamont Pass Road.
S3	Intersection Improvements	Narrow travel lanes and relocate the median to provide an additional westbound through lane. Install bike and pedestrian facilities on northerly shoulder and install new traffic signal at Jack London Boulevard and Zeppelin Drive.
I1	Isabel Ave. / I-580 Interchange, Phase 2	The second phase will widen the Isabel interchange and the Portola overcrossing by two lanes to ultimate configuration CIP No.202338 has not commenced.
I2	Vasco Rd. / I-580 Interchange	To meet current and future traffic operational needs, and integrate the Valley Link Rail, and refine or develop new design concepts to meet current project needs.
I3	El Charro Interchange	El Charro Rd interchange and widening of Jack London Blvd. to four lanes remain.
R1	Las Positas Road Widening Hilliker Place to First Street	Widen Las Positas Road (approximately 1.8 miles) from two to four lanes between Hilliker Place and First Street.
R2	Jack London Boulevard Widening	Converting Jack London Boulevard to four lane from Isabel Avenue to El Charro Road.
R3	Vasco Road Widening	The Vasco Road Widening project will widen northbound Vasco Road from one lane to two lanes between Garaventa Ranch Road and north of Dalton Avenue and improve existing traffic operations.
C1	North Canyons Parkway / Dublin Boulevard Connection	Connection of North Canyons Parkway and Dublin Boulevard as a four-lane major roadway between Doolan Canyon Road and the east Dublin City limits. The project will have a bridge crossing over Cottonwood Creek within the jurisdiction of Alameda County and will require coordination with Alameda County. The City of Dublin is the lead agency.
C2	Foley Road Realignment	This project will design and construct the realignment of Foley Road to the new signalized intersection of E. Vineyard Avenue and Vallecitos Road to make a four-leg intersection.

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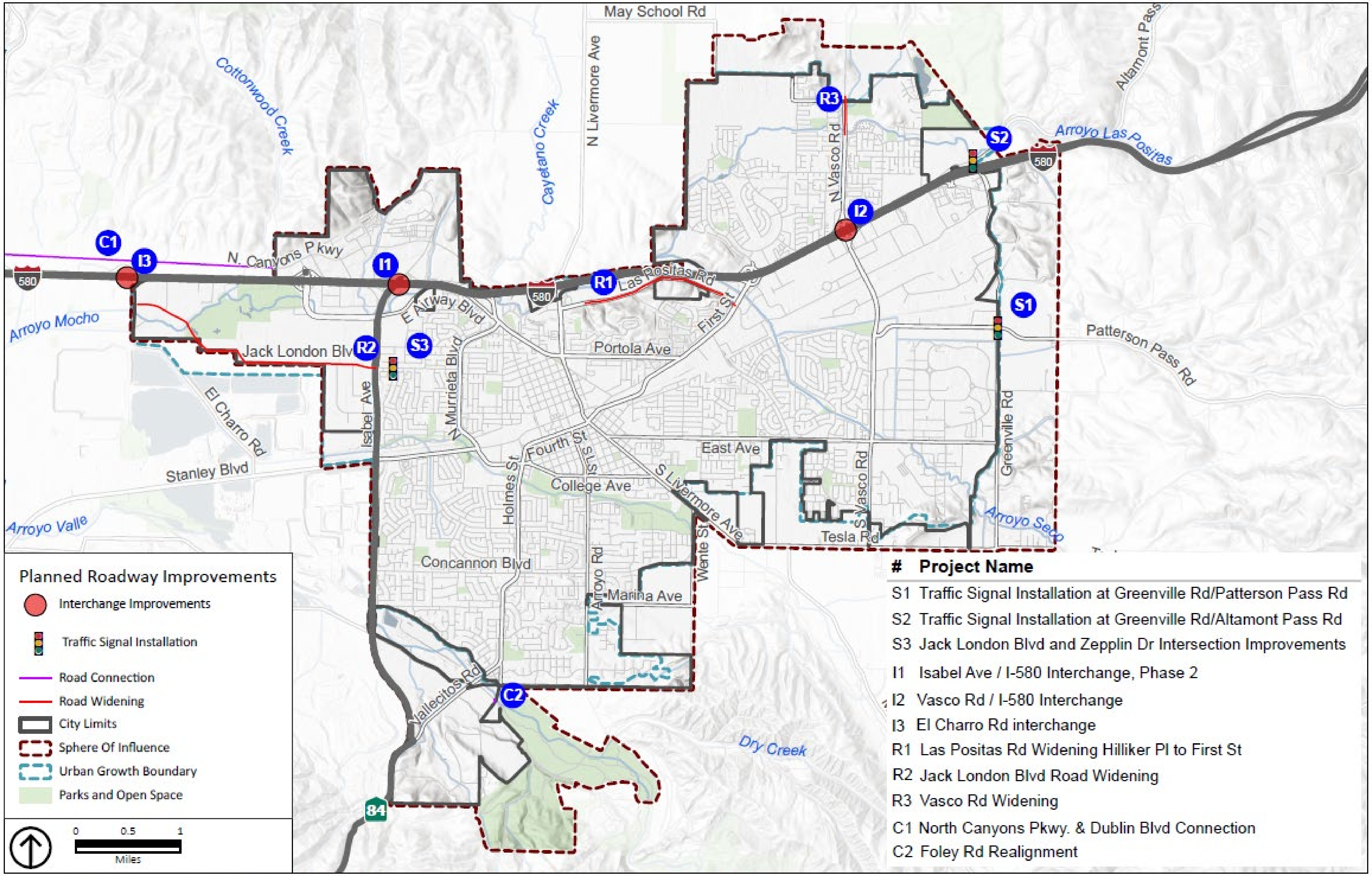
Figure 7- 12 Planned Roadway Improvements



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

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7.2.6 TRANSIT SYSTEM

Public transportation in Livermore is mainly provided by the Livermore Amador Valley Transit Authority (LAVTA) bus service and Altamont Corridor Express (ACE) passenger rail service. Figure 7-14 shows the existing and planned transit network for Livermore.

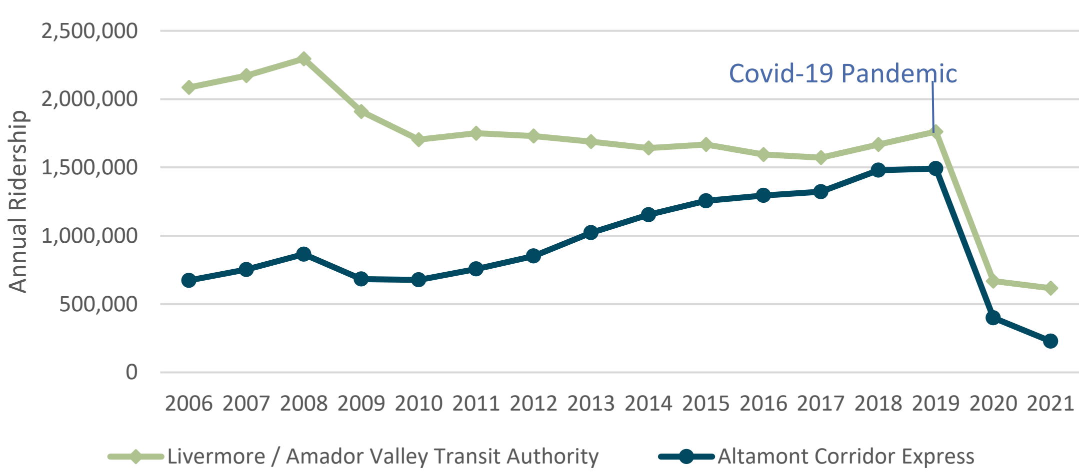
Livermore Amador Valley Transit Authority (LAVTA)

LAVTA provides bus service to Livermore, with routes to and from San Ramon, Dublin, and Pleasanton. The Livermore Transit Center in Downtown Livermore serves as a major hub for LAVTA bus service and provides transfer for downtown Livermore ACE station. It provides the following transportation services: Fixed Route (Wheels) Service, Bus Rapid Transit (Rapid) Service, Demand Responsive Paratransit Service (Dial-A-Ride) to senior and disabled persons and on-demand services throughout the area. The Wheels fixed route system runs throughout the year and carries an average of 5,700 passengers per day (during the pre-pandemic years). The annual ridership trend for LAVTA is shown in Figure 7-13 which shows LAVTA's entire service system, including the routes that serve Livermore.

Altamont Corridor Express (ACE)

The ACE commuter rail service runs from San Jose to Stockton during peak hours and has two stops in Livermore, one in Downtown and another at Vasco Road near Patterson Pass Road. The ACE rail service is managed by the San Joaquin Regional Rail Commission (SJRRC). In 2019, SJRRC developed an Altamont Corridor Vision to establish a universal rail corridor connecting the San Joaquin Valley and the Tri-Valley to San Jose, Oakland, San Francisco and the Peninsula. This Vision complements other similar investments being planned for the northern California region including the new Transbay Crossing, which would allow for passenger trains to flow from Oakland to San Francisco and Valley Rail, which will connect Merced and Sacramento.

FIGURE 7- 13 ANNUAL RIDERSHIP



Source: Federal Transit Administration (FTA) National Transit Database, 2021

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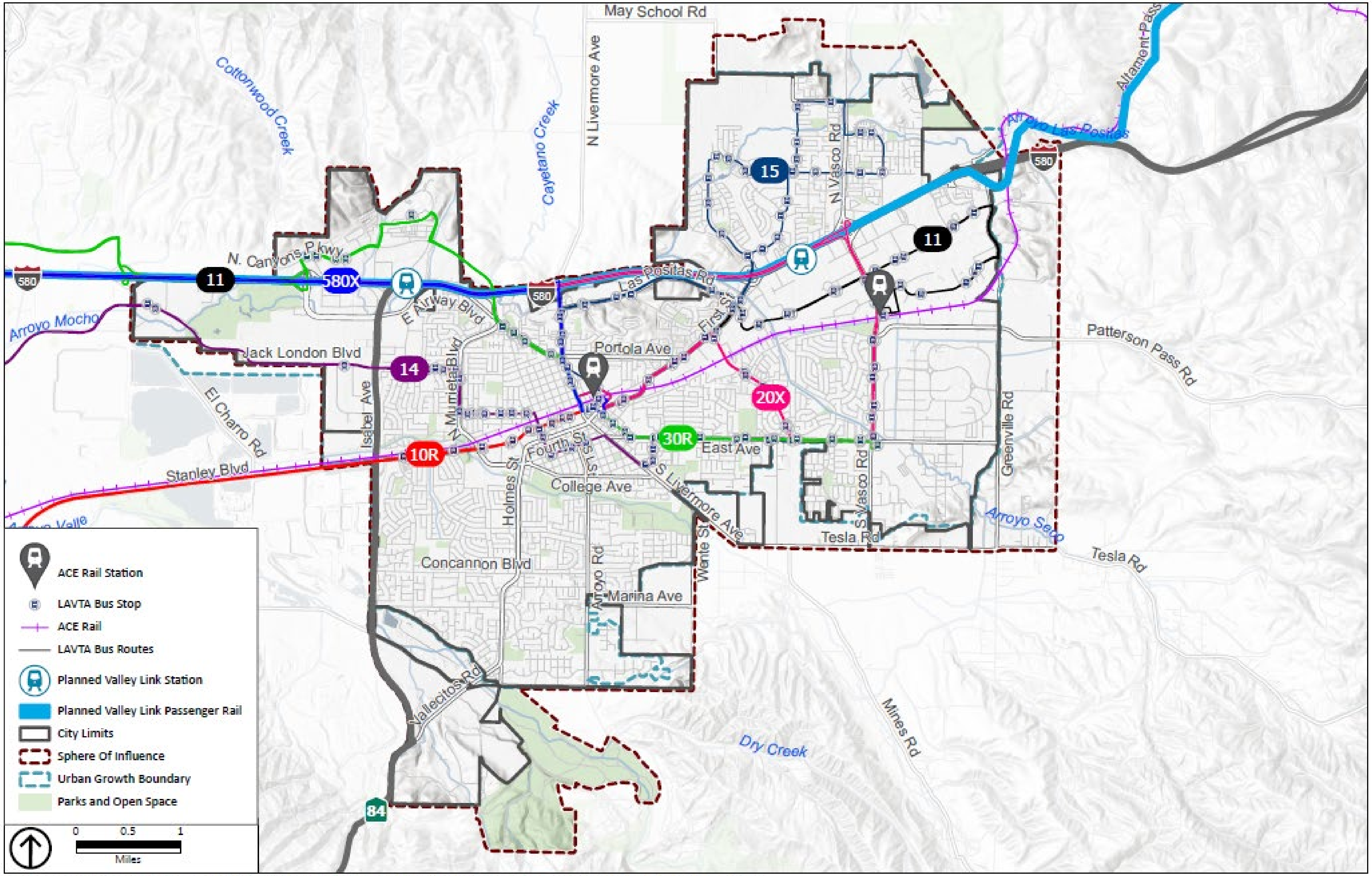
FIGURE 7- 14 EXISTING AND PLANNED TRANSIT NETWORK



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

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7.2.6.2 PLANNED TRANSIT IMPROVEMENTS

Valley Link

On January 1, 2018, the Tri-Valley – San Joaquin Valley Regional Rail Authority was established to plan and deliver cost-effective and responsive transit connectivity between the BART system in the Tri-Valley and the ACE, called Valley Link. After three years of developing a feasibility study, alternatives analysis and environmental documentation, the Final Environmental Impact Report (FEIR) was approved on May 12, 2021. The project proposes a new 42-mile passenger rail project with two stations in Livermore along the I-580 corridor: one at Isabel Avenue and another along Southfront Road just east of First Street. The project is estimates initial average weekday ridership to be around 8,372.

7.2.7 PEDESTRIAN NETWORK

The pedestrian network comprises sidewalks, pathways, crosswalks, curb ramps, crossing enhancements, and amenities like benches and lighting throughout Livermore.

7.2.7.1 EXISTING FACILITIES

Most streets in Livermore provide sidewalk coverage, accessible curb ramps, and crosswalks, including pedestrian signals at signalized intersections. Enhanced crosswalks and/or bulbouts are included at specific crosswalks, such as in the Downtown, to reduce crossing distances.

Livermore sidewalks vary in width from five to ten feet, depending on the adjacent land use. The City has approximately 566 miles of sidewalks, covering 93 percent of the street network.

Barriers to Walking

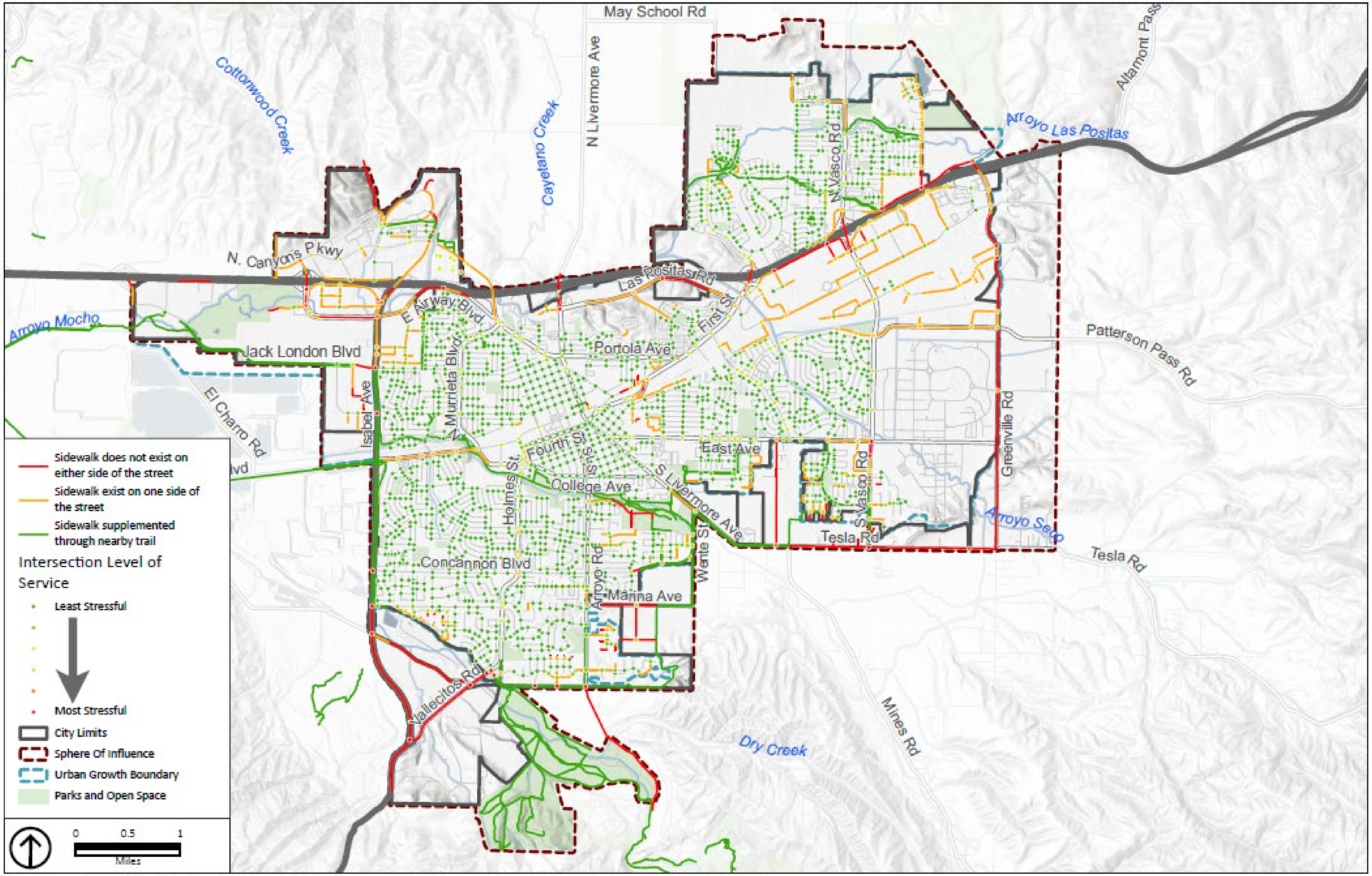
While the pedestrian network is generally well developed in Livermore, there are some locations where gaps or barriers limit pedestrian circulation, including lengthy crossings of busy streets and/or discontinuous street patterns in newer developments. Figure 7-15 illustrates the pedestrian barriers by identifying sidewalk gaps and pedestrian level of service at the intersections. Pedestrian level of service identifies street segments where people are unlikely to be comfortable walking due to sidewalk gaps, challenging crossing or speeding of vehicles.

The ATP identified 44 miles of roadways that have a sidewalk on only one side, and 32 miles that lack sidewalks entirely. Sidewalk gaps are primarily found on high-speed arterials, collectors and state routes especially located on the edge of the city and away from residential development. Small sidewalk gaps that exist sporadically throughout the city impede or discourage pedestrian activity.

7.2.7.2 PLANNED FACILITIES

Most pedestrian improvements or projects are developed at the neighborhood level or combined with a roadway project. The ATP proposes six miles of sidewalk improvements and 76 crossing improvements throughout the city. The crossing improvements in the ATP are classified as low, medium, or high intensity based on the complexity of facilities required. High-intensity crossings are further divided into low and high-cost categories.

FIGURE 7- 15 PEDESTRIAN GAPS AND BARRIERS



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

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7.2.8 BICYCLE NETWORK

7.2.8.1 EXISTING FACILITIES

The California Department of Transportation (Caltrans) classifies and defines bicycle facilities. Caltrans designates four classes of bicycle facilities: Classes I, II, III, and IV. Figure 7-16 below illustrates and describes the bicycle facility classifications. In addition, the Alameda County Transportation Commission (Alameda CTC) has adopted a set of sub-classifications for each Caltrans classification. These sub-classifications were designed to harmonize previously existing local classification systems within Alameda County and to incorporate emerging bikeway typologies.

Presently, the City of Livermore has 106 miles of bikeways which includes 40 miles of Class I Shared Use Path and 66 miles of Class II Bicycle Lanes. Figure 7-17 shows the existing bicycle network and Figure 7-20 shows the planned bicycle network.

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FIGURE 7- 16 TYPES OF BICYCLE FACILITIES

TYPES OF BICYCLE FACILITIES

There are four classifications of bikeway facilities in Caifornia as defined by the Department of Transportation (Caltrans).

Multi-Use Paths (Class I Bikeways)

A path physically separated from motor vehicle traffic by an open space or barrier, used by bicyclistes, pedestrians, joggers, skaters, and other non-motorized travelers. Because the availability of uninterrupted rights-of-way is limited, this type of facilities may be difficult to locate and expensive to build relative to other types of bicycle and pedestrian facilities, but inexpensive compared to new roadways. Prime locations for bike paths are areas such as power-line easements, utility easements, canal banks, river levees, drainage easements, railroad or highway rights-of-way, or regional community parks.

Bicycle Lanes (Class II Bikeways)

A travel lane on a roadway that has been set aside by striping and pavement markings for the preferential or exclusive use of bicyclists. Bicycle lanes are intended to promote an orderly flow of bicycle and motor vehicle traffic. This type of facility is established by using the appropriate striping, legends, and signs.

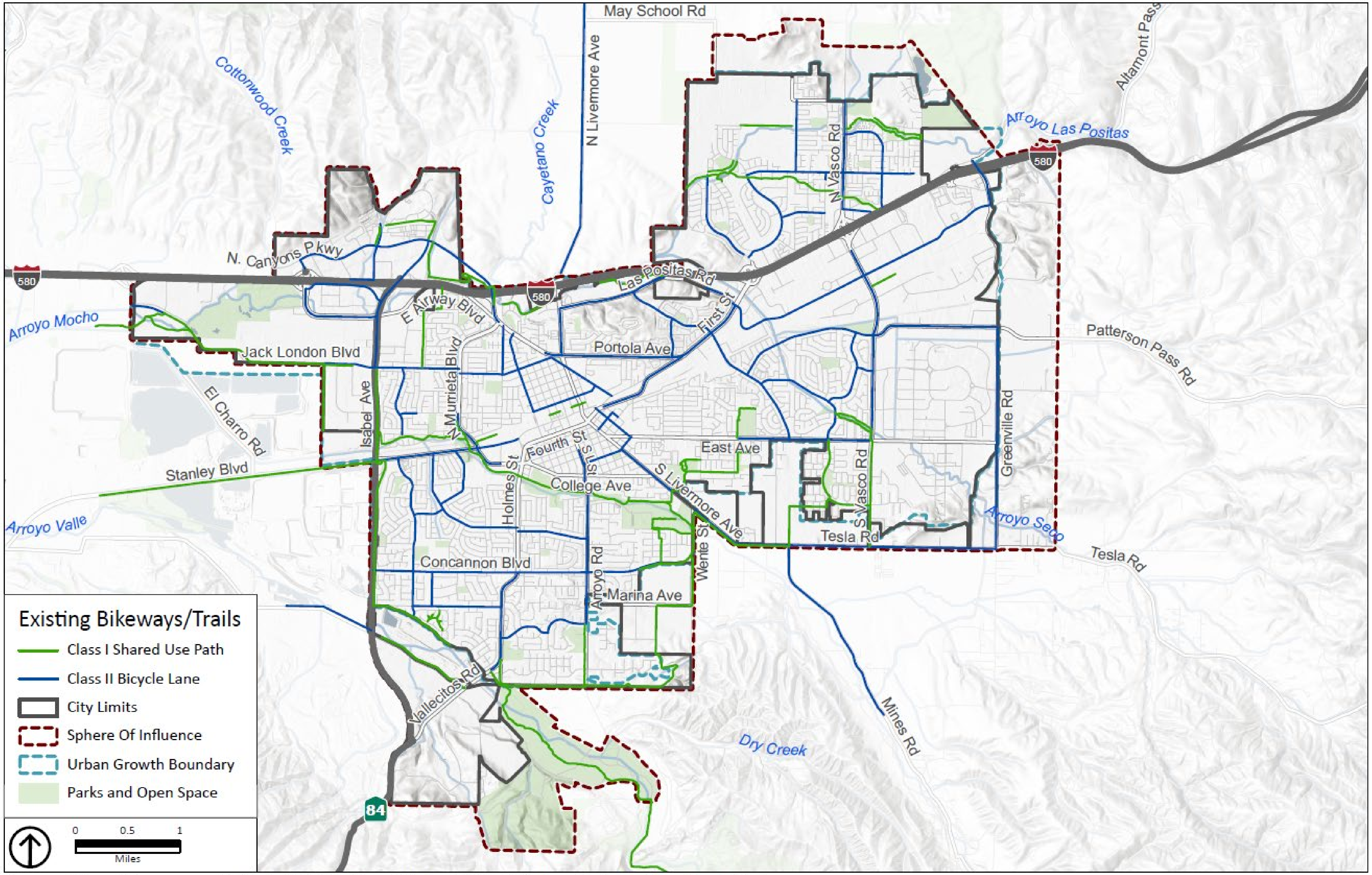
Bicycle Routes (Class III Bikeways)

Bicycle routes designated by signage where bicyclists share travel lanes with motor vehicle traffic. Bicycle routes must be of benefit to the bicyclists and offer a higher degree of service than adjacent streets. Class III bikeways are often designated on low-volume local residential streets. Additionally, many cities have installed an enhanced type of Class III Bicycle Route, referred to as a "Bicycle Boulevard." Bicycle Boulevard are generally installed on relatively low-volume streets and often include elements to facilitate bicycle travel, such as reorienting stop signs to reduce delays to cyclists, and/or discouraging use by motorists making through trips, such as through the inclusion of traffic calming measures.

Separated Bikeway (Class IV Bikeways)

A class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeways and adjacent vehicle traffic. The physical separation may include flexible posts, grade separation, inflexible physical barriers or on-street parking. Separated bikeways generally operate in the same direction as vehicle traffic on the same side of the roadway. However, two-way separation bikeways can also be used, usually in lower speed environments (35 miles per hour or less).

FIGURE 7- 17 EXISTING BICYCLE NETWORK



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

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Bicycle Level of Traffic Stress

The Bicycle Level of Traffic Stress (BLTS) analysis identifies street segments where people are likely to be uncomfortable due to stressful factors like speeding cars, high traffic volumes, or bicycle facilities that do not provide enough separation from moving cars. Figure 7-18 describes the different levels of BLTS. The ATP conducted a citywide BLTS analysis for street segments and intersections.

The BLTS approach quantifies the amount of discomfort that people feel when bicycling. It assigns a numeric stress level to roadway segments and intersections based on attributes such as motor vehicle speed, volume, number of lanes, lane blockage, on-street parking, and ease of intersection crossing. BLTS 1 represents a facility type that is suitable for all types of cyclists including children, while BLTS 4 represents a high amount of traffic stress. BLTS patterns are mapped spatially with the purpose of identifying opportunities for infrastructure improvements. Figure 7-19 shows the citywide BLTS analysis. Most stressful (BLTS 4) segments are primarily found on high-speed arterials, collectors and state routes especially located on the edge of the city and where there is no dedicated bicycle facilities.

FIGURE 7- 18 BICYCLE LEVEL OF TRAFFIC STRESS

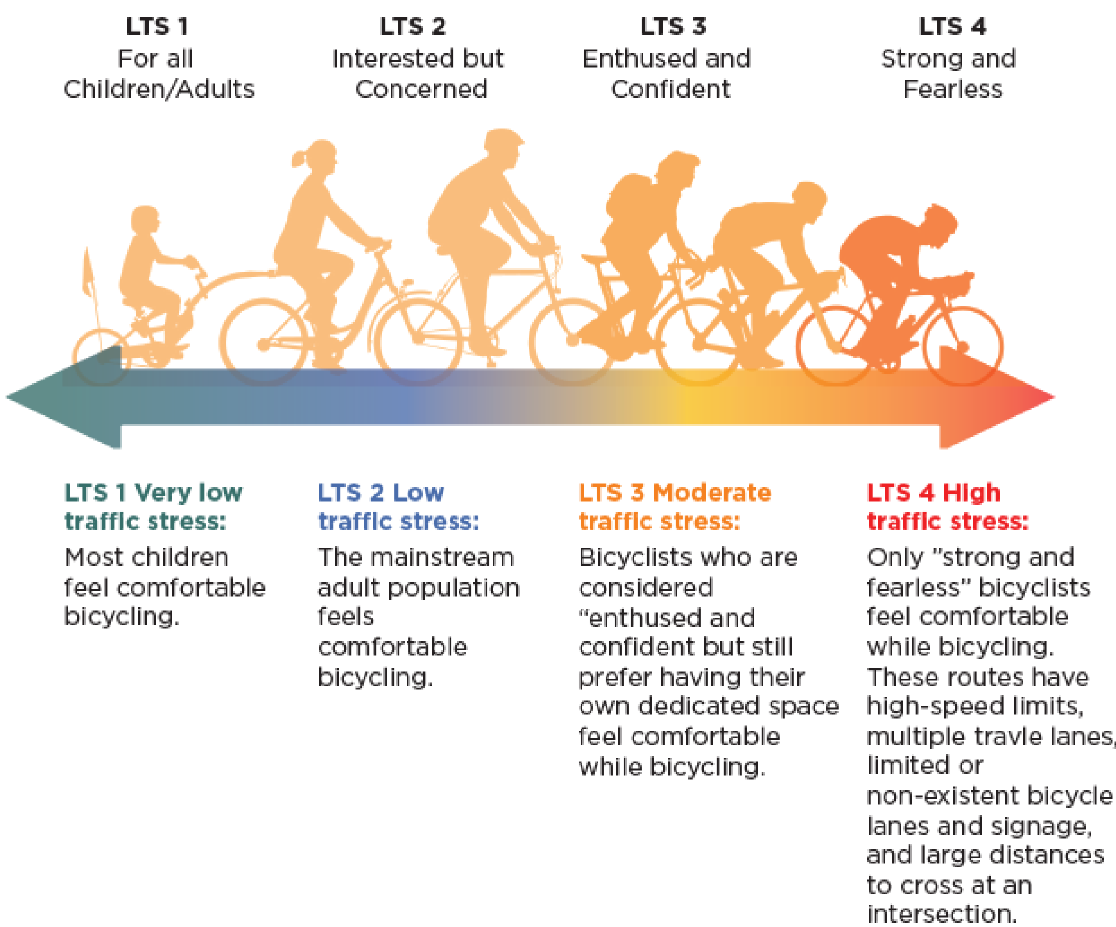

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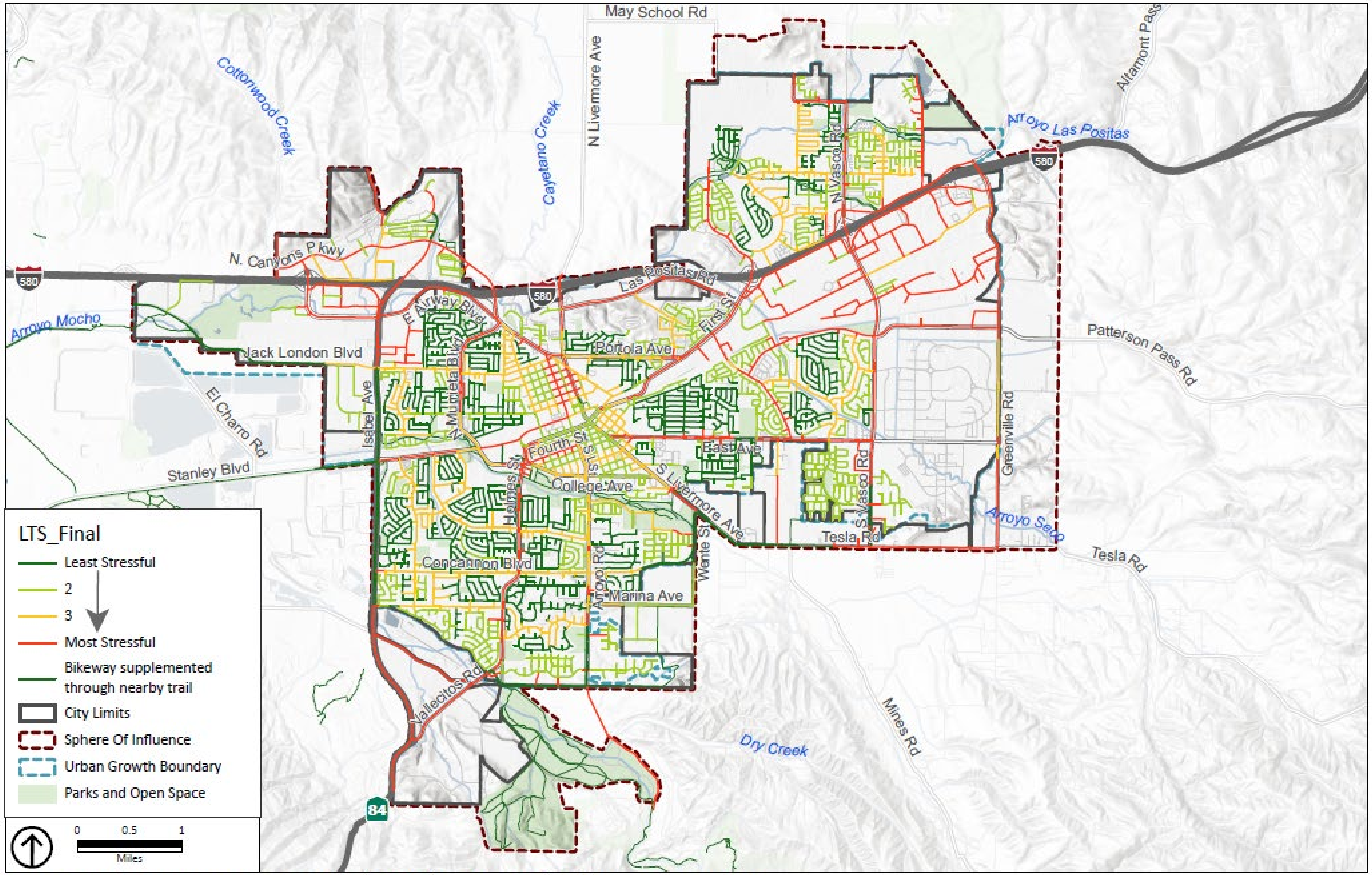
FIGURE 7- 19 CITYWIDE BICYCLE LEVEL OF TRAFFIC STRESS



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

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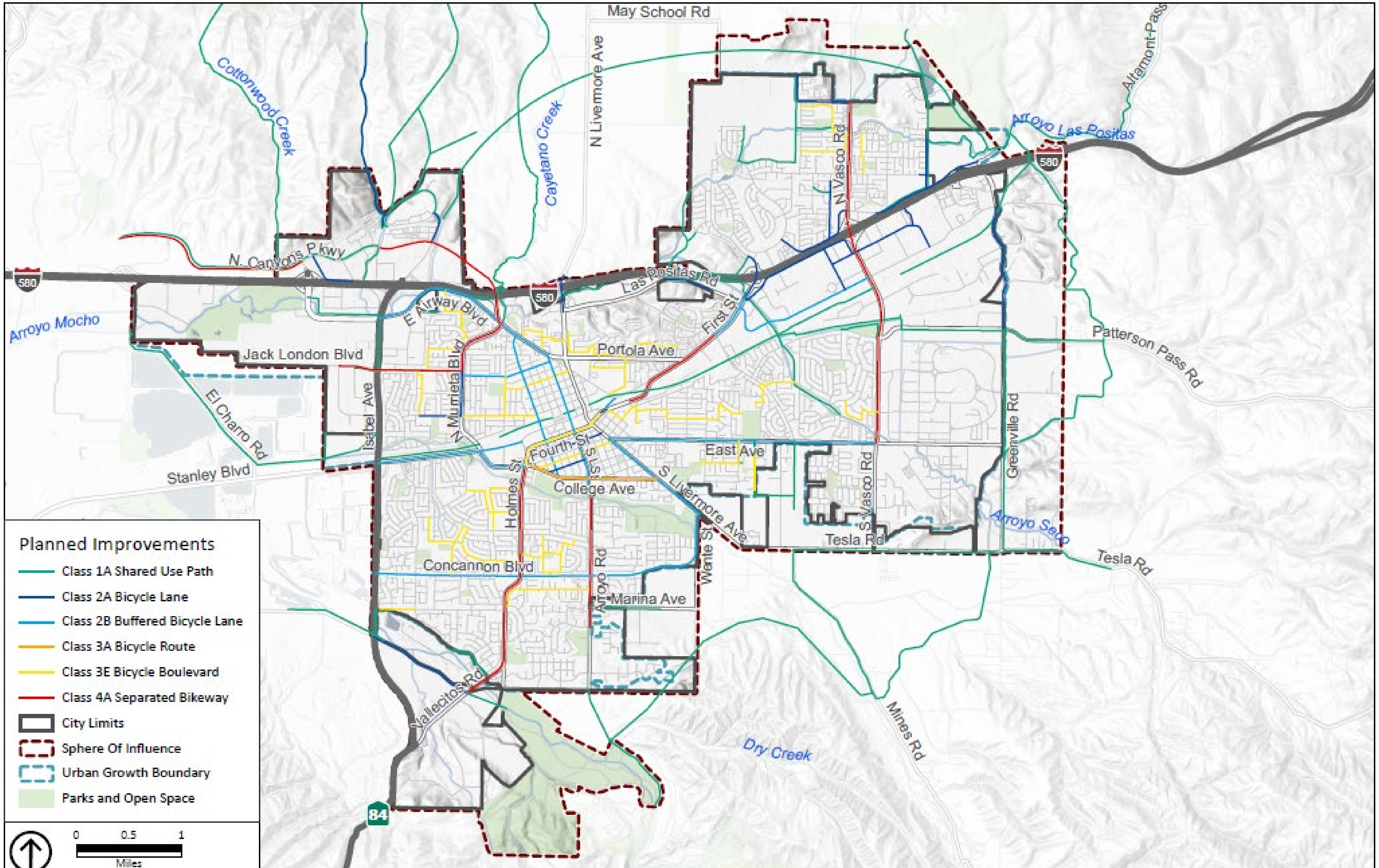
FIGURE 7- 20 PLANNED BICYCLE NETWORK



Source: City of Livermore, 2021; Esri, 2021; PlaceWorks, 2021; Kittelson & Associates, Inc. 2022

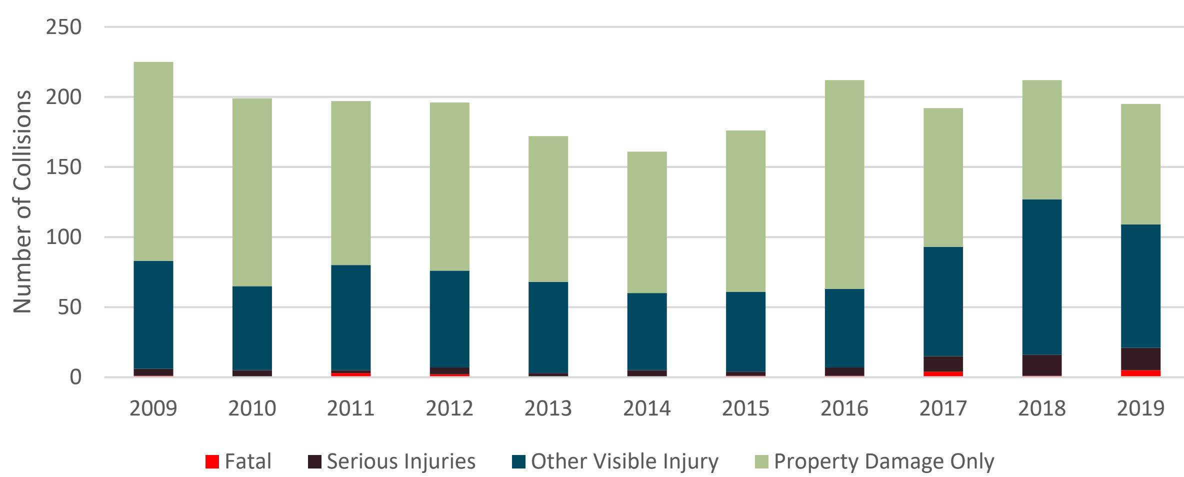
7.3 TRANSPORTATION SAFETY

The number of people killed or severely injured on Livermore roadways has more than doubled in the past decade. On an average annual basis, two people die and over 250 people suffer injuries on Livermore roadways. According to the University of California, Berkeley's Transportation Injury Mapping System (TIMS) collision data for 2009-19, a total of 2,869 reported collisions occurred on Livermore roadways during the study period. Conditions that affect transportation safety include distracted driving, speeding, and roadway design that prioritizes auto use over pedestrian and bicycle movement.

7.3.1.1 COLLISIONS

Collision severity is classified as fatal, severe injury collision, other visible injury, complaint of pain, and property damage only. Approximately 4 percent of the total collisions resulted in fatalities and serious injuries and the number has been continually rising since 2014. Figure 7-21 illustrates the collision trend by severity.

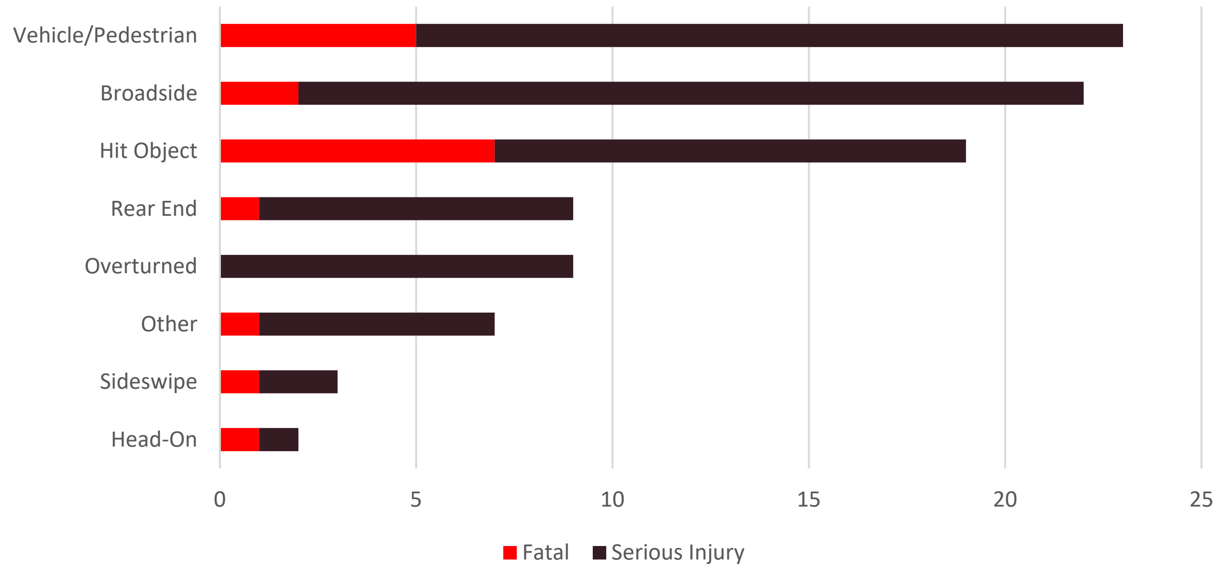
FIGURE 7- 21 COLLISION TREND BY SEVERITY (2009-2019)



Source: TIMS 2009-19

The top three collision types resulting in death or serious injury were vehicle/pedestrian crashes (24 percent), broadside (23 percent) and hit-object (20 percent). These three types of collisions collectively accounted for 67 percent of the total collisions resulting in fatality and severe injury.

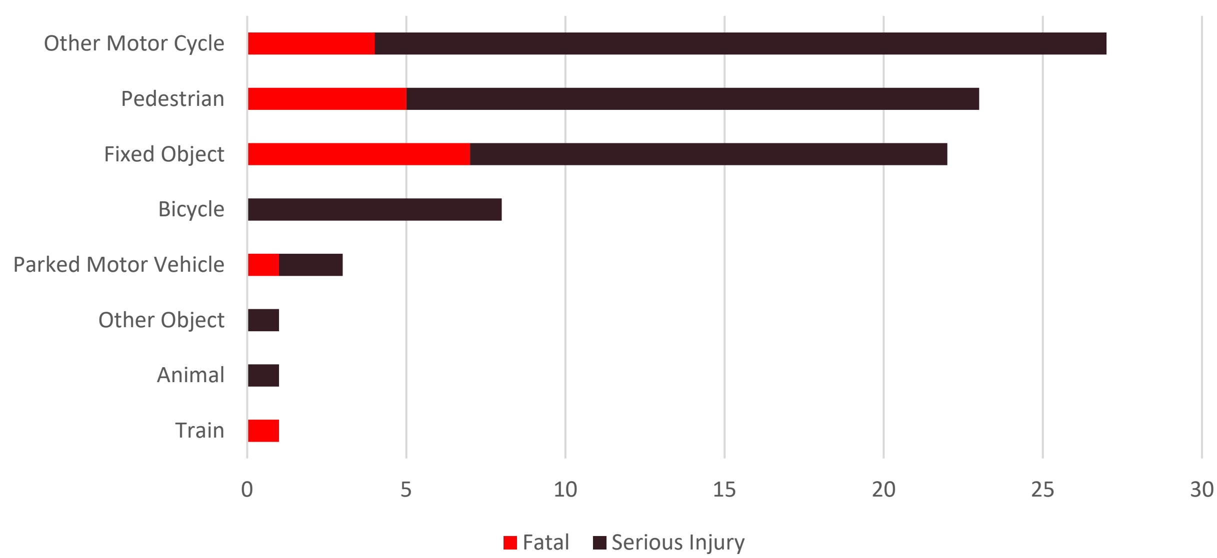
FIGURE 7- 22 LIVERMORE COLLISIONS BY TYPE AND SEVERITY (2009-2019)



Source: TIMS 2009-19

Pedestrians and bicyclists are typically considered the most vulnerable users of the street. When involved in a collision, the extent of injuries suffered by them are typically greater and increases exponentially with the speed of the roadway. Figure 7-23 shows the mode of transportation involved in collision that resulted in fatality or severe injury.

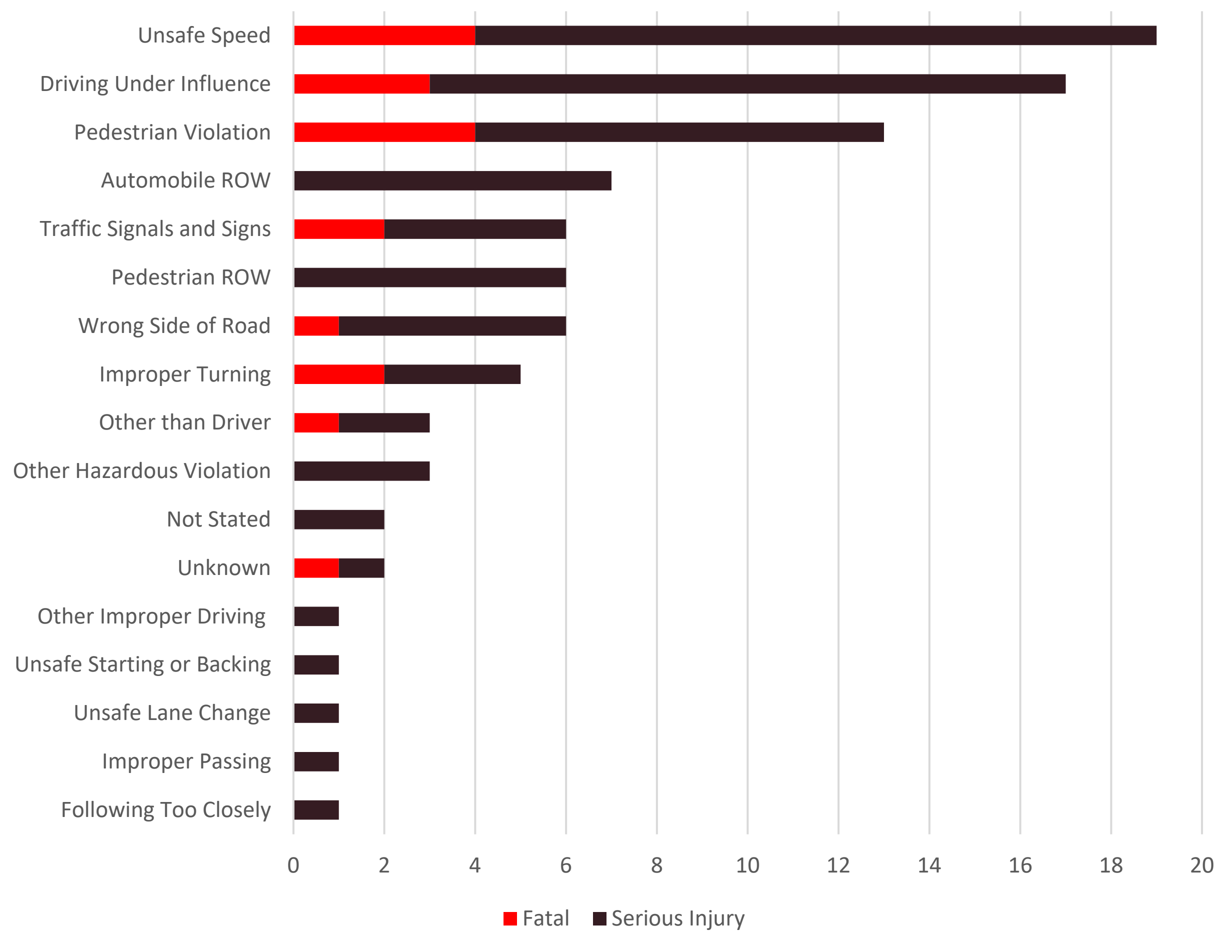
FIGURE 7- 23 LIVERMORE COLLISIONS BY MODE AND SEVERITY (2009-2019)



Source: TIMS 2009-19

Driving at an unsafe speed (20 percent) is the most common violation that has resulted in fatal and severe injuries. Other factors such as driving under influence (18 percent) and pedestrian violation (14 percent) are among the top three violation categories as shown in Figure 7-24.

FIGURE 7- 24 LIVERMORE COLLISIONS BY PRIMARY VIOLATION FACTOR (2009-2019)



Source: TIMS 2009-19

7.4 SHARED AND EMERGING MOBILITY

Transportation and mobility services are constantly evolving, with emerging technologies having the potential to significantly change travel behavior and the transportation system. While some new technologies are already being implemented and cities are beginning to understand their effects and implications, others are still in the future and thus require regular monitoring and studying. This section describes recent and emerging changes to the transportations system.

Alternative Fuel Vehicles

With incentives from the government, more Californians are moving towards cleaner, alternative energy sources for their vehicles as a way to reduce their impact on the natural environment. As one of the largest producers of pollution, the automobile and transportation industries are rapidly responding to this shift toward alternative fuel sources for vehicles. The City of Livermore is taking proactive measures by streamlining the process to apply for Electric Vehicles Charging Stations (EVCS) permits. There are several public EVCS along with one Ethanol (E85) station and one propane (LPG) station in Livermore[6].

Bicycle and Scooter Sharing Programs

Bicycle sharing services provide short-term bicycle rentals and are typically associated with bicycle travel in busy areas (such as downtowns and business districts) and improve access to transit stations. These services are becoming increasingly popular in California. Similarly, e-scooters sharing programs are gaining popularity, especially in the San Francisco Bay Area. However, it may be a while before bicycle and scooter sharing services arrive in suburban communities. Current costs to administer these programs do not make suburban areas like Livermore financially feasible to the service providers at this time because lower population densities can make it challenging to achieve a sufficient ridership base. To attract bicycle and scooter sharing services, suburban jurisdictions typically need to have good bicycle and sidewalk infrastructure, offer financial incentives, and provide a clear regulatory framework that describes the permit process, device parking, fee structures, use of public right-of-way, and whether the service can cross jurisdictional boundaries.

Transportation Network Companies (TNCs)

TNCs, such as Uber and Lyft, provide last-mile connections using smartphone applications. While data on TNC use (especially for commute trips) is still limited, these services are becoming a significant part of the transportation system; some jurisdictions and agencies have begun incorporating TNCs into their transportation systems, such as including ample pick-up and drop-off areas at transit stations and mobility hubs. As these programs increase in popularity, the City of Livermore may want to consider curbside management strategies to ensure the circulation system is not impacted by TNC drop-offs and pick-ups.

[6] Source: *U.S. Department of Energy, Alternative Fueling Station Locator.* Retrieved From: https://afdc.energy.gov/stations/#/find/nearest?location=Livermore&fuel=LPG

Car Sharing Programs

Car sharing programs, such as Zipcar or City CarShare, allow users to borrow a car for short periods of time (for example, to buy groceries for an hour) and provide increased mobility and flexibility for people who may not want to or cannot pay for vehicle ownership. As of April 2022, there are no car sharing programs in Livermore.

7.5 PARKING STANDARDS AND MANAGEMENT

Aside from requiring private developers to provide sufficient off-street parking, the City of Livermore provides on-street parking spaces along most residential streets and public parking lots and garages. In response to increases in parking concerns in the Downtown area, the City conducted a Downtown Parking Management Study to evaluate strategies and actions that can be undertaken to ensure convenient, available parking continues to be provided Downtown. The study revealed that parking occupancy during peak periods was above 85 percent to that of the day. However, while public parking lots were over capacity, the public parking garage did not exceed 70 percent even in peak periods.

Cities across the state are eliminating parking minimum requirements and beginning to implement parking maximums for new construction projects. The hope is that these changes will promote low carbon modes of transportation, such as public transit, biking, and walking, and lower the costs of construction, thereby lowering the cost of housing. Limiting residential parking supply is also considered a proven strategy to reduce vehicle miles traveled (VMT) and encourage smart growth[7].

[7] Source: 2021. *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.* Retrieved From: https://www.airquality.org/residents/climate-change/ghg-handbook-caleemod

7.6 IMPACT OF COVID-19 ON TRAVEL PATTERNS

The Covid-19 pandemic had a great impact on all areas of everyday life, including travel behavior. Like most cities across the nation, the pandemic altered the travel pattern by requiring most workers to work from home. The Alameda CTC developed a performance report[8] to evaluate the trends in 2020 and found:

- Transit Ridership fell more than 90 percent in Alameda County as a result of the pandemic. Ridership on routes serving lower-income areas, more likely to serve transit-dependent riders and essential workers, has declined less and recovered faster than overall transit ridership. Overall, bus ridership declined less than ridership on heavy rail and ferry services.
- Average freeway speeds increased more than 20 percent during the afternoon peak and congestion dropped significantly. However, this did not correlate to a comparable decrease in vehicle travel: vehicle trips across the Bay Bridge and total vehicles miles traveled were only down about 10 percent.
- Average speeds on major arterials increased by more than 14 percent during the afternoon peak commute. Speeds on suburban and rural arterials increased more than on urban arterials.
- Pedestrian volumes were down almost 60 percent in downtown areas.
- Interest in cycling increased and bicycle sales were up 75 percent year-over-year in the spring of 2020.
- Telecommuting skyrocketed as many jobs were performed remotely to support social distancing. An estimated 45 percent of Bay Area jobs were capable of being performed remotely before the pandemic, however, just nine percent of workers in Alameda County primarily worked from home. Both the percent of jobs eligible for telecommuting and the number of workers actually telecommuting increased during the pandemic.

Although the long-term impacts of Covid-19 are yet to be studied, it has been found the traffic is slowly coming back to the pre-pandemic levels with some transformations such as shifted rush hours and higher using bicycles.

[8] Source: 2021. *2020 Performance Report. Transportation and Covid-19 in Alameda County.* Retrieved From: https://www.alamedactc.org/wp-content/uploads/2021/02/2020_Performance_Report_RPT_Final.pdf

7.7 IMPLICATIONS FOR THE GENERAL PLAN UPDATE

Based on information contained in this chapter, the General Plan Update should consider the following:

- The future circulation system in Livermore will need to be designed to provide a citywide network of complete streets that accommodate forecasts of travel demand based on the land use projections contained in the Land Use Element while continuing to achieve the Complete Streets, Vehicle Miles Traveled (VMT) and Level of Service standard.
- Looking ahead to potential revisions to the City's Standard Specifications to be consistent with the latest design recommendations described in the National Association of City Transportation Officials (NACTO) Complete Street Guide and the latest Federal Highway Administration policies and manual.
- Considering TDM policies and actions tailored to Livermore that will help mitigate VMT impacts.
- Considering policy regulation to manage the use of the curbside along the major commercial corridors.
- Addressing vendors and users of micromobility vehicles.

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