# Transportation Concept Report
## State Routes 109 and 114
### District 4
### September 2017


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**California Department of Transportation**

Mission Statement: Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability

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This TCR will be posted on the Caltrans Corridor Mobility website at:
http://www.dot.ca.gov/dist4/systemplanning/

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# ABOUT THE TRANSPORTATION CONCEPT REPORT

System Planning is the long-range Transportation Planning process for the California Department of Transportation (Caltrans). The System Planning process fulfills Caltrans statutory responsibility as owner/operator of the State Highway System (SHS) by evaluating conditions and proposing enhancements to the SHS. Through System Planning, Caltrans focuses on developing an integrated multimodal transportation system that meets Caltrans Goals of Safety and Health, Stewardship and Efficiency, Sustainability, Livability, and Economy, System Performance, and Organizational Excellence.

The System Planning process is primarily composed of four parts: the District System Management Plan (DSMP), the Transportation Concept Report (TCR), the Corridor System Management Plan (CSMP), and the District System Management Plan (DSMP) Project List. The District-wide **DSMP** is a strategic policy and Planning document that focuses on maintaining, operating, managing, and developing the transportation system. The **TCR** is a Planning document that identifies the existing and future route conditions as well as future needs for each route on the SHS. The **CSMP** is a complex, multi-jurisdictional Planning document that identifies future needs within freeway corridors experiencing or expected to have high levels of congestion. The CSMP serves as a TCR for segments covered by the CSMP. The **DSMP Project List** is a list of planned and partially programmed transportation projects used to recommend projects for funding. These System Planning products are also intended as resources for stakeholders, the public, partner, regional, and local agencies.

### TCR Purpose

California's State Highway System needs long-range Planning documents to guide the logical development of transportation systems as required by CA Government Code §65086 and as necessitated by the public, stakeholders, and system users. The purpose of the TCR is to evaluate current and projected conditions along the route and communicate the vision for the development of each route in each Caltrans District during a 20-25 year Planning horizon. The TCR is developed with the goals of increasing safety, improving mobility, providing excellent stewardship, and meeting community and environmental needs along the corridor through integrated management of the transportation network, including the highway, transit, pedestrian, bicycle, freight, operational improvements and travel demand management components of the corridor.

# STAKEHOLDER PARTICIPATION

Stakeholder participation was sought during the development of the SR 109 and SR 114 TCR. As the document was finalized, stakeholders were asked to review the document for accuracy and consistency with regard to existing plans, policies, and procedures. The process of including stakeholders adds value to the TCR by allowing for outside input and ideas to be reflected in the document and help strengthen public support

# EXECUTIVE SUMMARY

Shared by the South Bay communities of Menlo Park and East Palo Alto in San Mateo County, State Route 114 (SR 114) and State Route 109 (SR 109) are unsigned,[1] parallel conventional highways located within a mile distance of each other. They are also known as Willow Road and University Avenue, respectively. Their similarities in functionality and proximity justify a combined TCR. Both routes are functionally classified as four-lane divided arterials and serve as intercity streets as well as highway connectors. SR 114 and SR 109 provide access to local roads within the area, but also see a high level of regional traffic during peak hours. Although both routes travel a short distance, they provide important links between the Dumbarton Bridge (SR 84) and Highway 101 (US 101).

Regional traffic between the Dumbarton Bridge and US 101 is dispersed via three arterials: Marsh Road (SR 84), Willow Road (SR 114) and University Avenue (SR 109). Marsh Road transitions into Bayfront Expressway, the western approach of the Dumbarton Bridge. See Figure 1. US 101 connects the area northward to San Francisco and southward to Silicon Valley; the Dumbarton Bridge connects San Mateo County with Alameda County, and the rest of the East Bay.

The 25-year concept for Routes 109 and 114 is guided by Caltrans Smart Mobility Framework (SMF),[2] which is a Planning tool that promotes convenient, accessible, and safe multi-modal travel of people and freight as well as efficient use of land. The concept is summarized in Table 1. A detailed list of recommended strategies is provided on the following pages. The concept is based on current and projected operating conditions and acknowledges both programmed and planned transportation improvement projects along the routes. The base year and horizon year for this TCR are 2015 and 2040, respectively.

### *Table 1. Corridor Concept Summary*

| Route Description | | Post Miles | Existing Facility | 25-Year Concept | Strategies to Achieve Concept |
|---|---|---|---|---|---|
| **SR 109 – University Avenue** | From US 101 to Notre Dame Ave., SR 109 is a Traversable Highway,[3] owned by the City of East Palo Alto | SM 0.0 to SM 1.10 | 4C | 4C | • Improve connection between US 101 & the Dumbarton Bridge through operational improvements and potential lane management<br>• Implement Complete Streets to encourage safe, multimodal travel<br>• Accommodate traffic impacts of major developments through transit improvements<br>• Consider alternative Route Concept for SR 109 |
| | From Notre Dame Ave. to SR 84, SR 109 is owned by Caltrans | SM 1.10 to SM 1.87 | | | |
| **SR 114 – Willow Road** | SR 114 is from US 101 to SR 84 | SM 5.00 to SM 5.92 | 4 C | 4 C | |

C = Conventional Highway

[1] Except as guidance "to SR 84" and "to US 101," the routes are only signed as SR 109 and SR 114 on maps.

[2] Caltrans Smart Mobility Framework (SMF) provides tools and strategies to meet the goals of Assembly Bill 32 (AB 32) and Senate Bill 375 (SB 375) on climate change and CO2 emissions reduction. Further detail is provided within "Land Use" on page 12 on this report.

[3] Traversable highways are routes that have been approved by the Legislation as future State Highway Routes. These routes when constructed to the Department of Transportation (Caltrans) standards, the California Transportation Commission (CTC) shall adopt them as state highways and Caltrans must maintain them with funds from State Highway account. These routes are described in the Division 1, Chapter 2, Article 3 of the Streets and Highway Code Section 300 and also are known as "paper" routes. Caltrans Traversable Highways, 2013, http://www.dot.ca.gov/hq/tsip/hseb/products/TravHwy02.pdf

## Recommended Corridor Strategies:

The following recommendations summarize issues and improvements discussed within this TCR and reflect the ideas expressed through various plans and studies from local and regional transportation agencies (pages 37 – 39). These strategies support the corridor concept which maintains the existing roadway of each route at its current capacity, while supporting California's transportation goals:[4]

**Improve connection between US 101 & the Dumbarton Bridge:**

- Implement interchange improvements at US 101/Willow Road and US 101/University Avenue junctions to relieve traffic congestion (see Planning and Programmed Projects Section, pages 37 & 38).
- Increase ramp storage at US 101/Willow Road and US 101/University Avenue interchanges and implement Intelligent Transportation System (ITS) elements to increase throughput (see Planning and Programmed Projects Section).
- Consider mainline metering at the Dumbarton Bridge (WB direction) similar to San Francisco Oakland Bay Bridge metering.
- Study improvements at the Bayfront Expressway junctions with SR 114 and SR 109 to address bottleneck issues caused by a combination of left-turning vehicles and vehicles exiting/entering the Facebook parking lot. Limit additional turns, signals, and access points on Bayfront Expressway.[5]
- Coordinate with the City of East Palo Alto to address pavement distress for SR 109 in East Palo Alto.

**Implement Complete Streets:**

- Eliminate bicycle and pedestrian access barriers on both SR 109 and SR 114 overcrossings with US 101.
- Support a multi-modal integrated system that provides a continuous sidewalk and bikeway system. Improve pedestrians and bicyclists' visibility at crosswalks and intersections, and install median strips to break large crossing distances, such as on University Avenue and Donohue Street.
- Improve visibility at pedestrian crosswalks near all ramps.
- Prioritize local needs of East Palo Alto residents through cohesive design of University Avenue that includes streetscape traffic calming, signal timing/synchronization, and improvements at Bay Road and Donohoe Street intersections.[6]
- Maintain emergency vehicle priority on both routes.

**Accommodate traffic impacts of major developments through transit improvements:**

- Support improvements to regional express bus service such as transit signal priority and increased service frequency, especially along routes connecting to regional networks.
- Support efforts that ensure equitability by improving public transportation, bicycle and pedestrian infrastructure, making sure that transit options are accessible to the local community.
- Consider expansion of Park-and-Ride facilities east of the Dumbarton Bridge in Alameda County, as well as shuttle service expansion to major employment hubs in Silicon Valley.
- Support efforts to develop the Dumbarton Rail corridor.

[4] The California Transportation Plan (CTP) 2040 outlines the following State Transportation Goals: Improve multimodal mobility and accessibility for all people; Preserve the multimodal transportation system; Support a vibrant economy; Improve public safety and security; Foster livable and healthy communities and promote social equity; and Practice environmental stewardship.

[5] Identified strategy per consultation with Caltrans D4 Highway Traffic Engineers.

[6] Identified in the 2020 Peninsula Gateway Corridor Study - C/CAG roundabouts are listed as a potential solution to address heavy commuter (cut-through) traffic in East Palo Alto. Meanwhile, these street/intersections are identified within the East Palo Alto General Plan as conflict points between bicycle, pedestrians, and vehicles, connecting to schools, parks and other community facilities.

**Consider alternative Route Concept for SR 109:**

- The portion of SR 109, from US 101 to Notre Dame Avenue, is owned by the City of East Palo Alto. Meanwhile the portion of SR 109, from Notre Dame Avenue to SR 84, is located within the City of Menlo Park and is owned by Caltrans; it runs along the city boundaries of Menlo Park and East Palo Alto. While SR 109/University Avenue is largely used by regional traffic, it is also the main local transportation spine and community focal point of East Palo Alto. Local authorities have suggested that allowing commuter movement via SR 109 creates a barrier to livability in East Palo Alto.

  Relinquishment of SR 109 by Caltrans may be mutually beneficial to local and State agencies, but requires further study regarding the impacts to SR 84, SR 114, and US 101, and the financial feasibility of local jurisdictions. Further study and consultation with the Cities of Menlo Park and East Palo Alto are needed before relinquishment can take place.

## CONCEPT RATIONALE

Shifting demographics[7] in the Dumbarton Corridor[8] have contributed to increased traffic congestion on SR 109 and SR 114. The increased traffic also reflects a growing economy and a regional commute pattern associated with an imbalance between job growth and housing within Silicon Valley. Severe congestion occurs during peak hours. As development continues near SR 109 and SR 114, there is a growing need for reliable mobility. The Corridor Concept for SR 109 and SR 114 emphasizes the need to expand multi-modal options and improve system management and operations.

Vehicle focused solutions such as increasing road capacity to address congestion can be financially and environmentally costly, and may provide only a short-term solution.[9] SR 109 and SR 114 pass through neighborhoods, including two communities of concerns. Adding road capacity could have the unintended consequence of limiting livability and the local economy because of the increased environmental impacts. For SR 109 and SR 114, increasing capacity is difficult since it would require Caltrans to either secure eminent domain of properties located along the roadways, or require utilizing space from the median, bicycle lanes, or sidewalks.

The concepts for both routes are to maintain the existing roadway capacity in a state of good repair, while improving transit, encouraging HOV use and active transportation, and introducing operational enhancements. Operational enhancements, such as signal synchronization, are recommended to improve roadway efficiency and safety and optimize the routes for all users. The corridor concepts for SR 109 and SR 114 aim to meet Caltrans goals to maintain the system, relieve traffic congestion, reduce Greenhouse Gas (GHG) emissions, plan for safety and health, and promote economic vitality.

[7] "East Palo Alto and Belle Haven in Menlo Park have seen half of their long-term residents leave in the past five years," David Plouffe, President of Policy and Advocacy, Chan Zuckerberg Initiative.

[8] Dumbarton Corridor is defined as communities near the Dumbarton Bridge and its connecting roadways, such as Menlo Park, East Palo Alto, Newark, and Union City.

[9] Transportation experts have repeatedly found that building new roads inevitably encourages more people to drive, which in turn negates any congestion savings—a phenomenon known as induced demand. See summary of research work Increasing Highway Capacity Unlikely to Relive Traffic Congestion, by Susan Handy (UC Davis) and Marlon Boarnet (USC) published by ARB and recognized by the Caltrans Division of Research, Innovation and System Information: http://www.dot.ca.gov/research/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf

# CORRIDOR OVERVIEW

*Figure 1. Map of SR 114 and SR 109 Corridors*

SR 109 and SR 114 are located within the Dumbarton Corridor, which includes both ends of the Dumbarton Bridge and connecting roadways. The Dumbarton Corridor connects Alameda County with San Mateo County and the Silicon Valley. The Dumbarton Bridge (SR 84) serves as a connection between US 101 and Interstate 880, and an alternate route to SR 92 (to the north) and SR 237 (to the south). Marsh Road (SR 84) and Bayfront Expressway (SR 84) provide a direct connection between US 101 and the Dumbarton Bridge. SR 114 and SR 109 serve as alternate State highway routes between US 101 and the Dumbarton Bridge.

SR 109 (University Avenue) from US 101 to Notre Dame Avenue is owned and maintained by the City of East Palo Alto, but the entire route is signed as SR 109 on maps. The road becomes a State route at the Menlo Park-East Palo Alto border, north of Notre Dame Avenue. SR 84 (Marsh Road), SR 114 (Willow Road) and SR 109 (University Avenue) are heavily utilized during peak hours.

### *Table 2. Route Designations and Characteristics*

| Corridor Segment: | SR 109 University Avenue | | SR 114 Willow Road |
|---|---|---|---|
| | PM 0.00 – 1.10 | PM 1.10 -1.87 | PM 5.00 – 5.92 |
| **Freeway & Expressway** | No | | No |
| **National Highway System** | No | | No |
| **Strategic Highway Network** | No | | No |
| **Scenic Highway** | No | | No |
| **Interregional Road System** | No | | No |
| **High Emphasis** | No | | No |
| **Focus Route** | No | | No |
| **Federal Functional Classification** | Other Principal Arterial | | Other Principal Arterial |
| **Goods Movement Route** | No | | No |
| **Truck Designation** | Local Route, no trucks over 3 tons[10] | CA Legal Route 65’ | CA Legal Route 65’ |
| **Rural/Urban/Urbanized** | Urban | | Urban |
| **Metropolitan Planning Organization** | Metropolitan Transportation Commission (MTC) | | |
| **Congestion Management Agency** | San Mateo City/County Association of Governments (C/CAG) | | |
| **County Transportation Commission** | San Mateo County Transportation Agency (SMCTA) | | |
| **Local Agency** | San Mateo County | | |
| | East Palo Alto | Menlo Park | Menlo Park |
| **Air District** | Bay Area Air Quality Management District (BAAQMD) | | |
| **Terrain** | Flat | | Flat |

**SR 109, entering East Palo Alto**

**SR 109, facing SR 84/Bayfront Expressway**

**SR 114 in Menlo Park**

** All images are from Google Maps, Street View*

[10] East Palo Alto Code of Ordinances, Title 10 Trucks and Vehicles (assessed 11/2016)
https://www.municode.com/library/ca/east_palo_alto/codes/code_of_ordinances?nodeId=TIT10VETR_CH10.36TRRO

**State Route 109 - University Avenue**

Spanning 1.87 miles between US 101 and SR 84, University Avenue is East Palo Alto's primary arterial. It is a four-lane conventional highway carrying nearly 22,200 vehicles daily.[11] On-street parking is prohibited, and sidewalks and bike paths are on both sides of the roadway. The US 101/University Avenue junction is one of the most traveled bicycle and pedestrian overcrossings in San Mateo County.[12] University Avenue is a continuous, direct route for East Bay commuters heading into Palo Alto and Stanford University. A project to modify the US 101/University Avenue crossing has been planned. The project includes widening the overcrossing to accommodate wider sidewalks and Class II bicycle lanes. Additional details are discussed later in this report.

The portion of SR 109 within East Palo Alto encompasses University Avenue, from US 101 to Notre Dame Avenue. Caltrans is not responsible for its maintenance or monitoring. Owned and operated by the City of East Palo Alto, this section travels through a historically marginalized but rapidly transforming, working class suburban community. Functioning as a Main Street, University Avenue has a speed limit of 25 miles per hour (mph) as it passes through residential neighborhoods and community institutions. Central city functions are located along the crossroads of University Avenue and Bay Street (see Figure 1).

When the Bayshore Freeway (US 101) was built during the 1960s, it divided the unincorporated community of East Palo Alto from the rest of San Mateo County and permanently displaced businesses. The City of East Palo Alto was incorporated in 1983. Local advocates sought to protect their community's assets by maintaining control of resources and refused Caltrans request for right-of-way (ROW) along University Avenue. In 1986, East Palo Alto was granted control of University Avenue, south of Notre Dame Avenue to US 101 by the State of California, under the condition that the City maintains the road in accordance with State highway standards.[13] Local control provided East Palo Alto flexibility over road development, however, maintenance has proven a financial burden. While there is potential for Caltrans to relinquish the entire route to a local agency, financially feasibility would need to be determined by Caltrans and the agency. Further study and analysis of this segment, "shall include the involvement of each governing party," according to California Streets and Highways Code, Section 409.

The remaining 0.8 miles of SR 109 follows the border between the Cities of East Palo Alto and Menlo Park. This portion is located at the edge of Belle Haven, a neighborhood within the City of Menlo Park (see Figure 1). This section is operated by Caltrans and is contiguous with East Palo Alto. The first segment passes through a residential zone and a commercial/industrial zone in Menlo Park. (See Land Use Maps, Appendix C). The second segment passes wetlands and salt ponds on both sides of the road. East of Michigan Avenue, near the Southern Pacific Railroad tracks, the speed limit increases from 25 mph to 35 mph. Towards its terminus, SR 109 widens to accommodate left and right turn pockets as it merges with SR 84/Bayfront Expressway.

There is potential for Caltrans to relinquish SR 109 entirely, however, this would require collaboration and a determination of financial feasibility between the Cities of East Palo Alto and Menlo Park, and Caltrans. Further study and analysis of this segment, "shall include the involvement of each governing party," according to California Streets and Highways Code, Section 409.

**State Route 114 - Willow Road**

Approximately one mile north of University Avenue, Willow Road runs from Alma Street (near SR 82) to Bayfront Expressway (SR 84). At the junction of US 101 and the Menlo Park/East Palo Alto boundary, Willow Road becomes a State highway and travels 0.93 miles as SR 114. The highway is unsigned and marked only on maps. On-street

[11] Caltrans Census, http://www.dot.ca.gov/trafficops/census/volumes2015/Route103-116.html

[12] This is attributed to the density of residential areas on both sides of US 101 in East Palo Alto, the high number of residents who do not own a private vehicle, as well as the location of city schools, parks, markets, restaurants and services which are located on the north side of US 101. For further data on pedestrian and bicycle volumes, see Willow Road and University Avenue Traffic Operations Study and Near Term Improvements, C/CAG (2011).

[13] Maintenance Agreement, City of East Palo Alto and Caltrans, Resolution No. 00291: http://sv04maint/maint_agreements/DMA/SM/DMA_SM_EPA.pdf

parking is prohibited and the speed limit is 40 mph. Class II bike lanes exist along Willow Road between Middlefield Road (located west of US 101) and Bayfront Expressway, with the exception of a gap at the US 101 interchange (See Figure 1). Willow Road is a primary access point to local roads, but also sees high levels of regional traffic between the Dumbarton Bridge and US 101. SR 114 is a four-lane divided arterial before it merges into the expressway portion of SR 84. Willow Road is located entirely within San Mateo County, and traverses through the neighborhood of Belle Haven in Menlo Park and the southeast edge of East Palo Alto.

As a more direct connector to US 101, SR 114 experiences higher traffic volumes than SR 109. The Average Annual Daily Traffic is 46,000 in 2015, while SR 109 has an Average Annual Daily Traffic (AADT) of 22,200. Despite years of increasing development and congestion within downtown Menlo Park (located near SR 82), Willow Road has remained a two-lane local road, west of US 101. The transition from four to two lanes west of US 101, combined with merging and weaving at the US 101 interchange, contributes to recurring peak hour congestion on Willow Road.

The construction of US 101/Willow Road Interchange Reconstruction project began in May 2017 and is expected to continue for approximately 2 years. The project will widen and reconfigure the existing ramps in order to eliminate weaving and reduce congestion. The project will also add new sidewalks and a dedicated bicycle lane on the Willow Road overcrossing, thereby closing the aforementioned bicycle gap. The $58 million project is funded by San Mateo County *Measure A* funds.

# COMMUNITY CHARACTERISTICS

SR 109 and SR 114 traverse residential and industrial areas within the City of East Palo Alto and the Belle Haven neighborhood, a low-income neighborhood in Menlo Park bound by SR 84/Marsh Road, US 101, and SR 114 (see Figure 1). Both routes link prominent cultural and business districts in Menlo Park and Palo Alto, and connect regional commuters to the Dumbarton Bridge and US 101. SR 114 connects Belle Haven to downtown Menlo Park and SR 109 connects East Palo Alto to downtown Palo Alto. Both Belle Haven and East Palo Alto have lower vehicle ownership rates and higher bicycle use than neighboring communities within the County, yet experience high vehicle congestion during peak hours due to regional commuting.

The two corridors bisect an enclave of low-income, predominantly Latino neighborhoods, but the population is quickly transforming. Belle Haven and East Palo Alto consist primarily of single-family residential communities, dotted with neighborhood retail and multi-family homes along the arterials, and some industrial/commercial areas near the eastern shore of the Bay. While the majority of homes are single-family, they often house more than one family, making the area distinctively denser than surrounding communities.

### *Table 3. Belle Haven and East Palo Alto Demographics & Comparisons to Neighboring Communities*

| **Community** | **Belle Haven** *In City of Menlo Park* | **Menlo Park** *San Mateo County* | **East Palo Alto** *San Mateo County* | **Palo Alto** *Santa Clara County* |
|---|---|---|---|---|
| Total Population 2010 | 5,970 | 32,026 | 29, 530 | 64,409 |
| Est. Pop. Change 2010 - 2014 | -2% | +4% | +4.9% | +4.0% |
| Est. Jobs 2015[14] | Data not available | 30,885 | n/a | 188,000 |
| # Housing Units | 1,300 | 13,085 | 7,182 | 28,216 |
| Pop. Per Square Mile | 8,800 | 3,240 | 10,777 | 2,497 |
| Household Size | 3.8 | 2.53 | 3.96 | 2.47 |
| Latino | 68.6% | 18.4% | 64.5% | 6.2% |
| African American | 17.9% | 4.6% | 16.7% | 1.9% |
| Pacific Islander | 5.5% | 1.4% | 7.5% | 0.2% |
| White | 3.6% | 62% | 28.8% | 64.2% |
| Asian | 2.7% | 9.8% | 3.8% | 27.1% |
| Median Income | $49,228 | $107,860 | $50,142 | $121,465 |
| Median Home | $562,100 | $1,000,000 + | $378,800 | $1,000,000+ |
| Below Poverty | 14% | 6% | 18.4% | 5.7% |
| Drive Alone to Work | Data not available | 66% | 70.7% | 67.3% |
| Travel Time to Work (Minutes) | Data not available | 22.1 | 23.9 | 22.1 |

Source: Data compiled from the U.S. Census Bureau. http://www.census.gov, accessed November 2015.

**Belle Haven, Menlo Park**

Physically separated from the rest of the City, Belle Haven has developed an identity distinct from Menlo Park and more similar to the bordering City of East Palo Alto. Belle Haven has a population of 4,709 residents within 0.54 square miles and an average household size of 3.8. Most of the City's Latino (68 percent) and African-American (17.9 percent) residents live in Belle Haven. Many residents speak limited English. The median income is $49,228, less than half of the City average. Almost 60 percent more people live below poverty in Belle Haven than Menlo Park. The rest of Menlo Park is overall much wealthier, with home values averaging $2 million.[15]

Menlo Park has a high jobs-housing ratio of 1.96, Palo Alto's is 3.13, and East Palo Alto's is 0.38.[20] The City has housed large firms, including Oracle, Sun Microsystems, TE Connectivity, and Tyco Industries. Today, the largest employer is notably Facebook, which has a net worth of $328 billion and is the City's largest landowner.[16]

[14] Jobs: http://menlopark.org/DocumentCenter/View/6297, http://www.paloaltocompplan.org/wp-content/uploads/2015/06/01_Demographics_final.pdf
[15] Zillow Reality (Accessed 1/2016): http://www.zillow.com/menlo-park-ca/home-values/
[16] Forbes Magazine Online (Accessed 1/2016): http://fortune.com/2016/02/01/facebook-value-exxon/

Approximately 7,000 employees work at the Facebook Campus in Belle Haven. With additional buildings underway, the company expects to employ 9,400.[17] Facebook's presence is rapidly transforming Belle Haven. To mitigate impacts, Facebook committed funding to support multi-modal transportation and affordable housing.

**East Palo Alto**

East Palo Alto is a 2.5 square mile city of about 30,000 residents. The City is primarily residential, with some industrial and commercial development. The population consists almost entirely of working class, low-income people of color. According to the 2010 US Census, 18.4 percent of East Palo Alto residents live below the federal poverty level—a figure that exceeds the State average by 15.9 percent and the County average by 7.6 percent.[18] The community presents a demographic and socioeconomic picture that contrasts with the affluent surrounding Silicon Valley. Across US 101, Sand Hill Road in Palo Alto commands the highest office real-estate prices in North America and the average home costs $2.5 million.[19] While 52 percent of East Palo Alto residents lack a high school diploma,[20] Stanford University is located just across US 101.

Compared with the County average of $45,732, the per capita income for East Palo Alto is $18,385. The average household size is 3.96 in East Palo Alto and 2.79 in San Mateo County. Two-thirds of East Palo Alto residents are Latino; 31 percent are not U.S. citizens; and 37 percent are not fluent in English.[21]

**Communities of Concern**

*Plan Bay Area*[22] recognizes Belle Haven and East Palo Alto as "Communities of Concern," representing a diverse cross-section of disadvantaged and vulnerable populations in terms of current conditions and potential impacts of future growth. A booming job market and an intensifying housing crisis has pushed more employees further into the suburbs, putting stress on the region's infrastructure. Belle Haven and East Palo Alto residents are confronted with displacement and increasing congestion. East Palo Alto has used policy tools to encourage affordable housing, but the City is significantly impacted by a lack of affordable housing available outside its borders. The City has resisted development that would jeopardize affordable housing, while neighboring cities have allowed industrial growth to outpace the construction of homes.

Population growth has accelerated regionwide, with higher increases in urban counties, including San Francisco, San Mateo, Contra Costa and Alameda.[23] The economy has expanded since the recession, but unevenly. Silicon Valley's technology-fueled economy is exacerbating a regional housing deficit that is pushing low income residents to move out of the region to more affordable cities or stay put in tough living conditions. As transportation is the second largest household expense,[24] displacement further constrains low income families. Since Facebook moved to Menlo Park in 2011, the median rental price for an apartment rose 42 percent, and in 2015 the median home sale price in Belle Haven rose 48 percent.[25] To address the imbalance, Menlo Park and Facebook are proposing to build 4,500 housing units, including 675 low income units.[26] In 2014, the City estimated that the new residential projects and Facebook's second campus would add 10,870 daily vehicle trips to the neighborhood in 2017 and 2018.[27] Facebook is working to mitigate the impacts through a travel demand management program that imposes a strict vehicle cap for employees and provides financial incentives to relocate their residence to near the campus.

[17] Facebook Campus Project Final Environmental Impact Report, City of Menlo Park, 2012: http://www.menlopark.org/648/Environmental-Impact-Report
[18] U.S. Census Bureau, 2010: http://www.census.gov, accessed November 2015.
[19] Zillow Reality: Palo Alto Market Overview (2015), (Accessed: 1/29/2016) http://www.zillow.com/palo-alto-ca/home-values/
[20] City of East Palo Alto, Ravenswood/4 Corners Plan, 2013: http://www.ci.east-palo-alto.ca.us/Archive/ViewFile/Item/125
[21] U.S. Census Bureau, 2010: http://www.census.gov, accessed November 2015.
[22] Plan Bay Area, the Regional Transportation Plan for the Nine County Bay Area Region is a joint-product of MTC and ABAG that satisfies SB 375.
[23] Association of Bay Area Governments (ABAG) State of the Region Report, 2015.
[24] US DOT Beyond Traffic 2045: The Blue Paper: https://www.transportation.gov/sites/dot.gov/files/docs/TheBluePaper.pdf
[25] Zillow Reality (Accessed 1/2016): http://www.zillow.com/menlo-park-ca
[26] ConnectMenlo General Plan & M-2 Area Zoning Update, Underway 2017: https://www.menlopark.org/145/General-Plan-land-use-and-zoning-map
[27] KQED (Accessed 1/2016): https://ww2.kqed.org/news/2014/12/26/shootings-vanish-Menlo-Park%E2%80%99s-Belle-Haven-neighborhood-transforms/

## LAND USE

San Mateo County covers most of the San Francisco Peninsula. The northern and eastern parts of the County consist of urban edge-cities,[28] suburban areas, and numerous corporate campuses. The western and central parts of the County comprise more rural environments and coastal beaches. Routes 109 and 114 traverse the southeast edge of the County through suburban communities, salt ponds and marshlands. Industrial and office areas dominate the eastern termini, bounded by wildlife refuge and wetlands undergoing restoration. Located on the western edge of the San Francisco Bay, the area provides valuable habitat and recreational uses, and is part of a regionally designated Priority Conservation Area[29] (PCA) known as the Menlo Park and East Palo Alto Baylands, shown on Figure 2. While SR 109 and SR 114 are relatively short routes, they serve important functions as local spines, intercity routes, and regional connectors.

***Figure 2. Priority Conservation Areas and Priority Development Areas in the Dumbarton Corridor Area***

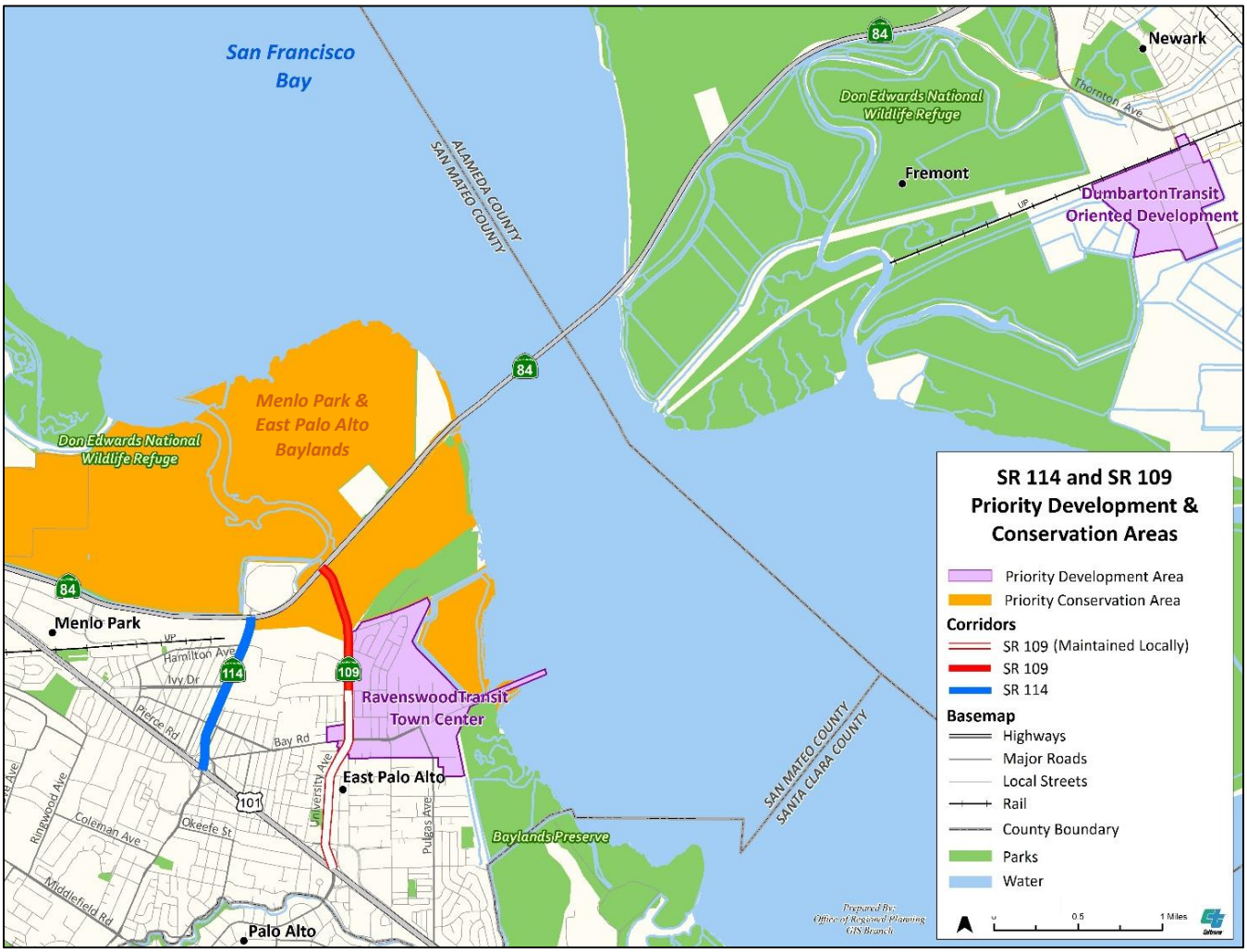



Figure 2 shows PCAs in orange and parks in green, which are predominantly wetlands along the Menlo Park and East Palo Alto shore as well as across the Dumbarton Bridge along the Fremont shoreline. These areas are connected by the San Francisco Bay Trail, which follows the shoreline and includes an eight-foot wide, Class I separated bicycle and pedestrian path on the Dumbarton Bridge.

[28] Edge-city: a relatively large urban area situated on the outskirts of a city, typically beside a major road.

[29] PCAs are a component of Plan Bay Area, the integrated long-range transportation and land-use/housing plan for the San Francisco Bay Area approved by the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) in 2013. These areas are identified as lands in need of protection due to pressure from urban development or other factors as part of the Regional Transportation Planning (RTP) process.

Highlighted in purple, the Ravenswood Transit Town Center is located on 274 acres in East Palo Alto. The vision for development in this area is to provide jobs for both local residents and the regional labor market, along with housing at affordable levels, increased parks and access to the Bay shoreline, and a positive net effect on the City's General Fund, so that the City can continue to provide services for all residents.

Improved transit services, such as the expansion of buses and shuttles, will enhance accessibility for current and future residents. Furthermore, a plan titled "Dumbarton Transportation Corridor Study" is currently being developed to identify short and long-term strategies that reduce traffic congestion and improve mobility between Alameda, San Mateo and Santa Clara Counties. The study will also identify ways to enhance rail bridge safety on the Bay's waterways and provide connectivity to commuter and intercity rail services by recommending options to preserve and repurpose the rail bridge. [30]

**University Avenue Corridor (SR 109)**

East Palo Alto's commercial hub is located near the junction of US 101 and University Avenue. The corridor segment through East Palo Alto is a suburban community, with a mix of single-family, multi-unit homes, small businesses, parks, schools, and civic buildings. The portion of University Avenue, from Bay Road to the railroad tracks, is included in the *Ravenswood/Four Corners Transit Oriented Specific Plan* (See Figure 2).[31] The local plan guides future development within 350 acres of East Palo Alto, and is regionally-designated as a Priority Development Area (PDA).[32] The City seeks to connect new development with improved public transit by planning for a mixture of homes, stores, and workplaces that are located near transit stops.

Beginning at the SR 109 intersection with Notre Dame Avenue, city boundaries highlight land use differences (see Appendix C). The north side of SR 109 has office/industrial parks which continue through Menlo Park via O'Brien Drive. On the south side of the route, the residential zone continues through East Palo Alto. Surrounded by salt marsh and nearing the edge of the Bay, Facebook's main campus is located between the junctions of SR 84 with SR 114 and SR 109. There are also undeveloped parcels zoned for future light industrial and commercial uses.

**Willow Road Corridor (SR 114)**

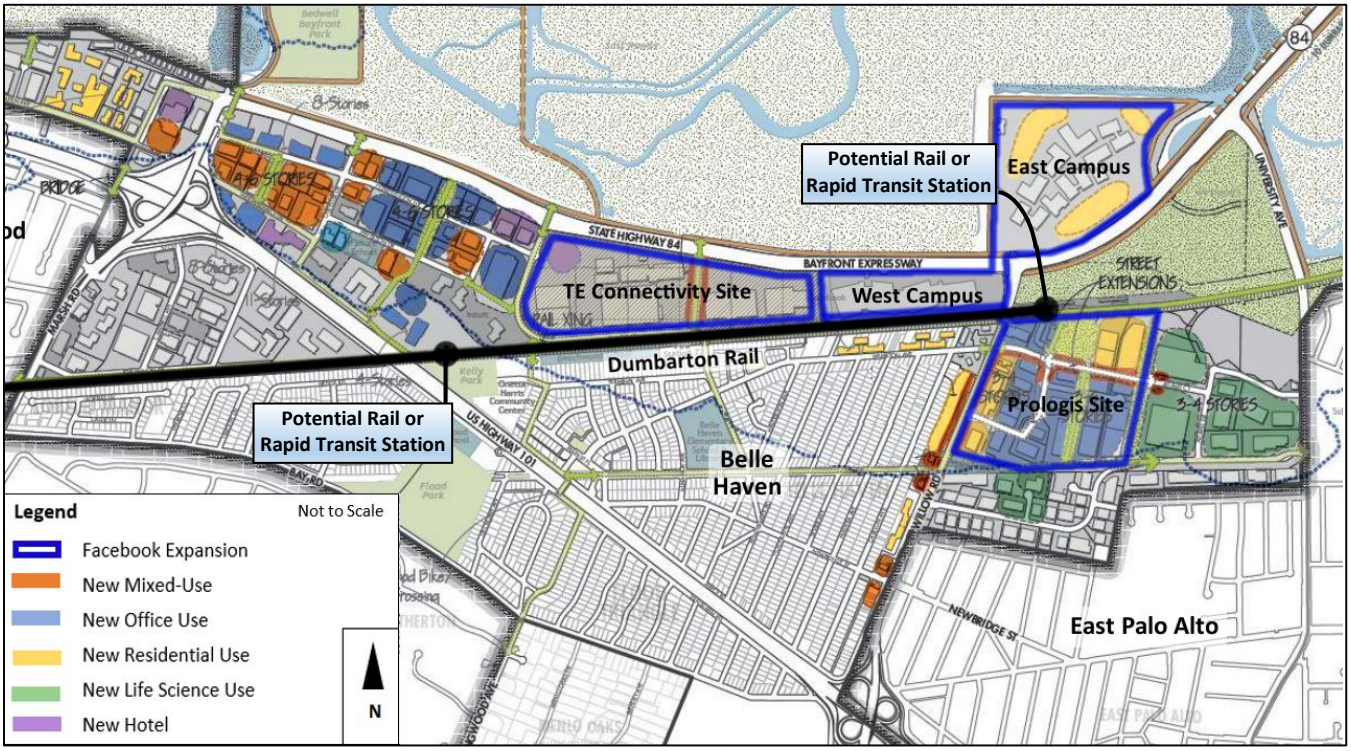
Located almost entirely in Menlo Park, SR 114 traverses the Belle Haven neighborhood. The area is suburban in nature, with a mix of single and multi-unit residences of one to two stories. Along O'Brien Drive, a light commercial/industrial zone dominates the eastbound side. Meanwhile the residential area continues along the westbound side until a shopping center emerges at the corner of Hamilton Avenue. Towards its eastern terminus, the route traverses office parks and soon to be developed properties, including Facebook's Campus West, located at the southwest corner of SR 114 and SR 84.

Several plans within Belle Haven are underway, including *Menlo Gateway,* near Marsh Road and US 101, and the *Facebook expansion*.[33] Facebook is actively transforming the area and proposes to develop new housing, office, and retail within walking distance of two potential Dumbarton Rail or Rapid Transit stations. [34] Current proposals are displayed in Figure 3, with Facebook sites outlined in blue. Additional high density residential projects are in various stages of development; at least five are planned within the SR 114 Corridor area.[35]

[30] Dumbarton Transportation Corridor Study, SanTrans, 2017
http://www.samtrans.com/Planning/Planning_and_Research/DumbartonTransportationCorridorStudy.html
[31] Ravenswood/Four Corners Specific Plan, City of East Palo Alto, 2013: http://www.ci.east-palo-alto.ca.us/ArchiveCenter/ViewFile/Item/125
[32] A component of Plan Bay Area, PDAs are identified as possible areas to develop more housing along with amenities and services to meet the day-to-day needs of residents in a pedestrian-friendly environment served by transit.
[33] City of Menlo Park, List of Approved Projects, accessed (2/1/2016): http://www.menlopark.org/512/Approved-Projects
[34] The Dumbarton Rail proposal to revitalize existing tracks for passenger service is discussed on page 23 of this report. Facebook is a large proponent of the plan and has recently allotted $1 million to revisit the defunded proposal. The Plan considers both rail and rapid transit options for the corridor.
[35] City of Menlo Park, List of R-4 Projects, accessed (2/1/2016): http://www.menlopark.org/891/High-Density-Residential-R-4-S-Projects

The black dots represent the locations for the potential Dumbarton Rail or Rapid Transit Stations; at Chilco Street in Belle Haven and south of University Avenue at the Menlo Park/East Palo Alto border. Additional high density residential projects are in various stages of development within the SR 114 Corridor area.[36] See Appendix C for additional land use maps of this area.

### *Figure 3. Facebook Expansion and Land Use Proposals[37]*




*Source: Menlo Park*

[36] City of Menlo Park, List of R-4 Projects: MidPen Housing on SR 114, between Ivy and Hamilton Streets, includes 90 units of senior housing. Greenheart-Hamilton, on Hamilton Avenue at SR 114, includes 195 market rate units, 117 of which are one bedroom units. St. Anton and Greystar are located at Marsh Road and Bayfront Expressway and consist 540 units, 37 of which are low income units. Core/VA will include 60 units near Willow Road and US 101. Accessed (2/1/2016): http://www.menlopark.org/891/High-Density-Residential-R-4-S-Projects

[37] Image: City of Menlo Park via Streetsblog (Accessed: 1/2016): http://sf.streetsblog.org/2015/03/20/dumbarton-rail-prospects-boosted-by-facebook-housing-proposal/ and available via "Dumbarton Rail First Phase" at http://www.bayrailalliance.org/dumbarton-rail-first-phase (Accessed 5/2017)

## SMART MOBILITY FRAMEWORK

To meet the goals of Assembly Bill 32 (AB 32) and Senate Bill 375 (SB 375) on Climate Change and Greenhouse Gas (GHG) emissions reduction, Caltrans introduced *Smart Mobility* to its Transportation Planning process and established the Smart Mobility Framework (SMF) in 2010.[38] Smart Mobility is a Planning tool that promotes convenient, accessible and safe multi-modal travel of people and freight as well as efficient use of land, in order to enhance California's economic, environmental and human resources. SMF is built on six principles: Location Efficiency, Reliable Mobility, Health and Safety, Environmental Stewardship, Social Equity, and Robust Economy.

The Location Efficiency principle identifies Place Types wherein implementation of specific transportation investments, along with Planning and management strategies, will help improve location efficiency and achieve Smart Mobility benefits. Location efficient design supports convenient, non-motorized travel, and efficient vehicle trips at the neighborhood and area scale, and combines land use with a multi-modal transportation system to make destinations available through non single-occupancy vehicle (SOV) travel and efficient vehicle trips at the regional scale. Table 4 suggests potential strategies for the Corridor area based on Place Types.

### *Table 4. Smart Mobility Strategies by Place Type*

| | Place Type | Strategy |
|---|---|---|
| **SR 109 and SR 114** | *Urbanized: Suburban Neighborhood* | ▪ Encourage Complete Streets projects such as continuous pedestrian facilities and bicycle network<br>▪ Prioritize infill, Transit Oriented Development (TOD) to increase density. Facilitate transit mobility<br>▪ Consider National Association of City Transportation Officials bicycle lane treatments such as buffers, bike boxes and painted pavement in high conflict areas to encourage bicycling, improve safety and encourage the multi-modal nature of Corridor<br>▪ Create accessible transit stations and reliable, interconnected transit options<br>▪ Preserve streets in a state of good repair, including pavement and sidewalk maintenance |
| | *Urbanized: Industrial/Special Use* | ▪ Institute travel demand management programs for major trip generators such as bike share, transit incentives, and commuter programs |

[38] Smart Mobility 2010: A Call to Action for the New Decade, Caltrans, 2010.

# SYSTEM CHARACTERISTICS

SR 114/US 101 Interchange | SR 109/US 101 Interchange | SR 84 with SR 114 & SR 109 Interchanges

*Google Images

The following sections describe various system characteristics of SR 109 and SR 114, including physical system characteristics, environmental considerations, as well as bicycle, pedestrian, transit, and freight facilities.

### *Table 5. Route System Characteristics*

| Route | SR 109 | | SR 114 |
|---|---|---|---|
| **Post Miles** | 0.00 – 1.10 | 1.13 – 1.87 | 5.00 – 5.92 |
| **Existing Facility (2015)** | | | |
| **Facility Type** | Conventional – Local Owned | Conventional – State Owned | Conventional – State Owned |
| **General Purpose Lanes** | 4 | 4 | 4 |
| **Lane Miles*** | 4.41 | 3.06 | 3.70 |
| **Centerline Miles** | 1.10 | 0.76 | 0.92 |
| **Median Width** | 0’ – 24’ | 10 - 19’ | 0 - 19’ |
| **Median Characteristics** | Separate structure at Interchange, paved | Paved or unpaved | Continuous left turn or paved |
| **Distressed Pavement**** | Severely distressed | Bad Ride Only** | Bad Ride Only** |
| **Current ROW** | None | 80 - 120’ | 80 - 200’ |
| **TMS Elements (BY)** | Jct. US 101: Closed Circuit Television (CCTV) | | Jct. US 101: CCTV<br>Jct. SR-84: CCTV |
| **Concept Facility (2040)** | | | |
| **Facility Type** | Conventional | Conventional | Conventional |
| **General Purpose Lanes** | 4 | 4 | 4 |
| **Lane Miles*** | 4.41 | 3.06 | 3.70 |
| **Centerline Miles** | 1.10 | 0.76 | 0.92 |
| **TMS Elements (HY)** | Mainline detection, Changeable Message Sign (CMS) | | Mainline detection, CMS |

* Approximate Lane Mileage

** The surface is rough, but repair not required

With the exception of overpass expansion and interchange realignment at the US 101 junctions, both routes will be maintained at existing capacity. Strategies to address safety and efficiency include operational improvements as well as enhancements to the bicycle and pedestrian networks.

Emphasis on preservation and maintenance drives the future concept. Based on Caltrans assessments of the State Highway System pavement conditions (2013 - 2015), both routes are classified as “Bad Ride Only,” and require preventative maintenance treatments or minor rehabilitation. The locally owned portion of SR 109 west of Notre Dame Avenue is not measured by Caltrans, however, observation of the route shows “Minor” to “Major” distress conditions, with visibly significant cracking.

### *Figure 4. Pavement Conditions Map*

## BICYCLE FACILITY

While the overall percentage of bicycle trips is relatively small in the Bay Area compared with other modes of travel, it varies greatly across communities. Considerably higher than the County average of 1.3 percent, East Palo Alto's bicycle commute share is 2.9 percent and Menlo Park's is 7.7 percent.[39] A growing number of people bike for recreation, to work, and for shopping. There is recognition that with an expanded and improved bicycle network, the mode share will increase.

Willow Road and University Avenue are city (Menlo Park and East Palo Alto) and county (San Mateo) designated Class II bicycle routes. Running west to east, both bicycle routes initiate near Middlefield Road approximately one mile west of US 101. To the east, the lanes merge with Class I paths at Bayfront Expressway and connect to a network of recreational bike paths and walking trails along the shore of the bay. Passing salt ponds and sloughs, the paths navigate Bayfront Park, Ravenswood Open Space Preserve, and Cooley Landing, connecting to the Bay Trail which traverses the Dumbarton Bridge. Both Willow Road and University Avenue bicycle routes have continuous, bi-directional bicycle lanes, with the exception of noteworthy gaps across US 101 (bicycle lanes terminate on both sides of the US 101 Interchanges). The bike lanes connect commuters with regional transit and recreationalists with trails.

Facility gaps at the US 101 junctions oblige bicyclists to utilize narrow shoulders, or compete with vehicles in shared, unmarked lanes. Visibility for bicyclists is compromised by wide crossings, multiple lanes, and high vehicle volumes. Additionally, shoulder pavement conditions are distressed at the west end, near the US 101 overcrossings. Please see Appendix C for the Bicycle Facilities Map, and Appendix D for detailed discussions on bicyclists' needs.

### *Table 6. SR 109 and SR 114 Bicycle Facilities*

| Segment | Post Mile | Location Description | Bicycle Access Prohibited | Facility Type | Outside Paved Shoulder Width (ft.) | Facility Description | Comments | Posted Speed Limit |
|---|---|---|---|---|---|---|---|---|
| *SR 109* | 0.0 -1.1 | US 101 overcrossing | No | *None | > 2' | On/off ramp obstacles | SR 109 and SR 114 are the only crossings; the University Avenue/US 101 interchange modification project will add a pedestrian overcrossing | 25 mph |
| | 1.1 - 1.5 | 300' west of Donohoe to railroad crossing | No | Class II | > 5' | Flat, paved, poor signage | EB and WB lanes | 25 mph |
| | 1.5 -1.8 | Railroad crossing to SR-84 | No | Class I | > 5' | Flat, paved | EB lane only | 35 mph |
| | 1.8 | Junction SR-84 | No | Class I | > 9' | Flat, paved, dedicated lanes | NB and SB paths connect to Bay Trail | 35 mph |
| *SR 114* | 5.0 -5.1 | US 101 overcrossing | No | *None | 0 – 5' | On/off ramp obstacles | SR 109 and SR 114 are the only crossings; The Willow Road/US 101 interchange modification project will add two bicycle lanes in each direction. | 40 mph |
| | 5.1 - 5.9 | Willow/SR 114 | No | Class II | 4 – 6' | Flat, paved, with facility gap at Newbridge Street | EB and WB lanes | 40 mph |
| | 5.9 | Junction SR-84 | No | Class I | > 5' | Flat, paved, merges to paths along SR 84 | NB and SB paths connect to Bay Trail | 45 mph |

[39] US 2010 Census, American Community Survey, 5-Year Estimates: Commuting Characteristics (2010-2014)

## PEDESTRIAN FACILITY

Unlike other modes, most walking "trips" are short and take place within a relatively small area. The linkages of pedestrians to other modes of transportation are vital to the trips that people take. Leading us to cars, bikes, buses, trains, or ferries, walking is part of almost every trip we make. Convenient and safe pedestrian facilities and access are critical for California to achieve emission reductions goals. According to the US Census, 2.5 percent of San Mateo County residents walk to work, 2.4 percent of East Palo Alto residents walk to work, and 3.7 percent of Menlo Park residents walk to work.[40]

Tables 7 and 8 list pedestrian facilities along each route and are segmented to identify notable changes. The most common issues for pedestrians along both routes are long crossing distances, large curb radii (which encourages high speed turns by motorists), missing sidewalks, and areas where crossing is prohibited.

### *Table 7. Pedestrian Facilities, SR 109*

| Description | Ped. Access Prohibited | Sidewalk Present | Facility Description | Intersection | Large Corner Radii | Intersections Description |
|---|---|---|---|---|---|---|
| From US 101 Overpass to Donohoe Street | No | West-bound Only | Pavement distressed | US 101 Overcrossing | No | Grade separated, not signalized |
| | | | | Donohoe Street | Yes | At-grade, signalized, crosswalks |
| From Donohoe Street to Bay Road | No | Yes | Some Obstructions on Sidewalk | Bell Street | No | At grade, signalized, crosswalks |
| | | | | Runnymede Street | Moderate | |
| | | | | Sacramento Street | No | At grade, crosswalks |
| | | | | Weeks Street | | |
| From Bay Road to Kavanaugh Drive | No | West-bound Only | No current sidewalk Eastbound | Bay Road | Yes | At grade, signalized, crosswalks |
| | | | | Michigan Street | Moderate | At grade, T-intersection, one marked crosswalk |
| | | | | Kavanaugh Drive | Moderate | At grade, T-intersection, two signalized crosswalks |
| From Notre Dame Avenue to Purdue Street | No | East-bound Only | No sidewalk Westbound | Notre Dame Avenue | No | At grade, T-intersection, one signalized crosswalk. School site. |
| From Purdue Street to Tulane Street | No | No | None | N/A | No | No crosswalk |
| From Tulane Street to SR 84 | No | No | Bike Lane | SR 84 | Yes | SR 84 intersection: at grade, signalized, crosswalks, and no sidewalks |

[40] US 2010 Census, American Community Survey, 5-Year Estimates: Commuting Characteristics (2010-2014)

### *Table 8. Pedestrian Facilities, SR 114*

| Description | Ped Access Prohibited | Sidewalk Present | Facility Description | Intersection | Large Corner Radii | Intersection Description |
|---|---|---|---|---|---|---|
| From US 101 overpass to Newbridge Street | No | Yes | Both sides are paved and at grade over US 101. WB facility narrows after steering pedestrians to alternate facility on Pierce Street | Overcrossing | No | Grade separated, not signalized |
| | | | | US 101 on/off Ramps | | At grade, not signalized |
| | | | | Westbound sidewalk veers to Pierce Road | | At grade, not signalized, no crosswalks |
| | | | | Newbridge Street | Yes | At-grade, signalized intersection, crosswalks & sidewalks |
| From Newbridge Street to Hamilton Street | No | Yes | EB facility adjacent to SR 109, WB facility separated by concrete wall | Ivy Drive | Yes | T-intersection |
| | | | | Hamilton Avenue | | At grade, signalized, crosswalks |
| From Hamilton Street to SR 84 | No | East-Bound Only | Obstacles include unpaved sidewalk and railroad crossing | Facebook West Entrance | No | At grade, crosswalk, wide footpath |
| | | | | SR 84, Facebook HQ Entrance | Yes | At grade, signalized, crosswalks, sidewalks to Facebook HQ, no sidewalks on SR 84 |

It is the State's policy to provide safe and convenient travel for pedestrians, and fully consider the needs of non-motorized travelers.[41] Both routes experience sidewalk discontinuity and need improved walkability. New and existing developments should incorporate sidewalks along property perimeters. Visibility and a secure pathway should be established for all modes.

While Tables 6 – 8 identify the existing bicycle and pedestrian facilities, the following are plans that incorporate bicycle and pedestrian improvements: *US 101/Willow Road Interchange Modification Project*, *US 101/University Avenue Interchange Improvement Project*, City of East Palo Alto *University Avenue/Bell Street Intersection Improvement Project*, and City of East Palo Alto *Highway 101 Pedestrian/Bicycle Overcrossing Project* between West and East Bayshore Roads, aligned with Clarke Avenue and connecting to West Bayshore Road at Newell Road. A summary of each project is discussed in the Planned and Programmed Projects and Studies section of this report. Please see detailed discussions in Appendix E, Pedestrian Facilities along the SR 109/114 Corridor.

As part of the Facebook Expansion Project, a proposed bicycle/pedestrian bridge over Bayfront Expressway between Chilco Street and SR 114 would link Facebook campuses and allow public access to the Bay Trail and Bayfront Park from the project site and the Belle Haven neighborhood. [42]

[41] CA Vehicle Code (Sec. 21949) states a policy for the Department to provide safe and convenient travel for pedestrians. The CA Complete Streets Act (2008) directs Caltrans to "fully consider the needs of non-motorized travelers (pedestrians, bicyclists & persons with disabilities) in all programming, planning, maintenance, construction, operations and project development."

[42] http://www.menlopark.org/643/Facebook-Campus-Project

## TRANSIT FACILITIES

Transit ridership in San Mateo County increased by eleven percent from 2013 to 2015.[43] Nine percent of San Mateo County residents travel by transit.[44] The Corridor is served by the San Mateo County Transit District (SamTrans), Alameda-Contra Costa County Transit District (AC Transit) and local shuttles, which provide connections to regional rail networks including Bay Area Rapid Transit (BART) and Caltrain.

### *Table 9. Transit Routes within the Corridor Vicinity*

| Mode & Collateral Facility | Name | Route End Points | Annual Ridership* | Operating Period | ITS & Technology | Stations: Cities | Amenities | Bikes Allowed on Transit * | Location Description | # Parking Spaces * |
|---|---|---|---|---|---|---|---|---|---|---|
| Rail | Caltrain | San Francisco to San Jose | 18 M | Daily | Real-time info | Menlo Park | Bike racks | 32/ Train | Parallels SR 82 | 155 |
| | | | | | | Palo Alto - University Ave. | Bike racks lockers, bike share | | | 389 |
| | | | | | | Palo Alto - California Ave. | | | | 185 |
| Transbay Commuter Express Bus | AC Transit: Dumbarton Express, Route U | Palo Alto to Union City | 0.2 M | M-F, No holiday service | Real-time info | Palo Alto, Menlo Park, Union City, Fremont | Free Wi-Fi | 3-4/ Bus | Stops on Willow Road (SR 114) | N/A |
| Traditional Bus | SamTrans Routes: 296, 297, 281, 397 | San Mateo County & adjoining communities | 12.6 M | Daily | N/A | East Palo Alto, Palo Alto, Menlo Park | Bike rack, express routes | 3/Bus | Multiple stops along SR 109/ SR 114 Corridor | N/A |

*Annual Ridership Data (2015) and Bike/Parking Allowances are provided by their respective transit agencies.

#### Intercity and Regional Bus Service

Bus service throughout the County is operated by SamTrans, which provides service to 42,028 daily passengers; 73 percent residing in San Mateo County[45]. Routes 281, 296, 297 and 397 serve the Corridor by connecting commuters with the Menlo Park and Palo Alto Caltrain stations, Transbay buses and the Millbrae BART Station. Stanford University, College of Menlo Park, hospitals, shopping centers and employers in downtown Palo Alto and Menlo Park are also accessible through SamTrans bus services. SamTrans arranges paratransit for persons with disabilities who cannot independently use regular bus services.

AC Transit operates commuter shuttles across the Dumbarton Bridge via SR 114, connecting the Peninsula with the East Bay, from the Palo Alto Caltrain Transit Station to the Union City BART Station. The Dumbarton Express (Routes DB and DB 1) stop on SR 114 at Hamilton, Ivy/Obrien and Newbridge streets. AC Transit Route U traverses SR 114, heading directly to Palo Alto and Stanford University.

Transbay ridership on AC Transit increased 20 percent from 2013 to 2015,[46] but after a system wide plateau in 2015, AC Transit ridership has mirrored a national trend of declining traditional bus transit ridership.[47] The ridership numbers coincide with lower fuel prices and a shift towards other forms of transportation services such

[43] C/CAG LOS and Performance Measure Monitoring Report - 2015
[44] US 2010 Census, American Community Survey, 5-Year Estimates: Commuting Characteristics (2010-2014)
[45] SamTrans Fast Facts 2015: http://www.samtrans.com/Assets/_Public+Affairs/Fact+Sheets/SamTrans+Fact+Sheet+-+FY+2015.pdf
[46] AC Transit Staff Report, (accessed 1/2/2015): http://www.actransit.org/wp-content/uploads/board_memos/15-191%20Transbay%20Ridership.pdf
[47] According AC Transit's FY15/16 Ridership Trend Analysis Report, the Transit System experienced a 1.8 percent decline over the previous year, with consecutive decline from October 2015 to January 2016. Alameda-Contra Costa Transit District Staff Report (April 2016): http://www.actransit.org/wp-content/uploads/board_memos/16-082%20Ridership%20Trend%20Analysis.pdf

as ride hailing, commuter rail, ferry, and employer-provided shuttles, which have experienced ridership growth in the Bay Area. Despite declining ridership, population in the Dumbarton Corridor and throughout the Bay Area has experienced dramatic increases and there remains a need for public transit for people of all income levels.[48] Transit preferential treatments (to improve bus travel times) and coordination across the Bay Area's many service providers could increase the efficiency and quality of Bay Area bus systems.[49]

**Commuter Rail Systems**

Caltrain operates commuter rail along the Peninsula between San Francisco and San Jose, which over the last decade has become the most productive area in the State. Caltrain runs about 80 trains per weekday, transporting 41,000 daily boarders in San Mateo County,[50] with a ridership that continues to grow each year. Caltrain does not run along the SR 114/SR 109 Corridor, nor within walking distance, but it is a major component of the transportation infrastructure. The Menlo Park and Palo Alto/California Avenue Caltrain stations are located approximately one mile west of US 101; accessible via bicycle, bus and shuttle. Park-and-Ride lots exist at each station. To facilitate commuter travel to the Menlo Park Caltrain Station, the Cities of East Palo Alto and Menlo Park operate free shuttles along Willow Road and University Avenue.

The Palo Alto Caltrain Transit Station is a major stopping and transfer point, servicing many Santa Clara Valley Transportation Authority (VTA) routes, including the 522/522R which connects with the Altamont Commuter Express Train (ACE) in San Jose and the Amtrak Capitol Corridor train in Santa Clara and San Jose.

*The Caltrain Modernization Program*, a project to electrify and upgrade the performance and capacity of Caltrain's service, is currently underway (2017) and is expected to be operational by 2020. The modernized system will reduce greenhouse gases and allow for the operation of additional trains to accommodate increased ridership and future High Speed Rail (HSR) service.

**California High Speed Rail**

The California High-Speed Rail Authority (Authority) is responsible for planning, designing, building and operation of the first HSR system in the nation. The first phase of California HSR, from San Francisco, through the Central Valley, to Los Angeles, is expected to be complete by 2029. Travel time is expected to be under three hours at speeds of over 200 miles per hour. HSR service between San Francisco and San Jose will be a blended system which will support modernized Caltrain service and high-speed rail service primarily on shared track largely within the existing Caltrain corridor.[51] Proposed service would parallel SR 82, with stations in San Francisco, Millbrae and San Jose.[52]

**Private Shuttle Services**

Facebook provides free-for-employees direct bus services or vanpools between Menlo Park and San Francisco, and a few cities in Santa Clara and Alameda Counties.[53] Stanford University also operates extensive shuttle services known as the Marguerite Bus System. The Marguerite is free and open to the public and provides connections between the Fremont BART Station, Palo Alto Transit Center Station, and the Stanford University campus. Additional tech employers in Menlo Park and Palo Alto likely use SR 114 as a transbay commuter shuttle route.

[48] California's population has steadily grown since 2010, with the Bay Area growing by more than 90,000 from 2015 to 2016. http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/

[49] SPUR: A Better Future for Bay Area Transit (2012), offers methods to deliver better transit service, control costs and attract more riders.

[50] Caltrain, 2015: http://www.caltrain.com/about/statsandreports/Ridership.html

[51] CA High Speed Rail Authority, 2017, http://www.hsr.ca.gov/

[52] Millbrae Intermodal Terminal in the City of Millbrae, San Mateo County is a hub for BART, Caltrain, and BART AirTrain. Diridon Station in the City of San Jose, Santa Clara County is a hub for ACE, Caltrain, Capitol Corridor, Coast Starlight, and VTA Light Rail.

[53] Facebook Revised Transportation Management Plan: http://www.menlopark.org/DocumentCenter/View/2634

Private shuttle buses provide commuter services that reduce pollution and traffic, but they have been criticized for inducing gentrification and displacement in the Bay Area, adding wear-and-tear to local streets by utilizing large buses, and interfering with public facilities such as bus stops. Private tech buses have created a two-tiered transit system, and pose significant competition to public transit providers in the Corridor. It is essential that continued investment and improvements are made to public transit. However, these services will have to be designed to compete with more flexible and demand driven private services.

**Park-and-Ride Facilities**

Located immediately east of the Dumbarton Bridge, the Ardenwood Park-and-Ride serves westbound commuters. The Ardenwood Park-and-Ride operates at capacity, and has already undergone expansion. Additional Park-and-Ride facilities in the area could help alleviate traffic west of the Dumbarton Bridge on SR 109 and SR 114, and increase the efficiency of bus transit.

**Proposals for Future Transit Services**

The Dumbarton Rail right-of-way between Redwood and Newark Junctions was purchased by SamTrans as an investment for future freight and commuter rail service. In 2003, the San Mateo County Transportation Agency (SMCTA) started to study the scope and cost of a Dumbarton Rail Corridor (DRC) project to extend commuter rail service across the Bay to the East Bay using an existing alignment.[54]

Service would consist of East Bay trains traveling west in the morning and returning in the evening. Daily ridership was projected at 6,900 by 2025. According to the Bay Area Toll Authority (BATA), weekday morning traffic on the Dumbarton Bridge has grown 27 percent since 2010.[55] The DRC project was listed as a regional transportation priority in MTC Blueprint for the 21st Century (2000) and Plan Bay Area (2013). It was been put on hold due to its high cost (estimated $300 million in 2010 and reappraised to $700 million in 2015).

As a continued effort to look for ways to reduce congestion between the East Bay and Silicon Valley, SamTrans and Facebook launched the one million dollar Dumbarton Transportation Corridor Study that focuses on mainline improvements to SR 84/Dumbarton Bridge and the DRC, as well as the arterial and highway networks that feed these areas on both sides of the Bay. Caltrans has been involved in stakeholder meetings and provided technical expertise to the study team in 2016.

Proposed alternatives include creating a bicycle/pedestrian trail or express bus service on the old span, or a "Community Transit Corridor" with a Bus Rapid Transit (BRT) lane and a bicycle/pedestrian trail, from the Redwood City Caltrain Station to Willow Road. Previously proposed BRT lanes or transit signal prioritization on SR 114/Willow Road could help alleviate congestion, compliment the DRC project, or connect with HOV lanes on US 101 and across the Dumbarton Bridge. With funding to accelerate the study, a report of solutions and funding strategies is expected to be completed by Samtrans in August 2017.[56] Pictured left shows the remains of Dumbarton Rail trestle across the San Francisco Bay.[57]

[54] DRC Project Study Report, 2004: http://www.smcta.com/Assets/Dumbarton+Rail+Corridor/documentation/DRC_PSR_Summary.pdf
[55] See SR 109/114 TCR Appendix 3 (Page 46), "Traffic of Bay Area Bridges, "provided by: http://www.sfgate.com/bayarea/article/Bay-Area-commute-analysis-Awful-ride-6647859.php
[56] Samtrans Dumbarton Transportation Corridor Study, http://www.samtrans.com/Planning/Planning_and_Research/DumbartonTransportationCorridorStudy.html
[57] Source: https://www.flickr.com/photos/eb78/with/25164150580/

## FREIGHT

The region's projected increases in population and economic activity will result in increased truck movement, especially near airports and seaports. US 101 and I-880 are the Bay Area's primary freight corridors and the Dumbarton Bridge connects these routes via SR-84. The Dumbarton Bridge, along with other transbay bridges, is part of the interregional core freight system.[58] SR 109 and SR 114 are California Legal Routes, a designation that allows use of trucks with a maximum 65 feet in length. According to Caltrans Vehicle Census (2015), trucks account for almost ten percent of the AADT on both routes.

A maritime freight facility is located at the Port of Redwood City. Publicly-owned, it is the only deep water port along the southern portion of the San Francisco Bay. The Port handles mostly bulk items such as concrete and scrap metal, with the majority of outbound materials being recycled metal. It is located north of the corridor along the Bay, near US 101. The Port is serviced by Union Pacific Railroad, which shares tracks with Caltrain commuter trains west of US 101.

### *Table 10. Freight Facilities*

| Facility Type/ Freight Generator | Location | Mode | Name | Major Commodity/ Industry | Comments |
|---|---|---|---|---|---|
| Highway | US 101 | Truck | US 101 | Bulk materials such as: agriculture, scrap, mineral, gravel, and others. | Peak hour bottleneck between SR 109 and Marsh Road |
| Rail | Dumbarton Rail | Train | Dumbarton Rail | Not in use | At-grade crossings on SR 109 and SR 114 |
| Port | Redwood City | Ship | Port of Redwood City | Bulk materials | The Port is located north of the corridor area. Ferry service is currently being proposed. |
| Airport | San Jose | Cargo and Passenger Plane | Norman Y. Mineta San José International Airport (SJC) | Domestic cargo: 54,000 metric tons (2015).[59] Typically high value goods and/or an operationally or commercially critical delivery time | Cargo-only carriers: FedEx Express, United Parcel Service |
| Airport | San Mateo County near San Bruno and Millbrae | Cargo and Passenger Plane | San Francisco International Airport (SFO) | Domestic and international cargo: 459, 500 metric tons (2015).[60] Typically high value goods and/or an operationally or commercially critical delivery time. | SFO is a major trade hub with Pacific Rim countries like South Korea, Japan, and Taiwan. Cargo-only carriers include: Asiana, China Air, EVA Air, Fed Ex Express, Korean Air, and Nippon Air.[56] |

[58] Caltrans, *San Francisco Bay Area Freight Mobility Study: http://www.dot.ca.gov/hq/tpp/offices/ogm/regional_level/FR3_SFBAFMS_Final_Report.pdf*
[59] SJC Fast Facts: http://www.flysanjose.com/fl/about.php?page=newsroom/fast_facts&exp=0
[60] SFO Economic Impact Report (2016): http://media.flysfo.com.s3.amazonaws.com/default/downloads/reports/2016_SFO_Economic_Impact_Report.pdf

## ENVIRONMENTAL CONSIDERATIONS

This section provides a high-level identification of potential environmental factors that may require future analysis in the project development process. Potential factors along the Corridor include the presence of hazardous facilities, habitats of threatened or potentially threatened species, fragile wetlands, and flood-prone areas. This information may not represent all environmental considerations that exist within the Corridor vicinity.

### Wildlife and Habitat

SR 109 and SR 114 are situated close to the Bay, home to federally-protected salt marsh and environmentally sensitive habitat. The Don Edwards National Wildlife Refuge at the southern end of San Francisco Bay is a 30,000-acre oasis for millions of migratory birds and endangered species. Fifteen habitat types exist and more than 280 bird species have been sighted. The refuge also provides habitat for mammals, reptiles, amphibians, and invertebrates. Several federally-listed threatened and endangered species inhabit the refuge including the Salt Marsh Harvest Mouse, California Clapper Rail, and Western Snowy Plover.[61] See Figure 5.

**The Western Snowy Plower and California Clapper Rail on the left [62]**

### Hazardous Waste

The communities near SR 109 and SR 114 have been disproportionally affected by environmental justice issues, including the siting of hazardous waste facilities. Cooley Landing, located on the East Palo Alto shore, is a former toxic dump. Designated by the U.S. Environmental Protection Agency as a Superfund site, Cooley Landing received funding for cleanup and has since become a natural and historic area. Figure 5 depicts locations of underground storage tanks as well as other environmental factors along the Corridor.

### Climate Change and Sea Level Rise

Sea Level Rise (SLR) is one of the most documented and widely accepted impacts of climate change. Observation of sea levels along the California coast indicate that areas along the San Francisco Bay will experience rising sea levels of 16 inches by mid-century (2050) and up to up to 55 inches by the end of this century.[63] The effects of SLR and flooding are expected to increasingly impact transportation infrastructure in low-lying coastal areas, including parts of SR 114 and SR 109. Rising sea levels will significantly increase the challenge to transportation managers in ensuring reliable transportation routes are available. Inundation of even small segments of the intermodal transportation system can render much larger portions impassable, disrupting connectivity and access to the wider transportation network.[64] Figure 6 reveals areas in which transportation assets and other facilities would be vulnerable to inundation and flooding by wave and tidal action.

[61] GIS data provided by California Department of Fish and Wildlife (2015).
[62] Photos: Wikipedia.org & Sfwatertrail.org
[63] The Federal Emergency Management Agency (FEMA), the Pacific Institute, the California Bay Coastal Development Commission (BCDC) and the U.S. Geological Survey have prepared inundation maps for the San Mateo County shoreline.
[64] *Guidance on Incorporating Sea Level Rise*, Caltrans Climate Change Workgroup, per California Ocean Protection Council Resolution of March 2011.

**San Francisquito Watershed**

Many East Palo Alto and Menlo Park streets, homes, and businesses are adjacent to the San Francisquito Creek, and are subject to potentially major flood events (see Figure 6).[65] Flood risk has become more severe as increased urbanization along the creek has expanded the area of impermeable surfaces. In the 1998 El Niño storms, the creek burst its banks resulting in flood damage. San Francisquito Creek Joint Powers Authority (SFCJPA) was formed a year after that.

To protect people, property, and public infrastructure within the cities of East Palo Alto, Menlo Park, and Palo Alto from San Francisco Bay flooding, provide habitat restoration for the Bay's tidal marsh ecosystem, and to enhance recreation opportunities along the Bay shoreline, the SFCJPA and its member agencies launched a project called the *Strategy to Address Flood Protection, Ecosystems and Recreation along the San Francisco Bay* (SAFER). As part of the SAFER project, a study was conducted in 2016 to develop and evaluate flood protection alternatives. The alternatives currently being considered would protect various reaches of the area, and include levee options parallel to SR 84/Bayfront Expressway and well as a retaining wall along SR 84/Marsh Road. Further details can be found in the *SAFER Bay Public Draft Feasibility Report* (2016).[66]

Figure 7 shows Special Flood Hazard Areas subject to inundation by the one percent Annual Chance Flood (100-year flood).

[65] San Francisquito Joint Powers Authority (assessed 11/2016) http://sfcjpa.org/
[66] SAFER Bay Public Draft Feasibility Report (accessed 5/2017)
http://www.sfcjpa.org/documents/SAFER_Bay_Public_Draft_Feasibility_Report_Summary_Oct._2016_.pdf

*Figure 5. Environmental Factors*

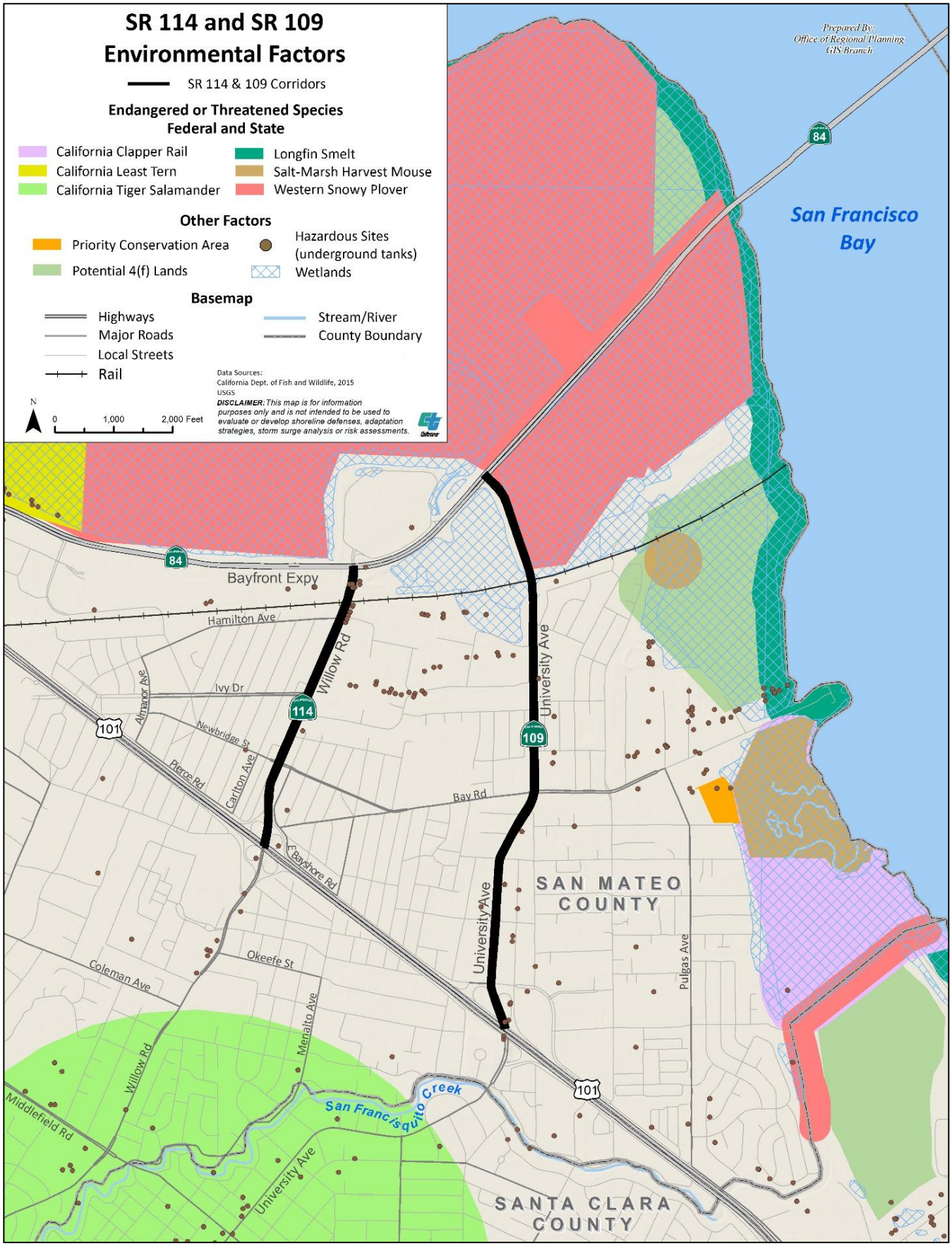
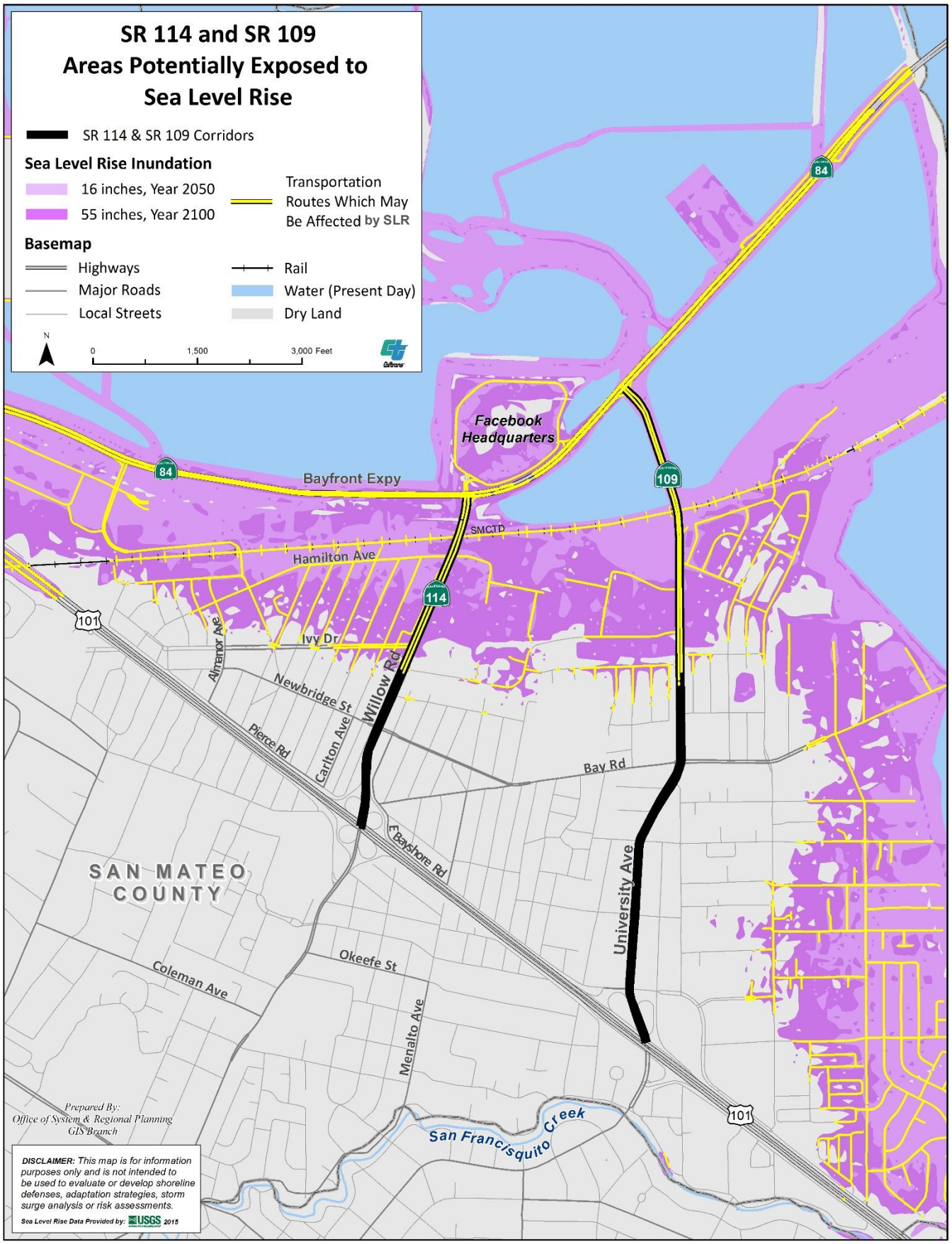
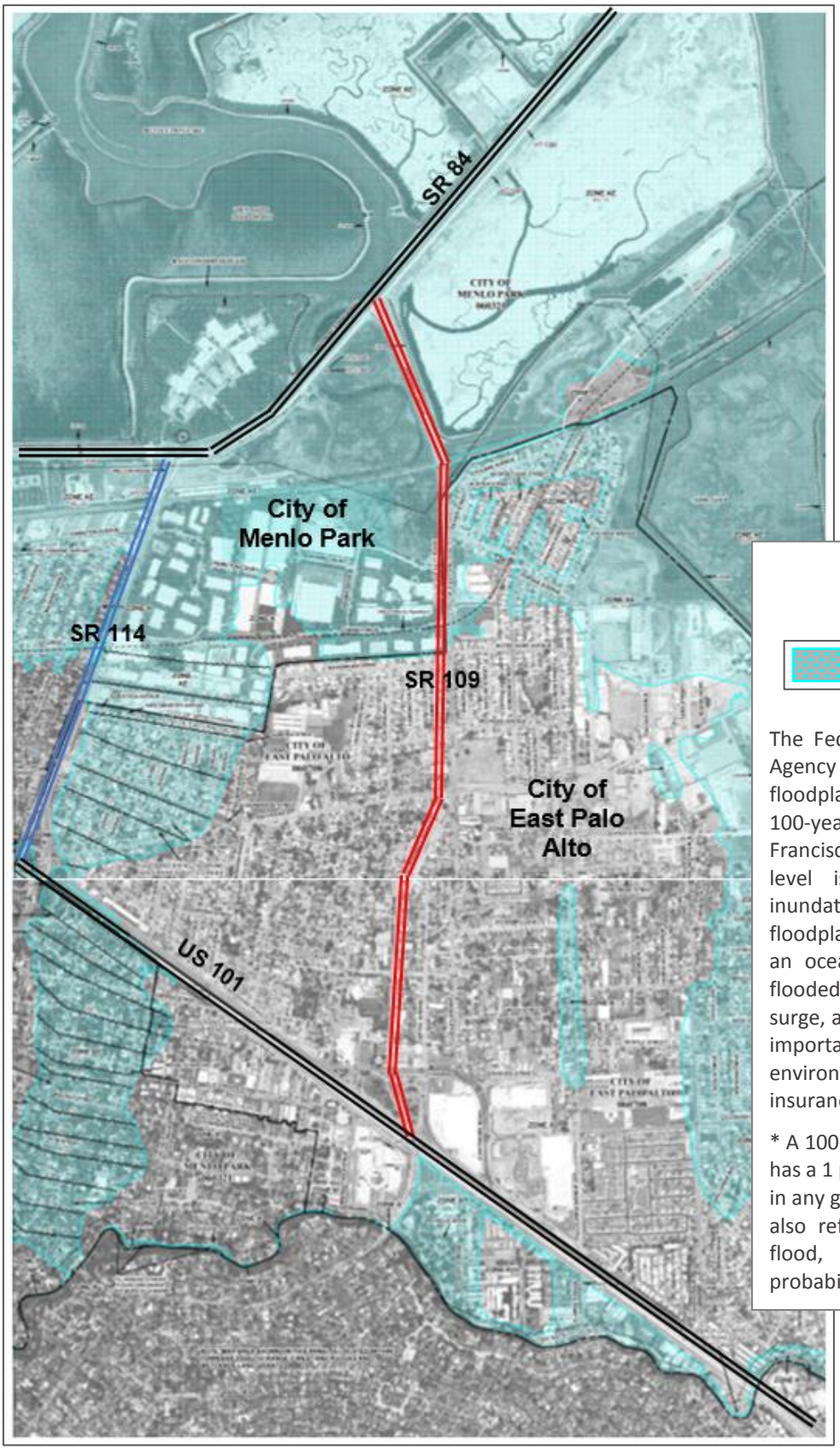


*Figure 6. Corridor Areas Vulnerable to Coastal Inundation*



### *Figure 7. Flood Zone Map* [67]




**Special Flood Hazard Areas Subject to Inundation by the One Percent Annual Chance Flood (100-year flood)***

The Federal Emergency Management Agency (FEMA) has prepared floodplain maps based on the expected 100-year flood flow rate of the San Francisquito Creek. The flood water level is mapped as an area of inundation, referred to as the 100-year floodplain. The areas near the coast of an ocean or large lake also can be flooded by combinations of tide, storm surge, and waves. Floodplain maps are important in building permits, environmental regulations, and flood insurance.

* A 100-year flood is a flood event that has a 1 percent probability of occurring in any given year. The 100-year flood is also referred to as the one percent flood, since its annual exceedance probability is one percent.

[67] The Federal Emergency Management Agency (FEMA) Flood Map: https://msc.fema.gov/portal/search?AddressQuery=East%20Palo%20Alto%2C%20California%20#searchresultsanchor

## TRANSPORTATION SYSTEM MANAGEMENT AND OPERATIONS

Caltrans is committed to effective Transportation System Management and Operations (TSMO) to optimize the performance of California's transportation systems for all users and modes of travel. TSMO strategies are essential to a performance-based decision-making process to improve the efficient and effective operation of the transportation network. Examples of TSMO strategies include, but are not limited to, ramp metering, traffic signal synchronization, Intelligent Transportation System (ITS) and managed lanes. Efficiency can often be achieved by operational improvements through ITS deployments. These include four types of management for improving throughput:

- System management for recurring localized congestion (ramp metering, managed lanes, traveler information, dynamic speed limit, traffic signals and transit priority, Integrated Corridor Management (ICM), parking management system, and automated vehicles).
- Incident management for non-recurrent congestion (detection-verification-response, Close Circuit Television (CCTV), Changeable Message Sign (CMS), Highway Advisory Radio (HAR), weather detection, traveler information system, and ICM).
- Event management for emergencies, disasters and other occurrences (through system monitoring, evacuation management, route selection, and ICM).
- Asset Management for managing existing infrastructure and other assets to deliver an agreed standard of service. One of the first steps in the efficient management of the transportation system will be the completion and implementation of a Transportation Asset Management Plan.

In partnership with regional and local agencies, and other stakeholders, operational strategies form the basis of ICM. TSMO and ICM require proactive integration of the transportation systems to efficiently move people and goods along highly congested urban corridors. TSMO and ICM strategies improve operations of multimodal transportation infrastructure.

The Caltrans Strategic Management Plan 2015–2020 has a strategic objective to effectively manage transportation assets by implementing the Asset Management Plan, embracing a fix-it-first philosophy and specifying a target of "(B)y 2020, maintain 90% or better ITS elements health." Operations and Maintenance (O&M) resources are essential to achieve this fix-it-first target. Many TSMO strategies involve ITS equipment. As more TSMO/ITS elements (CCTV, CMS, detection stations, etc.) are implemented, O&M resource needs will continue to grow.

### San Mateo SMART Corridor Project

San Mateo County is in the process of implementing the SMART Corridor[68] project, which is an ITS project designed to improve mobility along the US 101 Corridor in San Mateo County. The estimated cost of the project is $35M. The project is sponsored by the City/County Association of Governments of San Mateo County (C/CAG). The project is located along predefined designated arterial routes, parallel to US 101, connecting US 101 to SR 82 (El Camino Real) between I-380 and the Santa Clara County line. The Smart Corridor routes are alternate routes consisting of State Highways (I-380, SR 82, SR 84, SR 109 and SR 114) and local arterials expected to accommodate traffic diverted off the freeway due to a major incident on US 101.

The project, which has been partially implemented, will enable Caltrans and cities to implement traffic management strategies through the deployment of ITS elements along State routes and major local streets. The ITS elements to be implemented for the SMART Corridor Project include: arterial changeable message signs, center-to-center communications between the San Mateo County Hub and the District 4 Traffic Management Center (TMC), communications equipment (conduit, fiber, copper, wireless, software, and power supply line and equipment), directional signs, closed-circuit television cameras, and vehicle detection systems.

[68] http://publicworks.smcgov.org/san-mateo-county-smart-corridors-project

# CORRIDOR PERFORMANCE

Traffic forecasts for SR 109 and SR 114 indicate significant traffic growth by 2040. Due to a high number of commuters traveling from Alameda County to San Mateo County, heavy congestion currently exists on all three Dumbarton Corridor routes (SR 84, SR 114 and SR 109) during peak hours. Data collected from 2013 to 2015, shows a decline in Level of Service (LOS) for westbound traffic on SR 109 and SR 114 during the morning peak period, and eastbound traffic on SR 114 during the evening peak period.[69] The peak numbers explain a commuter flow into Silicon Valley for work from Alameda County, or beyond.

### *Table 11. Corridor Performance*

| Route | **SR 109** | **SR 114** |
|---|---|---|
| **Basic System Operations[70]** | | |
| AADT (BY) | 22,200 | 46,000 |
| AADT EB/WB Directional Split (BY) | 55/45 | 65/35 |
| AADT (HY) | 44,300 | 74,200 |
| AADT EB/WE Directional Split (HY) | 55/45 | 70/30 |
| **Truck Traffic** | | |
| Total Average Annual Daily Truck Traffic (AADTT) (BY) | 3,335 | 6,566 |
| Total Average Annual Daily Truck Traffic (AADTT) (HY) | 3,654 | 6,669 |
| Total Trucks (% of AADT) (BY) | 9.57% | 9.26% |
| 5+ Axle AADTT (BY) | 100 | 296 |
| 5+ Axle Trucks (as % of AADT)(BY) | 0.28% | 0.41% |
| **Bottlenecks** | | |
| Bottleneck Existing | Yes | Yes |
| Bottleneck Location | SR 109/Bayfront (SR 84) and SR 109/Donohoe | SR 114/US 101 and SR 114/Bayfront (SR 84) |
| Bottleneck Causality | Demand exceeds capacity. Westbound left turn at Bayfront Expressway. | Demand exceeds capacity. US 101/SR 114 on/off ramp capacity, lane drop west of US 101, westbound left turn at Bayfront Expressway. |
| **Peak Hour Traffic Data** | | |
| EB AM Peak Hour Vol (BY) | 630 | 1510 |
| EB AM Peak Hour Vol (HY) | 870 | 2100 |
| WB AM Peak Hour Vol (BY) | 1630 | 2230 |
| WB AM Peak Hour Vol (HY) | 2270 | 3110 |
| AM Peak Hour EB/WB Directional Split (BY) | 28/72 | 40/60 |
| AM Peak Hour EB/WB Directional Split (HY) | 28/72 | 40/60 |
| EB PM Peak Hour Vol (BY) | 1810 | 2620 |
| EB PM Peak Hour Vol (HY) | 2520 | 3650 |
| WB PM Peak Hour Vol | 560 | 1610 |
| WB PM Peak Hour Vol (HY) | 780 | 2240 |
| PM Peak Hour EB/WB Directional Split (BY) | 76/24 | 62/38 |
| PM Peak Hour EB/WB Directional Split (HY) | 76/24 | 62/38 |

BY = Base Year (2015)  HY= Horizon Year (2040)

[69] SM County LOS Monitoring Report – 2015: http://ccag.ca.gov/wp-content/uploads/2015/10/2015-San-Mateo-Monitoring-Report-091415.pdf
[70] Data Provided by Caltrans – Traffic Census Program (2015) and District 4 Forecasting, Using MTC's Model Projections (2015).

Shown in Table 12, Caltrans AADT counts and their respective forecasts show higher numbers of eastbound vehicles accessing SR 109 and SR 114 compared to the numbers of westbound vehicles. This figure is especially significant for SR 114. The high influx of vehicles may be explained by East Bay commuters accessing alternate transbay routes (e.g. SR 237) during morning commute and using SR 109 or SR 114 during the evening commute. More importantly, this may be indicative of a commuter response to avoid bridge tolls or congestion involving US 101 or I-880.

**San Mateo County LOS and Performance Monitoring Report (2015)**

In accordance with State legislation, local governments demonstrate that all Congestion Management Program (CMP) routes within their jurisdiction operate at or above the Level of Service (LOS) standard.[71] San Mateo County's Performance Measure Monitoring Report (2015) monitored SR 109 and SR 114 segments from US 101 to SR 84 and at SR 84 intersections.[72] All segments and intersections operated at standard, but should be evaluated for possible improvements. According to the report, from 2013 to 2015, LOS for westbound traffic on SR 109 and SR 114 has declined during the morning peak period and eastbound LOS on SR 114 has declined during the evening peak period. On SR 84, from Willow to University, LOS is lower than standard during westbound AM and eastbound PM. During the AM peak, 94 percent of traffic volume is attributed to regional travel and during the PM peak, 40 percent of the volume is attributed to regional travel. Without regional travel, the LOS for SR 84 would be LOS A in the AM and LOS B in the PM.

### *Table 12. LOS and Performance Monitoring, 2015*

| Route | Roadway Segment | LOS Standard | AM | PM |
|---|---|---|---|---|
| SR 109 | Kavanaugh Drive to SR 84 (Bayfront Expressway) | E | C | D |
| SR 114 | US 101 to SR 84 (Bayfront Expressway) | E | B | C |
| SR 84 | Willow Road to University Avenue | E | F | F |

| Intersection | LOS Standard | AM | PM |
|---|---|---|---|
| SR 109 (University Ave) & SR 84 (Bayfront Expressway) | F | C | F |
| SR 114 (Willow Rd) & SR 84 (Bayfront Expressway) | F | D | F |

Typical conditions show heavier westbound AM traffic and heavier eastbound PM traffic on both routes. This fluctuation explains a regional commuter flow toward Silicon Valley that generates within Alameda County, or outlying counties. Morning and evening traffic is largely regional. However, it is possible that local traffic contributes to the overall increase of vehicles during the evening peak. SR 114 and SR 84/Marsh Road experience a larger share of traffic compared to SR 109. The higher share of traffic on SR 114 is largely attributed to US 101 bound commuters, as SR 114 serves as a more direct route between Bayfront Expressway and US 101 than SR 109. Whereas SR 114 largely handles regional traffic, SR 109 is more likely to accommodate local travelers and commuters destined for Palo Alto.

[71] California Government Code, Sec. 65089 (b) (1) (B)
[72] SM County LOS Monitoring Report – 2015: http://ccag.ca.gov/wp-content/uploads/2015/10/2015-San-Mateo-Monitoring-Report-091415.pdf

# KEY CORRIDOR ISSUES

## Congestion:

The Corridor area is rapidly transforming. The fast rate of economic development and changing land use have intensified road congestion. SR 109 and SR 114 are heavily congested during peak hours, with a growing number of East Bay commuters accessing a booming Silicon Valley. Meanwhile, local circulation within the Corridor is characterized by a discontinuous grid street pattern, lacking a local arterial for east-west travel. As a result, traffic concentrates on the only two continuous routes: SR 109 and SR 114.

While both routes generally operate at capacity during peak periods, three key bottleneck locations are identified: one at the junction of US 101 and Willow Road, and another two at SR 109 (PM only) and SR 114 (AM and PM) intersections with Bayfront Expressway. An additional bottleneck occurs along US 101, between the Embarcadero Road/Oregon Expressway and University Avenue. The bottleneck is caused by the removal of the auxiliary lanes for the construction on the San Francisquito Creek Bridge. This bottleneck occurs in both the northbound and southbound direction of US 101 during the AM and PM peak periods. In addition, traffic from the northbound and southbound US 101 off-ramps to northbound Willow Road spills back onto the freeway during the PM peak period, adding to the congestion on both northbound and southbound US 101 due constraints on Willow Road. Also there is queue spill back from the Marsh Road off-ramp on to southbound US 101 in the PM peak period due to constrains on the Bayfront Expressway.

A high level of merging and short distance weaving results in congestion near the US 101/Willow Road Interchange. This is due to a lane drop on Willow Road (west of US 101) and a high frequency of on and off-ramp movements near the interchange. During both peak periods SR 114 has a vehicle queue that extends to Bayfront Expressway (SR 84). SR 114 has become too congested for emergency vehicles to navigate during peak hours, and SR 109 is used as an alternate route. Meanwhile, at the east end of SR 114 and SR 109, turning vehicles to and from SR 84, and vehicles entering and exiting Facebook parking lots (located on Bayfront Expressway at SR 114) contribute to congestion.

## Imbalance between Local and Regional Uses:

Although short in length, SR 109 and SR 114 provide a dual and complex responsibility as local and regional routes. The communities of Belle Haven and East Palo Alto are severely impacted by regional traffic. This is especially the case for East Palo Alto where SR 109 acts as a Main Street, yet 84 percent of its traffic is cut-through traffic that neither originates nor ends within the city.[73]

## Physical Barriers:

Mobility obstacles are present at the US 101 crossings as well as key intersections along both routes. The most common issues for pedestrians along the corridors are long crossing distances, large curb radii, missing sidewalks, and areas where crossing is prohibited.

Bicycle facility gaps at the US 101 junctions oblige bicyclists to utilize narrow shoulders, or compete with vehicles in shared, unmarked lanes. Visibility is compromised by wide crossings, multiple lanes, and high vehicle volumes.

In addition, shoulder pavement conditions are distressed at the west end, near the US 101 overcrossings. Pavement on East Palo Alto's portion of SR 109 is severely distressed.

[73] City of East Palo Alto General Plan (2015)

# CORRIDOR CONCEPT AND STRATEGIES

## CONCEPT RATIONALE

SR 109 and SR 114 are part of the Dumbarton Corridor, which provides Alameda County with an important link to Silicon Valley employers. According to the 2010 U.S. Census estimates (2011 to 2013), approximately 100,000 Alameda County residents commute into San Mateo and Santa Clara Counties each day.[74] The high-speed growth of the Bay Area's tech industry following the Great Recession (2007–2009) has contributed to increasing freeway delays of over 60 percent (from 2009 to 2015) and growing displacement regionwide.[75] Silicon Valley added 299,288 new jobs (a 23 percent increase), along with 170,000 new residents (a 7.5 percent increase) between 2010 and 2016.[76] Growth is expected to continue within the Dumbarton Corridor, with social media company Facebook leading much of the growth. The effects of increased population on housing in Silicon Valley is of particular importance due to the region's geographic constraints and its effect on housing availability.

Population growth and housing are closely tied to the region's transportation issues. As Bay Area residents move further away from jobs in search of housing affordability, an increase in transbay commuting has resulted in unprecedented roadway congestion. Both SR 109 and SR 114 experience peak-hour congestion, with approximately 75 to 80 percent attributed to regional traffic.[77] Strategies to accommodate growth could include private-public partnerships and interagency collaboration. It is recommended that Caltrans support transit improvements and expansion, and Transit Oriented Development (TOD).

A robust and equitable public transit system is needed to support Silicon Valley's economy. Commuter transit service is largely being fulfilled by private employers offering private services, which creates unequal access. Within the Dumbarton Corridor public transit may include a passenger rail system that spans across the Bay, passenger ferry service utilizing the Port of Redwood City, or a rapid bus system on State facilities. This level of transit expansion will require cross-collaboration between private employers and all levels of government in order to generate higher transit ridership that sustains public investment.

It is important to consider SR 109 and SR 114 within their context as highway connectors as well as local roads. Despite relatively short lengths, both corridors play a significant role by linking travelers to regional highways. Their primary role as State routes is to complement SR 84 and connect to the State highway network. Meanwhile in their entirety, Willow Road and University Avenue provide an important, multimodal function by connecting local communities to a network of vital services, employment and cultural resources. Through East Palo Alto and eastern Menlo Park, SR 109 and SR 114 are transportation spines and provide for a high level of community interaction. They are the only continuous east-west routes through these communities. To facilitate safe movement and optimize use for all modes, bicycle, pedestrian, and transit network connectivity should be coordinated and promoted on both routes. Future planning of these routes requires congestion management from both regional and local perspectives.

Relinquishment of University Avenue would allow East Palo Alto more flexibility in urban design and the ability to achieve local priorities. It is advised that Caltrans and local jurisdictions work together to decide on a long-term strategy for SR 109, and whether it may be practical to relinquish the route entirely. Planning along the route should emphasize location-efficient community design elements, with investments in *Complete Streets* and *Safe Routes to School* projects. Projects that improve bicycle, pedestrian and transit travel, and promote TOD can encourage non-auto mode trips and help achieve *Smart Mobility* benefits.

[74] Commute Pattern Data is from the U.S. Census Bureau, 2010 Census: 2011, 2012, and 2013 American Community Survey, 1-Year Public Use Microdata Samples (PUMS). Data includes the Place of Work PUMA for San Francisco, San Mateo, Santa Clara and Alameda Counties.
[75] Metropolitan Transportation Commission (MTC), Vital Signs: http://www.vitalsigns.mtc.ca.gov/time-spent-congestion#chart-0, 2/17/2017
[76] U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (Employment Estimates): www.bls.gov/cew and the California Department of Finance (Population Estimates) http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/ (accessed 5/2017)
[77] City of Menlo Park, City Council Staff Report, 8/23/2016 and consultation with Caltrans Traffic Operations Branch, 4/2017.

Caltrans will continue to provide safe and reliable multi-modal infrastructure, and implement operational improvements to reduce collisions and manage congestion. Corridor strategies focus on improving mobility efficiency, which requires getting the most out of the existing road system, while investing in better integration between transportation modes. The future concept maintains existing road capacity while improving operations, managing demand, and promoting Complete Streets.[78] The goal of the corridor strategies is to meet future mobility needs while reducing GHG emissions.

As discussed earlier, the maintenance and management of the portion of SR 109 within the jurisdiction of East Palo Alto is directed by a 1987 maintenance agreement between the City of East Palo Alto and Caltrans, (Resolution No. 00291). Further planning, design, and/or maintenance issues along this portion of SR 109, should be coordinated with the City of East Palo Alto.

### *Table 13. Corridor Concept Summary*

| Route Description | | Post Miles | Existing Facility | 25-Year Concept | Strategies to Achieve Concept |
|---|---|---|---|---|---|
| **SR 109 – University Avenue** | From US 101 to Notre Dame Ave., SR 109 is a Traversable Highway,[79] owned by the City of East Palo Alto | SM 0.0 to SM 1.10 | 4C | 4C | • Improve connection between US 101 & the Dumbarton Bridge through operational improvements and potential lane management<br>• Implement Complete Streets to encourage safe, multimodal travel<br>• Accommodate traffic impacts of major developments through transit improvements<br>• Consider alternative Route Concept for SR 109 |
| | From Notre Dame Ave. to SR 84, SR 109 is owned by Caltrans | SM 1.10 to SM 1.87 | | | |
| **SR 114 – Willow Road** | SR 114 is from US 101 to SR 84 | SM 5.00 to SM 5.92 | 4C | 4C | |

C = Conventional Highway

## Recommended Corridor Strategies:

**Improve connection between US 101 & the Dumbarton Bridge (SR 84):**

- Implement interchange improvements at US 101/Willow Road and US 101/University Avenue junctions to relieve traffic congestion and improve active transportation (see Planning and Programmed Projects Section).
- Increase ramp storage at US 101/Willow Road and US 101/University Avenue interchanges and implement ITS elements to increase throughput (see Planning and Programmed Projects Section).
- Consider mainline metering at the Dumbarton Bridge (WB direction) similar to San Francisco Oakland Bay Bridge metering, and provide open road tolling.
- Study improvements at Bayfront Expressway junctions to address bottleneck conditions caused by a combination of left-turning vehicles and vehicles exiting/entering Facebook parking lot. Limit additional turns, signals, and access points on Bayfront Expressway.[80]
- Coordinate with the City of East Palo Alto Department of Public Works to improve pavement distress for SR 109 in East Palo Alto.

[78] [Caltrans Deputy Directive, 64 – R1, 2008] A Complete Street is a transportation facility that is planned, designed, operated, and maintained to provide safe mobility for all users, including bicyclists, pedestrians, transit riders, and motorists appropriate to the function and context of the facility.
[79] Traversable highways are routes that have been approved by the Legislation as future State Highway Routes. These routes when constructed to the Department of Transportation (Caltrans) standards, the California Transportation Commission (CTC) shall adopt them as state highways and Caltrans must maintain them with funds from State Highway account. These routes are described in the Division 1, Chapter 2, Article 3 of the Streets and Highway Code Section 300 and also are known as "paper" routes. Caltrans Traversable Highways, 2013, http://www.dot.ca.gov/hq/tsip/hseb/products/TravHwy02.pdf
[80] Identified strategy per consultation with Caltrans District 4 Highway Operations.

**Implement Complete Streets:**

- Eliminate bicycle and pedestrian access barriers on both SR 109 and SR 114 overcrossings with US 101.
- Support a multi-modal integrated system that provides a continuous sidewalk and bikeway system. Improve pedestrians and bicyclists' visibility at crosswalks and intersections, and install median strips to break large crossing distances, such as University Avenue and Donohue Street.
- Improve visibility at pedestrian crosswalks near all ramps.
- Prioritize local needs of East Palo Alto residents through cohesive design of University Avenue that includes streetscape traffic calming, signal timing/synchronization, and improvements at Bay Road and Donohoe Street intersections.[81]
- Maintain emergency vehicle priority on both routes.
- Support a multi-modal integrated system and plan for safety, health and social equity:
  Specific treatments on SR 114:
  1. Install accessible pedestrian signals with detectors and countdown signals.
  2. Improve pedestrian intersection crossing and bicycle design at Newbridge Street.
  3. Install warning signs/high visibility markings at Ivy Drive, in front of Mid-Peninsula High School.
  4. Install benches or protected seating areas at bus stops.
  Specific treatments on SR 109:
  1. Improve pedestrian crossings across and along SR 109 at Notre Dame Avenue and at Kavanaugh Drive, near school. Provide Americans with Disabilities Act (ADA) appropriate median nose for pedestrian highway crossings.
  2. Provide continuous bikeway across US 101, improve safety and visibility near the overpass approach.
  3. Maintain pavement and landscaping, and improve bicycle signage throughout the Corridor.
  4. Consider closure of through traffic on/off of SR 109 at Pulgas, Clarke and/or Bay streets.[82]

**Accommodate traffic impacts of major developments[83] through transit improvements:**

- Support improvements to regional express bus service (AC Transit) such as increasing service frequency, especially along routes connecting to regional networks.
- Support efforts that ensure equitability by improving public transportation, bicycle and pedestrian infrastructure, making sure that transit options are accessible to the local community.
- Consider expansion of Park-and-Ride facilities east of the Dumbarton Bridge, as well as shuttle service expansion to major employment hubs in Silicon Valley and the west side of the Dumbarton Bridge.
- Work with regional and local transportation partners to develop the Dumbarton Rail Corridor. Study cost/benefit of transit signal priority for buses along conventional highways in the Dumbarton Corridor as an alternative to improve and expand public transit.

**Consider Additional Route Concept for SR 109 (University Avenue)**

- Relinquishment of SR 109 by Caltrans may be mutually beneficial to local and State agencies, but requires further study regarding the impacts to SR 84, SR 114, and US 101, and the financial feasibility of local jurisdictions. SR 109 and SR 114 traverse residential communities, while providing for regional traffic. Local authorities have suggested that allowing commuter movement via SR 109 creates a barrier to livability in East Palo Alto. Caltrans should coordinate with local jurisdictions to determine whether relinquishment of Route 109 is appropriate.

[81] Per 2020 Peninsula Gateway Corridor Study (C/CAG,) roundabouts here are a potential solution to address heavy commuter (cut-through) traffic in East Palo Alto. While the East Palo Alto General Plan identifies the intersections as conflict points between bicycle, pedestrians and vehicles, connecting to schools, parks and other community facilities.
[82] Strategy proposed in the 2020 Peninsula Gateway Corridor Study
[83] See Land Use Section of this Report

# PLANNED AND PROGRAMMED PROJECTS AND STUDIES

Tables 14 to 16 list planned and programmed projects along SR 109 and SR 114, or nearby facilities. Programmed projects or studies are from the State Highway Operation and Protection Program (SHOPP),[84] the Regional Transportation Improvement Program (RTIP), or an approved State, regional, or countywide Transportation Plan.[85] These lists are followed with descriptions of major projects that will help achieve the Corridor Concept.

### *Table 14. Planned or Programmed Projects along SR 109*

| Description | Planned or Programmed | Location | Source (s) | Purpose and Project Details |
|---|---|---|---|---|
| US 101/ University Ave. Interchange Improvements | *Partially Programmed (Stage I Only)* | US 101/University Ave. Interchange, between Woodland Avenue and Donohoe Street | East Palo Alto General Plan (2015),[86] MTC RTP (2017) | Modify SB off-ramp of US 101/University Avenue and widen University overcrossing to accommodate bike lanes and sidewalks. No additional lanes. Expected project completion 2020. |
| *US 101 Bike/Ped. Overcrossing*, include in SM County Bicycle & Pedestrian Program | *Programmed* | Between West Bayshore Road and East Bayshore Road, between Clarke Avenue and Newell Road | East Palo Alto General Plan (2015), MTC RTP (2017) | Construct Pedestrian/Bicycle overcrossing to connect the west-side with the east-side of East Palo Alto for safe pedestrian/bicycle. Per RTP funded as part of a countywide project on-going through 2040. This project will be awarding in late 2017. |
| Traffic Signal Upgrade and Geometrics Design at Bell Street | *Planned* | University Avenue and Bell Street | East Palo Alto General Plan (2015)[87] | Protected left turn phasing to reduce accidents. |
| San Francisquito Bridge Replacement | *Programmed* | US 101, south of the University Avenue Interchange | Caltrans SHOPP (2014) | Replace bridge structure at San Francisquito Creek. Project in progress, Phase 3, expected completion 2018. |
| Bay Road Pedestrian Network Improvements Phase II and III | *Programmed* | E. Palo Alto, on Bay Road between Clarke/Illinois & Tara Road (Phase II) & between Tara Road & Bay Trail (Phase III) | E. Palo Alto General Plan (2015), E. Palo Alto Bay Access Master Plan (2009), and MTC RTP (2017) | Resurface, streetscape, bike lanes, & other improvements. Project construction expected to initiate in 2018. |
| *University Ave. Complete Streets Pilot Project*, included in SM County Multimodal Streetscape | *Planned* | University Ave., East Palo Alto | MTC RTP (2017) | Design roadway to safely accommodate all users, including bicyclists, pedestrians, transit riders, children, older people, and disabled people, as well as motorists. Part of on-going countywide project with implementation through 2040. |

***US 101/University Avenue (SR 109) Interchange Modification Project[88]***

The City of East Palo Alto, in cooperation with Caltrans and SMTCA, seeks to construct safety and operational improvements at the US 101/University Avenue overcrossing. The project includes widening the overcrossing to accommodate wider sidewalks and Class II bicycle lanes. This would fill a missing bicycle gap over US 101, and improve bicycle and pedestrian access and safety along University Avenue. The project was originally approved to be implemented over two stages: Stage 2A includes construction of a diagonal southbound off-ramp, and widening of the University Avenue overcrossing for pedestrians on the north side of the structure. In 2017, Stage

[84] SHOPP D4 Milestone Report (3/2017)
[85] MTC Draft Final TIP Project List (2017): http://mtc.ca.gov/sites/default/files/Final_2017_TIP_Project_Listings-All_09-16.pdf
[86] http://www.ci.east-palo-alto.ca.us/index.aspx?NID=183 & http://www.cityofepa.org/DocumentCenter/View/1160
[87] http://www.ci.east-palo-alto.ca.us/index.aspx?NID=487
[88] City of East Palo Alto – RFP for US 101/University Avenue Interchange Improvements, HPLUL-5438 (015)

2A (or Phase I) was programmed $11 million with local funding, with a proposed completion year of 2020. Stage 2B of the project would include widening the overcrossing structure on the south side of University Avenue across US 101, between Woodland Avenue and Donohoe Street, as well as modifying the NB and SB off-ramps on both sides of the structure to accommodate bike lanes, eliminate pedestrian/bicycle conflicts, and improve traffic operations. Stage 2B of the project currently remains unfunded.

***US 101 Pedestrian and Bicycle Overcrossing between Newell Road and Clark Avenue***

The project will consist of constructing a Class I pedestrian/bicycle overcrossing structure over US 101 to provide a direct connection between the south and north sides of US 101 in East Palo Alto. This project is in the Plans, Specifications and Estimation (PS&E) phase (as of 2017), and the proposed project completion year is 2019.

***Traffic Signal Upgrade and Geometrics Design at Bell Street Project***

The project will add protected left-turn phasing to the University Avenue traffic signals. The protected left-turn phase will improve the traffic operations at the University Avenue/Bell Street Intersection and enhance safety by reducing conflicting movements. The existing mast arm will be upgraded since it only extends to the through lanes and is not long enough to reach the existing left turn lane.

### *Table 15. Planned or Programmed Projects along SR 114*

| Description | Planned or Programmed | Location | Funding Source | Purpose and Project Details |
|---|---|---|---|---|
| US 101/SR 114 Interchange Reconstruction Project | *Local Measure Programmed (2017) $80M* | US 101/SR 114 Interchange | 2016 STIP,[89] MTC RTIP (2017) | Address operational deficiencies and congestion for motorists, bicyclists and pedestrians. Build dedicated bike lanes and sidewalks. Construction begins 2017. Expected project completion 2019. |
| SR 114 Pavement Management | *Planned* | SR 114/Willow Road, from US 101 to SR 84 | Caltrans D4 Ten-Year SHOPP[90] | Roadway preservation. |
| Facebook west campus Bayfront Expressway Improvements | *Programmed* | Southeast corner of Willow Road and Bayfront Expressway | City of Menlo Park, Facebook Inc. | Traffic signal upgrades, drainage, bike/pedestrian path, sidewalk, curbs, ADA ramps, street lights, pavement widening. Expected project completion 2017. |
| Pedestrian Overcrossing | *Programmed* | On Bay Front Expressway (SR 84), 1500 feet East of Chilco Street. | City of Menlo Park, Facebook Inc. | Pedestrian bridge. Expected project completion 2020. |
| Facebook Bicycle Improvements | *Planned* | SR 114/SR 109 Corridor | City of Menlo Park/Facebook Inc. | Bicycle Path Improvements on Willow Road, University Avenue, Bay Road, Chilco Street; pedestrian/bicycle path between East Palo Alto and the Redwood City Caltrain Station, and the Bay Trail. |

[89] http://www.dot.ca.gov/dist4/envirodocs/rt101willow/willowFEDfrontmatterthruchapter1.pdf & http://ccag.ca.gov/wp-content/uploads/2014/05/Willow-University-Study-and-App-Final.pdf
[90] http://sv04maint/shopp/3pavemt_mgmt.htm

***US 101/Willow Road (SR 114) Interchange Reconstruction Project[91]***

The project proposes to reconstruct the Interchange of US 101 and Willow Road on its existing alignment to a partial cloverleaf interchange. The project will address deficiencies impacting motorists, bicyclists, and pedestrians by eliminating traffic weaving and providing adequate storage for vehicles on freeway off-ramps. The project would alleviate the bottleneck condition by increasing ramp storage, improving metering timing, and providing space for future HOV bypass lanes. The new configuration will redistribute existing traffic, but it is not expected to impact demand. Caltrans is the lead agency, however the project is funded by San Mateo County Measure A and construction is planned to begin this year. The project is expected to be completed in two years. Major components include:

- Widening the overcrossing to eight lanes, with dedicated bicycle lanes, sidewalks and a standard vertical clearance for the mainline.
- Realignment and widening of diagonal off-ramps from US 101 to Willow Road to provide additional storage.
- Construction of signalized intersections at the realigned off-ramp terminals.
- Realignment and widening of diagonal and loop on-ramps to provide HOV bypass lane(s), in conjunction with the modification of existing ramp metering system.

***Facebook West Campus Bayfront Expressway Improvements***

Currently underway, the Bayfront Expressway Improvement Project, sponsored by Facebook, includes traffic signal upgrades, drainage, bike/pedestrian path, sidewalk, curbs, ADA ramps, street lights, pavement widening and other related improvements at the southeast corner of Willow Road (SR 114) and Bayfront Expressway (SR 84).[92] The project includes a third right-turn lane from eastbound SR 114 to Bayfront Expressway, and an extension of the right turn/ entrance ramp for SR 114 west to US 101 north to address congestion at the junction.

[91] http://www.dot.ca.gov/dist4/envirodocs/rt101willow/willowrdinterchangeDEDsigned.pdf

[92] Menlo Park Construction News Update, 1/29/2016: http://www.menlopark.org/ArchiveCenter/ViewFile/Item/4155

## *Table 16. Other Projects and Studies within the Dumbarton Corridor*

| Description | Status | Location | Source/Sponsor | Purpose |
|---|---|---|---|---|
| Dumbarton Rail Corridor Study [93] | *Completed Study (1999)* | Menlo Park/East Palo Alto to Union City/Freemont | Menlo Park, SamTrans, San Mateo & Alameda Counties, MTC Blueprint 2030 (2000) | Rehabilitate existing rail right of way to provide commuter service between the East Bay and the Peninsula. Connect to Caltrain, BART, Altamont Express, and the Capitol Corridor Train. |
| 2020 Peninsula Gateway Corridor Study | *Completed Study (2008)* | SR 109 and SR 114 | C/CAG | Define and evaluate alternative traffic improvements in the Peninsula Gateway Corridor area. |
| Willow Road-University Avenue Traffic Operations Study & Recommended Near Term Improvements | *Completed Study (2011)* | SR 109 and SR 114 | C/CAG | Improve traffic operations for vehicles, including transit, and improve safety for bicyclists and pedestrians, with minimal impacts and costs. |
| SAFER Bay Project | *Completed Study (2016)* | East Palo Alto and Menlo Park | San Francisquito Creek Joint Powers Authority, Department of Water Resources, Facebook, East Palo Alto, and Menlo Park | Develop strategy to advance flood protection, ecosystems and recreation along San Francisco Bay |
| Dumbarton Corridor Study | *Pending Study (Fall 2017)* | The Dumbarton Bridge and nearby communities in the East Bay and Peninsula | SamTrans, Sponsored by Facebook | Review several options to provide congestion relief, study feasibility and funding strategies to achieve Concept |
| SR-84 Express Lanes | *$6M Partially Programmed (2017)* | SR 84 westbound, Alameda County from I-880 through Dumbarton Bridge toll plaza | MTC RTIP (2017) | Convert existing HOV lane to express lane. Including Dumbarton study - flyovers, interchange improvements, and conversion of Willow Rd. between SR 84 and US 101 to expressway. Expected completion 2020. |
| Improve Access to/from the west side of the Dumbarton Corridor | *$36M Partially Programmed (2017)* | On SR 84, connecting to US 101 in East Palo Alto and Menlo Park | MTC RTP (2017), San Mateo CCAG | Per Gateway 2020 recommendations: improve access to/from the west side of Dumbarton Bridge on SR 84 connecting to US 101. Phased implementation of short-term projects and environmental phase for long-term projects. Expected completion: 2040. |
| US 101 Ramp Metering | *Planned Project (2015)* | Willow Road onramps to NB US 101 | Caltrans 2015 Ramp Metering Development Plan | Traffic management at freeway ramps at Willow Road to reduce congestion and travel time |
| Smart Corridor Project | *Project in Construction* | US 101, I-380, SR 82, SR 109, SR 114, and local roads in San Mateo County | San Mateo C/CAG STIP-RIP and TSLP (2011) | Install Intelligent Traffic System Technologies |
| Redwood City Ferry Service | *Partially Programmed* | Port of Redwood City | MTC 2017 FTIP | The project is currently funded through the conceptual design and environmental review phases only (as of 2017). While there is partial funding for system capital and operating needs in the form of $15 million in San Mateo County sales tax funds, this service lacks full capital and operating funds to build and operate service at this time. Water Emergency Transportation Authority (WETA) is the lead agency. [94] |

[93] http://www.bayrailalliance.org/dumbarton_rail
[94] http://sanfranciscobayferry.com/weta/expansion

### *C/CAG Willow Road-University Avenue Traffic Operations Study and Recommendations, 2011* [95]

The study identified conceptual plans for traffic improvements on Willow Road (SR 114) and University Avenue (SR 109) to improve traffic operations for vehicles, including transit, and improve safety for pedestrians and bicyclists, while mitigating potential impacts on parallel streets and neighborhoods. Additional project objectives included identifying improvements for short-term implementation (less than five years), at a relatively reasonable cost, with minimal right of way acquisition and construction impacts on the community, as well as acceptance by neighboring residents, businesses, and the city councils of East Palo Alto and Menlo Park. Table 17 summarizes the study recommendations.

*Table 17. Willow Road-University Avenue Traffic Operations Study Reccomendaations*

| Study Recommendations |
|---|
| Coordinate all signals along SR 109 and SR 114 – with adaptive signal control as a long-term solution |
| Install pedestrian countdown signals and bicycle detectors at all existing traffic signals |
| Widen SR 114 between the northbound US 101 ramps and the Newbridge Street intersection, with traffic control devices |
| Add third right-turn lane for the eastbound right turn movement and eliminate the split-phase signal operation at the intersection of SR 114 and SR 84 |
| Install protected left-turn signal phasing for SR 109 traffic and an emergency signal for the adjacent Fire Station access at the SR 109 / Runnymede Street intersection |
| Modified signage and pavement markings and install a red light camera enforcement system at the intersections of SR 109/ Donohoe Street and Donohoe Street / Capitol Avenue |
| Install in-roadway warning lights on SR 109 at marked crosswalks at Michigan Avenue and Sacramento Street |
| Install warning signs, pedestrian-activated flashing beacons, and pavement markings at the pedestrian crossing across the northbound US 101 off-ramp at University Avenue |
| Install emergency vehicle preemption systems on all approaches at all traffic signals where they do not exist, including SR 109 and SR 114 at Ivy Drive, O'Brien Drive and Hamilton Street |
| Widen or replace the pedestrian crossing on SR 109 over US 101 to meet the standard width and configuration for a sidewalk |

### *The Dumbarton Corridor Study, 2016* [96]

Initiated in 2016 and expected to be completed by August 2017, the study includes the Corridor between Alameda and San Mateo Counties and the adjacent communities of Redwood City, Menlo Park, East Palo Alto, Newark, Union City and Fremont. The study will look at the transportation connections to Palo Alto and other jurisdictions in Santa Clara County. Facebook contributed $1 million to fund the study that will focus on mainline improvements to SR 84/Dumbarton Bridge and the Dumbarton Rail Corridor, as well as the arterial and highway networks that feed these areas on both sides of the Bay. Caltrans District 4 Engineering and Planning staff have attended stakeholders meetings and provided technical advice to the Dumbarton Corridor Study team in 2016.

### *Strategy to Advance Flood protection, Ecosystems and Recreation along San Francisco Bay (SAFER), 2016*[97]

Currently, the communities of East Palo Alto and Menlo Park have shorelines that are prone to tidal flooding. The SAFER project conducted a feasibility study to evaluate flood protection alternatives along the San Francisco Bay shoreline. Alternatives include the placement of levees and seawalls east of Bayfront Expressway and along the southern shore of the bay in East Palo Alto. The SAFER Bay Feasibility Report was released in October 2016, and an Environmental Impact Reported will be prepared as the next step.

[95] http://ccag.ca.gov/wp-content/uploads/2014/05/Willow-University-Study-and-App-Final.pdf
[96] http://www.samtrans.com/DBCstudy & http://www.smdailyjournal.com/articles/lnews/2016-05-05/dumbarton-rail-bridge-study-being-revived-samtrans-considers-east-west-commuter-options-and-private-partners/1776425162857.html
[97] http://www.sfcjpa.org/documents/SAFER_Bay_Public_Draft_Feasibility_Report_Summary_Oct._2016_.pdf

***The San Mateo County Smart Corridors Project (SMART Corridor)***

The SMART Corridor[98] project is an Intelligent Transportation System (ITS) project designed to improve mobility along US 101 corridor in San Mateo County, between I-380 and the Santa Clara County line. The project includes traffic management strategies on US 101 as well alternate routes expected to accommodate traffic diverted off the freeway due to a major incident on US 101. State Highways (I-380, SR 82, SR 84, SR 109 and SR 114) and local arterials will be part of the SMART Corridor. The project enables Caltrans and cities to implement traffic management strategies through the deployment of ITS elements along State routes and major local arterials. The project is sponsored by the City/County Association of Governments of San Mateo County (C/CAG). Construction is expected to be completed in 2017.

***2020 Peninsula Gateway Corridor Study, 2008[99]***

The Peninsula Gateway Corridor Study developed various corridor scenarios as potential strategies to relieve congestion, address safety concerns, and/or meet future regional needs:

### *Table 18. Peninsula Gateway Corridor Study (PGCS) Strategies Summary*

| Strategies | Potential Benefits | Issues and Challenges |
|---|---|---|
| Road diet of SR 114 | Through traffic discouraged | Slow down traffic, more congested roads, hard for emergency vehicles to maneuver. |
| Expand capacity of Willow Road | Reduced congestion (Temporarily) | Induced traffic (Long term) |
| Turn Bayfront Expressway and Marsh Road, from the Dumbarton Bridge to US 101 into a full freeway with grade separated interchanges at SR 109 and SR 114 | Increased traffic speed, reduced cut-through driving in Menlo Park and East Palo Alto neighborhoods | Induced traffic, a total project cost of $640 million (estimated 2025 cost), and considerable environmental impacts such as aesthetics, noise, pipeline, groundwater, etc. |
| SR 114 elevated/depressed express lanes or cantilever | Increased traffic speed, reduced cut-through driving in Menlo Park and East Palo Alto neighborhoods | Induced traffic, a total project cost of $336-852 million (estimated 2025 cost), and considerable environmental impacts. |
| SR 109 elevated/depressed express lanes, cantilever, or tunnel | Increased traffic speed, reduced cut-through driving in Menlo Park and East Palo Alto neighborhoods | Induced traffic, a total project cost of $1,023-1,700 million (estimated 2025 cost), and considerable environmental impacts. |

While the above strategies are worthy of consideration, they are not adopted as part of the Corridor Concept because of being high in construction costs or environmental impacts. The TCR for State Routes 109 and 114, however, recommends further study of the following measures proposed in the PGCS:

- Additional coordinated signal timing
- Congestion pricing on the Dumbarton Bridge, with revenue used to improve mobility in local communities as a potential Regional Measure 3 project[100]
- Closure of through traffic on University Avenue at Pulgas, Clarke, and/or Bay streets (see Figure 1) to reduce regional traffic on those streets

[98] http://publicworks.smcgov.org/san-mateo-county-smart-corridors-project

[99] http://ccag.ca.gov/wp-content/uploads/2014/05/2020-Gateway-Final-Report-Jul08c.pdf

[100] The Bay Area Toll Authority (BATA), part of the Bay Area Metropolitan Planning Commission (MTC), is in the process of recommending a Regional Measure 3 (RM-3), voter-approved bridge toll increase program to fund regional traffic relief. Previous bridge toll increase (RM-1) revenue was used to widen Bayfront Expressway and to improve the SR 109/US 101 Interchange. RM-2 projects have included BART Expansion, SR-4 Widening, construction of the Transbay Transit Terminal, and Safe Routes-to School Programs. MTC's Draft recommendations for RM-3 spending include projects which have a clear nexus with bridge corridors, are consistent with the Regional Transportation Plan, and include demand management (the use of technology and pricing to optimize roadway capacity). The San Francisco County Transportation Agency (SFCTA) is recommending the inclusion of equity and multimodal transportation into the RM-3 Principles. For PowerPoint slides (listing principles) from the most recent SFCTA Citizens Advisory Meeting please see: http://www.sfcta.org/sites/default/files/content/Executive/Meetings/cac/2017/02-Feb/Item%2012%20-%20RM3%20PPC%20February%202017.pdf

# APPENDIX

## Appendix A: Glossary of Terms and Acronyms

### Acronyms

AADT – Annual Average Daily Traffic
AADTT – Annual Average Daily Truck Traffic
AB – Assembly Bill
ABAG – Association of Bay Area Governments
ADA – Americans with Disabilities Act of 1990
ADT – Average Daily Traffic
Alameda CTC – Alameda County Transportation Commission
ATP – Active Transportation Program
BAAQMD – Bay Area Air Quality Management District
BCDC – Bay Conservation and Development Commission
BRT – Bus Rapid Transit
BY – Base Year
Caltrans – California Department of Transportation
CARB – California Air Resources Board
C/CAG – City/County Association of Governments of San Mateo County
CCC – California Conservation Corps
CCTA – Contra Costa Transportation Authority
CDFW – California Department of Fish and Wildlife
CEC – California Energy Commission
CESA – California Endangered Species Act
CFAC – California Freight Advisory Committee
CFMP – California Freight Mobility Plan
CMA – Congestion Management Agencies
CMAQ – Congestion Mitigation and Air Quality
CMP – Congestion Management Plan
CSFAP – California Sustainable Freight Action Plan
CSMP – Corridor System Management Plan
CEQA – California Environmental Quality Act
CSS – Context Sensitive Solutions
CTC – California Transportation Commission
CTP – California Transportation Plan
DD – Deputy Directive
DSMP – District System Management Plan
ECA – Essential Connectivity Areas
EPA – Environmental Protection Agency
FAST Act – Fixing America's Surface Transportation Act
FASTLANE – Fostering Advancements in Shipping and Transportation for the Long-Term Achievement of National Efficiencies grant program
FHWA – Federal Highway Administration
FSR – Feasibility Study Report
FSTIP – Federal Statewide Transportation Improvement Program
FTA – Federal Transit Administration
FTIP – Federal Transportation Improvement Program

GHG – Greenhouse Gas
GIS – Geographic Information System
HCP – Habitat Conservation Plan
HOT – High Occupancy Toll lane
HOV – High Occupancy Vehicle lane
HY – Horizon Year
ICM – Integrated Corridor Mobility
IGR – Intergovernmental Review
ITIP – Interregional Transportation Improvement Program
ITS – Intelligent Transportation System
ITSP – Interregional Transportation Strategic Plan
KPRA – Kingpin-to-Rear-Axle
LOS – Level of Service
MAP-21 – Moving Ahead for Progress in the 21st Century
MPO – Metropolitan Planning Organizations
MTC – Metropolitan Transportation Commission
NOA – Naturally Occurring Asbestos
NEPA – National Environmental Policy Act
NHS – National Highway System
NHFN – National Highway Freight Network
NMFN – National Multimodal Freight Network
NVTA – Napa Valley Transportation Authority
PAED – Project Approval/Environmental Document
PBA – Plan Bay Area
PCA – Priority Conservation Area
PDA – Priority Development Area
PFN – Primary Freight Network
PID – Project Initiation Document
PIR – Project Initiation Report
PM – Post Mile
PM 2.5 – Particulate Matter 2.5 micrometers or less in diameter
PM 10 – Particulate Matter 10 micrometers or less in diameter
PSR – Project Study Report
PR – Project Review
RHNA – Regional Housing Needs Allocation
RTP – Regional Transportation Plan
RTIP – Regional Transportation Improvement Program
RTPA – Regional Transportation Planning Agencies
SACOG – Sacramento Area Council of Governments
SAFETEA-LU – Safe, Accountable, Flexible and Efficient Transportation Equity Act, a Legacy for Users
SB – Senate Bill
SCS – Sustainable Community Strategies
SCTA – Sonoma County Transportation Authority
SFCTA – San Francisco County Transportation Authority
SHOPP – State Highway Operation Protection Program
SHS – State Highway System
SJCOG – San Joaquin Council of Governments
SMF – Smart Mobility Framework
SR – State Route
STA – Solano Transportation Authority
STIP – State Transportation Improvement Program

STP – Surface Transportation Program
STRAHNET – Strategic Highway Network
TAM – Transportation Authority of Marin
TCIF – Trade Corridors Improvement Fund
TCRP – Transit Cooperative Research Program
TEA-21 – Transportation Equity Act for the 21st Century
TCR – Transportation Concept Report
TIGER – Transportation Investment Generating Economic Recovery
TDM – Transportation Demand Management
TMP – Transportation Management Plan
TMS – Transportation Management System
TSN – Transportation System Network
USFWS – United States Fish and Wildlife Service
VMT – Vehicle Miles Traveled
VTA – Santa Clara Valley Transportation Authority
VPH – Vehicles per Hour

## Definitions

AADT – Annual Average Daily Traffic is the total volume for the year divided by 365 days. The traffic count year is from October 1st through September 30th. Traffic counting is generally performed by electronic counting instruments moved from location throughout the State in a program of continuous traffic count sampling. The resulting counts are adjusted to an estimate of annual average daily traffic by compensating for seasonal influence, weekly variation and other variables which may be present. Annual ADT is necessary for presenting a statewide picture of traffic flow, evaluating traffic trends, computing accident rates, Planning and designing highways and other purposes.

Base Year – The year that the most current data is available to the Districts.

Bikeway Class I (Bike Path) – Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with cross flow by motorists minimized.

Bikeway Class II (Bike Lane) – Provides a striped lane for one-way bike travel on a street or highway.

Bikeway Class III (Bike Route) – Provides for shared use with pedestrian or motor vehicle traffic.

Bikeway Class IV (Separated Bikeway/Cycle Track) – Provides for exclusive use for bicycles by separating bikeway from motor vehicle traffic.

Bottlenecks – A bottleneck is a location where traffic demand exceeds the effective carrying capacity of the roadway. In most cases, the cause of a bottleneck relates to a sudden reduction in capacity, such as a lane drop, merging and weaving, driver distractions, a surge in demand, or a combination of factors.

Capacity – The maximum sustainable hourly flow rate at which persons or vehicles reasonably can be expected to traverse a point or a uniform section of a lane or roadway during a given time period under prevailing roadway, environmental, traffic, and control conditions.

Capital Facility Concept – The 20-25 year vision of future development on the route to the capital facility. The capital facility can include capacity increasing, State Highway, bicycle facility, pedestrian facility, transit facility (Intercity Passenger Rail, Mass Transit Guideway etc.), grade separation, and new managed lanes.

Conceptual Project – A conceptual improvement or action is a project that is needed to maintain mobility or serve multimodal users, but is not currently included in a fiscally constrained plan and is not currently programmed. It could be included in a General Plan or in the unconstrained section of a long-term plan.

Corridor – A broad geographical band that follows a general directional flow connecting major sources of trips that may contain a number of streets, highways, bicycle, pedestrian, and transit route alignments. Off system facilities are included as informational purposes and not analyzed in the TCR.

Express Lanes – Specially designated highway lanes that are toll-free for carpools, vanpools, motorcycles, buses and eligible clean-air vehicles. Solo drivers can choose to pay a toll to access the lanes for reliable travel times.

Facility Concept – Describe the Facility and strategies that may be needed within 20-25 years. This can include capacity increasing, State Highway, bicycle facility, pedestrian facility, transit facility, Non-capacity increasing operational improvements, new managed lanes, conversion of existing managed lanes to another managed lane type or characteristic, TMS field elements, Transportation Demand Management and Incident Management.

Facility Type – The facility type describes the State Highway facility type. The facility could be freeway, expressway, conventional, or one-way city street.

Freight Generator – Any facility, business, manufacturing plant, distribution center, industrial development, or other location (convergence of commodity and transportation system) that produces significant commodity flow, measured in tonnage, weight, carload, or truck volume.

Headway – The time between two successive transit net vehicles as they pass a point on the roadway, measured from the same common feature of both vehicles.

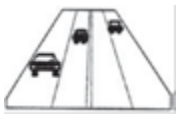
Horizon Year – The year that the future (20-25 years) data is based on.

Intermodal Freight Facility – Intermodal transport requires more than one mode of transportation. An intermodal freight facility is a location where different transportation modes and networks connect and freight is transferred (or “transloaded”) from one mode, such as rail, to another, such as truck.

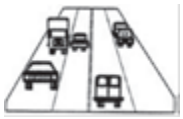
IRRS – The Interregional Road System, a series of interregional State highways outside the urbanized areas that provides access to, and links between, the State’s economic centers, major recreational areas, and urban and rural regions.

ITS – Intelligent Transportation System improves transportation safety and mobility and enhances productivity through the integration of advanced communications technologies into the transportation infrastructure and in vehicles. Intelligent Transportation Systems encompass a broad range of wireless and wireline communications-based information and electronics technologies to collect and process information, and take appropriate actions.

LOS – Level of Service is a qualitative measure describing operational conditions within a traffic stream and their perception by motorists. A LOS definition generally describes these conditions in terms of speed, travel time, freedom to maneuver, traffic interruption, comfort, and convenience. Six levels of LOS can generally be categorized as follows:



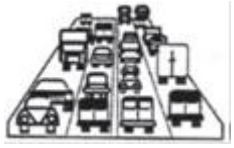
**LOS A** describes free flowing conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway.



**LOS B** is also indicative of free-flow conditions. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver.

**LOS C** represents a range in which the influence of traffic density on operations becomes marked. The ability to maneuver with the traffic stream is now clearly affected by the presence of other vehicles.

**LOS D** demonstrates a range in which the ability to maneuver is severely restricted because of the traffic congestion. Travel speed begins to be reduced as traffic volume increases.



**LOS E** reflects operations at or near capacity and is quite unstable. Because the limits of the level of service are approached, service disruptions cannot be damped or readily dissipated.

**LOS F** describes a stop and go, low speed conditions with little or poor maneuverability. Speed and traffic flow may drop to zero and considerable delays occur. For intersections, LOS F describes operations with delay in excess of 60 seconds per vehicle. This level, considered by most drivers unacceptable often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection.

Multi-modal – The availability of transportation options using different modes within a system or corridor, such as automobile, subway, bus, ferry, rail, or air.

Managed Lanes – highway facilities or a set of lanes where operational strategies are proactively implemented and managed in response to changing conditions.

NHFS – a federally established freight network to strategically direct Federal resources and policies toward improved performance of highway portions of the U.S. freight transportation system.

National Highway System (NHS) – a federally established interconnected system of principle arterial routes to serve major travel destinations and population centers, international border crossings, as well as ports, airports, public transportation facilities, and other intermodal facilities. The NHS must also meet national defense requirements and server interstate and interregional travel.

Peak Hour – The hour of the day in which the maximum volume occurs across a point on the highway.

Peak Hour Volume – The hourly volume during the highest hour traffic volume of the day traversing a point on a highway segment. It is generally between 6 percent and 10 percent of the ADT. The lower values are generally found on roadways with low volumes.

Planned Project – A planned improvement or action is a project in a fiscally constrained section of a long-term plan, such as an approved Regional or Metropolitan Transportation Plan (RTP or MTP), Capital Improvement Plan, or local Sales Tax Measure.

Post Mile – A post mile is an identified point on the State Highway System. The milepost values increase from the beginning of a route within a county to the next county line. The milepost values start over again at each county line. Milepost values usually increase from south to north or west to east depending upon the general direction the route follows within the State. The milepost at a given location will remain the same year after year. When a section of road is relocated, new milepost (usually noted by an alphabetical prefix such as "R" or "M") are established for it. If relocation results in a change in length, "milepost equations" are introduced at the end of each relocated portion so that mileposts on the reminder of the route within the county will remain unchanged.

Programmed Project – A programmed improvement or action is a project in a near-term programming document identifying funding amounts by year, such as the State Transportation Improvement Program (STIP) or the State Highway Operations and Protection Program (SHOPP).

Route Designation – A route's designation is adopted through legislation and identifies what system the route is associated with on the State Highway System. A designation denotes what design standards should apply during project development and design. Typical designations include but not limited to National Highway System (NHS), Interregional Route System (IRRS), and Scenic Highway System.

P3 - A public–private partnership, which is a cooperative arrangement between one or more public and private sectors.

Post 25-Year Concept – This dataset may be defined and re-titled at the District's discretion. In general, the post 25-year Concept could provide the maximum reasonable and foreseeable roadway needed beyond a 20 to 25 year horizon. The post 25-Year Concept can be used to identify potential widenings, realignments, future facilities, and rights-of-way required to complete the development of each corridor.

Relinquishment – the act and the process of legally transferring property rights, title, liability, and maintenance responsibilities of a portion or entirety of a State highway or a Park-and-Ride lot to another entity.

Rural – Fewer than 5,000 in population designates a rural area. Limits are based upon population density as determined by the U.S. Census Bureau.

Segment – A portion of a facility between two points.

TDM – Transportation Demand Management programs designed to reduce or shift demand for transportation through various means, such as the use of public transportation, carpooling, telework, and alternative work hours. Transportation Demand Management strategies can be used to manage congestion during peak periods and mitigate environmental impacts.

TSMO – Integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects, describing the system operations and management elements that may be needed within 20-25 years. This can include Non-capacity increasing operational improvements (auxiliary lanes, channelization's, turnouts, etc.), conversion of existing managed lanes to another managed lane type or characteristic (e.g. HOV lane to HOT lane), TMS Field Elements, Transportation Demand Management, and Incident Management.

Urban – 5,000 to 49,999 in population designates an urban area. Limits are based upon population density as determined by the U.S. Census Bureau.

Urbanized – Over 50,000 in population designates an urbanized area. Limits are based upon population density as determined by the U.S. Census Bureau.

VMT – Is the total number of miles traveled by motor vehicles on a road or highway segments.

# Appendix B: Federal, State, and Regional Plans and Policies

## FEDERAL

Fixing America's Surface Transportation Act (FAST Act) December, 2015
FAST Act will provide $305 Billion in funding for surface transportation programs and was signed into law in December 2015. The federal spending bill replaces MAP-21, Moving Ahead for Progress in the 21st Century signed into law in 2012. FAST Act provides funding for highway, transit, and railroad networks, most of which will be distributed to state departments of transportation and local transit agencies.

Federal Transportation Improvement Program (FTIP)
All federally funded projects, and regionally significant projects (regardless of funding), must be listed in the FTIP per federal law. A project is not eligible to be programmed in the FTIP until it is programmed in the *State Transportation Improvement Program* (STIP) or in the *State Highway Operations and Protection Program* (SHOPP). Other types of funding (Federal Demonstration, Congestion Mitigation and Air Quality (CMAQ), Transportation Enhancement Activities (TEA), and Surface Transportation Program (STP) must be officially approved before the projects can be included in the FTIP.

## STATE

California Transportation Plan (CTP) 2040
The CTP is a long-range policy framework to meet California's future multi-modal mobility needs and reduce greenhouse gas and particulate matter (PM) emissions. The CTP defines goals, performance-based policies, and strategies to achieve a collective vision for California's future Statewide, integrated, multimodal transportation system. A new updated plan was recently finalized in June 2016. It focuses on meeting new trends and challenges, such as economic and job growth, climate change, freight movement, and public health. In addition, performance measures and targets were developed to assess performance of the transportation system to meet the requirements of MAP-21.

California Interregional Blueprint (CIB)
Responding to Senate Bill 391 of 2009, CIB informs and enhances the State's Transportation Planning process. Similar to requirements for regional transportation plans under Senate Bill 375, SB 391 requires the State's long-range transportation plan to meet California's climate change goals under Assembly Bill 32. In response to these statutes, Caltrans is preparing a state-level transportation blueprint to inform CTP 2040 and articulate the State's vision for an integrated, multi-modal interregional transportation system that integrates the Regional Blueprint Program (see the Regional appendix section) and complements regional transportation plans. The CIB will integrate the State's long-range multi-modal plans and Caltrans-sponsored programs with the latest technology and tools to enhance our ability to plan for and manage a transportation system that will expand mode choices and meet future increases in transportation needs and still meet the GHG-reduction targets or SB 375.

State Transportation Improvement Program (STIP)
The STIP is a multi-year capital improvement program of transportation projects on and off the State Highway System, funded with revenues from the Transportation Investment Fund and other funding sources. Caltrans and the regional Planning agencies prepare transportation improvement plans for submittal. Local agencies work through their Regional Transportation Planning Agency (RTPA), County Transportation Commission, or Metropolitan Planning Organization (MPO), as appropriate, to nominate projects for inclusion in the STIP.

Interregional Transportation Improvement Program (ITIP)

The Interregional Transportation Improvement Program (ITIP) is a State funding program for the Interregional Improvement Program (IIP) and is a sub-element of the State Transportation Improvement Program. The 2014 ITIP is a five year program of projects from fiscal years 2014-15 through 2018-19. The IIP is a State funding category created in SB 45 for intercity rail, interregional road or rail expansion projects outside urban areas, or projects of statewide significance, which include projects to improve State highways, the intercity passenger rail system, and the interregional movement of people, vehicles, and goods. Caltrans nominates and the California Transportation Commission approves a listing of interregional highway and rail projects for 25 percent of the funds to be programmed in the STIP (the other 75 percent are Regional Improvement Program funds). Only projects planned on State highways are to be included in this program.

Interregional Transportation Strategic Plan (ITSP) 2015

The ITSP is a California Department of Transportation (Caltrans) document that provides guidance for the identification and prioritization of interregional State highway projects. The ITSP promotes the State of California's role of improving mobility while providing opportunity for efficient goods movement. It also provides summary information regarding other interregional transportation modes—in particular, intercity passenger rail. The ITSP highlights critical Planning considerations such as System Planning, complete streets, and climate change.

District System Management Plan (DSMP)

The DSMP provides a vehicle for the development of multi-modal and multi-jurisdictional transportation strategies. These strategies must be based on an analysis that is developed in partnership with regional and local agencies. The DSMP is the State's counterpart to the Regional Transportation Plan (RTP) for the region. The former Transportation System Development Program (TSDP) is now incorporated within this management plan as a Project List.

State Highway Operation and Protection Program (SHOPP)

Caltrans prepares the SHOPP for the expenditure of transportation funds for major capital improvements necessary to preserve and protect the State Highway System. The SHOPP is a four-year funding program, focusing available resources on the most critical categories of projects: safety mandates, bridge, and pavement preservation. The 10-Year SHOPP anticipates long-term projected expansion and maintenance needs.

Ten-Year SHOPP

The Ten-Year SHOPP is a State plan for the rehabilitation and reconstruction, of State highways and bridges by the SHOPP. The purpose of the Plan is to identify needs for the upcoming ten years. The Plan is updated every two years. It includes specific milestones, quantifiable accomplishments and strategies to control cost and improve the efficiency of the Program. The Ten-Year SHOPP differs from SHOPP, as it has no funding constraints assigned.

Senate Bill 45 (SB 45)

SB 45 (1997) establishes guidelines for the California Transportation Commission to administer the allocation of funds appropriated from the Public Transportation Account for capital transportation projects designed to improve transportation facilities.

Smart Mobility Framework

Caltrans released *Smart Mobility 2010: A Call to Action for the New Decade* in February 2010. SMF was prepared in partnership with US Environmental Protection Agency, the Governor's Office of Planning and Research, and the California Department of Housing and Community Development to address both long-range challenges and short-term pragmatic actions to implement multi-modal and sustainable transportation strategies in California.

*Smart Mobility 2010* provides new tools and techniques to improve Planning. It links land use "place types," considers growth scenarios and how growth will best gain the benefits of smart mobility. The SMF emphasizes travel choices, healthy, livable communities, reliable travel times for people and freight, and safety for all users. This vision supports the goals of social equity, climate change intervention, and energy security as well as a robust and sustainable economy.

Caltrans Deputy Directive 64-R2 *Complete Streets - Integrating the Transportation System, 2008 & 2014*
This Deputy Directive expresses Caltrans commitment to provide for the needs of all travelers including pedestrians, bicyclists and persons with disabilities in all programming, Planning, maintenance, construction, operations, and project development activities and products.

State Assembly Bill 32 (AB 32) *Global Warming Solutions Act, September 2006*
This bill requires the State's greenhouse gas emissions to be reduced to 1990 levels by the Year 2020. Caltrans strategy to reduce global warming emissions has two elements. The first is to make transportation systems more efficient through operational improvements. The second is to integrate emission reduction measures into the Planning, development, operations and maintenance of transportation elements.

Senate Bill 375 (SB 375) *Addressing Greenhouse Gas Emissions from the Transportation Sector*
SB 375 provides a means for achieving AB 32 goals from cars and light trucks. The transportation sector contributes over 40 percent of the GHGs throughout the State. Automobiles and light trucks alone contribute almost 30 percent. SB-375 requires the California Air Resources Board (ARB) to develop regional greenhouse gas (GHG) emission reduction targets for cars and light trucks for each of the 18 Metropolitan Planning Organizations (MPOs). Through their Planning processes, each of the MPOs is required to develop plans to meet their regional GHG reduction target. This would be accomplished through either the financially constrained "Sustainable Communities Strategy" as part of their Regional Transportation Plan (RTP) or an unconstrained alternative Planning strategy. SB-375 also provides streamlining of California Environmental Quality Act (CEQA) requirements for specific residential and mixed-use developments.

Senate Bill 391 (SB 391) *California Transportation Plan updates, 2009*
This bill requires the department to update the California Transportation Plan (CTP) by December 31, 2015, and every five years thereafter. The bill requires the CTP to address how the State will achieve maximum feasible emissions reductions in order to attain a statewide reduction of greenhouse gas emissions to 1990 levels by 2020 and 80 percent below 1990 levels by 2050. SB 391 requires the Plan to identify the statewide integrated multimodal transportation system needed to achieve these results. CTP was finalized in June 2016.

Senate Bill 743 (SB 743) *California Environmental Quality Act (CEQA) updates, 2013*
This bill requires the Office of Planning and Research to update guidelines for analyzing transportation project impacts as they relate to CEQA legislation. Vehicle Miles Traveled (VMT) provides an alternative to LOS for evaluating transportation impacts. Particularly within areas served by transit, those alternative criteria must "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." Alternative criteria may include "vehicle miles traveled, vehicle miles traveled per capita, automobile trip generation rates, or automobile trips generated."

Caltrans - Climate Action Plan
Greenhouse gas (GHG) emissions and the related subject of global climate change are emerging as critical issues for the transportation community. Caltrans recognizes the significance of cleaner, more energy efficient transportation. On June 1, 2005 the State established climate change emissions reduction targets for California that lead to development of the Climate Action Program. This program highlights reducing congestion and improving efficiency of transportation systems through smart land use, operational improvements, and Intelligent Transportation Systems (objectives of the State's Strategic Growth Plan). The Climate Action Plan approach also includes institutionalizing energy efficiency and GHG emission reduction

measures and technology into Planning, project development, operations, and maintenance of transportation facilities, fleets, buildings, and equipment.

Corridor System Management Plans (CSMP)

In 2007, the California Transportation Commission adopted a resolution stating "…the Commission expects Caltrans and regional agencies to preserve the mobility gains of urban corridor capacity improvements over time that will be described in Corridor System Management Plans (CSMPs)." A CSMP is a Transportation Planning document that will study the facility based on comprehensive performance assessments and evaluations. The strategies are phased, and include both operational and more traditional long-range capital expansion strategies. They take into account transit usage, projections, and interactions with arterial network, and connection to State highways. Each CSMP presents an analysis of existing and future traffic conditions and proposes traffic management strategies and capital improvements to maintain and enhance mobility within each corridor.

A CSMP results in a listing and phasing plan of recommended operational improvements, Intelligent Transportation System (ITS) strategies, and system expansion projects to preserve or improve performance measures within the corridor. CSMPs are required for all projects receiving Proposition 1B (2006) Corridor Mobility Improvement Account (CMIA) funding.

California Freight Mobility Plan Dec. 2014
The California State Transportation Agency (CalSTA) and Caltrans developed a State freight plan, titled the California Freight Mobility Plan (CFMP). Per Assembly Bill 14 (Lowenthal, 2013) the CFMP is a comprehensive plan that governs the immediate and long-range Planning activities and capital investments of the State with respect to the movement of freight. The CFMP will also comply with the relevant provisions of the federal Moving Ahead for Progress in the 21st Century Act (MAP-21) which encourages each state to develop a freight plan. The *CFMP* is a modal plan contributing to the Department's ongoing California Interregional Blueprint (CIB) initiative. The plan will also incorporate information from the Freight Element of the California State Rail Plan. It will use recent freight industry information developed by seaports, railroads, airports, and others, as well as benefit from important regional freight mobility Planning programs by partner agencies.

California State Rail Plan (CSRP), 2013
The California State Rail Plan is a plan for passenger and freight rail to address environmental, economic development, and population growth challenges such as increased travel demand, traffic congestion, and Greenhouse Gas emissions. CSRP programs additional funding for capital investments, operations, and maintenance. The plan provides a framework for improving the State's rail system, noting improvements, future needs, and plans for expansion/integration of rail services.

## REGIONAL

Regional Transportation Plan (RTP) "Plan Bay Area"
Plan Bay Area is a long-range integrated transportation and land-use/housing strategy through 2040 for the San Francisco Bay Area. On July 18, 2013, the Plan was jointly approved by the Association of Bay Area Governments (ABAG) Executive Board and by the Metropolitan Transportation Commission (MTC). The Plan includes the region's Sustainable Communities Strategy (SCS) and the 2040 Regional Transportation Plan represents the next iteration of a Planning process that has been in place for decades.

Plan Bay Area marks the nine-county region's first long-range plan to meet the requirements of California's landmark 2008 Senate Bill 375, which calls on each of the State's 18 metropolitan areas to develop a Sustainable Communities Strategy (SCS) to accommodate future population growth and reduce greenhouse

gas emissions from cars and light trucks. Working in collaboration with cities and counties, the Plan advances initiatives to expand housing and transportation choices, create healthier communities, and build a stronger regional economy.

Regional Transportation Improvement Program (RTIP)

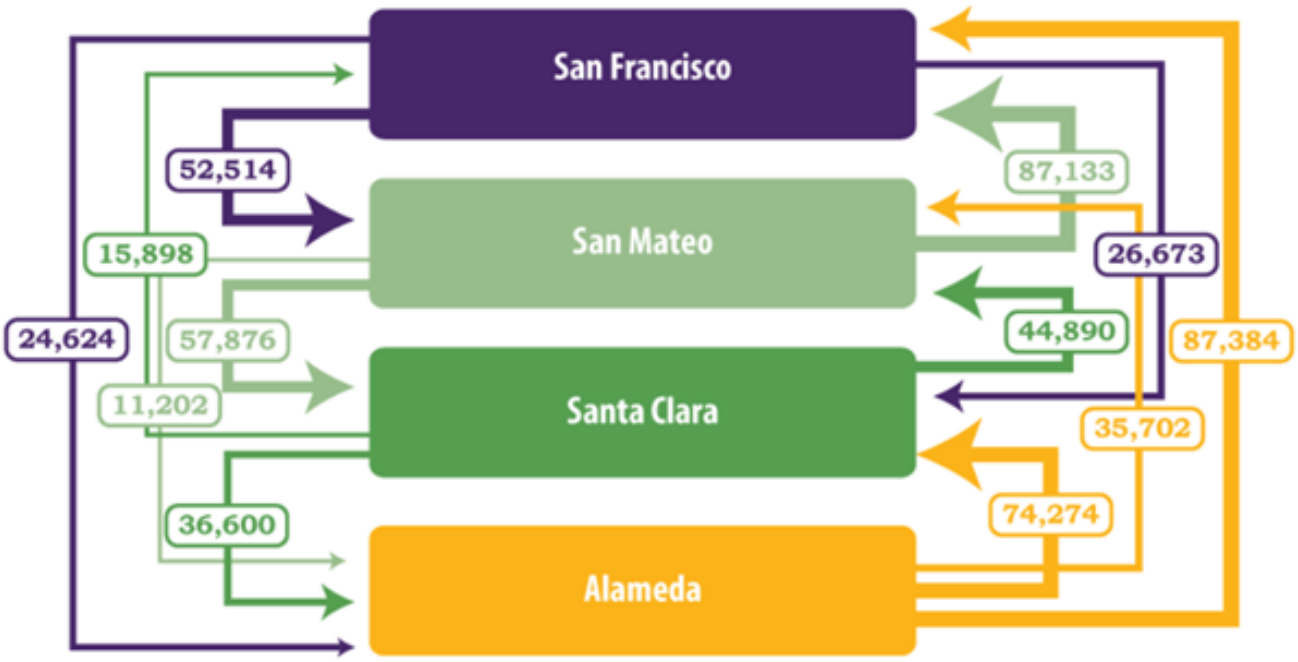
The Regional Transportation Improvement Program is a sub-element of the State Transportation Improvement Program (STIP). The Metropolitan Transportation Commission is responsible for developing regional project priorities for the RTIP for the nine counties of the Bay Area. The biennial RTIP is then submitted to the California Transportation Commission for inclusion in the STIP.

Freeway Performance Initiative (FPI)

This is the Metropolitan Transportation Commission's ongoing effort to improve the operations, safety, and management of the Bay Area's freeway network by deploying system management strategies, completing the HOV lane system, addressing regional freight issues, and closing key freeway infrastructure gaps.

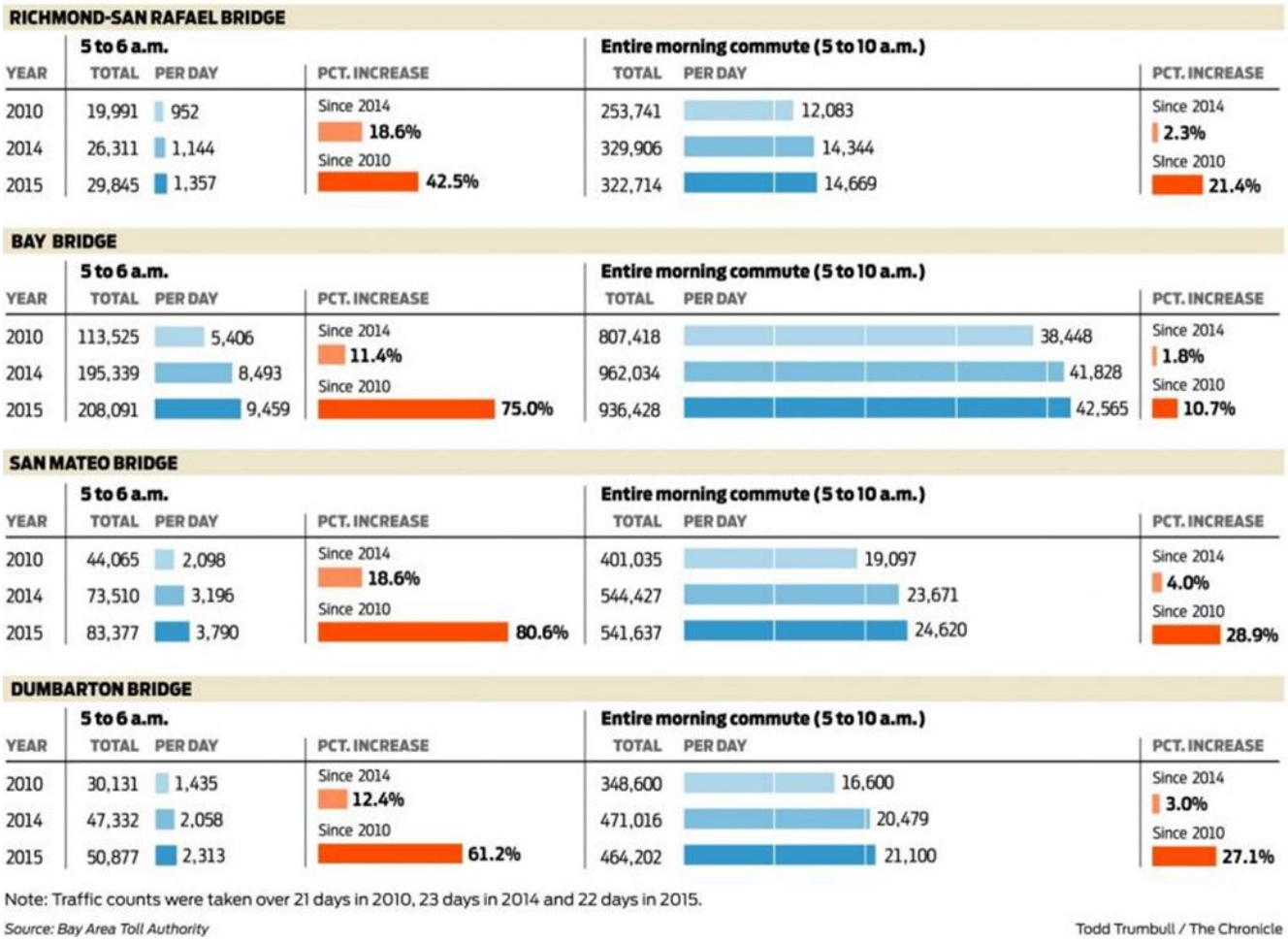
## APPENDIX C: ADDITIONAL CORRIDOR DATA

### Number of Residents Who Commute to another County within the Region (2013)[101]




[101] http://siliconvalleyindicators.org/data/place/transportation/commute-patterns/

**Number of vehicles crossing each of four Bay Area bridge during the morning commute in 2010, 2014 and 2015[102]**

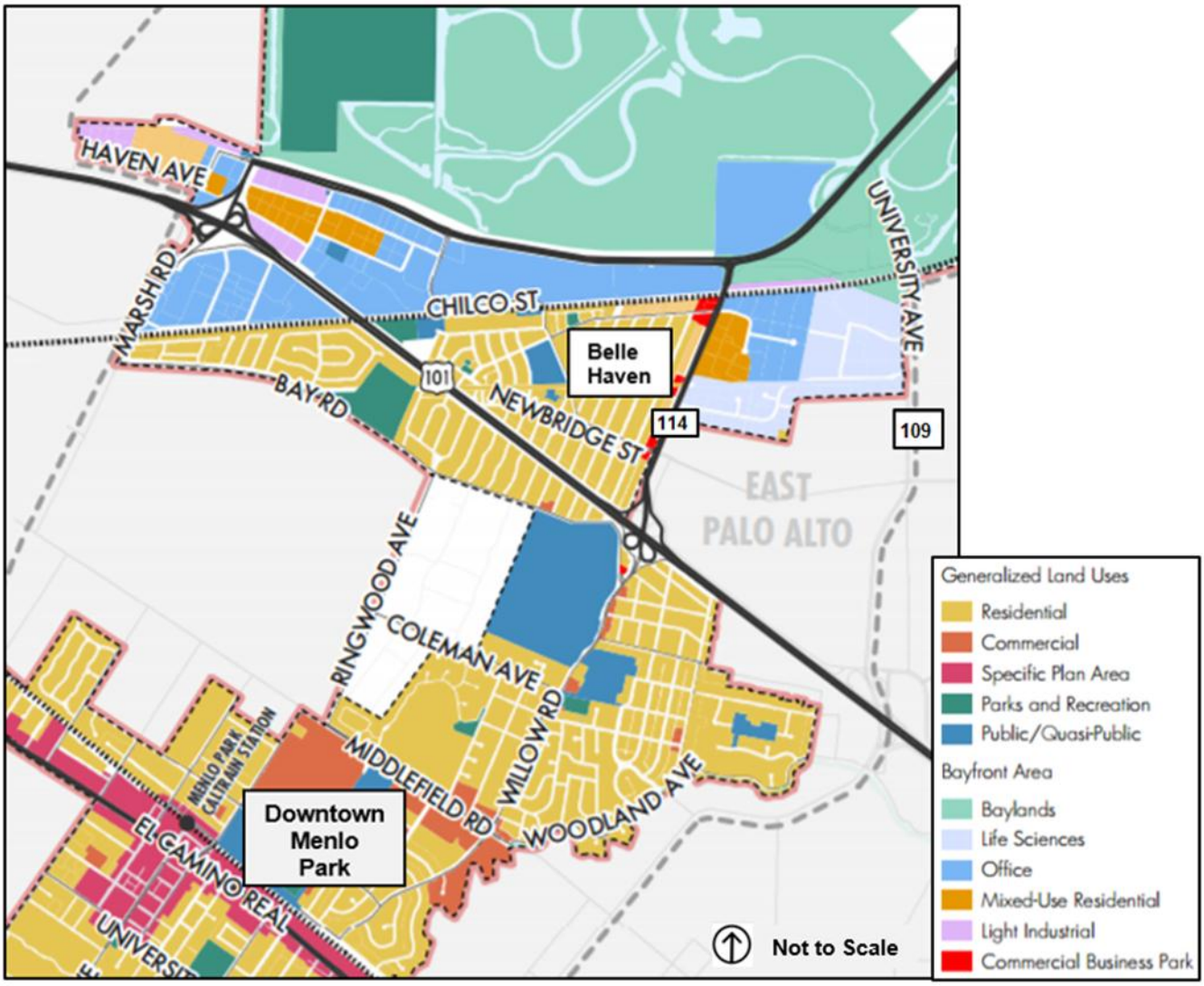



[102] Tom Trumbull, SF Chronicle, Source: Bay Area Toll Authority

## Menlo Park: M-2 Planning Area[103]

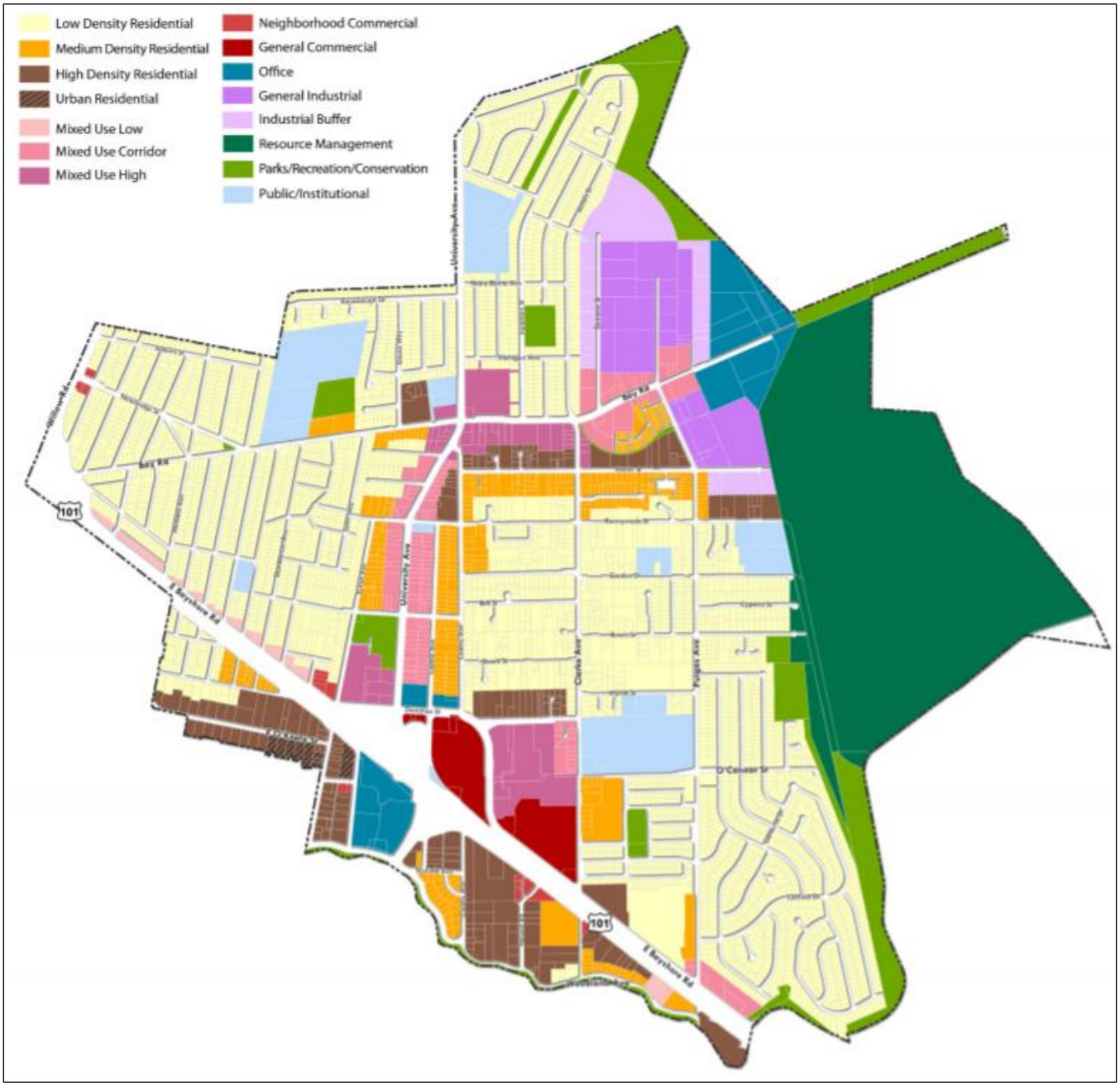

[103] http://menlopark.org/879/Background-information-maps-and-graphics

**General Land Use Map, Eastern Menlo Park[104]**



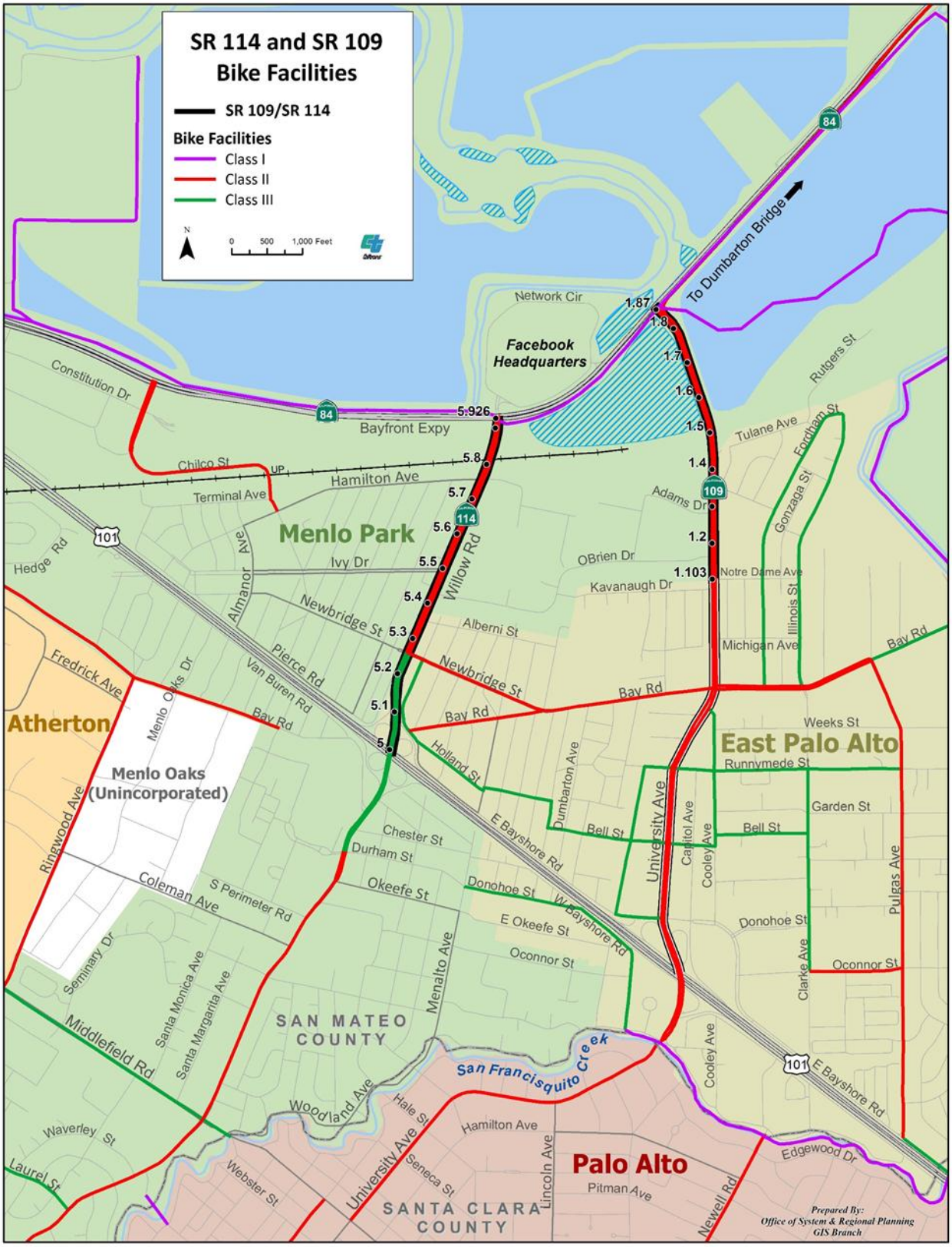

[104] http://menlopark.org/879/Background-information-maps-and-graphics

## General Plan Land Use Designations, East Palo Alto[105]




[105] http://vista2035epa.org/wp-content/uploads/2016/01/EPA-GP-Chapter-4-Land-Use-and-Urban-Design-Public-Draft.pdf

**Bicycle Facilities within the SR 114 and SR 109 Corridor Area**



## APPENDIX D: SUMMARY OF BICYCLISTS' NEEDS


On University, a bike lane is completely obstructed by brush.

Photo: Bryan Goebel, 2012.

A bicyclist waits to cross the University and Donohoe intersection.

Photo: Richard Masoner, 2011

The westbound crossing at US 101/SR 109 is the only connection between west and east sides of East Palo Alto. Often, it's shared with bicyclists, especially children.

Photo: Bryan Grobel, 2012

Connectivity: Facility gaps oblige bicyclists to utilize narrow shoulders, or compete with vehicles in shared, unmarked lanes. While access is permitted entirely across University Avenue and Willow Road, overcrossings and ramps at the US 101 junctions lack bicycle lanes. Despite narrow sidewalks and shoulders, the University Avenue crossing is one of the most traveled by bicyclists and pedestrians countywide. Improving bicycle and pedestrian access across US 101 is regionally recognized as a high priority. Caltrans is working with local agencies to address deficiencies in continuity.

Visibility: Wide crossings, multiple lanes, and high vehicle volume at major intersections creates a mobility barrier for bicyclists, as well as pedestrians. Intersections should be designed to reduce conflict between bicyclists, other vulnerable road users and vehicles by increasing visibility, denoting right-of-way, and facilitating eye contact and awareness with competing modes. Intersections along the Corridor may benefit from improved road markings that highlight bike positioning and movement, for example, bike lanes at intersections may be sited left of right turn lanes to avoid conflict between turning vehicles and bicyclists. Other treatments that would increase visibility and help delineate space for bicyclists along the Corridors include bike boxes at heavy intersections, bike lane buffers, and green painted pavement at high conflict areas.

At a minimum, lane restriping and additional bike signage will improve portions of the routes where visibility is compromised.[106] As illustrated left, landscaping and obstructions impact visibility and access.

Network Expansion and Transit Links: The San Mateo County Comprehensive Bicycle Route Plan,[107] identifies a need for improved access to the San Francisco Bay Trail in East Palo Alto. Expansion plans include lanes along Bay Road that connect SR 114 and SR 109 through residential neighborhoods to shoreline facilities.

Improving the bicycle-transit link is an important part of making bicycling a viable transportation option. Linking bicycles with mass transit overcomes such barriers as lengthy trips, personal security concerns, and riding at night or in poor weather. Bicycle parking and bike-sharing programs reinforce access to transit.

[106] A Guide to Reconstructing Intersections and Interchanges for Pedestrians and Bicyclists, Caltrans, 2010

[107] City/County Association of Governments, San Mateo County: http://ccag.ca.gov/wp-content/uploads/2014/07/CBPP_Main-Report__Sept2011_FINAL.pdf

## APPENDIX E: PEDESTRIAN FACILITIES ALONG THE SR 109/114 CORRIDOR

At US 101, pedestrian access is permitted across a grade-separated overpass, but limited to a narrow westbound-only sidewalk. This is the only connection across US 101 in East Palo Alto. The sidewalk is often shared with young bicyclists and the pavement is distressed. Pedestrian crossings at the nearby on/off ramps are not signalized. Improvements could include adequate width bike lanes, crosswalks on both sides of the road, Americans with Disabilities Act (ADA) compliant curb ramps, and highly visible crosswalk markings at on/off ramps.

Initiating at Donohoe Road, high-volume traffic, larger corner radii, and wide crossings pose obstacles to pedestrians. According to East Palo Alto's General Plan (2015), Bay Road and Bell Street intersections experience the highest rate of vehicle-pedestrian collisions along University Avenue.[108] Bell Street has undergone sidewalk enhancements, crosswalk restriping and signal upgrades. Bay Road/University Avenue, situated at the City's core and a significant crossroads for all modes, is the planned junction for two citywide bike paths and is part of the Ravenswood/Four Corners Transit Oriented Specific Plan. Future improvements should ensure maximum visibility, shortened crossing distances, and safer vehicle throughput.

From Bay Street to Notre Dame Avenue, a sidewalk exists westbound-only. At Kavanaugh Drive/Notre Dame Avenue, the sidewalk switches to an eastbound-only facility that runs adjacent to a middle school. The switchback contributes to otherwise unnecessary road crossings and makes pedestrian navigation difficult. Sidewalks should be added to both sides of the road and include appropriate curb ramps. Intersection crossings along and across SR 109 at Notre Dame and Kavanaugh streets should be restriped to improve visibility.

Sidewalks end after Purdue Avenue. Eastbound, an unpaved facility passes an at-grade rail crossing before merging with a Class I bicycle path. Few pedestrians navigate the eastern terminus, which is mostly marsh.

Pedestrian access is permitted across US 101 on Willow Road, but the sidewalk and shoulders on the overpass are narrow, several ramp crossings are not signalized, and the intersection experiences severe peak congestion. Following the US 101 Intersection, the westbound sidewalk on SR 114 disappears behind an adjacent wall, reemerging for one block only at a signalized crossing on Newbridge Street. Adjacent to a high school, the Newbridge crossing will benefit from visibility improvements. After the Hamilton Avenue intersection, the eastbound facility becomes a shared Class I bicycle/pedestrian path, with heavy bike use.

[108] General Plan, City of East Palo Alto, 2015.

## *Bay Trail and Corridor Area*[109]


[109] http://baytrail.org/about-the-trail/welcome-to-the-san-francisco-bay-trail/