Existing Conditions Report Draft

City of Palo Alto Rail Program Management

November 2, 2017

City of Palo Alto

Mott MacDonald
4301 Hacienda Drive
Suite 300
Pleasanton CA 94588
United States of America

T +1 (925) 469 8010
F +1 (925) 469 8011
mottmac.com/americas

City of Palo Alto
250 Hamilton Avenue
Palo Alto, CA 94301

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Abbreviations/Acronyms

ADA ....American Disabilities Act

ADT..................Average Daily Traffic

BAAQMD ....Bay Area Air Quality Management District

BPTP ....Bicycle and Pedestrian Transportation Plan

BTG ....Bicycle Technical Guidelines

CAP ....Climate Action Plan

CBOSS ....Communications Based Overlay Signal System

CHSRA ....California High-Speed Rail Authority

CMP.................Congestion Management Program

CPP ....Climate Protection Plan

CTC ....California Transportation Commission

EMU.................Electrical Multiple Unit

FTA..................Federal Transit Administration

GHG.................Greenhouse Gas

HCM.................Highway Capacity Manual

HSR ....High-Speed Rail

LOS..................Level of Service

MTC.................Metropolitan Transportation Commission

PCEP...............Peninsula Corridor Electrification Project

PTC..................Positive Train Control

SCCBP.............Santa Clara Countywide Bicycle Plan

VTA..................Santa Clara Valley Transportation Authority

1 Introduction

The City of Palo Alto (referred to as the “City”) is preparing for increases in passenger rail service along the existing Caltrain rail corridor and potential impacts to existing at-grade crossings associated with service increases. Passenger rail service changes will be a result of the Peninsula Corridor Electrification Project (PCEP) and potentially the California High-Speed Rail (HSR) project.

The City of Palo Alto is bisected by the Caltrain rail corridor and enjoys both the benefits as well as the impacts associated with rail service: train noise and vibration, traffic congestion around grade crossings, and community safety concerns. These impacts are expected to grow as train service in the corridor increases regardless of whether or not the state’s HSR project comes to fruition. As a result, the City is conducting a study to assess grade separation alternatives and minimize the impact of increased rail services on local traffic, the basis of which is referred to as the “Rail Program” throughout this document.

In 2010, the City Council initiated the Palo Alto Rail Corridor Study to evaluate land use, transportation, and urban design elements of the rail corridor, particularly in response to potential improvements to passenger rail service on the Caltrain corridor. The study report, as a result of a two-year process, includes an analysis of those elements and their potential impacts from the range of possible rail improvements, including Caltrain upgrades, such as electrification and/or grade separations, and/or the potential options for the HSR project[1]. In early 2014, the City conducted a study for conceptual grade separation alternatives for a portion of the Caltrain right-of-way encompassing three existing at-grade crossings: Charleston Road, Meadow Drive, and Churchill Avenue[2]. This study provided preliminary information on the potential impacts and costs of construction (by order of magnitude) for various roadway depression and trenching of the railroad alternatives. A railroad trench alternative would place the railroad tracks and rail operations below street-level, thus separating train traffic from motor vehicles, pedestrian, and bicyclist activity at the street-level. The study was not definitive in determining an ultimate configuration, but provided a starting point for dialogue on the issue, and indicated that roadway depression alternatives would require significant property acquisitions, while trenching alternatives would not. The study also concluded that while not all of the roadway depressions could maintain turning movements along Alma Street, the trenching alternatives could do so.

1.1 Purpose

The purpose of this Existing Conditions report is to examine the current conditions relevant to the Palo Alto Rail Corridor Circulation Study. This report includes sections on the policy framework for the Palo Alto Rail Program, overview of the study area, bike and pedestrian access, transportation networks, traffic conditions, and existing transit services in the City.

[1] Palo Alto Rail Corridor Study, 2013 https://www.cityofpaloalto.org/civicax/filebank/documents/38025

[2] Palo Alto Grade Separation and Trenching Study, 2014 https://www.cityofpaloalto.org/civicax/filebank/documents/44211

2 Policy Framework

The City of Palo Alto is the lead agency for the Rail Program, and as such this section summarizes City policies that govern the Rail Corridor Circulation Study. The purpose of this review is to ensure that the Circulation Study is consistent with existing and planned future transportation and development policies and strategies.

2.1 Palo Alto Policies

The Circulation Study process builds upon the City's previous planning efforts to accommodate future transit growth along the existing Caltrain corridor, brought about by the California High-Speed Rail (HSR) project, the Peninsula Corridor Electrification Project (PCEP), and the growing population of the San Francisco Bay Area. Existing plans, policies, and guidelines set the foundation for the corridor planning process and the development of an implementable document. Key City documents include the Palo Alto Bicycle and Pedestrian Transportation Plan, the Palo Alto Climate Protection Plan, the City of Palo Alto Municipal Code, the Rail Corridor Study, and the Transportation Element of the City of Palo Alto Comprehensive Plan. The Rail Corridor Study was developed by the Rail Corridor Task Force to generate a community vision for land use, transportation, and urban design opportunities along the Caltrain corridor. This policy document was incorporated into the Comprehensive Plan in 2013 and provides land use and transportation policies under a variety of scenarios. It is the intention of this study to build on the outcomes of the Rail Corridor Study.

2.1.1 Palo Alto Comprehensive Plan – Transportation Element

The City of Palo Alto Comprehensive Plan was last revised in 2007 and is currently in the process of being updated. It is the primary document guiding the City's planning decisions. The Transportation Element of the existing Palo Alto Comprehensive Plan includes 10 goals to guide the development of the City's transportation programs and facilities (see Table 2-1). A total of 57 policies and 58 programs are identified in the current Comprehensive Plan's transportation chapter to further focus and carry out these goals.

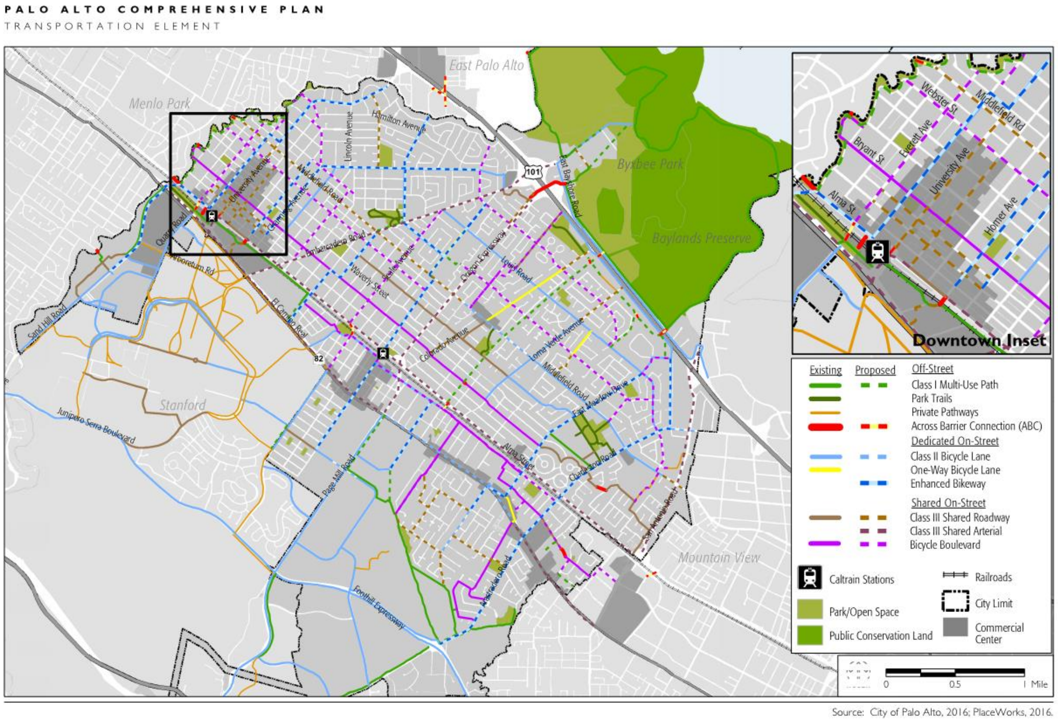
Table 2-1: Summary of Transportation Goals from Comprehensive Plan

Goal Number	Transportation Goals
Goal T-1	Less reliance on Single-Occupant Vehicles
Goal T-2	A convenient, efficient public transit system that provides a viable alternative to driving
Goal T-3	Facilities, services, and programs that encourage and promote walking and bicycling
Goal T-4	An efficient roadway network for all users
Goal T-5	A transportation system with minimal impact on residential neighbourhoods
Goal T-6	A high level of safety for motorists, pedestrians, and bicyclists on Palo Alto Streets
Goal T-7	Mobility for people with special needs
Goal T-8	Attractive, convenient public and private parking facilities
Goal T-9	An influential role in shaping and implementing regional transportation decisions
Goal T-10	A local airport with minimal off-site impacts

Source: City of Palo Alto Comprehensive Plan 2007

The updated plan, Our Palo Alto 2030 Comprehensive Plan, will carry over and update the current plan's transportation goals and include an emphasis on reducing congestion. Related to this study, the new Comprehensive Plan will include a policy supporting Caltrain modernization and a policy identifying grade separations as a city priority.

Figure 2-1: City of Palo Alto Comprehensive Plan – Bikeways in Palo Alto



Source: City of Palo Alto, Comprehensive Plan Transportation Element Draft 2017

2.1.2 Palo Alto Bicycle and Pedestrian Transportation Plan

The Palo Alto 2012 Bicycle and Pedestrian Transportation Plan (BPTP 2012) was adopted in July 2012 and builds upon the 2003 Bicycle Transportation Plan by adding coverage of pedestrian issues, priorities, and design standards. The BPTP 2012 contains the policy vision, design guidance, and specific recommendations to increase walking and biking rates over the next decade and beyond – rates that will be instrumental in helping to address the impacts of regional growth while maintaining mobility. Objective One in the BPTP 2012 aims to "double the rate of bicycling for both local and total work commutes by 2020 (to 15 percent and 5 percent, respectively.)" This objective supports Goals T-1 and T-3 of the City's Comprehensive Plan. Objective Four, which aims to "plan, construct, and maintain 'Complete Streets' that are safe and accessible to all modes and people of all ages and abilities," supports and expands Goal T-3 of the City's current Comprehensive Plan.

2.1.3 Palo Alto Climate Protection Plan

The City of Palo Alto adopted a Climate Protection Plan (CPP) in December 2007. The City then updated the mid-term and long-term Greenhouse Gas (GHG) emissions reduction goals for both municipal and community-wide GHG emissions in 2010. Overall GHG emissions in 2013 within the City were estimated to have decreased 29 percent from 2005 levels, which exceeds the City's goal of 15 percent reduction below 2005 levels by 2020. The CPP contains a range of goals and actions that target GHG emissions reductions from the transportation sector, including measures to promote alternative fuels, facilitate increased biking and walking, increase mass transit availability, and encourage electronic alternatives to travel. In 2015, the City began the preparation of a Sustainability and Climate Action Plan (S/CAP) and adopted a new GHG reduction goal of 80 percent below 1990 levels by 2030, otherwise referred to as the “80x30” goal.

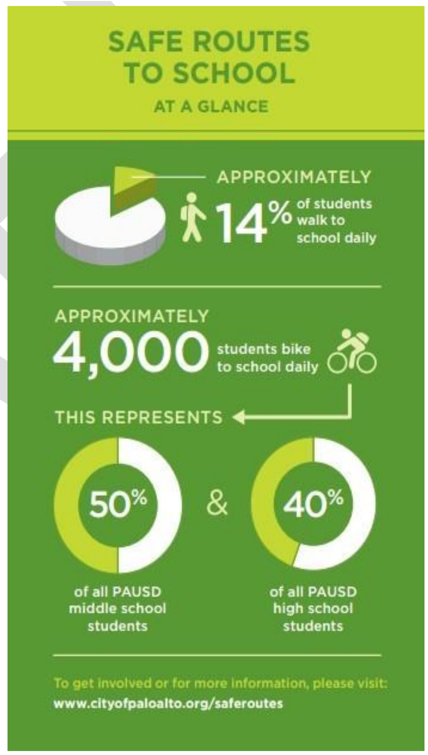
2.1.4 Palo Alto Municipal Code

The purpose of the City’s Municipal Code is to protect and promote the public’s health and safety through ordinances and regulations. Title 10 regulates vehicle and traffic operations within the City, including traffic-control devices, pedestrian safety, bicycling safety and routes, and general vehicle and traffic safety. For example, chapter 10.32 establishes pedestrian safety regulations, such as the establishment and appropriate usage of crosswalks. Chapter 10.36 addresses general parking regulations, such as where parking is permitted.

2.1.5 Safe Routes to School

The Safe Routes to Schools (SRTS) Program is a collaborative effort between the City of Palo Alto and the Palo Alto Unified School District (PAUSD). Its goal is to improve safety for school commuters and to reduce school commute-related congestion on city streets. Approximately 14 percent of Palo Alto’s students walk to school daily, while 4,000 students from the PAUSD bike to school, as shown in Figure 2-2.

Figure 2-2: Safe Routes to School Statistics



Source: City of Palo Alto, Safe Routes to School

The program is consistent with key transportation goals outlined in the City’s Comprehensive Plan, including giving priority to facilities, services, and programs that encourage and promote walking and bicycling, and providing a high level of safety for motorists, pedestrians, and bicyclists. Specific policies and programs include[3]:

- Policy T-14: Improve pedestrian and bicycle access to and between local destinations, including public facilities, schools, parks, open space, employment districts, shopping centers, and multi-modal transit stations.
- Policy T-39: To the extent allowed by law, continue to make safety the first priority of citywide transportation planning.
- Policy T-40: Continue to prioritize the safety and comfort of children on school travel routes. This includes program T-45, which calls for providing adult crossing guards at school crossings that meet adopted criteria, and T-46, which encourages the City-sponsored bicycle education programs in the public schools.

The SRTS Program produced 18 Walk and Roll maps that outline suggested bicycle and pedestrian paths around a one-mile radius of a school within PAUSD. Among the 18 Walk and Roll Maps, four maps designate suggested routes that cross two of the four identified at-grade crossings within the Study Area. These four Walk and Roll Maps are:

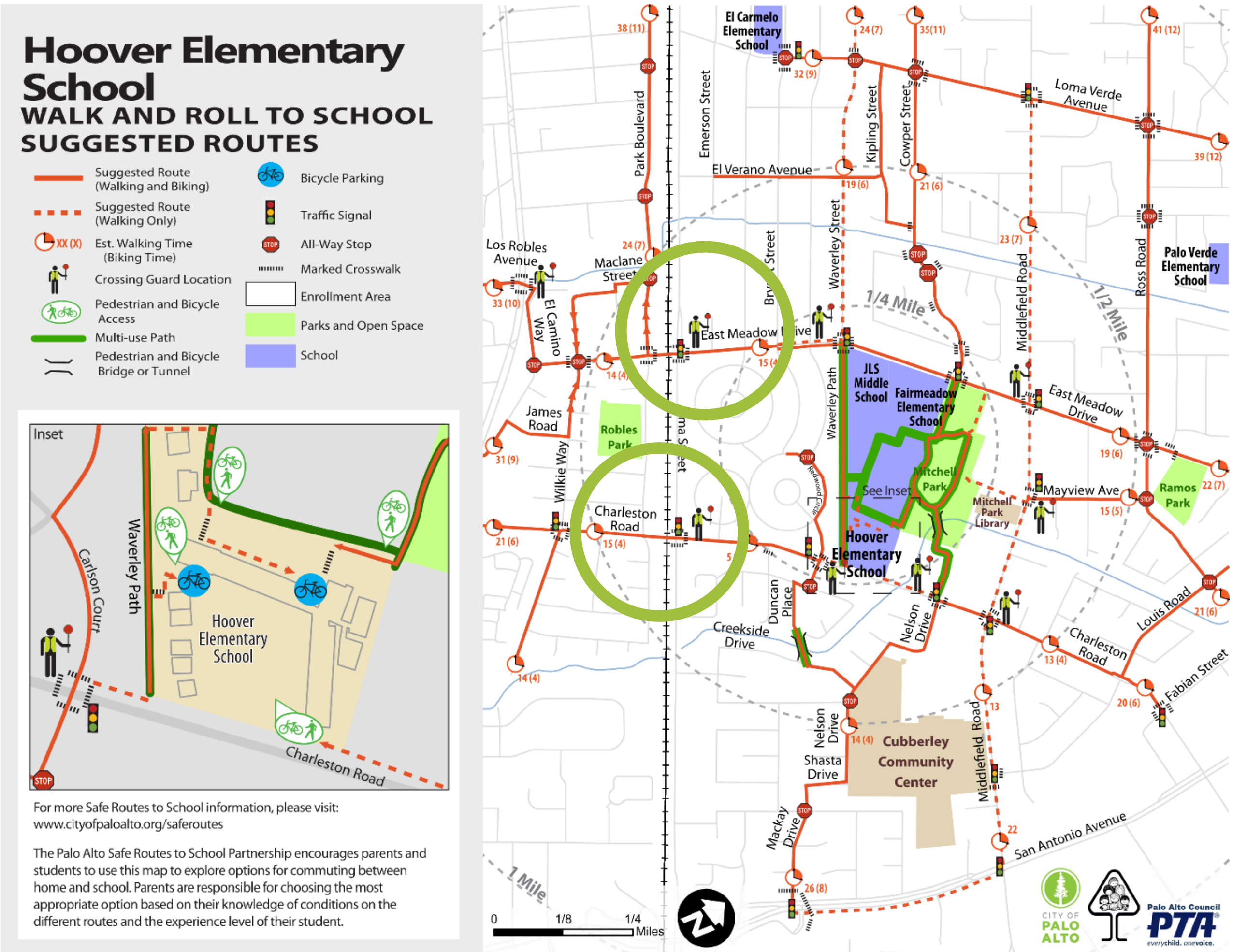
- Briones Elementary School
- Gunn High School

[3] https://paloaltocityca.iqm2.com/Citizens/FileOpen.aspx?Type=30&ID=9461&MeetingID=2088

- Hoover Elementary School
- Terman Middle School

All four maps for the above schools suggest routes that cross both Meadow Drive and Charleston Road railroad crossings, and crossing guards are assigned to these locations to help ensure the safety of students and guardians on their routes to school. An example of one of the Walk and Roll maps is shown in Figure 2-3.

Figure 2-3: Walk and Roll Map Example – Hoover Elementary School



Source: City of Palo Alto, Safe Routes to School

The SRTS Program includes an ongoing, year-round program with both engineering and programmatic elements. A timeline of recently completed and upcoming infrastructure projects, as they relate to the four aforementioned schools, is presented in Table 2-2.

Table 2-2: SRTS Infrastructure Project Timeline

Project	School Routes to be Improved	Completion Date or Future Construction Start
Georgia Ave High Visibility Crosswalk	Terman MS, Gunn HS	Completed Summer 2016
Los Robles Bikeway Enhancements	Briones ES, Terman MS, Gunn HS	Completed Summer 2016
Donald/Arastradero Intersection Spot Improvements	Terman MS	Summer 2017
Bryant Street Bicycle Boulevard Upgrade	Gunn HS	Summer 2017
Louis Road-Montrose Ave Bicycle Boulevard	Gunn HS	Summer 2017
Ross Road Bicycle Boulevard	Gunn HS	Summer 2017
Charleston/Arastradero Corridor Plan	Briones ES, Hoover ES, Terman MS, Gunn HS	Winter 2017/2018
Bryant Street Bicycle Boulevard Extension	Hoover ES, Gunn HS	Summer 2018
Maybell Avenue Bicycle Boulevard	Briones ES, Terman MS, Gunn HS	Summer 2018
Park Blvd/Wilkie Way Bicycle Boulevard	Briones ES, Terman MS, Gunn HS	Summer 2018
East Meadow Drive and Fabian Enhanced Bikeways	Hoover ES, Gunn HS	January 2020 (Pending VERBS Funding)

Source: Planning and Community Environment Department, April 2017

2.2 Stakeholder Agencies

Stakeholder agencies with potential impact on the City's Rail Program include:

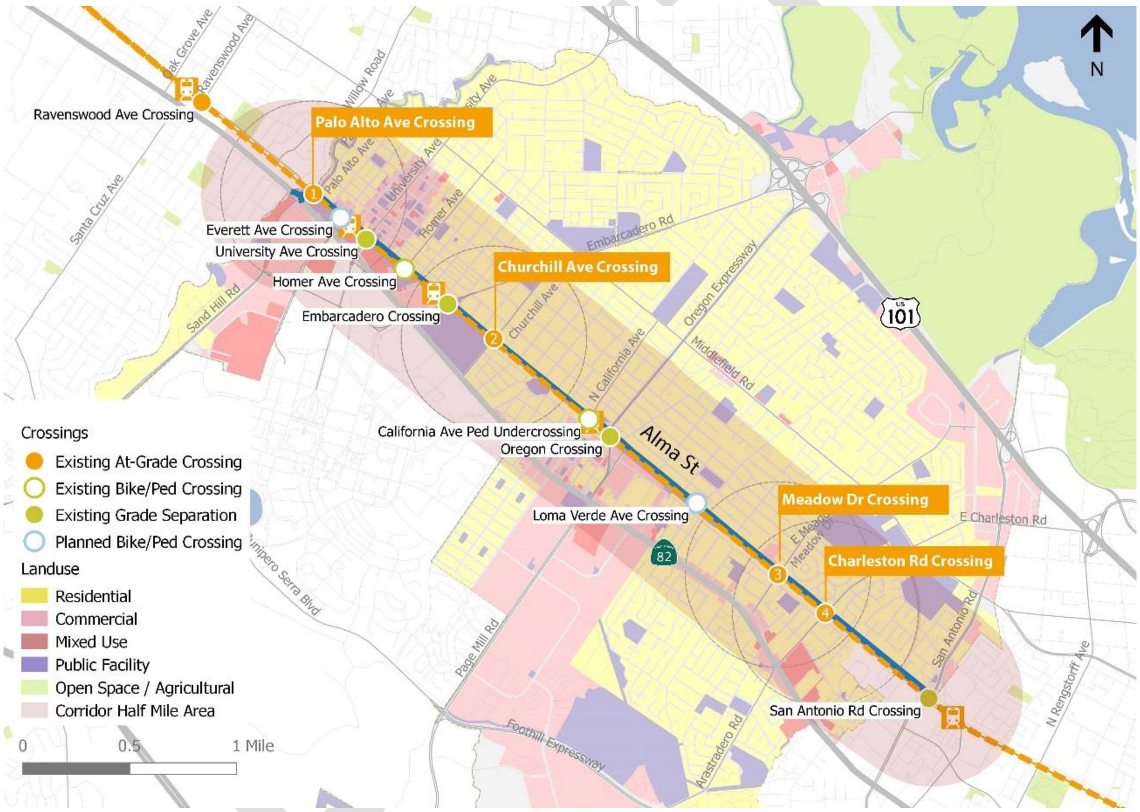
- Association of Bay Area Governments (ABAG)
- Bay Area Air Quality Management District (BAAQMD)
- California Department of Transportation (Caltrans)
- California High Speed Rail Authority (CHSRA)
- California Transportation Commission (CTC)
- California Public Utilities Commission (CPUC)
- Federal Highway Administration (FHWA)
- Federal Railroad Administration (FRA)
- Metropolitan Transportation Commission (MTC)
- Peninsula Corridor Joint Powers Board (PCJPB), aka Caltrain (and Samtrans)
- Santa Clara Valley Transportation Authority (VTA)
- Santa Clara County
- Union Pacific Railroad
- Other:
  - Americans with Disabilities Act (ADA)
  - California legislation, such as SB 743 (CEQA LOS Alternative) and AB 1358 (Complete Streets)

A summary review of applicable Federal, State, and Regional agency policies and stakeholders is included in Appendix A — Federal, State and Regional Policy and Framework Review.

3 Study Area

The study area is defined as the half-mile area centered around the rail corridor in the City, including the four existing at-grade crossings. The rail corridor in the City spans approximately four miles in length, and includes three train stations: Palo Alto Station, Stanford Station, and California Ave Station. The major arterial that runs parallel to the rail line is Alma Street. There are five existing grade separations in the City, including University Ave, Homer Ave (bike/ pedestrian undercrossing), Embarcadero Road, Oregon Expressway, and California Ave (bike/ pedestrian undercrossing), and a portion of the San Antonio Road separation touches the City boundary as well. The study area map is shown in Figure 3-1.

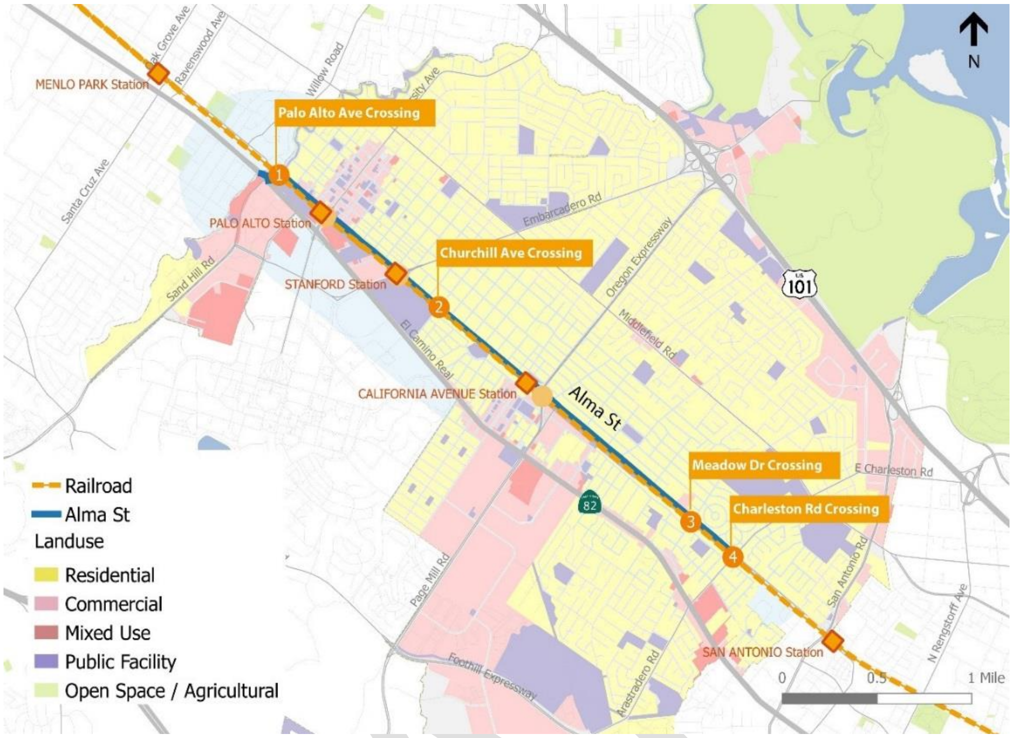
Figure 3-1: Study Area Map



3.1 Land Use

The existing land uses within the study area are shown in Figure 3-2. The updated Comprehensive Plan will focus on ensuring that public services can adequately serve new housing development and that sufficient land for neighborhood-serving retail uses is preserved.

Figure 3-2: Overall Land Use Map



3.2 Demographics

The City of Palo Alto is located in the northwest portion of Santa Clara County in the San Francisco Bay Area. The community is largely residential with sizeable employment in the management, business, science, and arts industries. Approximately 65 percent of residents commute to work by driving alone and almost six percent of residents take transit. In comparison, 76 percent of Santa Clara County residents commute by driving alone and less than four percent of residents take transit, as detailed in Table 3-1. The City is one of the most bike-friendly cities in the nation, and this is reflected in the rate of residents who use bicycles as their primary commute mode. Over nine percent of Palo Alto residents commute locally by bicycle currently, and the BPTP 2012 seeks to increase this rate to 15 percent by 2020 under the plan's Objective One.

Table 3-1: Commute Modes

Commute Mode	City of Palo Alto	Santa Clara County
Drive Alone	64.6%	76.0%
Carpool	6.6%	10.4%
Transit	5.8%	3.9%
Walk	5.2%	2.0%
Bicycle	9.2%	1.9%
Taxi, Motorcycle, Other	0.9%	1.3%
Work at Home	7.8%	4.6%

Source: US Census ACS 5-Year, 2015

3.3 At-Grade Crossings

The following section presents each of the four at-grade crossings, with a discussion of physical attributes and surrounding land uses. An at-grade crossing is an intersection of a roadway or path and a railroad at the same level, as opposed to the railroad crossing over or under via a bridge or tunnel. Information included in the following sections was sourced from the February 2016 Caltrain Grade Crossing Hazards Analysis.

3.3.1 Palo Alto Avenue

The Palo Alto Avenue at-grade crossing is the northernmost crossing within the City. Palo Alto Avenue is a minor two-lane collector street that connects El Camino Real (State Route 82) with Alma Street. The Palo Alto Avenue approach is stop-sign controlled at Alma Street, just east of the railroad. Palo Alto Avenue extends northwest of Alma Street as an at-grade crossing over the railroad tracks, and extends west to connect to form a signalized intersection at El Camino Real/Sand Hills Road approximately 300 feet west of the railroad crossing. The Palo Alto segment through the railroad crossing has a general two-lane cross-section, with Class II bike lanes and a sidewalk/pedestrian path on the north side of the road. Class II bike lanes are on-street marked bike lanes for the exclusive use of bicycles. Currently, Palo Alto Avenue carried an average weekday traffic volume of approximately 16,200 vehicles and 550 bicycles per day across the at-grade crossing. Weekday pedestrian and bicycle volumes for this crossing are summarized in Table 3-2.

Figure 3-3: Palo Alto Avenue At-Grade Crossing

Source: Google Earth 2016

Table 3-2: Pedestrian and Bicycle Volumes at Palo Alto Avenue Crossing

Direction	Pedestrians			Bicycles		
	Total Weekday	Peak Hour / Time		Total Weekday	Peak Hour / Time	
Eastbound	152	12	08:00 – 09:00	276	40	17:00 – 18:00
Westbound	147	15	08:00 – 09:00	274	49	08:30 – 09:30

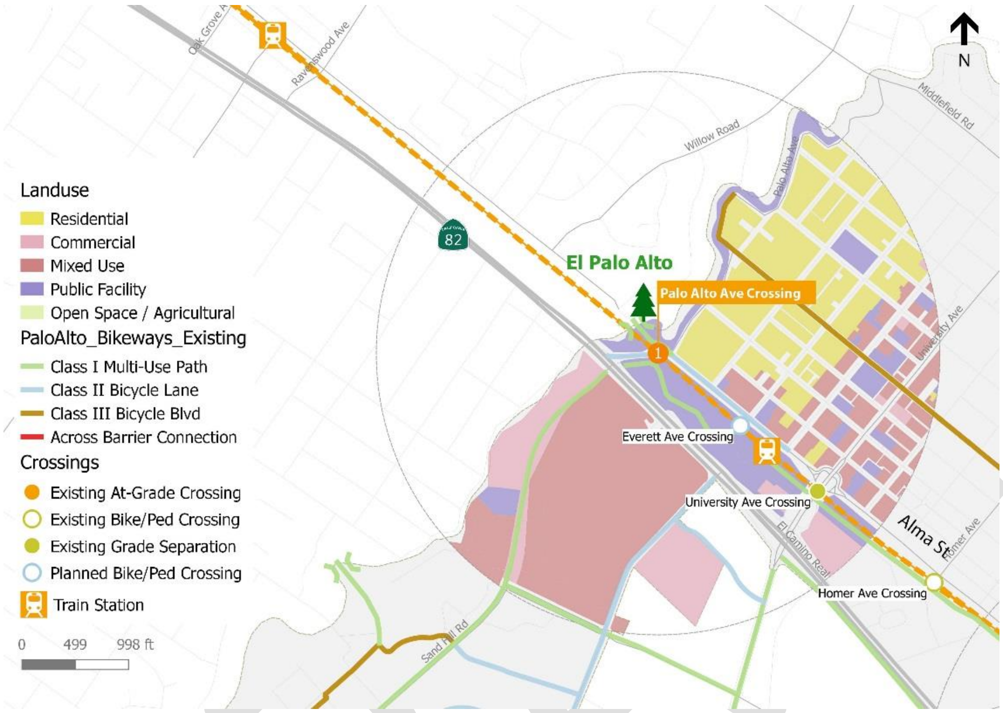
Source: Caltrain Grade Hazard Analysis Final Report, Feb 2016

Land Use

The Palo Alto Avenue at-grade crossing is in proximity to a few major landmark destinations within the City, including El Palo Alto, the historic tree and City's namesake shown in Figure 3-3.

To the southwest of the crossing is the mixed-use complex of Stanford Shopping Center, in addition to the El Camino Park. The Palo Alto Transit Center is approximately 2,000 feet away to the south of the crossing, and northeast of the transit center is the major commercial corridor of Downtown Palo Alto along University Avenue.

Figure 3-4: Palo Alto Avenue Grade Crossing Land Use



3.3.2 Churchill Avenue

Churchill Avenue is an east-west local collector street that provides a connection between El Camino Real (State Route 82) and Embarcadero Road, through Old Palo Alto. The roadway has a general two-lane cross-section, with Class II bike lanes and sidewalks. Within the vicinity of the Churchill Avenue crossing, Churchill Avenue forms a signalized intersection with Alma Street, and unsignalized intersections (i.e. side-street stop-controlled) at Mariposa Avenue.

Figure 3-5: Churchill Avenue At-Grade Crossing

Source: Google Earth 2016

The Churchill Avenue/Alma Street intersection is an existing at-grade signalized intersection located within close proximity (less than 50 feet) from the railroad crossing, and as such represents the key intersection that influences at-grade railroad crossing operations. In 2015, the City of Palo Alto, Caltrain, Caltrans Rail Division, and the California Public Utilities Commission (CPUC) met to review the Churchill Avenue crossing to determine possible funding of safety improvements through the Federal Section 130 funds. Currently, Churchill Avenue carried an average weekday traffic of approximately 9,200 vehicles and 1,020 bicycles per day across the at-grade crossing[4]. Weekday pedestrian and bicycle volumes for this crossing are summarized in Table 3-3.

Table 3-3: Pedestrian and Bicycle Volumes at Churchill Avenue Crossing

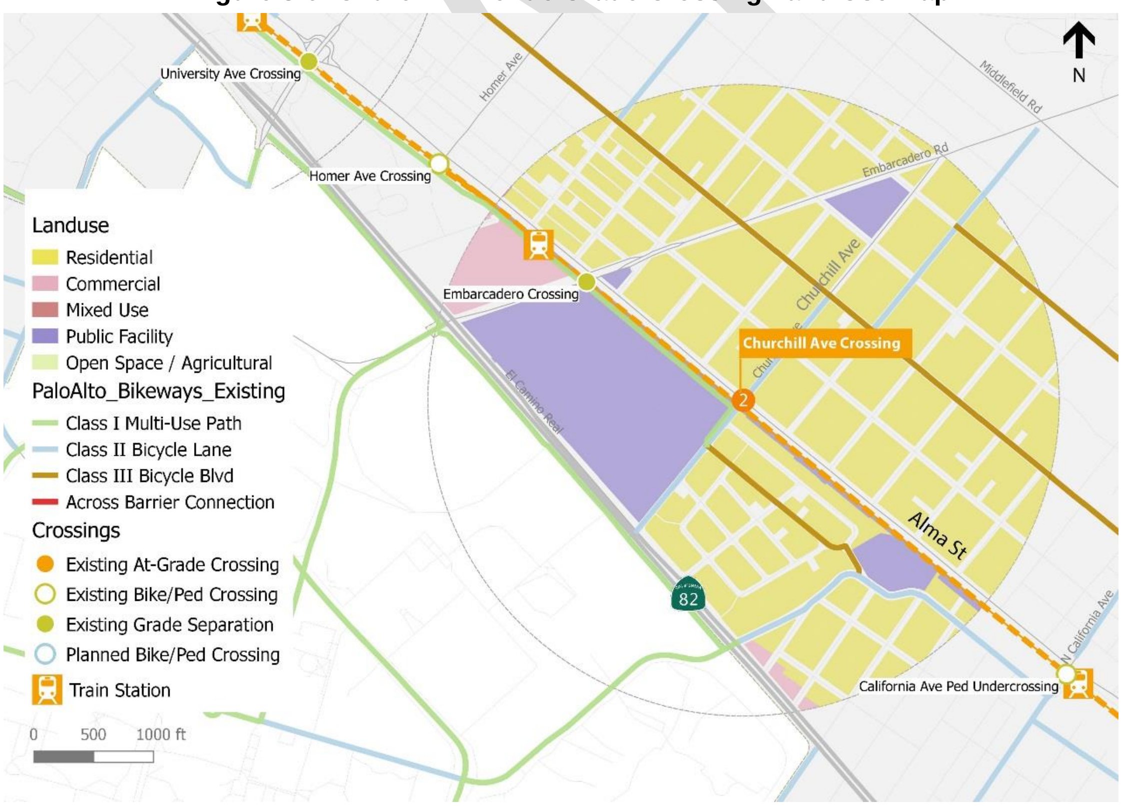
Direction	Pedestrians			Bicycles		
	Total Weekday	Peak Hour / Time		Total Weekday	Peak Hour / Time	
Eastbound	139	36	13:45 – 14:45	541	202	13:45 – 14:45
Westbound	131	36	07:45 – 08:45	481	265	07:30 – 08:30

Source: Caltrain Grade Hazard Analysis Final Report, Feb 2016

Land Use

As shown in Figure 3-6, land use around the Churchill Avenue crossing is mostly residential, except for the southwest corner which borders a stadium and school facilities owned by the Palo Alto Unified School District. Nearby land uses are primarily comprised of low-density residential communities and schools such as Palo Alto High School and the Castilleja School. The Stanford Caltrain Station, is a special station only utilized during Stanford University special events and football games. Access to these platforms is provided through the Embarcadero Road grade separation structure.

Figure 3-6: Churchill Avenue Grade Crossing Land Use Map



[4] Grade Crossing Hazard Analysis Final Report, Caltrain, 2016

3.3.3 Meadow Drive

Figure 3-7: Meadow Drive At-Grade Crossing

Source: Google Earth 2016

The Meadow Drive at-grade crossing is located approximately 1,200 feet north of the Charleston Road arterial at-grade crossing. Meadow Drive is an east-west local street/collector that provides local connection between El Camino Way and Louis Road, through the south-central part of the City. The roadway has a general two-lane cross-section, with Class II bike lanes and sidewalks. Within the vicinity/influence of the Meadow railroad crossing, Meadow Drive forms a signalized intersection with Alma Street, and unsignalized intersections (i.e. side-street stop-controlled) at Park Boulevard, Wilkie Way, and Ramona Street. The Meadow Drive/Alma Street intersection is an existing at-grade signalized intersection located within close proximity (less than 50 feet) from the railroad crossing, and as such represents the key intersection that influences at-grade railroad crossing operations. Currently, Meadow Drive carried an average weekday traffic of approximately 8,900 vehicles and 900 bicycles per day across the at-grade crossing of the railroad. Weekday pedestrian and bicycle volumes for this crossing are summarized in Table 3-4.

Table 3-4: Pedestrian and Bicycle Volumes at Meadow Drive Crossing

Direction	Pedestrians			Bicycles		
	Total Weekday	Peak Hour / Time		Total Weekday	Peak Hour / Time	
Eastbound	93	15	07:45 – 08:45	413	38	17:15 – 18:15
Westbound	88	14	07:45 – 08:45	483	274	07:45 – 08:45

Source: Caltrain Grade Hazard Analysis Final Report, Feb 2016

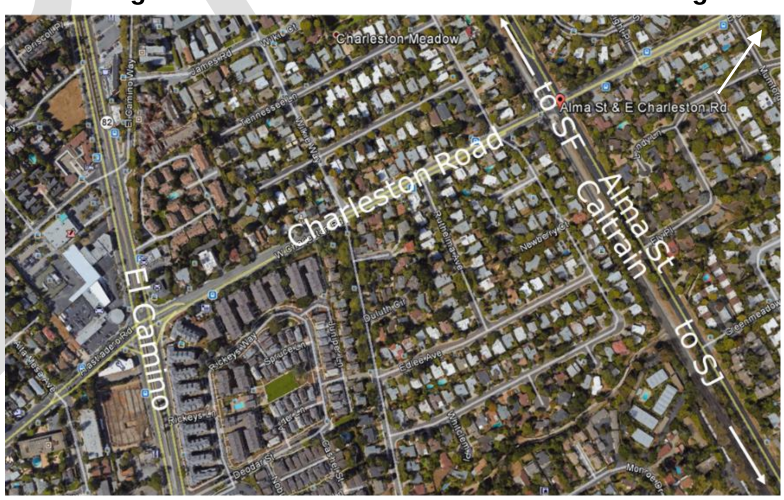
Land Use

The designated land uses around Meadow Drive Crossing are primarily residential with nearby schools and neighborhood-retail shops and public recreational facilities such as Mitchell Park Library and the Magical Bridge Playground within Mitchell Park near JLS Middle School (see Figure 3-8).

Figure 3-8: Meadow Drive Crossing Land Use Map

3.3.4 Charleston Road

Figure 3-9: Charleston Road At-Grade Crossing



Source: Google Earth 2016

Charleston Road is an east-west residential arterial facility through the City, that provides cross-town circulation between the El Camino Real (State Route 82) corridor to the west and the US 101/Rengstorff Avenue interchange to the east. The roadway has a general four-lane cross-section with left-turn channelization at key intersections. Through the crossing of the railroad, Charleston Road has a four-lane undivided section with Class II bike lanes and sidewalks on both sides. The crossing is provided with crossing/gate appurtenances and marked for 25 mph speed limit.

Within the vicinity/influence of the railroad crossing, Charleston Road forms a signalized intersection with Alma Street, and unsignalized intersections (i.e. side-street stop-controlled) at Park Boulevard, Wilkie Way and Wright Place. The Charleston Road/Alma Street intersection is an existing at-grade signalized intersection located within close proximity (less than 50 feet) from the railroad crossing, and as such represents the key intersection that influences at-grade railroad crossing operations. In 2013, Charleston Road carried an average weekday traffic of approximately 17,900 vehicles and 240 bicycles per day across the at-grade crossing of the railroad[5]. Weekday pedestrian and bicycle volumes for this crossing are summarized in Table 3-5.

Table 3-5: Pedestrian and Bicycle Volumes at Charleston Road Crossing

Direction	Pedestrians			Bicycles		
	Total Weekday	Peak Hour / Time		Total Weekday	Peak Hour / Time	
Eastbound	61	8	12:00 – 13:00	105	25	08:15 – 09:15
Westbound	79	11	12:00 – 13:00	139	48	07:45 – 08:45

Source: Caltrain Grade Hazard Analysis Final Report, Feb 2016

Land Use

The land uses surrounding the Charleston Road crossing are illustrated in Figure 3-10. The immediate surrounding area around Charleston Road crossing is predominantly residential, similar to the area surrounding the Meadow Drive railroad crossing. It should be noted that approximately half a mile north from the crossing is the Magical Bridge Playground, Mitchell Park, and the Mitchell Park Library, which could attract traffic from beyond the immediate surrounding.

Figure 3-10: Charleston Road Crossing Land Use Map

[5]Grade Crossing Hazard Analysis Final Report, Caltrain, 2016

3.4 Grade-Separated Crossings

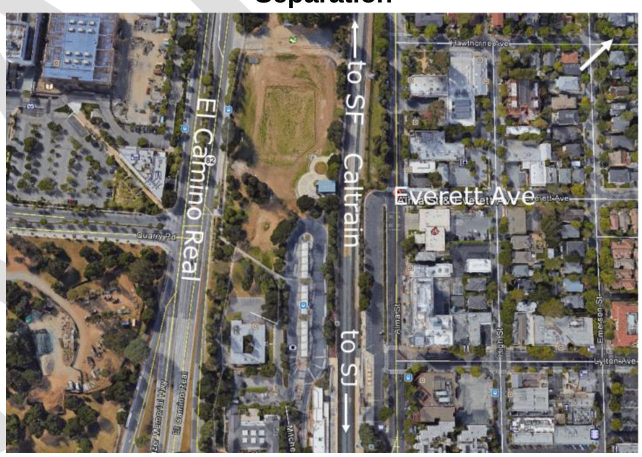
There are eight existing or planned grade-separated crossings along the rail corridor within the Study Area. This section describes the existing and future grade-separated crossings and serves to provide context on rail improvements in the corridor to illustrate what has been accomplished to date and what could be done in the future to improve safety and operability.

- Everett Avenue – Planned bicycle/pedestrian undercrossing
- University Avenue – Existing grade separation
- Homer Avenue – Existing bicycle/pedestrian undercrossing
- Embarcadero Road – Existing grade separation
- Seale Avenue – Planned bicycle/pedestrian crossing
- California Avenue – Existing bicycle/pedestrian undercrossing
- Oregon Expressway – Existing grade separation
- Loma Verde Avenue – Planned bicycle/pedestrian crossing
- San Antonio Road – Existing grade separation

3.4.1 Everett Avenue

The planned grade separation of Everett Avenue would connect Quarry Road (at the north end of the Stanford University campus) with the Bryant Street bicycle boulevard and the Palo Alto Caltrain Station. Everett Avenue is one of 15 priority crossings identified by the Palo Alto Rail Task Force. The Palo Alto 2012 BPTP identified opportunities to improve linkages to services and enhance the bicycle and pedestrian connections. The resulting improvements that were proposed include installing additional traffic circles and wayfinding improvements along Everett Avenue to designate it as a "complete" bicycle boulevard. Bicycle boulevards are signed, shared roadways with low vehicle volume which prioritize convenient and safe bicycle travel through the use of traffic calming strategies.

Figure 3-11: Everett Avenue Planned Grade Separation



Source: Google Earth 2016

Currently, the lack of a grade-separated crossing somewhat isolates the El Camino Park, shown in Figure 3-11 from the Downtown North neighborhoods in Palo Alto. The nearest railroad crossings are the Palo Alto Avenue grade crossing to the north and the University Avenue grade-separated crossing to the south. By implementing a grade-separated crossing at Everett Avenue, there could be opportunities to provide connections between the Park, the surrounding communities, Stanford University, the Stanford University Medical Center, and the Stanford Shopping Center.

Pedestrian and bicycle access will most likely be accomplished through a grade-separated underpass where vehicles would be prohibited. Coordination between the City, Caltrain, Peninsula Corridor Joint Powers Board, and other agencies would be required to implement this project.

3.4.2 University Avenue

The existing University Avenue grade-separated crossing allows for vehicular, pedestrian, and bicycle connections between the commercial corridor along University Avenue to the Stanford University campus southwest of the rail line. Sidewalks under the tunnel are grade separated from the street to offer more protection to pedestrians and bicycles are permitted in the underpass alongside vehicles. The underpass was constructed in 1936 in response to public safety concerns. The intersection itself, shown in Figure 3-12, is complex due to the convergence of the multi-modal Palo Alto station, El Camino Real, and the gateway to both the university and Downtown Palo Alto. This station is a critical connection for transit vehicles and is served by VTA, SamTrans, and Stanford University Marguerite shuttles.

Figure 3-12: University Avenue Grade Separation

Source: Google Earth 2016

The grade separation caters primarily to vehicular traffic, with four lanes and no Class II bicycle lanes, however there is adequate pedestrian access through the underpass and cyclists are permitted on University Avenue (Figure 3-13 and Figure 3-14). Currently, traffic volumes along University Avenue remain relatively manageable at 19,000 ADT. Opportunities exist to improve the underpass as “gateway” by enhancing wayfinding and placemaking strategies, as well as creating safer bicyclist and pedestrian passage through the underpass.

Figure 3-13: University Avenue Underpass, Looking West

Source: Google Earth 2016

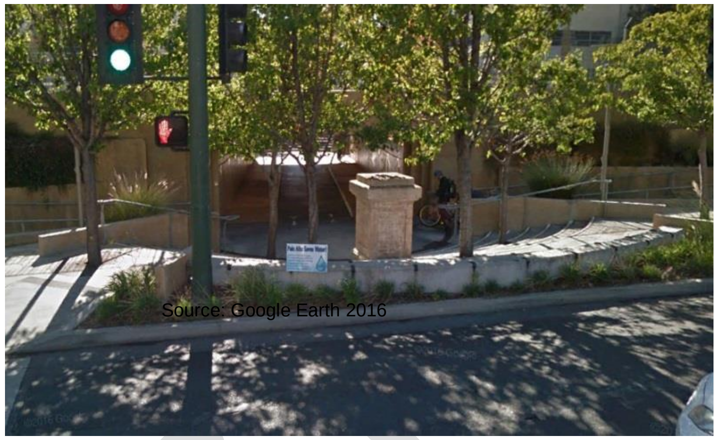
Figure 3-14: University Avenue Underpass, Looking East

Source: Google Earth 2016

3.4.3 Homer Avenue

Completed in 2005 for $4.1 million, the Homer Avenue underpass (Figure 3-15 and Figure 3-16) connects Homer Avenue residential communities to the Embarcadero bike path that runs parallel to the Caltrain tracks. The pedestrian and bicycle underpass is a high-quality and fully accessible crossing. The Palo Alto Medical Foundation is also located west of the crossing, and thus the tunnel was designed with ramp users in mind (shown in Figure 3-17). There are minor opportunities for improvement, including increasing visibility from the tunnel and enhancing the safety of Alma Street crossings.

Figure 3-15: Homer Avenue Tunnel, Looking East

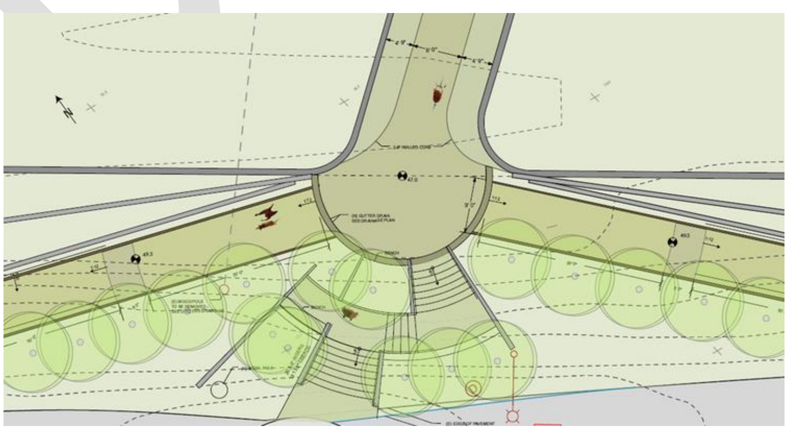


Source: Google Earth 2016

Figure 3-16: Homer Avenue and Alma Street Bike and Pedestrian Undercrossing

Source: Google Earth 2016

Figure 3-17: Homer Avenue Undercrossing Design



Source: Steven Grover & Associates

3.4.4 Embarcadero Road

Figure 3-18: Embarcadero Grade Separation

Source: Google Earth 2016

The Embarcadero Road grade-separated crossing (shown in Figure 3-18) allows for vehicular, pedestrian, and bicycle access. Its proximity to the Palo Alto High School, the Palo Alto School District, Stanford University, and neighborhood retail center, Town & Country Village, make it a popular route for pedestrian and bicycle traffic during peak hours. Currently, average daily traffic volumes can reach up to 25,000 vehicles per day. While commuters see the benefits of this safe railroad underpass, some pedestrian and vehicle conflicts in the Alma Street interchange remain. At this point, Alma Street transitions from a high-speed arterial to a neighborhood street.

3.4.5 Seale Avenue

Figure 3-19: Seale Ave Proposed Bike/Ped Crossing

Source: Google Earth 2016

The Seale Avenue grade-separated crossing was proposed by the BPTP 2012 to connect Peers Park with the northeastern neighborhoods and create a link between the east-west bikeways along Park Boulevard and Stanford Avenue across Caltrain. If established, the connection could trigger the implementation of Seale Avenue as a bicycle boulevard and further enhance safe access to the schools and parks along these routes.

3.4.6 California Avenue

The California Avenue grade-separated pedestrian/bicycle underpass allows for access under the railroad just northwest of the California Avenue Caltrain Station (Figure 3-20). The existing tunnel is not ADA accessible and the tunnel itself is dark and narrow. Widening the tunnel and improving the tunnel lighting may increase visibility and meet ADA standards while potentially mitigating the risk of bicycle-pedestrian conflicts.

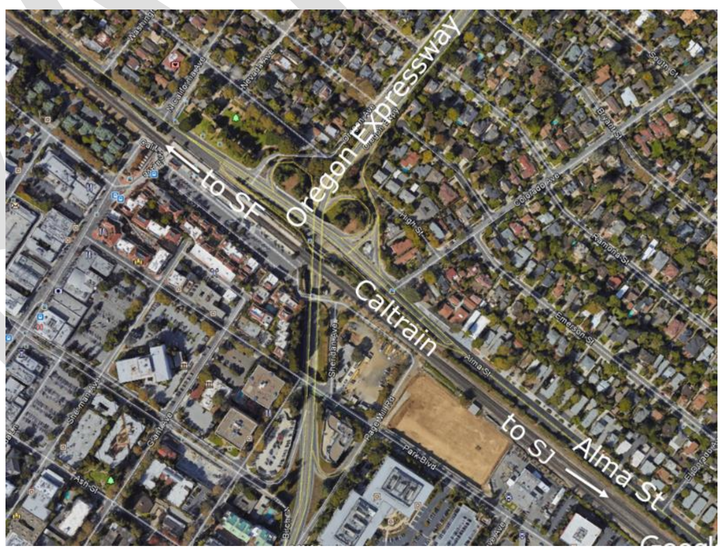
Figure 3-20: California Ave Bike/Ped Crossing

Source: Google Earth 2016

3.4.7 Oregon Expressway

The existing Oregon Expressway grade separation, shown in Figure 3-21, allows for vehicular and bicycle crossings under both the railroad and Alma Street. The Oregon Expressway is a high-volume arterial currently carrying an average daily traffic volume of 31,000 vehicles per day, and the Alma Street interchange poses some minor pedestrian and vehicular conflicts. In addition, this particular underpass has been prone to flooding during rainy seasons due to issues with the drainage system.

Figure 3-21: Oregon Expressway Grade Separation



Source: Google Earth 2016

Bicycles are permitted to travel through Oregon Expressway, but the fast-moving traffic along Oregon Expressway and the lack of Class II bicycle lanes within the 4-lane underpass may encourage bicyclists to seek an alternate route.

Figure 3-22: Oregon Expressway Underpass, Looking West

Source: Google Earth 2016

Figure 3-23: Oregon Expressway Underpass, Looking East

Source: Google Earth 2016

3.4.8 Loma Verde Avenue

The planned pedestrian and bicycle underpass at Loma Verde Avenue is in its early conceptual phase. It is predominantly surrounded by residential uses. The intersection at Alma Street is unsignalized and crosswalks are not marked. The nearest railroad crossing is Meadow Drive to the south and Oregon Expressway to the north.

Figure 3-24: Loma Verde Avenue

Source: Google Earth 2016

3.4.9 San Antonio Road

The San Antonio Road grade separation allows for vehicular travel over the railroad tracks. Most of the separation falls within the City of Mountain View; however, a portion of the San Antonio Road overpass falls within the City of Palo Alto, as shown in Figure 3-25. The San Antonio Caltrain Station lies less than 500 feet southeast of the crossing and is surrounded by a mix of commercial offices, educational facilities, and medium-density residential communities. Pedestrians and bicyclists are prohibited on the San Antonio Road overpass; however, they may access the opposite side of the railroad tracks via the San Antonio Caltrain Station. The current high volume of average daily traffic, approximately 36,000 vehicles per day, may be intimidating to pedestrians and bicyclists on the surrounding streets. Opportunities exist to improve connectivity at this grade separation by adding a new bicycle crossing, although special attention should be paid to conflicts between vehicles, pedestrians, and bicycles in the area.

Figure 3-25: San Antonio Road Grade Separation

Source: Google Earth 2016

4 Caltrain

4.1 Caltrain Operations

Figure 4-1: Caltrain System Map

Source: Caltrain Website 2017

Since 1992, the Peninsula Corridor Joint Powers Board (PCJPB) has provided commuter rail, Caltrain service along the San Francisco Peninsula, from San Francisco 4th and King to San Jose Diridon and Gilroy stations, as illustrated in Figure 4-1.

In 2016, Caltrain service carried 62,416 riders on an average weekday, which represented a 7.2 percent increase from 2015 ridership, an 83 percent increase since 2010, and a 161 percent increase compared to ridership in 2004. Most riders continue to travel during peak commute hours, with 9.6 percent increase from 29,143 riders in 2015 to 31,948 in 2016. Caltrain also saw a 3.8 percent growth in reverse peak riders, from 18,842 in 2015 to 19,564 in 2016. Since 2010, Caltrain has experienced significant ridership growth, as seen in Figure 4-2.

Caltrain currently operates 92 weekday trains, 36 Saturday trains, and 32 Sunday trains. Palo Alto has two Caltrain stations that operate seven days per week: the Palo Alto station is located at 95 University Avenue, and the California Avenue station is located at 101 California Avenue. Additionally, there is a station at 100 Embarcadero Road for Stanford University football games only.

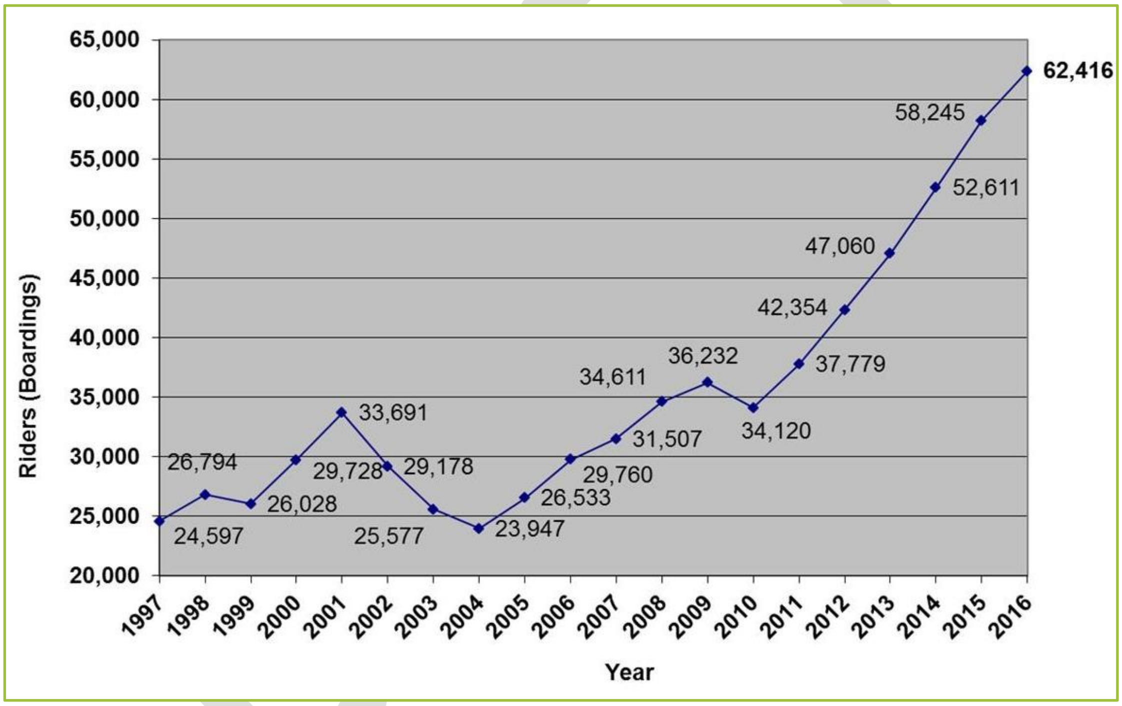
There are a total of 42 rail and highway at-grade crossings between Mission Bay Drive (San Francisco) on the north and Virginia Ave (San Jose) on the south. Caltrain operations are summarized below.

Table 4-1: Caltrain Operations

Trains Per Weekday	92 trains per weekday (46 trains in each direction)
Express Trains	22 express trains (11 trains in each direction)
Max Speed	79 mph
Termini	San Francisco and San Jose
Special Event Trains	Sporting events: Giants, Sharks, Stanford Football, etc.
Freight	Union Pacific Railroad: up to 6 trains per day during non-peak hours and evenings
Other Tenant Railroads	Altamont Commuter Express, Capital Corridor, and Amtrak West operate between Santa Clara and Tamien Stations

Source: Caltrain Website 2017

Figure 4-2: Change in Caltrain Average Weekday Ridership 1997-2016



Source: Caltrain Annual Ridership 1997-2016

4.1.1 Caltrain Stations

Within the City of Palo Alto, there are two Caltrain stations and one special event station. The Palo Alto Caltrain Station has the second highest average weekday ridership (AWR) within the Caltrain system, as shown Table 4-2. Between 2015 and 2016, ridership at the Palo Alto Caltrain Station increased by over three percent over the same period.

Table 4-2: Average Weekday Ridership for Major Caltrain Stations

Station	2015 AWR	% of Total AWR	2016 AWR	% of Total AWR	% Increase
San Francisco*	13,571	23.3%	14,769	23.7%	8.8%
Palo Alto*	7,197	12.4%	7,424	11.9%	3.2%
San Jose Diridon*	4,160	7.1%	4,712	7.5%	13.3%
Mountain View*	4,570	7.8%	4,659	7.5%	1.9%
Redwood City*	3,233	5.6%	3,814	6.1%	18.0%
Millbrae*	3,536	6.1%	3,606	5.8%	2.0%
Sunnyvale+	2,881	4.9%	3,190	5.1%	10.7%
Hillsdale+	2,706	4.6%	2,958	4.7%	9.3%
San Mateo+	2,061	3.5%	2,179	3.5%	5.7%
Menlo Park+	1,762	3.0%	1,796	2.9%	1.9%
Total	**45,677**	**78.4%**	**49,107**	**78.7%**	**7.5%**

Source: Caltrain Ridership Counts 2015-2016
*Baby Bullet station served by all express train service
+Served by some express trains

The Palo Alto Caltrain Station is served by 43 trains each weekday, with 11 of these being “baby bullet” trains with limited stop service through the corridor. The Caltrain schedule for trains stopping at the Palo Alto and California Ave Stations during in the northbound and southbound directions is included in Appendix B – Caltrain Weekday Train Schedule.

Palo Alto Caltrain Station

Figure 4-3: Palo Alto Caltrain Station

Source: Jeremiah Cox, 2014

The **Palo Alto Caltrain Station** provides 178 bike racks and indoor bicycle parking for up to 96 bikes at the Bikestation, which offers 24-hour key access, bike repairs, accessory sales, and a changing room. Paid parking is available for up to 389 vehicles. Service headways vary during the peak period with trains coming every 10-30 minutes, and Baby Bullet trains every 20-30 minutes; off-peak service is hourly. Transit connections from this station can be made to SamTrans (Lines ECR, 280, 281, 297, and 397), shuttles (Deer Creek, Stanford Marguerite, and Crosstown/ Embarcadero), and VTA (Routes 22, 35, 522, DB Express). The Palo Alto Station has the second highest Caltrain ridership, following San Francisco, accounting for 11.9 percent in 2016.

California Avenue Caltrain Station

The **California Ave Caltrain Station** provides 33 bike racks, paid parking for up to 185 vehicles, and 42 bike lockers, although some lockers were removed recently as part of the California Avenue Streetscape Improvements Project. There was an average of 1,628 weekday passenger boardings at California Avenue Caltrain Station in February 2016, which represents an increase of 4.8 percent over the previous year in the same period.[6] Passengers can connect to VTA bus route 89 at the station or walk ½-mile to El Camino Real to connect with VTA routes 22, 522, and the Dumbarton (DB) Express.

Figure 4-4: California Ave Caltrain Station

Source: Jeremiah Cox, 2014

Stanford Caltrain Station

The **Stanford Caltrain Station** is located at Embarcadero Road and Alma Street, in between Palo Alto Station and California Ave Station, and is utilized only during Stanford football game days. There are two side platforms with pedestrian ramps leading below to Embarcadero Road. The Stanford Stadium is located within a ½-mile walk from the station platform.

Figure 4-5: Stanford Caltrain Station

Source: Jeremiah Cox, 2014

4.2 Grade Crossing Inventory Checklist from Caltrain Hazard Analysis

Caltrain produces inventory summaries of all rail crossings along their corridor. Table 4-3 and Table 4-4 present summary sheets for the grade crossings within the Study Area.

[6] Caltrain 2016 Annual Passenger Counts

Table 4-3: At-Grade Crossing Intersection Inventory

Street Name	Palo Alto Ave	Churchill Ave	Meadow Dr	Charleston Road
Milepost	29.76	31.01	33.00	33.33
Emergency Notification Sign Installed	Yes	Yes	Yes	Yes
Railroad Operating Company	XTAS	XTAS	XTAS	XTAS
Total Trains Per Day	91	96	94	93
Passenger Trains Per Day	92	92	92	92
Gate Down (secs)	43 (25-75)	39 (30-78)	39 (20-74)	40 (22-76)
Total Switching Trains	2	0	0	0
Total Daylight Trains (6AM-6PM)	65	65	65	65
Passenger Max Speed	79	79	79	79
Freight Max Speed	50	50	50	50
Typical Train Speed Range Over Crossing	40-79 mph	40-79 mph	40-79 mph	40-79 mph
Number of Tracks	2	2	2	2
Train Detection	Constant Warning Time	Constant Warning Time	Constant Warning Time	Constant Warning Time
Roadway Classification	Urban Other Principal	Urban Collector	Urban Collector	Urban Minor Arterial
Number of Traffic Lanes	2	2	2	2
Posted Speed Limit	25 mph	25 mph	25 mph	25 mph
2017 ADT (veh/day)	16,200	9,200	8,900	17,900
Transit Crossing Per Day	33	7	11	45
School Bus Crossing Per Day	0	64	48	20
2017 Heavy Trucks Percentage	<1%	<1%	<1%	<1%
Other RR Operators Over Track at Crossing	Union Pacific	Union Pacific	Union Pacific	Union Pacific

Source: 2017 ADT data from February 2017, as provided by City of Palo Alto; All other data from the Grade Crossing Hazard Analysis Final Report, Caltrain, 2016

Table 4-4: At-Grade Crossing Intersection Inventory

Street Name	Palo Alto Ave		Churchill Ave		Meadow Dr		Charleston Road	
	#	Existing	#	Existing	#	Existing	#	Existing
Vehicle Gates	2	✓	2	✓	2	✓	2	✓
Pedestrian Guardrails	2	✓	4	✓	4	✓	4	✓
Sidewalk	-	✓	-	✓	-	✓	-	✓
RR Advance Warning Signs (W10-1)	4	✓	3	✓	3	✓	3	✓
24” Stopline Pavement Markings	2	✓	2	✓	2	✓	2	✓
R&R Pavement Markings	2	✓	6	✓	2	✓	9	✓
12” Pedestrian Delineation Line	-	✓	-	✓	-	✓	-	✓
Advanced Signal Preemption	None		Advanced Preemption		Advanced Preemption		Simultaneous Preemption	

Source: Grade Crossing Hazard Analysis Final Report, Caltrain, 2016

4.3 Caltrain Capital Projects

The information on the following Caltrain capital projects was primarily sourced from the February 2016 Caltrain Grade Crossing Hazards Analysis.

4.3.1 Signal Preemption Improvement Project

The Signal Preemption Improvement Project will upgrade the interface between the Caltrain grade crossing warning system and the traffic signal control system at five grade crossings in three cities and the County of Santa Clara. New traffic signal equipment and roadway improvements will be constructed at Brewster Avenue in Redwood City, and Rengstorff Avenue and Castro Street in Mountain View. Electrical upgrades and improvements to the pedestrian crossing system will be constructed at Churchill Avenue and East Meadow Drive in Palo Alto. At all locations, the preemption interface between the grade crossing warning system and traffic signal control system will be upgraded to a new 10-wire preemption circuit to provide improved preemption safety at the grade crossings. The upgraded systems will provide increased capability to clear vehicle traffic and exchange information between systems, in addition to improving ADA access for pedestrians and normal traffic operation of the intersections.

4.3.2 CBOSS Positive Train Control System

Caltrain has developed specifications for an enhanced Positive Train Control (PTC) system, referred to as Communications Based Overlay Signal System (CBOSS), which incorporate the essential functions of positive train separation, over-speed enforcement, and roadway worker protection, plus other capabilities specifically designed to improve grade crossing performance. CBOSS is a vital overlay of the existing wayside signal system, providing a transition from Caltrain's Centralized Traffic Control (CTC) block signal system. In addition, CBOSS will allow Caltrain to reduce the peak minimum operating headway to five minutes, greatly increasing system capacity. CBOSS is specified to be compliant with the requirements of the Rail Safety Improvement Act of 2008 and all relevant regulations provided by 49 CFR 236. Furthermore, Caltrain is participating in discussions with the interchanging railroads to achieve a PTC system solution that is interoperable with freight operator systems.

Caltrain has been working to implement PTC on its corridor for several years to achieve the resulting safety and performance benefits. CBOSS will prevent over-speed-related derailments and collisions between trains under normal "signaled moves". When PTC enforcement cannot be sustained, CBOSS provides contingency operating modes that allow operations to be conducted with reduced risk by enabling the train engineer to revert to CTC operations through the temporary use of the wayside signals. CBOSS also provides a "Restricted Manual" operating mode to enhance safety when the wayside signal system is unable to display permissive signals. While in Restricted Manual mode, CBOSS enforces the Restricted Speed to ensure that collisions at elevated speed do not occur.

The CBOSS system will provide a crossing inhibit function, whereby a train which is making a station stop will not activate the grade crossing warning system, including advance preemption, as the train is approaching the station with an enforced stop short of the crossing. The CBOSS system will then provide an operator initiated start to the crossing and traffic signal preemption circuits prior to departing the station.

4.3.3 Peninsula Corridor Electrification Project (PCEP)

The Peninsula Corridor Electrification Project (PCEP) would electrify the Caltrain Corridor from San Francisco's 4th and King Station to the Tamien Station in San Jose, convert diesel-hauled to Electric Multiple Unit (EMU) trains, and increase service to up to six Caltrain trains per peak hour per direction by 2021. Initially, service between San Francisco and San Jose would include a mixed fleet of EMU's and diesel locomotives. Eventually diesel locomotives would be replaced with EMUs over time as they reach the end of their service life. Caltrain's diesel-powered locomotive service would continue to be used to provide service between the San Jose Diridon and Gilroy stations. The PCEP will allow Caltrain to operate quieter, cleaner, more frequent train service to more riders. Increased capacity and improved service will help Caltrain meet increasing ridership demand. Estimated ridership increases for 2020 and 2040 are shown in Table 4-5.

Table 4-5: Estimated Ridership with Proposed Caltrain Electrification Project

Estimated Ridership with the Proposed Project			
	2013	**2020**	**2040**
Existing/No Project	47,000	57,000	84,000
With Project	N/A	69,000	111,000

Source: Caltrain Ridership Technical Memorandum, 2014

4.3.4 PCEP Relation to the High-Speed Rail Project

The electrification system envisioned for the corridor would be configured in such a way that it would support the future operation of California HSR. Twenty-five-kV, 60-Hz single-phase AC electrification would be the power supply system of choice for a steel-wheel-on-steel-rail high-speed train operation. The Caltrain corridor is currently only rated for a maximum of 79 mph and, thus, there would be a need for track and other system upgrades to support higher speeds than at present. The Proposed PCEP includes electrification infrastructure that would first be used by Caltrain and could later be used for high-speed trains. However, the proposed project does not include other improvements necessary for high-speed trains such as platform improvements, high-speed rail maintenance facilities, passing tracks or other Core Capacity projects. The proposed project does not include improvements to support speeds greater than 79 mph or high-speed rail operations on the Caltrain corridor at speeds up to 110 mph. High-speed rail construction and operations would be the subject of a later, separate environmental analysis to be conducted by CHSRA and the Federal Railroad Administration (FRA).

5 Traffic Operational Analysis

This section describes the existing intersection and roadway traffic operating conditions at the at-grade roadway crossings of the railroad, within the limits of the City of Palo Alto.

5.1 Vehicular Level of Service Methodology and Standards

Level of service (LOS) is a qualitative description of vehicular traffic operating conditions ranging from LOS A, or free-flow conditions with little or no delay, to LOS F, or jammed conditions with excessive delays. The Santa Clara Valley Transportation Authority (VTA) Congestion Management Program (CMP) guidelines dictate the use of the 2000 Highway Capacity Manual (HCM) methodology to analyze intersections. The City of Palo Alto uses the same methodology to evaluate its intersections. The 2000 HCM operations method evaluates signalized intersection operations based on average control delay time for all vehicles at the intersection.

Consistent with operations analysis software used in prior planning studies prepared for the railroad corridor (such as the Peninsula Corridor Electrification Plan Environmental Impact Report, Transportation Chapter, 2015) this study utilized Synchro/SimTraffic 8 software based implementation of the more current 2010 HCM methods for purposes of quantifying traffic operating conditions at the study intersections. Note that the Synchro/SimTraffic software is a widely-recognized software (including by agencies such as Caltrans) that is relatively more reliable for purposes of assessing operational characteristics of closely spaced intersections, including signalized intersections located in close proximity to at-grade railroad crossings.

The City of Palo Alto LOS standard for signalized non-CMP intersections is LOS D or better. For CMP intersections, the City's LOS standard is LOS E or better, meaning that only LOS F is considered unacceptable. The exception is the intersection of Foothill Expressway and Page Mill Road, which has a grade of LOS F and is considered acceptable by VTA. This is because it has operated at LOS F in the 1991 baseline conditions and thus the City of Palo Alto has not adopted the CMP standards for that particular intersection.

The LOS definitions for signalized intersections are shown in Table 5-1. Motor vehicle level of service D and E are typical at intersections in many urban areas where a high volume of vehicles pass through an intersection that is physically constrained by existing adjacent structures.

Table 5-1: LOS Definition for Intersection Control Delay (sec/veh)

LOS	Description	Signal Control	2-Way Stop or All-Way Stop Control
A	Signal progression is extremely favorable. Most vehicles arrive during the green phase and do not stop at all. Short cycle length may also contribute to the very low vehicle delay.	10.0 or less	0 – 10
B	Operations characterized by good signal progression and/or short cycle lengths. More vehicles stop than LOS A, causing higher levels of average vehicle delay.	10.1 to 20.0	> 10 – 15
C	Higher delays may result from fair signal progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though may still pass through the intersection without stopping.	20.1 to 35.0	> 15 – 25

LOS	Description	Signal Control	2-Way Stop or All-Way Stop Control
D	The influence of congestion become more noticeable. Longer delays may result from the same combination of unfavorable signal progression, long cycle lengths, or high V/C ratios. Many vehicle stops and individual cycle failures are not noticeable.	35.1 to 55.0	> 25 – 35
E	This is considered the limit of acceptable delay. These high delay values generally indicate poor signal progression, long cycle lengths and high V/C ratios. Individual cycle failures occur frequently.	55.1 to 80.0	> 35 – 50
F	This level of delay is considered unacceptable by most drivers. This condition often occurs without oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes of such delay levels.	Greater than 80.0	> 50

Source: Transportation Research Board, 2000 and 2010

The LOS descriptions in Table 5-1 are framed entirely from the perspective of motor vehicle drivers and their passengers. VTA's Transportation Impact Analysis (TIA) Guidelines require the consideration of other modes of travel when recommending changes to improve an intersection's motor vehicle level of service. Senate Bill 743 created a process to change the way that transportation impacts are analyzed under CEQA and requires an alternative LOS for evaluating transportation impacts. This is described in further detail in Appendix A — Federal, State and Regional Policy and Framework Review.

5.2 Significant Impact Criteria

Significance criteria are used to establish what constitutes an impact at an intersection. The City of Palo Alto uses the same impact criteria as the CMP. A project is deemed to create a significant adverse impact on traffic conditions at a signalized intersection in the City of Palo Alto if for either peak hour:

a. the level of service at the intersection degrades from an acceptable level of service (LOS D or better for non-CMP intersections, and LOS E or better for CMP intersections) to an unacceptable level of service; and
b. the intersection is already operating at an unacceptable level of service (LOS E or F for non-CMP intersections and LOS F for CMP intersections), and the project causes both the average control delay for the critical movements at the intersection to increase by four or more seconds and the critical volume-to-capacity ratio (V/C) to increase by one percent (0.01) or more.

For both CMP and non-CMP intersections, if an intersection is operating at an unacceptable level of service and the change in critical delay is negative (i.e., decreases), a significant impact is said to occur if the project causes the V/C ratio to increase by 0.01 or more. This can occur if the critical movements at an intersection change.

5.3 Traffic Signal Warrant Analysis Criteria

A traffic signal warrant analysis was also completed per criteria contained in the California Manual on Uniform Traffic Control Devices (CA-MUTCD, 2014 Edition, Chapter 4C). The peak-hour volume Warrant 3 (urban areas) analysis was completed as a representative warrant analysis to determine if "significance" should be associated with unsignalized operations. Other signal warrant criteria, including Warrant 9: Intersection Near a Grade Crossing, will also be evaluated for key study intersections where applicable. Note that the CA-MUTCD indicates that "the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal."

5.4 Traffic Count Data

Intersection turning movement and vehicular traffic volume counts were collected by the City on Thursday, February 16, 2017, under AM peak hour, mid-day peak hour, and PM peak hour conditions, at key study intersections along each of the at-grade crossing corridors. For the purposes of this study, AM peak hour is defined as one hour of peak traffic flow between 7:30 and 9:30 AM on a typical weekday, mid-day peak hour is defined as one hour of peak traffic flow between 2:30 and 4:30 PM on a typical weekday, and PM peak hour is defined as one hour of peak traffic flow between 4:30 and 6:30 PM on a typical weekday.

The intersection traffic counts were obtained at a total of thirteen (13) study intersections listed as follows:

1. Charleston Road / Alma Street
2. Charleston Road / Park Blvd.
3. Charleston Road / Wilkie Way
4. Charleston Road / Wright Place
5. Meadow Drive / Alma Street
6. Meadow Drive / Park Blvd.
7. Meadow Drive / Wilkie Way
8. Meadow Drive / Ramona St.
9. Churchill Avenue / Alma Street
10. Churchill Avenue / Mariposa Ave.
11. Churchill Avenue / Madrono Ave.
12. Palo Alto Avenue / Alma Street
13. Palo Alto Avenue / El Camino Real

contains the raw traffic count data. For a graphical illustration of the existing traffic volumes at the study intersections, refer to **Error! Reference source not found.**.

5.4.1 Intersection Traffic Operations

The Existing Conditions delay and LOS operations for study intersections are summarized in Table 5-2. Note that this table summarizes traffic operating conditions under normal/typical operating conditions within the typical weekday AM, midday and PM peak hour periods at the study intersections when the railroad gates are "open", meaning there is no railroad-related interruption of vehicular traffic flow on the roadway crossings.

Table 5-2: Existing Conditions: Intersections Level of Service – Typical Operations

#	Study Intersection	Control Type	AM PEAK HOUR			MID-DAY PEAK HOUR			PM PEAK HOUR		
			Delay (sec/veh)	LOS	Signal Warrant Met?	Delay (sec/veh)	LOS	Signal Warrant Met?	Delay (sec/veh)	LOS	Signal Warrant Met?
101	Charleston Rd / Alma St	Signal	40.9	D	-	45.6	D	-	46.6	D	-
102	Charleston Rd / Park Blvd	TWSC	23.5	C	No	19.1	C	No	25.6	D	No
103	Charleston Rd / Wilkie Way	Signal	31.9	C	-	30.4	C	-	31.5	C	-
104	Charleston Rd / Wright Pl	TWSC	15.2	C	No	18.6	C	No	16.4	C	No
105	Meadow Dr / Alma St	Signal	34.2	C	-	33.5	C	-	33.0	C	-
106	Meadow Dr / Park Blvd	TWSC	10.2	B	No	11.0	B	No	10.5	B	No
107	Meadow Dr / Wilkie Way	AWSC	9.6	A	No	10.1	B	No	11.8	B	No
108	Meadow Dr / Ramona St	TWSC	12.4	B	No	13.1	B	No	17.5	C	No
109	Churchill Ave / Alma St	Signal	28.1	C	-	28.9	C	-	27.3	C	-
110	Churchill Ave / Mariposa Ave	TWSC	10.1	B	No	12.5	B	No	13.1	B	No
111	Churchill Ave / Madrono Ave	TWSC	12.0	B	No	13.4	B	No	11.9	B	No
112	Palo Alto Ave / Alma St	TWSC	15.7	C	No	15.8	C	No	19.4	C	No
113	Palo Alto Ave / El Camino Real / Sand Hill Ave	Signal	19.4	B	-	30.1	C	-	48.9	D	-

Notes:

AWSC = All-Way Stop Control, TWSC = Two-Way Stop Control

Operating conditions indicated in this table refer to typical (non railroad pre-empted) signal operations.

For TWSC intersections, worst-case movement/approach delay are reported. For signalized and AWSC intersections, average control delays for the whole intersection are reported. All reported delay and LOS values are computed values from Synchro 8 software.

Signal Warrant = California-MUTCD (November 2014) Chapter 4C 'Peak Hour Warrant 3' (Urban/Rural Areas)

Source: Mott MacDonald, 2017

Intersection Operations during Railroad-related Signal Pre-emption Cycles: Per the Caltrain schedule, currently up to six (6) trains (three northbound trains and three southbound) may traverse the railroad segment across the study at-grade crossings within the "one hour" of AM and PM peak of vehicular traffic demand. Each train arrival will trigger a railroad gate closing, which will impact at least one (1) full signal cycle and up to two (2) cycles at the adjacent Alma Street corridor signalized intersection, therefore up to twelve (12) signal cycles could be impacted in one hour. At a minimum of 100 seconds cycle length, there are approximately 36 signal cycles in a single hour. With up to approximately 12 out of the 36 signal cycles (33 percent of the cycles) impacted by railroad gate closures, the average peak "one hour" intersection delays at the Alma Street signalized study intersections (as reported in Table 5-2) in fact could be significantly higher (by 33 percent or more) should railroad gate closures be factored in the average peak hour delay estimates.

5.4.2 Roadway Traffic Counts and Traffic Operations

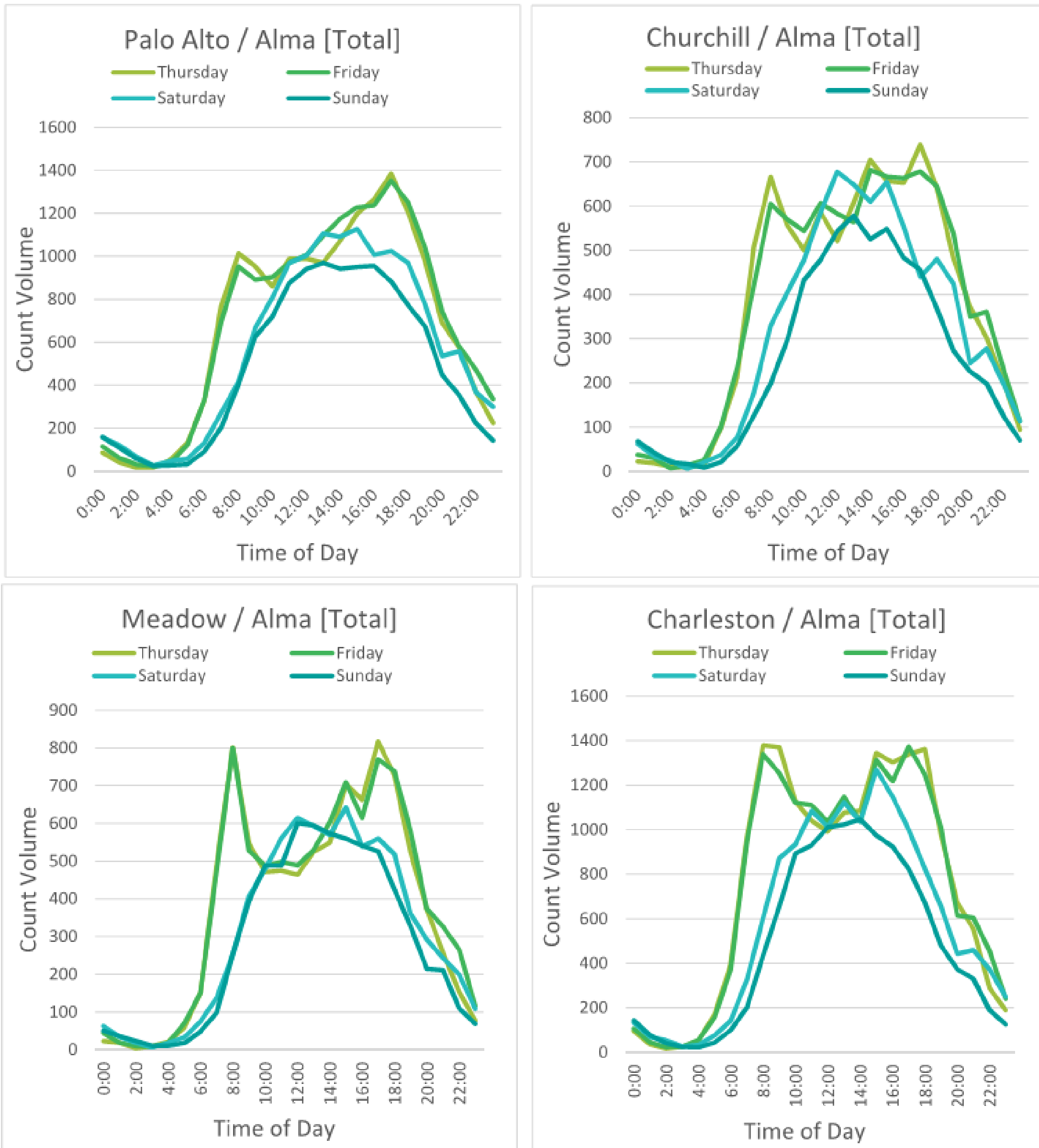
The City of Palo Alto provided roadway traffic counts collected from Thursday, February 23, 2017 through Sunday, February 26, 2017 for the following four at-grade roadway crossing segments:

- Charleston Road west of Alma Street
- Churchill Avenue west of Alma Street
- Meadow Drive west of Alma Street
- Palo Alto Avenue west of Alma Street

The count data included continuous 24-hour bi-directional counts recorded at 15-minute intervals. FHWA-definitions based axle-classified count data were also provided for Palo Alto Avenue, Churchill Avenue, and Meadow Drive segments.

The roadway crossing traffic count data (total of eastbound and westbound directions) is graphically illustrated by time-of-day from Thursday, February 23, 2017 through Sunday, February 26, 2017 and is shown in Figure 5-1.

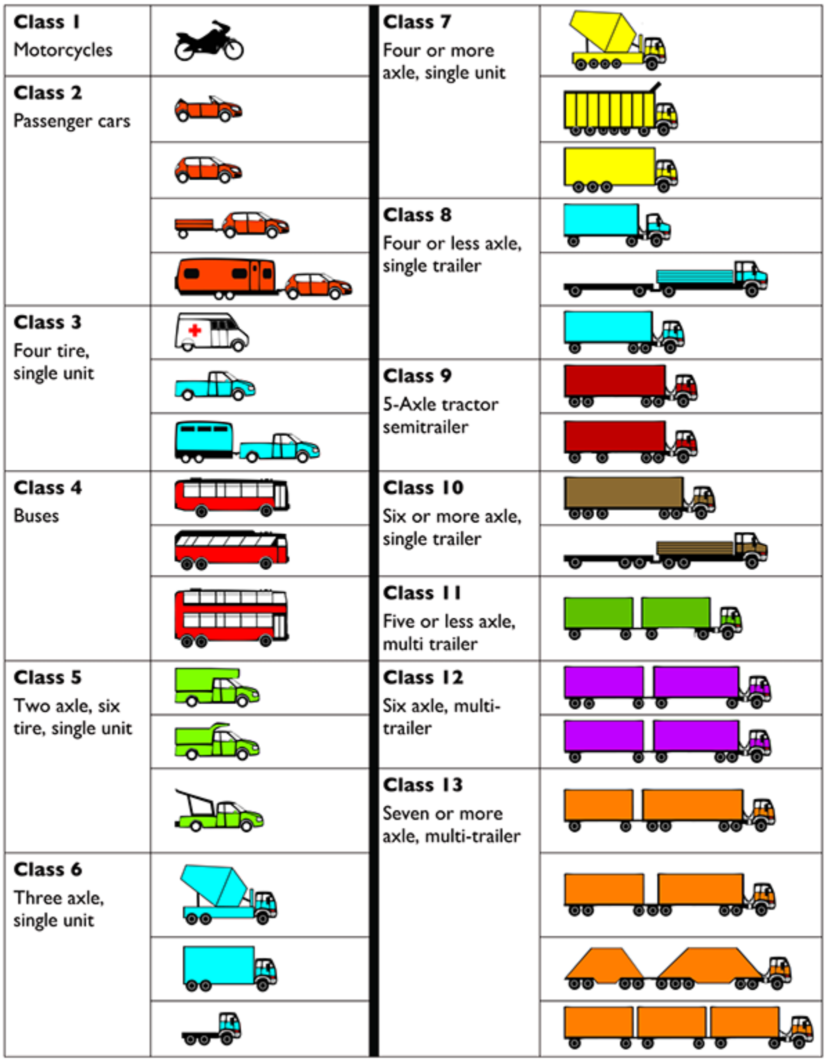
Figure 5-1: Vehicle Total Counts (Eastbound & Westbound)



Source: City of Palo Alto, 2017

The FHWA axle-classification definitions that were used in the traffic counts provided for this study are illustrated in Figure 5-2.

Figure 5-2: FHWA Vehicle Classifications



Source: Federal Highway Administration, DATE

For the purposes of this report, vehicle classes 5 through 7 are considered light trucks and vehicle classes 8 through 13 are considered heavy trucks in Table 5-3, Table 5-4, and Table 5-5, which depict average weekday and average weekend vehicle counts by type. Vehicle count data by type was not available for the Charleston Road segment west of Alma Street (Table 5-5). Meadow Drive showed the highest rate of truck traffic out of the three available data sets of vehicle type counts despite not having the highest vehicle volume out of the three intersections. Heavy trucks are not permitted on Churchill Avenue, which shows the lowest rate of truck volumes.

Table 5-3: Palo Alto Avenue Railroad Crossing Traffic Volumes

Palo Alto Avenue (west of Alma Street)	FHWA Axle-Class	Weekday ADT			Weekend ADT		
		EB	WB	Total	EB	WB	Total
Motorcycles	1	94	97	**191**	66	72	**138**
Passenger Cars	2	6,286	7,854	**14,140**	5,647	6,687	**12334**
Pick-up Trucks	3	736	964	**1,700**	507	532	**1039**
Buses	4	17	15	**32**	16	10	**26**
Light Trucks	5 thru 7	83	22	**105**	46	16	**62**
Heavy Trucks	8 thru 13	11	10	**21**	6	8	**14**
Total ADT		**7,227**	**8,962**	**16,189**	**6,288**	**7,325**	**13,613**
% Heavy Trucks		0.15%	0.11%	0.13%	0.10%	0.11%	0.10%

Notes:

ADT = Average Daily Traffic (estimated annual average) EB = Eastbound WB = Westbound

The weekday ADT reported herein are based on counts from Thursday, February 23, 2017

The weekend ADT reported herein are based on counts from Saturday, February 25, 2017

FHWA Axle-Class 3 includes Emergency Vans

Source: City of Palo Alto, 2017

Table 5-4: Churchill Avenue Railroad Crossing Traffic Volumes

Churchill Avenue (west of Alma Street)	FHWA Axle-Class	Weekday ADT			Weekend ADT		
		EB	WB	Total	EB	WB	Total
Motorcycles	1	43	46	**89**	34	19	**53**
Passenger Cars	2	3,574	4,743	**8,317**	3,188	3,895	**7,083**
Pick-up Trucks	3	273	404	**677**	192	200	**392**
Buses	4	18	26	**44**	10	2	**12**
Light Trucks	5 thru 7	29	16	**45**	12	5	**17**
Heavy Trucks	8 thru 13	9	7	**16**	4	2	**6**
Total ADT		**3,946**	**5,242**	**9,188**	**3,440**	**4,123**	**7,563**
% Heavy Trucks		0.23%	0.13%	0.17%	0.12%	0.05%	0.08%

Notes:

ADT = Average Daily Traffic (estimated annual average) EB = Eastbound WB = Westbound

The weekday ADT reported herein are based on counts from Thursday, February 23, 2017

The weekend ADT reported herein are based on counts from Saturday, February 25, 2017

FHWA Axle-Class 3 includes Emergency Vans

Source: City of Palo Alto, 2017

Table 5-5: Meadow Drive Railroad Crossing Traffic Volumes

Meadow Drive (west of Alma Street)	FHWA Axle-Class	Weekday ADT			Weekend ADT		
		EB	WB	Total	EB	WB	Total
Motorcycles	1	103	169	**272**	67	104	**171**
Passenger Cars	2	3,522	4,076	**7,598**	3,052	3,365	**6,417**
Pick-up Trucks	3	475	464	**939**	401	299	**700**
Buses	4	13	12	**25**	6	10	**16**
Light Trucks	5 thru 7	17	28	**45**	6	10	**16**
Heavy Trucks	8 thru 13	7	15	**22**	4	7	**11**
Total ADT		**4,137**	**4,764**	**8,901**	**3,536**	**3,795**	**7,331**
% Heavy Trucks		0.17%	0.31%	0.25%	0.11%	0.18%	0.15%

Notes:
ADT = Average Daily Traffic (estimated annual average) EB = Eastbound WB = Westbound
The weekday ADT reported herein are based on counts from Thursday, February 23, 2017
The weekend ADT reported herein are based on counts from Saturday, February 25, 2017
FHWA Axle-Class 3 includes Emergency Vans

Source: City of Palo Alto, 2017

Table 5-6: Charleston Road Railroad Crossing Traffic Volumes

Charleston Road (west of Alma Street)	FHWA Axle-Class	Weekday ADT			Weekend ADT		
		EB	WB	Total	EB	WB	Total
Total ADT		9,258	8,603	17,861	7,325	6,617	13,942

Notes:
ADT = Average Daily Traffic (estimated annual average) EB = Eastbound WB = Westbound
The weekday ADT reported herein are based on counts from Thursday, February 23, 2017
The weekend ADT reported herein are based on counts from Saturday, February 25, 2017
FHWA Axle-classification data was not available for this segment.

Source: City of Palo Alto, 2017

5.4.3 Roadway Intersection Collision Data

For study intersections along Alma Street, roadway collision data from the Statewide Integrated Traffic Records System (SWITRS) database was compiled and provided by the City of Palo Alto. The SWITRS is a statewide database maintained by the California Highway Patrol (CHP) that collects and processes accident data for use by local and state agencies throughout the state.[7] Table 5-7 summarizes the most recent collision reports from 2011 to 2015. While Palo Alto Avenue experiences relatively high traffic volume, it shows the least number of collisions out of the four intersections.

[7] California Highway Patrol, SWITRS

Table 5-7: Study Area Intersection Roadway Collision Data 2011-2015

	Alma St & Palo Alto Ave	Alma St & Churchill Ave	Alma St & Meadow Dr	Alma St & Charleston Rd
Total Collisions	**6**	**30**	**25**	**27**
Injury Collisions	**1**	**10**	**11**	**10**
Fatal Collisions	**0**	**0**	**0**	**1**

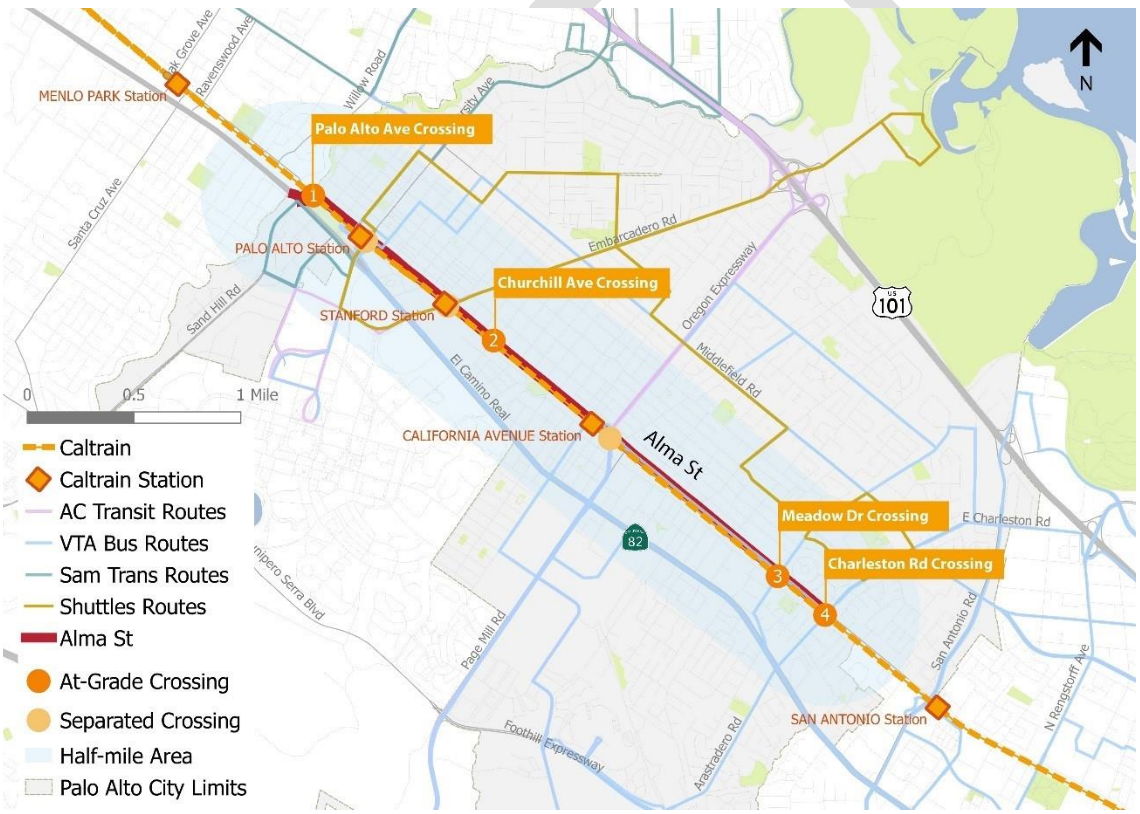
Source: SWITRS data provided by City of Palo Alto, 2017

6 Other Transit Services

6.1 Overview

In addition to Caltrain, Santa Clara Valley Transportation Authority (VTA), San Mateo County Transit District (SamTrans), and Alameda-Contra Costa Transit (AC Transit) all provide transit service to and from Palo Alto, as illustrated in Figure 6-1. Additionally, the City of Palo Alto operates a free, public shuttle service to points throughout the City, and Stanford University's Marguerite Shuttle provides free public bus service to destinations on the Stanford campus and at the Stanford Shopping Center. Details of the service provided by each transit operator are described below. Furthermore, the Palo Alto Transit Center, located on University Avenue between El Camino Real and Alma Street, is a regional transit hub, providing numerous connections to neighboring communities and the wider Bay Area.

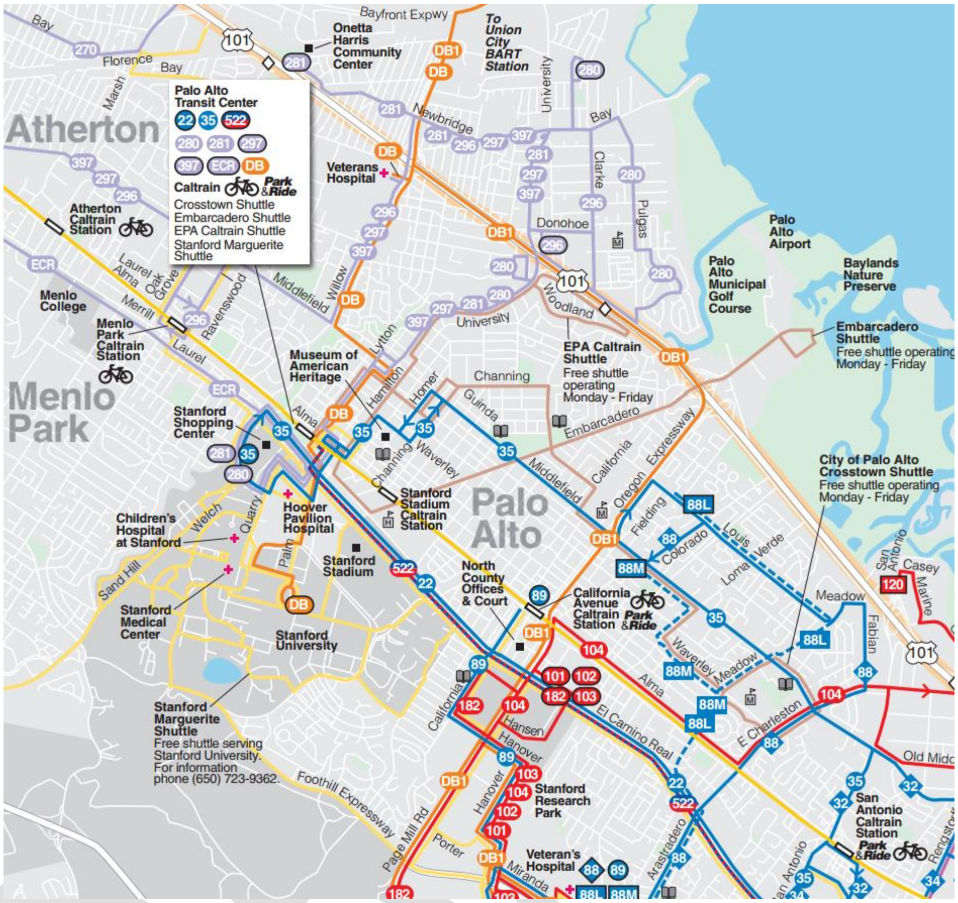
Figure 6-1: Exiting Transit Services Map



6.2 Santa Clara Valley Transportation Authority

The VTA provides bus service throughout the cities of Campbell, Cupertino, Fremont, Gilroy, Los Altos, Los Altos Hills, Milpitas, Morgan Hill, Mountain View, Palo Alto, San Jose, San Martin, Santa Clara, Saratoga, Sunnyvale, as well as Stanford. The VTA operates 14 bus routes in Palo Alto as listed below, providing connections to VTA light rail, Caltrain, Altamont Corridor Express (ACE), and AMTRAK Capitol Corridor. Times vary by weekday and weekend on each route; however, each route generally operates from the early morning hours to evening hours, with some routes operating overnight. A sample of the routes serving the City is illustrated in Figure 6-2.

Figure 6-2: VTA Bus Route Map - Palo Alto



Source: Santa Clara Valley Transportation Authority, 2017

- **Line 22** provides service between the Palo Alto Transit Center and the Eastridge Transit Center via El Camino Real
- **Line 32** provides service between the San Antonio Shopping Center and the Santa Clara Transit Center
- **Line 35** provides service between Downtown Mountain View and the Stanford Shopping Center
- **Line 88/L/M** provides varying service between the Palo Alto Veterans Hospital and Middlefield & Colorado
- **Line 89** currently provides service between the California Avenue Caltrain Station and the Palo Alto Veterans Hospital, but will be eliminated due to duplicated service
- **Line 101** provides express bus service between Camden & Highway 85 and Palo Alto
- **Line 102** provides express bus service between South San Jose and Palo Alto
- **Line 103** provides express bus service between the Eastridge Transit Center and Palo Alto
- **Line 104** provides express bus service between the Penitencia Creek Transit Center and Palo Alto
- **Line 182** provides express bus service between Palo Alto and IBM & Bailey Avenue

- **Line 522** provides limited stop bus service between the Palo Alto Transit Center and the Eastridge Transit Center
- **Line 824** provides service between the Great America ACE Station and Meadow Drive & Meadow Circle

6.3 SamTrans

SamTrans operates 73 bus routes throughout San Mateo, San Francisco, and Santa Clara counties, including parts of Palo Alto. SamTrans regularly provides more than 1,000 trips per day using a fleet of 296 fixed-route revenue vehicles, comprised of 55 articulated coaches, 237 standard coaches, and 4 mini coaches. Additionally, SamTrans operates a fleet of 83 paratransit vehicles, including buses, vans, and sedans. SamTrans Lines 280, 281, 297, 397 provide service to Palo Alto residents. A description of each route is provided below.

- **Line 280** provides eastbound and westbound service between the Stanford Shopping Center, Palo Alto Transit Center, Manhattan Avenue/O'Conner Street, Wisteria Drive/Camellia Drive, and Purdue Avenue/Fordham Street.
- **Line 281** provides eastbound and westbound service between Onetta Harris Community Center, Newbridge Street/Willow Road, Bay Road/University Avenue, University Avenue/Woodland Avenue, Palo Alto Transit Center, and Stanford Shopping Center.
- **Line 297** provides northbound and southbound service between Redwood Transit Center, Middlefield Road/5th Avenue, Bay Road/University Avenue, and the Palo Alto Transit Center.
- **Line 397** provides northbound and southbound service to and from San Francisco, including the San Francisco International Airport, as well as the Millbrae Transit Center, Burlingame, Redwood City Transit Center, and the Palo Alto Transit Center.
- Line ECR provides northbound and southbound service between the Daly City BART train station and the Palo Alto Transit Center along El Camino Real.

6.4 AC Transit

The Alameda-Contra Costa Transit District (AC Transit) provides weekday bus service on Line U between the Fremont Bay Area Rapid Transit (BART) train station and Stanford University. Six weekday trips are offered and Table 6-1 shows the times for only the major stops along the route.

Figure 6-3: AC Transit Line U

Source: AC Transit, 2017

Table 6-1: AC Transit - Line U Schedule

Stanford Oval	Stanford Shopping Center	Embarcadero Road & Wildwood Lane	Ardenwood Park & Ride	Fremont/ Centerville Amtrak	Fremont BART
245p	253p	304p	329p	342p	352p
345p	353p	404p	429p	442p	452p
415p	423p	434p	459p	512p	522p
445p	453p	504p	529p	542p	552p
515p	523p	534p	559p	612p	622p
555p	603p	614p	639p	652p	702p

Source: AC Transit, 2017

6.5 Shuttles

The City of Palo Alto, along with transit service providers such as VTA and Caltrain, and major community stakeholders such as Stanford University and others, offer a range of shuttle services within the City. All shuttles are wheelchair accessible, equipped with bicycle racks on the exterior of the vehicle, and can accommodate up to two conventional bicycles.

The Embarcadero Shuttle

Operated by the Caltrain Commuter Shuttle Program, the Embarcadero Shuttle provides peak hour service between the University Avenue Caltrain Station and the Baylands Business Parks east of Highway 101/Embarcadero. Local schools and community facilities are also served along the route including Palo Alto High School and Castilleja School. The Embarcadero Shuttle runs approximately every 20 minutes, Monday through Friday from the Palo Alto Caltrain Station to the Embarcadero/Baylands during peak commute hours and is coordinated with the Caltrain schedule.

The Crosstown Shuttle

Operated by MV Transportation, Inc. and managed by the City of Palo Alto, the Crosstown Shuttle connects the University Avenue/Downtown to South Palo Alto at Charleston Road. The Crosstown Shuttle traverses several residential neighborhoods, schools, senior residences, libraries, recreation centers, and commercial districts helping to link public service areas within the community. A Special School run operates during the morning and afternoons to help encourage alternative transportation options for students.

Marguerite Shuttle

Operated by Stanford University, the Marguerite Shuttle service is free and open to the public. The main shuttle lines traverse the campus Monday through Friday all year (except university holidays). Evening and weekend services are available from mid-September to mid-June with Lines N, O, OCA, and Shopping Express. The Marguerite service to the Caltrain stations are made possible, in part, by grants from the BAAQMD Transportation Fund for Clean Air and the PCJPB. Local businesses and organizations also contribute financially to the service.

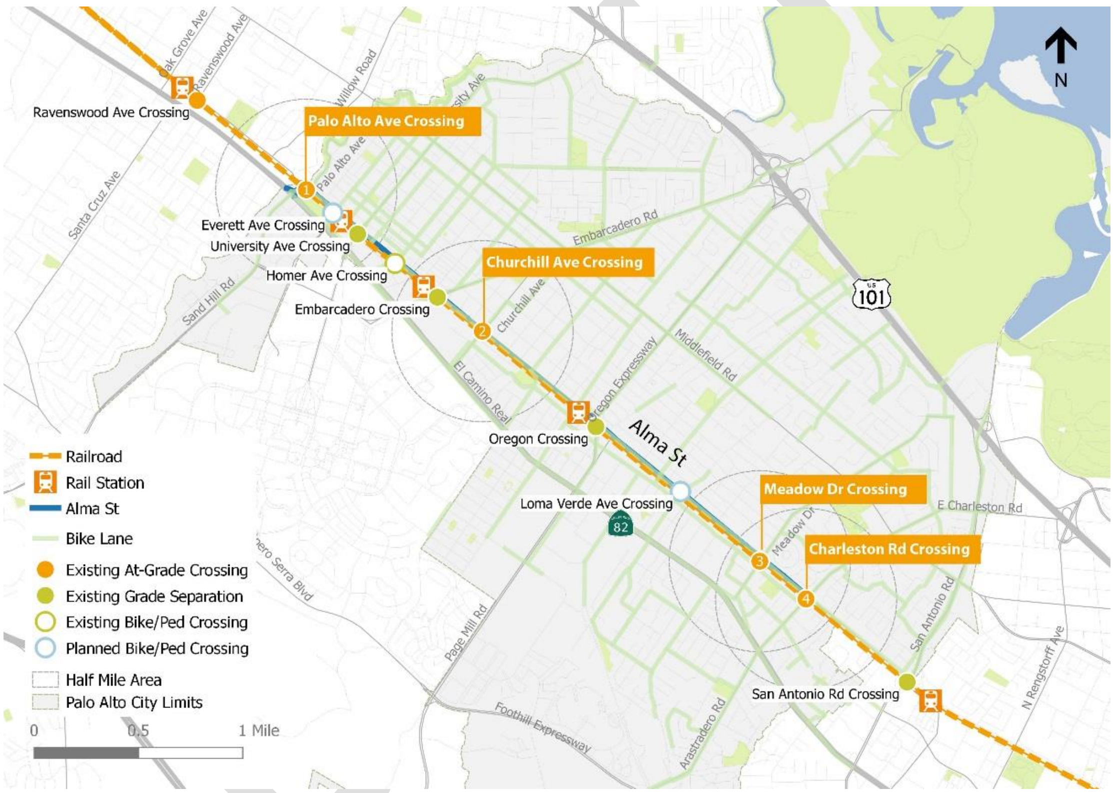
7 Bicycle and Pedestrian Network

7.1 Overview

In the 2000s, the City of Palo Alto released the 2003 Bicycle Transportation Plan, improvements through the Safe Routes to School program, and land use planning reforms, which all encouraged the creation of a bicycle and pedestrian friendly built environment. The existing Bicycle and Pedestrian network in the City is largely based on of the recommendations of the 2012 City of Palo Alto Bicycle + Pedestrian Transportation Plan.

The existing bicycle network in the Study Area is shown in Figure 7-1. All four at-grade crossings are currently connected to roadways with bike lanes.

Figure 7-1: Existing Bicycle Network within Study Area



7.2 2012 City of Palo Alto Bicycle + Pedestrian Transportation Plan

The 2012 City of Palo Alto Bicycle and Pedestrian Transportation Plan (BPTP) updates the initiatives outlined in the 2003 Bicycle Transportation Plan and provides strategic guidance to the public and private non-motorized transportation investment in facilities and related programs. The Palo Alto BPTP not only reaffirms city-wide goals of increasing pedestrian and bicycle usage over the next decade (see Table 7-1), it also takes into account relevant City plans, surrounding community plans, and state and regional bicycle and pedestrian plans to create a larger picture.

The Palo Alto BPTP includes five key objectives which are extensions of the transportation element of the City of Palo Alto Comprehensive Plan, to provide a focus on non-motorized transportation modes. Each objective includes its rationale, consistency with the Comprehensive Plan, key strategies of implementation and benchmarks to measure progress.

Table 7-1: City of Palo Alto Bicycle + Pedestrian Transportation Plan Objectives

Objectives
1. Double the rate of bicycling for both local and total work commutes by 2020 (to 15% and 5%, respectively).
2. Convert discretionary vehicle trips into walking and bicycling trips in order to reduce City transportation-related greenhouse gas (GHG) emissions 15% by 2020.
3. Develop a core network of shared paths, bikeways, and traffic-calmed streets that connects business and residential districts, schools, parks, and open spaces to promote healthy, active living.
4. Plan, construct, and maintain 'Complete Streets' that are safe and accessible to all modes and people of all ages and abilities.
5. Promote efficient, sustainable, and creative use of limited public resources through integrated design and planning.

Source: 2012 City of Palo Alto Bicycle + Pedestrian Transportation Plan

7.3 Safe Routes to Schools

The Safe Routes to Schools program is a collaborative effort between the City of Palo Alto and the Palo Alto Unified School District (PAUSD), with the goal to improve safety for school commuters and to reduce school commute-related congestion on city streets. Approximately 14 percent of Palo Alto's students walk to school daily, while 4,000 students from the PAUSD bike to school. The Safe Routes to Schools program produced a series of Walk and Roll maps that outline suggested bicycle and pedestrian paths around a one-mile radius around a school within PAUSD, as described in Section 2.1.5.

7.4 Bicycle Facilities

The Palo Alto Caltrain Station has had a Bikestation since 2007 which utilizes a former baggage building at the historical train depot. Bikestations offer 24-hour indoor, secure bike parking facilities. Some locations include restrooms, showers, and/or changing rooms and repair and rental services. The Palo Alto Bikestation provides bicycle parking for 96 bikes, recreational rentals, bike repairs, accessory sales, a changing room, and an outdoor seating area with concessions.

The Palo Alto Caltrain Station also has bikeshare, provided by Bay Area BikeShare. This is a shared use service for passengers who wish to travel short distances with a bike. Bicycles can be rented from this station and returned to another BikeShare dock within the area. This program will soon transition into Ford GoBike, which is set to launch June 2017. The San Antonio Caltrain Station is also a bikeshare station.

In addition, the three Caltrain stations in Palo Alto provide ample bicycle racks and locker spaces (detailed in Table 7-2: Bicycle Facilities) which can be rented and reserved in advance. The locker spaces at Palo Alto and California Ave Caltrain Stations are typically fully reserved.

Table 7-2: Bicycle Facilities

Palo Alto	California Ave	San Antonio
178 Bicycle Rack Spaces	33 Bicycle Rack Spaces	18 Bicycle Rack Spaces
94 Locker Spaces	42 Locker Spaces	38 Locker Spaces

Appendix A — Federal, State and Regional Policy and Framework Review

Federal

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) of 1990 provides comprehensive rights and protections to individuals with disabilities. The goal of the ADA is to assure equality of opportunity, full participation, independent living, and economic self-sufficiency for people with disabilities. To implement this goal, the US Access Board, an independent federal agency created in 1973 to ensure accessibility for people with disabilities, has created accessibility guidelines for public rights-of-way. While these guidelines have not been formally adopted, they have been widely followed by jurisdictions and agencies nationwide in the last decade. The guidelines, last revised in July 2011, address various issues, including roadway design practices, slope and terrain issues, and pedestrian access to streets, sidewalks, curb ramps, street furnishings, pedestrian signals, parking, and other components of public rights-of-way. These guidelines would apply to proposed roadways in Palo Alto.

Federal Highway Administration

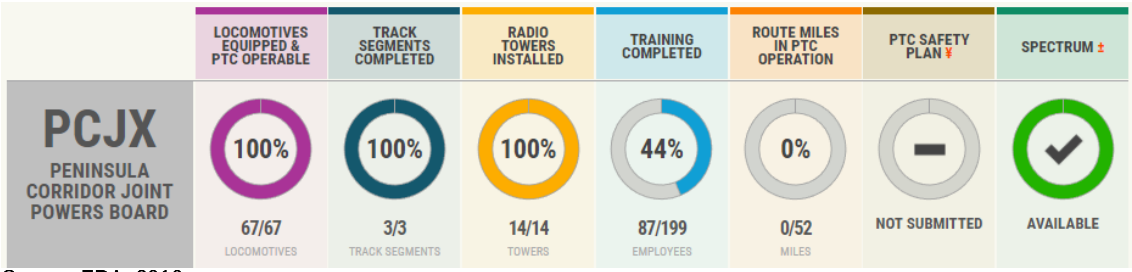
The Federal Highway Administration (FHWA) is the agency of the United States (US) Department of Transportation (DOT) responsible for the federally funded roadway system, including the interstate highway network and portions of the primary State highway network, such as Interstate 280 (I-280) and U.S Highway 101 (US 101).

Federal Railroad Administration

The Federal Railroad Administration (FRA) was created by the Department of Transportation Act of 1966. The FRA's mission is to enable the safe, reliable, and efficient movement of people and goods for a strong America, now and in the future. In 2008, Congress required Class I railroad main lines handling hazardous materials and railroad main lines with regularly scheduled intercity and commuter rail passenger service to fully implement Positive Train Control (PTC) by December 31, 2015. PTC uses communication-based/processor-based train control technology that provides a system capable of reliably and functionally preventing train-to-train collisions, overspeed derailments, incursions into established work zone limits, and the movement of a train through a main line switch in the wrong position. The deadline was extended to December 31, 2018, with the possibility for two additional years if certain requirements are met. The Peninsula Corridor Joint Powers Board (Caltrain) is slated to reaching full PTC implementation by the end of 2017.[8] The PTC implementation status as of December 2016 for PCJPB is shown in Figure 0-1.

[8] FRA.dot.gov; https://www.fra.dot.gov/Media/File/1109

Figure 0-1: PTC Implementation for Caltrain



Source: FRA, 2016

Union Pacific Railroad

The Union Pacific Railroad (UPRR) is a national freight hauling railroad and operates on the largest railroad network in the county and one of the largest transportation companies in the world. The UPRR does operate freight rail service through the Caltrain corridor, which is owned by the PCJPB, and there are UPRR properties along the right-of-way within the City of Palo Alto[9].

State

California Complete Streets Act of 2008 (AB 1358)

Originally passed in 2008, California's Complete Streets Act came into force in 2011 and requires local jurisdictions to plan for land use transportation policies that reflect a "complete streets" approach to mobility as a result of Assembly Bill 1358. The Complete Streets approach is essentially a suite of policies and street design guidelines which provide for the needs of all road users, including pedestrians, bicyclists, transit operators and riders, children, the elderly, and the disabled. From 2011 onward, any local jurisdiction—county or city—that undertakes a substantive update of the circulation element of its general plan must consider complete streets and incorporate corresponding policies and programs.

California Department of Transportation

The California Department of Transportation, or Caltrans, is the primary State agency responsible for transportation issues. One of its duties is the construction and maintenance of the state highway system. Caltrans approves the planning, design, and construction of improvements for all State-controlled facilities including I-280, US 101, and the associated interchanges for these facilities located in Palo Alto. Caltrans' jurisdiction includes State Route 82 (SR 82), El Camino Real, in Palo Alto. Caltrans has established standards for roadway traffic flow and developed procedures to determine if state-controlled facilities require improvements. For projects that may physically affect facilities under its administration, Caltrans requires encroachment permits before any construction work may be undertaken. For projects that would not physically affect facilities, but may influence traffic flow and levels of services at such facilities, Caltrans may recommend measures to mitigate the traffic impacts of such projects. The following Caltrans procedures and directives are relevant to the proposed Comprehensive Plan update, particularly State roadway facilities:

[9] Calhsr.com, Caltrain ROW Maps; http://calhsr.com/resources/caltrain-row-maps/

- **Level of Service Target.** Caltrans maintains a minimum level of service (LOS) at the transition between LOS C and LOS D for all of its facilities. Where an existing facility is operating at less than the LOS C/D threshold, the existing measure of effectiveness should be maintained.
- **Caltrans Project Development Procedures Manual.** This manual outlines pertinent statutory requirements, planning policies, and implementing procedures regarding transportation facilities. It is continually and incrementally updated to reflect changes in policy and procedures. For example, the most recent revision incorporates the Complete Streets policy from Deputy Directive 64-R1, which is detailed below.
- **Caltrans Deputy Directive 64.** This directive requires Caltrans to consider the needs of non-motorized travelers, including pedestrians, bicyclists, and persons with disabilities, in all programming, planning, maintenance, construction. This includes incorporation of the best available standards in all of Caltrans' practices.
- **Caltrans Deputy Directive 64-RI.** This directive requires Caltrans to provide for the needs of travelers of all ages and abilities in all planning, programming, design, construction, operations, and maintenance activities and products on the State highway system. Caltrans supports bicycle, pedestrian, and transit travel with a focus on "complete streets" that begins early in system planning and continues through project construction and maintenance and operations.
- **Caltrans Director's Policy 22.** This policy establishes support for balancing transportation needs with community goals.

Caltrans seeks to involve and integrate community goals in the planning, design, construction, and maintenance and operations processes, including accommodating the needs of bicyclists and pedestrians.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) serves the public interest by protecting consumers and ensuring the provision of safe, reliable utility service and infrastructure. The CPUC regulates utility services, stimulates innovation, and promotes competitive markets, where possible, in the communications, energy, transportation, and water industries. In addition, the CPUC administers funding programs for railroad crossings: Section 130, Section 190, and Maintenance Fund.

The Section 130 Grade Crossing Hazard Elimination Program provides federal funds to local agencies (cities and counties) and railroads to eliminate hazards at existing at-grade public highway-rail crossings.

The Section 190 Grade Separation Program provides state funds to local agencies to grade-separate at-grade crossings, or to improve grade-separated crossings. The program typically provides approximately $15 million distributed among three or four projects each fiscal year.[10] Eligible projects include the alteration or reconstruction of existing separations and the construction of new grade separations to eliminate existing grade crossings.

[10] CPUC, Railroad Crossing Funding Programs; http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=2722

The Railroad Crossing Automatic Warning Device Maintenance Fund provides funds to railroads to pay for the local government's share of the costs of maintaining automatic warning devices at railroad crossings.

California Transportation Commission

The California Transportation Commission (CTC) administers the public decision-making process that sets priorities and funds projects envisioned in long-range transportation plans. The CTC's programming includes the State Transportation Improvement Program (STIP), a multi-year capital improvement program of transportation projects on and off the State highway system, funded with revenues from the state highway account and other funding sources. The California Department of Transportation (Caltrans) manages the operation of state highways.

Senate Bill 743 (Steinberg, 2013)

Senate Bill 743 (SB 743) requires the California Governor's Office of Planning and Research (OPR) to amend the CEQA Guidelines to provide an alternative to LOS as the metric for evaluating transportation impacts under CEQA. Particularly within areas served by transit, the alternative criteria must promote the reduction of greenhouse gas (GHG) emissions, development of multimodal transportation networks, and diversity of land uses. Measurements of transportation impacts may include VMT, VMT per capita, automobile trip generation rates, or automobile trips generated. Once alternative criteria are incorporated into the CEQA Guidelines, auto delay will no longer be considered a significant impact under CEQA. SB 743 also amended State congestion management law to allow cities and counties to opt out of LOS standards in certain infill areas.

Regional and Local

Association of Bay Area Governments

The Association of Bay Area Governments (ABAG) is comprised of the Bay Area's local governments as a result of state legislation that would have supplanted local control over all bridges, ports, and transit operations in the Bay Area. ABAG provides planning and research resources related to land use, housing, environmental and water resource protection, disaster resilience, energy efficiency and hazardous waste mitigation, risk management, financial services and staff training to local cities, and towns. ABAG's planning and research programs are committed to addressing sustainability, resilience and equity in the region.

Metropolitan Transportation Commission

The Metropolitan Transportation Commission (MTC) is the transportation planning, coordinating, and financing agency for the nine-county Bay Area, including Santa Clara County. It also functions as the federally mandated metropolitan planning organization (MPO) for the region. It is responsible for regularly updating the Regional Transportation Plan (RTP), a comprehensive blueprint for the development of mass transit, highway, airport, seaport, railroad, bicycle, and pedestrian facilities. With the passage of Assembly Bill (AB) 32, the Global Warming Solutions Act of 2006, the State of California committed itself to reducing statewide GHG emissions to 1990 levels by 2020. Subsequent to adoption of AB 32, the State adopted Senate Bill 375 (SB 375) as the means for achieving regional transportation-related GHG targets. Among the requirements of SB 375 is the adoption of targets to be met by 2020 and 2035 for each MPO in the State, as well as the creation of a Sustainable Communities Strategy (SCS) that provides a plan for meeting regional targets. The SCS and the RTP must be consistent with one other, including action items and financing decisions. MPOs must use transportation and air emissions modeling techniques consistent with guidelines prepared by the State CTC.

The current RTP, Plan Bay Area: Strategy for a Sustainable Region, was adopted on July 18, 2013 and includes both the region's Sustainable Communities Strategy and the 2040 Regional Transportation Plan. Plan Bay Area was prepared by MTC in partnership with the Association of Bay Area Governments (ABAG) and cities and counties throughout the region. Plan Bay Area is an integrated long-range transportation and land-use/housing plan intended to support a growing economy, provide more housing and transportation choices, and reduce transportation-related pollution in the Bay Area. It also specifies a detailed set of investments and strategies to maintain, manage, and improve the region's transportation system, specifying how anticipated federal, State, and local transportation funds will be spent.

The MTC has established its policy on Complete Streets in the Bay Area. The policy states that projects funded all, or in part, with regional funds (e.g., federal, State Transportation Improvement Program, bridge tolls) must consider the accommodation of bicycle and pedestrian facilities, as described in Caltrans Deputy Directive 64. These recommendations do not replace locally adopted policies regarding transportation planning, design, and construction. Instead, these recommendations facilitate the accommodation of pedestrians, including wheelchair users, and bicyclists into all projects where bicycle and pedestrian travel is consistent with current adopted regional and local plans.

Bay Area Air Quality Management District

The air quality district that addresses air pollution in the Plan Area is the BAAQMD. Since a primary source of air pollution in the Palo Alto region is from motor vehicles, air district regulations affect transportation planning in the Plan Area. The BAAQMD is a public agency tasked with regulating air pollution in the nine-county Bay Area, including Santa Clara County. The BAAQMD's goals include reducing health disparities due to air pollution, achieving and maintaining air quality standards, and implementing exemplary regulatory programs and compliance of federal, State, and regional regulations.

California High-Speed Rail Authority

The California High Speed Rail Authority is responsible for the planning, designing, building and operation of the nation's first high-speed rail system. Their future corridor and planned service along Caltrain right-of-way makes them a key stakeholder in future corridor improvements.

Peninsula Corridor Joint Powers Board (Caltrain)

The Peninsula Corridor Joint Powers Board (PCJPB) is the governing body for the Caltrain commuter rail service that operates in the counties of San Francisco, San Mateo, and Santa Clara. The PCJPB was formed in 1987 to oversee the passenger rail service.

Santa Clara Valley Transportation Authority and the Congestion Management Plan

The MTC requires the local transportation authority, such as the Santa Clara Valley Transportation Authority (VTA), to establish transportation plans that can feed into the larger

RTP. In Santa Clara County, the VTA is the Congestion Management Agency (CMA) tasked with preparing the Congestion Management Plan (CMP) that describes the strategies to address congestion problems and monitoring compliance. The VTA works cooperatively with the MTC, transit agencies, local governments, the Caltrans and the BAAQMD. The CMP contains LOS standards for highways and arterials, multimodal performance standards, a capital improvement program, a program for analyzing land use decisions, and a travel demand management (TDM) program.

The minimum LOS standard for VTA-monitored CMP intersections is LOS E, except for facilities grandfathered in at LOS F, which states that intersections operating at LOS F at the baseline year for implementation of an LOS standard can be grandfathered in. The standards for Santa Clara County were established in October of 1991; thus, any intersection operating at LOS F prior to the established 1991 LOS standards are not held to the minimum standard of LOS E.3 Member Agencies, which include the cities and County of Santa Clara, must ensure that CMP roadways operate at or better than the minimum LOS standard. The VTA monitors the performance of CMP facilities at a minimum of every two years. If the minimum LOS standards are not met, Member Agencies plan for improvements to address the congestion. Palo Alto uses a minimum LOS standard of LOS D for its intersections not monitored as part of the VTA CPM program.

To manage the transportation system and monitor performance in relation to established LOS standards, the VTA has designated a CMP roadway system for Santa Clara County. The CMP roadway system contains 434.5 miles of roadways, of which: 267.4 miles (61 percent) are State highways, 58.7 miles (14 percent) are expressways, and 108.4 miles (25 percent) are city/county arterials.5 If adopted standards are not being maintained on a specific roadway in the designated system, actions must be taken to address problems on that facility or plans must be developed to improve the overall LOS of the system and improve air quality. The CMP roadway system is a subset of the broader Metropolitan Transportation System.

Santa Clara Valley Transportation Authority Bicycle Program

In 1998, the VTA implemented a comprehensive Bicycle Program to improve the bicycle infrastructure throughout the Santa Clara County, and to encourage people to utilize biking as a form of commute and recreation. The Bicycle Program provides facilities, services, and programs to make provide bikes a safer option for residents and visitors in Santa Clara County. Under the Bicycle Program, the VTA prepared a Countywide Bicycle Plan, and associated Bicycle Technical Guidelines.

Santa Clara County

Bicycle Plan

In 2008, VTA completed the Santa Clara Countywide Bicycle Plan (SCCBP), which provided a foundation for maintaining and enhancing the countywide bicycle network. The vision of the SCCBP is: To establish, protect and enhance bicycling as a viable transportation mode and to assure that bicycling is a practical and safe mode of travel, by itself and in combination with other modes.   The SCCBP identifies existing and proposed cross county bicycle corridors, some which pass through Palo Alto, such as the Dumbarton East-West Connector Corridor, which stretches from North Palo Alto to Los Altos, and the Matadero Creek/Page Mill Trail, which stretches from the southeast corner of the Foothill Expressway/Page Mill Road intersection along Page Mill Road to Arastradero Road. The SCCBP establishes several goals, and policies to achieve the vision through transportation planning and programming, land use and transportation integration, local ordinance and guidelines development, and design and construction. The VTA's Bicycle Expenditure Program (BEP) was created to provide a funding stream to implement the SCCBP.

Santa Clara County Bicycle Technical Guidelines

The VTA Bicycle Technical Guidelines (BTG) establish standards and guidance for planning, designing, operating, retrofitting and maintaining roadways and bikeways throughout Santa Clara County, including parts of Palo Alto. The BTGs are intended to improve the quality of bicycle facilities and to ensure countywide consistency in the design and construction of the countywide bicycle network, including roadways. The BTGs apply to projects that are a part of the countywide bicycle network. The BTGs are divided into the following four parts:

- Part 1 provides an introduction and general guidance, including purpose and policy guidance, as well as bicycle characteristics, such as bicyclist skill levels and facilities that best accommodate them.
- Part 2 includes the technical guidelines for roadways, including roadway design elements, construction zones and maintenance, intersections and interchanges, and signalized intersections.
- Part 3 establishes technical guidelines for on-road bikeways, including bikeways on major rural roads, and local roads.
- Part 4 includes technical guidelines for bike-only facilities, including bike paths, and bike bridges, as well as bike parking.

Appendix B – Caltrain Weekday Train Schedule

Appendix B - Caltrain Station Schedules

AM Southbound - WEEKDAY SERVICE to SAN JOSE / GILROY

5:28 ▸ 5:33 / 7:02 ▸ 7:18 Timed transfers for local service.
+ Train may leave up to 5 minutes early.
- Train bypasses station.

Train No.	102	104	206	208	310	212	314	216	218	320	222	324	226	228	330	232	134	236	138	142
San Francisco	4:55	5:25	6:05	6:15	6:35	6:45	6:59	7:05	7:15	7:35	7:45	7:59	8:05	8:15	8:35	8:45	9:00	9:45	10:00	11:00
22nd Street	4:59	5:29	6:09	6:19	6:39	6:51	7:03	7:10	7:19	7:39	7:51	8:03	8:10	8:19	8:39	8:49	9:05	–	10:04	11:04
Bayshore	5:04	5:34	–	6:24	–	–	–	–	7:24	–	–	–	–	8:24	–	–	9:10	–	10:09	11:09
So. San Francisco	5:10	5:40	–	6:31	–	–	–	–	7:31	–	–	–	–	8:31	–	–	9:17	–	10:16	11:16
San Bruno	5:14	5:44	–	6:35	–	–	–	7:20	7:35	–	–	–	8:20	8:35	–	–	9:21	9:57	10:20	11:20
Millbrae	5:18	5:48	6:22	6:39	6:52	7:04	7:16	–	7:39	7:52	8:04	8:16	–	8:39	8:52	9:02	9:25	10:01	10:25	11:25
Burlingame	5:22	5:53	6:26	6:44	–	–	–	7:27	7:44	–	–	–	8:27	8:44	–	–	9:29	10:06	10:29	11:29
San Mateo	5:25	5:57	6:30	6:48	–	7:11	–	7:31	7:48	–	8:11	–	8:31	8:48	–	9:09	9:32	10:10	10:32	11:32
Hayward Park	5:28	6:00	–	6:51	–	–	–	–	7:51	–	–	–	–	8:51	–	–	9:36	–	10:36	11:36
Hillsdale	5:32	6:03	6:34	6:54	–	–	7:24	7:35	7:54	–	–	8:24	8:35	8:54	–	9:13	9:39	10:14	10:39	11:39
Belmont	5:35	6:07	–	6:58	–	–	–	–	7:58	–	–	–	–	8:58	–	–	9:43	10:18	10:43	11:43
San Carlos	5:38	6:10	6:39	7:02	–	7:18	–	7:40	8:02	–	8:18	–	8:40	9:02	–	9:18	9:46	10:21	10:46	11:46
Redwood City	5:41	6:15	6:44	7:06	7:11	7:23	7:31	–	8:06	8:11	8:23	8:31	–	9:06	9:11	9:23	9:51	10:26	10:51	11:51
Menlo Park	5:47	6:20	6:50	–	7:17	7:29	–	7:48	–	8:17	8:29	–	8:48	–	9:17	9:29	9:56	10:31	10:56	11:56
Palo Alto	5:51	6:24	6:54	7:14	7:21	7:33	7:37	7:52	8:14	8:21	8:33	8:37	8:52	9:14	9:21	9:33	10:00	10:35	11:00	**12:00**
California Avenue	5:55	6:28	6:57	–	–	7:37	–	–	–	–	8:37	–	–	–	–	9:37	10:04	10:38	11:04	**12:04**
San Antonio	5:59	6:32	–	–	–	7:41	–	–	–	–	8:41	–	–	–	–	9:41	10:08	10:43	11:08	**12:08**
Mountain View	6:04	6:37	7:04	–	7:28	7:46	7:50	7:59	–	8:28	8:46	8:50	8:59	–	9:28	9:46	10:13	10:47	11:13	**12:13**
Sunnyvale	6:10	6:42	–	–	–	7:51	–	–	–	–	8:51	–	–	–	–	9:51	10:18	10:52	11:18	**12:18**
Lawrence	6:15	6:46	7:09	–	–	7:56	–	8:07	–	–	8:56	–	9:07	–	–	9:56	10:22	10:56	11:22	**12:22**
Santa Clara	6:22	6:51	–	7:27	–	8:03	–	–	8:27	–	9:03	–	–	9:27	–	10:03	10:27	11:02	11:28	**12:28**
College Park	–	–	–	–	–	8:06	–	–	–	–	–	–	–	–	–	–	–	–	–	–
San Jose Diridon	6:31	7:01	7:19	7:36	7:43	8:12	8:05	8:20	8:36	8:43	9:12	9:05	9:20	9:36	9:43	10:11	10:35	11:12	11:35	**12:35**
Tamien		7:06			7:48					8:48					9:48			11:17		
Capitol																				
Blossom Hill																				
Morgan Hill																				
San Martin																				
Gilroy																				

AM AM PM

PM Southbound - WEEKDAY SERVICE to SAN JOSE / GILROY

100 Local | 200 Limited | 300 Baby Bullet

Train No.	146	150	152	254	156	258	360	262	264	366	268	370	272	274	376	278	380	282	284	386	288	190	192	194	196	198
San Francisco	12:00	1:00	2:00	2:43	3:00	3:34	4:12	4:23	4:32	4:38	4:58	5:16	5:27	5:32	5:38	5:58	6:16	6:23	6:32	6:38	6:58	7:30	8:30	9:30	10:40	12:05
22nd Street	12:04	1:04	2:04	–	3:04	–	–	–	4:36	–	–	–	–	5:36	–	–	–	–	6:36	–	–	7:34	8:34	9:34	10:44	12:10
Bayshore	12:09	1:09	2:09	–	3:09	–	–	–	4:41	–	–	–	–	5:42	–	–	–	–	6:41	–	–	7:39	8:39	9:39	10:49	12:15
So. San Francisco	12:16	1:16	2:16	–	3:16	–	–	–	4:52	–	5:09	–	–	5:51	–	6:09	–	–	6:52	–	7:09	7:46	8:46	9:46	10:56	12:21
San Bruno	12:20	1:20	2:20	2:55	3:20	3:46	–	4:36	4:55	–	–	–	5:40	5:55	–	–	–	6:36	6:55	–	–	7:50	8:50	9:50	11:00	12:25
Millbrae	12:25	1:25	2:25	2:59	3:24	3:51	4:27	–	5:00	4:53	5:15	5:33	–	6:00	5:53	6:15	6:33	–	7:00	6:53	7:15	7:56	8:56	9:56	11:06	12:29
Burlingame	12:29	1:29	2:29	3:04	3:29	3:56	–	4:42	5:05	–	–	–	5:46	6:05	–	–	–	6:42	7:05	–	–	8:01	9:01	10:01	11:11	12:33
San Mateo	12:32	1:32	2:32	3:07	3:32	3:59	–	4:46	5:08	4:59	–	–	5:50	6:09	5:59	–	–	6:46	7:08	6:59	–	8:04	9:04	10:04	11:14	12:36
Hayward Park	12:36	1:36	2:36	–	3:36	–	–	–	5:12	–	–	–	–	6:12	–	–	–	–	7:12	–	–	8:08	9:08	10:08	11:18	12:40
Hillsdale	12:39	1:39	2:39	3:11	3:39	4:04	4:35	4:50	5:15	–	5:23	5:43	5:54	6:15	–	6:23	6:43	6:50	7:15	–	7:23	8:11	9:11	10:11	11:21	12:43
Belmont	12:43	1:43	2:43	3:15	3:43	4:08	–	–	5:19	–	–	–	–	6:19	–	–	–	–	7:19	–	–	8:15	9:15	10:15	11:25	12:47
San Carlos	12:46	1:46	2:46	3:18	3:46	4:11	–	4:56	5:22	–	–	–	6:00	6:22	–	–	–	6:56	7:22	–	–	8:18	9:18	10:18	11:28	12:50
Redwood City	12:51	1:51	2:51	3:23	3:51	4:16	–	–	5:28	5:08	5:33	–	–	6:28	6:08	6:33	–	–	7:28	7:08	7:33	8:23	9:23	10:23	11:33	12:55
Menlo Park	12:56	1:56	2:56	3:28	3:56	4:22	–	–	5:34	–	5:39	–	–	6:34	–	6:39	–	–	7:34	–	7:39	8:28	9:28	10:28	11:38	1:00
Palo Alto	1:00	2:00	3:00	3:32	4:00	4:26	4:46	5:04	–	5:15	5:43	5:55	6:08	–	6:15	6:43	6:55	7:04	–	7:15	7:43	8:32	9:32	10:32	11:42	1:04
California Avenue	1:04	2:04	3:04	3:36	4:04	4:29	–	5:08	–	5:18	5:46	–	6:12	–	6:18	6:46	–	7:08	–	–	7:46	8:35	9:35	10:35	11:45	1:07
San Antonio	1:08	2:08	3:08	3:40	4:08	4:34	–	–	–	–	5:50	–	–	–	–	6:50	–	–	–	–	7:50	8:39	9:39	10:39	11:49	1:11
Mountain View	1:13	2:13	3:13	3:45	4:13	4:38	4:55	5:15	5:42	–	5:55	6:02	6:19	6:42	–	6:55	7:02	7:15	7:43	–	7:55	8:44	9:44	10:44	11:54	1:16
Sunnyvale	1:18	2:18	3:18	3:50	4:18	4:44	–	5:20	5:47	5:29	6:00	–	6:24	6:47	6:29	7:00	–	7:20	7:48	7:28	8:00	8:49	9:49	10:49	11:59	1:21
Lawrence	1:22	2:22	3:22	3:54	4:23	4:48	–	–	–	–	6:05+	–	–	6:51	–	7:05+	–	–	–	–	8:05	8:53	9:53	10:53	12:03	1:25
Santa Clara	1:28	2:28	3:28	3:59	4:28	4:53	–	5:27	5:54	–	6:12+	–	6:31	6:57	–	7:12+	–	–	7:55	–	8:10	8:58	9:58	10:58	12:08	1:30
College Park	–	–	–	–	4:31	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
San Jose Diridon	1:35	2:35	3:35	4:09	4:39	5:03	5:11	5:34	6:02	5:44	6:23	6:17	6:38	7:06	6:44	7:23	7:18	7:33	8:04	7:43	8:21	9:06	10:06	11:06	12:16	1:38
Tamien				4:14	4:43	5:08				5:49	6:27			7:10	6:49	7:28				7:48	8:26		10:11	11:11		
Capitol					4:50						6:34			7:17												
Blossom Hill					4:56						6:40			7:23												
Morgan Hill					5:09						6:53			7:36												
San Martin					5:15						6:59			7:42												
Gilroy					5:28						7:12			7:55												

PM PM AM

FARES

Caltrain fares are based on the number of zones that are partially or wholly traveled through by the customer.

Ticket Type ▾	How to Buy	Travel within: 1 Zone	2 Zones	3 Zones	4 Zones	5 Zones	6 Zones
One-way Valid 4 hours from time of purchase	Ticket Machine	$3.75	$5.75	$7.75	$9.75	$11.75	$13.75
		$1.75	$2.75	$3.75	$4.75	$5.75	$6.75
	Clipper Card	$3.20	$5.20	$7.20	$9.20	$11.20	$13.20
		$1.60	$2.60	$3.60	$4.60	$5.60	$6.60
Day Pass Valid the date of purchase, unlimited travel within zones indicated	Ticket Machine	$7.50	$11.50	$15.50	$19.50	$23.50	$27.50
		$3.75	$5.75	$7.75	$9.75	$11.75	$13.75
Zone Upgrade	Ticket Machine			$2.00	$1.00		
		Valid 4 hours from time of purchase, one way when accompanying another valid ticket (not valid with 8-ride Ticket)					
8-ride Valid 30 days from date of purchase	Clipper Card	$23.70	$38.50	$53.30	$68.10	$82.90	$97.70
		$11.85	$19.25	$26.65	$34.05	$41.45	$48.85
Monthly Pass Valid month of purchase	Clipper Card	$84.80	$137.80	$190.80	$243.80	$296.80	$349.80
		$42.40	$68.90	$95.40	$121.90	$148.40	$174.90

Eligible Discount Fare:
Seniors (65 years or older) and passengers with disabilities, who present a Regional Transit Connection Discount Card or a current Disabled Person Placard Identification card issued by the CA Department of Motor Vehicles or a valid transit discount card issued by another California transit agency which is equivalent to the RTCDC, or those who are **Medicare cardholders** may ride for a discounted fare. The conductor or fare inspector may ask to see a valid ID to verify eligibility or identity. An attendant accompanying a person with a disability also is eligible for this discount when indicated on the RTCDC. Passengers **18 years old and younger** qualify for a discount fare. One child four years old or younger may ride free when accompanied by a fare-paying adult. Other children must travel with Eligible Discount tickets.

▾ Full description of ticket types is available in the Caltrain Information Guide or at www.caltrain.com/tickettypes

PROOF -of- PAYMENT SYSTEM

Caltrain is a **Proof-of-Payment** system. **Tickets must be purchased and/or tagged (Clipper) before boarding the train.** Tickets must be presented for inspection on request. Passengers who do not have a valid ticket are subject to citation and fine.

READING THE TIMETABLE

1. Locate the box for weekday or weekend trains and the direction you want to travel (northbound or southbound).
2. Find the station where you wish to board. Then read to the right for departure times and choose when you wish to ride.
3. From the departure time you have chosen, read down the column for the station where you wish to get off the train. The time shown is when you will arrive.

Example: The 5:25 a.m. train leaving San Francisco on weekdays arrives in San Carlos at 6:10 a.m.
Note: - (dash) means that the train bypasses the station.

HOLIDAY SERVICE

Caltrain operates the Sunday schedule on the following holidays and observed holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. A Modified-Saturday schedule will be operated on Presidents Day and Day after Thanksgiving. Details are posted online two weeks in advance.

REMINDERS

- Remain behind the yellow line on the main platform until the train comes to a complete stop.
- Smoking is not permitted on trains and station property.
- Bike riding on platforms and ramps is prohibited.
- Roller blades/skates may not be worn onboard trains or on station property.
- All strollers must be folded/stored on the luggage rack.
- Personal items may be placed under the seat. Please store luggage in the designated areas.
- Keep vestibule, aisles and stairs clear.
- Don't put feet on the seats.
- Open alcoholic containers aren't permitted on trains beginning at 9 p.m. on special event nights.
- Keep cell phone use to a minimum and speak quietly when in use.
- In case of onboard emergency, the conductor will provide necessary instructions. Please follow these instructions for safety reasons.

Caltrain – Regional Rail Link

Transit Police: 1.877.723.7245
Regional transit info: 511 or 510.817.1717 • www.511.org
Clipper Customer Service: 1.877.878.8883 • custserv@clippercard.com

Para traducción llama al 1.800.660.4287
如需翻譯,請電 1.800.660.4287

Connecting transit services

ACE: 1.800.411.7245
BART: 511
SamTrans: 1.800.660.4287
VTA: 408.321.2300 or 1.800.894.9908 (650 area code and South Santa Clara County)
Amtrak: 1.800.872.7245
Dumbarton Express: 511
Marguerite shuttle: 650.723.9362
SFMTA (Muni): 415.673.6864

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Caltrain

TIMETABLE

Effective April 10, 2017

Regional Rail Link

San Francisco ⟷ San Jose/Gilroy

www.caltrain.com
1.800.660.4287 • (TTY 650.508.6448)

AM Northbound - WEEKDAY SERVICE to SAN FRANCISCO

6:41 ▸ 6:54 / 4:24 ▸ 4:40 Timed transfers for local service.
+ Train may leave up to 5 minutes early.
- Train bypasses station.

Zone	Train No.	101	103	305	207	309	211	313	215	217
ZONE 6	Gilroy	AM								6:06
	San Martin									6:15
	Morgan Hill									6:21
ZONE 5	Blossom Hill									6:36
	Capitol									6:42
ZONE 4	Tamien		4:55		5:51	5:56				6:50
	San Jose Diridon	4:28	5:03	5:45	5:59	6:04	6:23	6:49	6:54	6:59
	College Park	–	–	–	–	–	–	–	–	–
	Santa Clara	4:33	5:08	–	6:06	–	6:28	–	–	7:06
	Lawrence	4:39	5:13	–	6:12	–	–	–	–	7:12
ZONE 3	Sunnyvale	4:43	5:18	–	6:20	6:14	6:36	–	7:06	7:20
	Mountain View	4:48	5:23	6:00	6:25	–	6:42	7:04	7:11	7:25
	San Antonio	4:52	5:27	–	6:29	–	–	–	–	7:29
	California Avenue	4:57	5:31	–	6:34	–	6:48	–	7:17	7:34
	Palo Alto	5:01	5:36	6:08	6:38	6:26	–	7:12	7:21	7:38
	Menlo Park	5:04	5:39	–	6:41	–	6:54	–	–	7:41
ZONE 2	Redwood City	5:10	5:44	–	6:47	6:32	6:59	–	–	7:47
	San Carlos	5:15	5:49	–	–	–	7:04	–	7:29	–
	Belmont	5:18	5:52	–	–	–	7:07	–	–	–
	Hillsdale	5:22	5:56	6:18	6:54	–	7:11	7:23	7:34	7:54
	Hayward Park	5:25	5:59	–	–	–	7:14	–	–	–
	San Mateo	5:28	6:03	–	–	6:43	7:18	–	7:38	–
	Burlingame	5:32	6:06	–	–	–	7:21	–	7:43	–
	Millbrae	5:36	6:11	6:26	7:03	6:51	7:26	7:31	–	8:03
ZONE 1	San Bruno	5:41	6:16	–	–	–	7:30	–	7:50	–
	So. San Francisco	5:45	6:20	–	7:09	–	7:34	–	–	8:09
	Bayshore	5:51	6:26	–	–	–	7:41+	–	–	–
	22nd Street	5:57	6:32	–	–	–	7:50+	–	–	–
	San Francisco	6:03	6:38	6:47	7:24	7:08	7:57	7:51	8:07	8:24

Train No.	319	221	323	225	227	329	231	233	135	237	139	143
Gilroy		6:28			7:06						AM	
San Martin		6:37			7:15							
Morgan Hill		6:43			7:21							
Blossom Hill		6:58			7:36							
Capitol		7:04			7:42							
Tamien	6:56	7:15			7:53	7:58		8:28		9:37		
San Jose Diridon	7:04	7:23	7:49	7:54	7:59	8:04	8:23	8:36	9:13	9:50	10:13	11:13
College Park	–	–	–	–	8:03	–	–	–	–	–	–	–
Santa Clara	–	7:28	–	–	8:08	–	8:28	8:41	9:18	9:55	10:18	11:18
Lawrence	–	7:33	–	–	8:14	–	–	8:47	9:24	10:00	10:24	11:24
Sunnyvale	7:14	7:38	–	8:06	8:21	8:14	8:36	8:52	9:28	10:05	10:28	11:28
Mountain View	–	7:44	8:04	8:11	8:27	–	8:42	8:57	9:33	10:10	10:33	11:33
San Antonio	–	–	–	–	8:31	–	–	9:01	9:37	10:14	10:37	11:37
California Avenue	–	7:49	–	8:17	8:35	–	–	9:06	9:41	10:18	10:42	11:41
Palo Alto	7:26	–	8:12	8:21	8:40	8:26	–	9:11	9:46	10:23	10:47	11:46
Menlo Park	–	7:54	–	–	8:43	–	8:51	9:14	9:49	10:26	10:50	11:49
Redwood City	7:32	8:00	–	–	8:49	8:32	8:57	9:20	9:55	10:31	10:55	11:55
San Carlos	–	8:05	–	8:29	–	–	9:02	9:24	9:59	10:36	10:59	11:59
Belmont	–	8:08	–	–	–	–	9:05	9:28	10:03	10:39	11:03	**12:03**
Hillsdale	–	8:12	8:23	8:34	8:57	–	9:09	9:31	10:06	10:43	11:06	**12:06**
Hayward Park	–	8:15	–	–	–	–	9:12	–	10:09	–	11:09	**12:09**
San Mateo	7:43	8:19	–	8:38	–	8:43	9:15	9:36	10:12	10:48	11:12	**12:12**
Burlingame	–	8:22	–	8:43	–	–	9:19	9:39	10:15	10:51	11:15	**12:15**
Millbrae	7:51	8:27	8:31	–	9:06	8:51	9:24	9:44	10:20	10:56	11:20	**12:20**
San Bruno	–	8:31	–	8:50	–	–	9:28	9:49	10:25	11:01	11:25	**12:25**
So. San Francisco	–	8:35	–	–	9:13	–	9:32	–	10:29	–	11:29	**12:29**
Bayshore	–	8:43+	–	–	–	–	9:39	–	10:35	–	11:35	**12:35**
22nd Street	–	8:51+	–	–	–	–	9:45	–	10:41	–	11:41	**12:41**
San Francisco	8:11	8:58	8:51	9:07	9:29	9:11	9:52	10:05	10:48	11:16	11:48	**12:48**

PM Northbound - WEEKDAY SERVICE to SAN FRANCISCO

* Train departure may be delayed up to 15 minutes after Sharks games.

100 Local | 200 Limited | 300 Baby Bullet

Zone	Train No.	147	151	155	257	159	261	263	365	267	269	371	273
ZONE 6	Gilroy	PM											
	San Martin												
	Morgan Hill												
ZONE 5	Blossom Hill												
	Capitol												
ZONE 4	Tamien				2:16		3:32				4:32		
	San Jose Diridon	12:13	1:13	2:13	2:24	3:13	3:40	4:12	4:24	4:35	4:40	4:45	5:08
	College Park	–	–	–	–	3:16	–	–	–	–	–	–	–
	Santa Clara	12:18	1:18	2:18	2:29	3:20	3:45	4:18	–	–	4:46	–	5:14
	Lawrence	12:24	1:24	2:24	2:34	3:25	3:50	–	–	4:44	4:54	–	–
ZONE 3	Sunnyvale	12:28	1:28	2:28	2:39	3:30	3:57	–	–	–	5:00	–	–
	Mountain View	12:33	1:33	2:33	2:44	3:35	4:02	–	4:36	4:51	5:05	4:57	–
	San Antonio	12:37	1:37	2:37	2:47	3:39	4:06	–	–	–	5:09	–	–
	California Avenue	12:41	1:41	2:41	2:52	3:43	4:11	–	–	–	5:14	–	–
	Palo Alto	12:46	1:46	2:46	2:56	3:47	4:15	4:33	4:44	4:59	5:20	5:05	5:29
	Menlo Park	12:49	1:49	2:49	2:59	3:51	4:19	–	4:47	5:02	5:23	–	–
ZONE 2	Redwood City	12:55	1:55	2:55	3:05	3:56	4:24	4:40	4:53	–	5:29	5:11	5:36
	San Carlos	12:59	1:59	2:59	3:09	4:01	4:29	4:44	–	5:10	5:33	–	5:40
	Belmont	1:03	2:03	3:03	3:13	4:04	–	4:47	–	–	–	–	5:43
	Hillsdale	1:06	2:06	3:06	3:16	4:08	–	4:51	–	5:14	–	5:18	5:47
	Hayward Park	1:09	2:09	3:09	–	4:11	–	4:54	–	–	–	–	5:50
	San Mateo	1:12	2:12	3:12	3:21	4:15	4:36	4:57	–	5:18	5:40	–	5:53
	Burlingame	1:15	2:15	3:15	3:24	4:18	–	5:01	–	5:22	–	–	5:57
	Millbrae	1:20	2:20	3:20	3:29	4:23	4:42	5:05	5:10	–	5:48	5:30	6:01
ZONE 1	San Bruno	1:25	2:25	3:25	3:33	4:28	–	5:10	–	5:29	–	–	6:06
	So. San Francisco	1:29	2:29	3:29	–	4:32	–	5:14	–	–	–	–	6:10
	Bayshore	1:35	2:35	3:35	–	4:38	–	5:21+	–	–	–	–	6:17+
	22nd Street	1:41	2:41	3:41	–	4:44	4:56	5:30+	5:25	5:40	6:00	5:45	6:26+
	San Francisco	1:48	2:48	3:48	3:50	4:50	5:02	5:36	5:31	5:47	6:06	5:51	6:33

Train No.	375	277	279	381	283	385	287	289	191	193	195	197	*199
Gilroy												PM	
San Martin													
Morgan Hill													
Blossom Hill													
Capitol													
Tamien			5:32					6:33			8:37	9:37	
San Jose Diridon	5:20	5:35	5:40	5:45	6:08	6:20	6:35	6:40	7:07	7:45	8:45	9:45	10:30
College Park	–	–	–	–	–	–	–	–	–	–	–	–	–
Santa Clara	–	–	5:46	–	6:14	–	–	–	7:12	7:50	8:50	9:50	10:35
Lawrence	–	5:44	5:54	–	–	–	6:44	6:48	7:18	7:55	8:55	9:55	10:40
Sunnyvale	–	–	6:00	–	–	–	6:48	–	7:22	8:00	9:00	10:00	10:45
Mountain View	5:32	5:51	6:05	5:57	–	6:32	6:53	6:56	7:27	8:05	9:05	10:05	10:50
San Antonio	–	–	6:09	–	–	–	–	–	7:31	8:08	9:08	10:08	10:54
California Avenue	–	–	6:14	–	–	–	–	7:02	7:35	8:13	9:13	10:13	10:59
Palo Alto	5:40	5:59	6:20	6:05	6:29	6:40	7:01	7:06	7:40	8:17	9:17	10:17	11:04
Menlo Park	5:43	6:02	6:23	–	–	6:43	7:04	7:09	7:43	8:20	9:20	10:20	11:07
Redwood City	5:49	–	6:29	6:11	6:36	6:49	–	7:15	7:49	8:27	9:27	10:27	11:13
San Carlos	–	6:10	6:33	–	6:40	–	7:12	7:19	7:53	8:31	9:31	10:31	11:17
Belmont	–	–	–	–	6:43	–	–	–	7:57	8:35	9:35	10:35	11:21
Hillsdale	–	6:14	–	6:18	6:47	–	7:16	7:24	8:00	8:38	9:38	10:38	11:24
Hayward Park	–	–	–	–	6:50	–	–	–	8:03	8:41	9:41	10:41	11:27
San Mateo	–	6:18	6:40	–	6:53	–	7:20	7:28	8:07	8:44	9:44	10:44	11:30
Burlingame	–	6:22	–	–	6:57	–	7:24	7:32	8:10	8:48	9:48	10:48	11:34
Millbrae	6:06	–	6:48	6:30	7:01	7:06	–	7:36	8:15	8:52	9:52	10:52	11:38
San Bruno	–	6:29	–	–	7:06	–	7:31	–	8:20	8:57	9:57	10:57	11:42
So. San Francisco	–	–	–	–	7:10	–	–	–	8:24	9:01	10:01	11:01	11:46
Bayshore	–	–	–	–	7:17+	–	–	–	8:30	9:07	10:07	11:07	11:52
22nd Street	6:21	6:40	7:00	6:45	7:26+	7:21	7:42	7:50	8:36	9:13	10:13	11:13	11:58
San Francisco	6:27	6:47	7:06	6:51	7:33	7:27	7:49	7:57	8:42	9:20	10:20	11:20	12:05

Northbound - WEEKEND SERVICE to SAN FRANCISCO

On weekends, a shuttle bus connects the Tamien and Diridon stations. Caltrain fare policies apply.
Timetable subject to change without notice. * Train departure may be delayed up to 15 minutes after Sharks games.

400 Local | 800 Baby Bullet

Zone	Train No.	421 (SAT ONLY)	423	425	427	801	429	431	433
	Shuttle Bus							AM	PM
	Departs Tamien	–	7:33	8:33	9:33	10:10	10:33	11:33	12:33
	Arrives SJ Diridon	–	7:45	8:45	9:45	10:22	10:45	11:45	12:45
ZONE 4	San Jose Diridon	7:00	8:00	9:00	10:00	10:35	11:00	12:00	1:00
	Santa Clara	7:05	8:05	9:05	10:05	–	11:05	12:05	1:05
	Lawrence	7:10	8:10	9:10	10:10	–	11:10	12:10	1:10
ZONE 3	Sunnyvale	7:14	8:14	9:14	10:14	10:45	11:14	12:14	1:14
	Mountain View	7:19	8:19	9:19	10:19	10:50	11:19	12:19	1:19
	San Antonio	7:23	8:23	9:23	10:23	–	11:23	12:23	1:23
	California Ave	7:27	8:27	9:27	10:27	–	11:27	12:27	1:27
	Palo Alto	7:31	8:31	9:31	10:31	10:58	11:31	12:31	1:31
	Menlo Park	7:34	8:34	9:34	10:34	–	11:34	12:34	1:34
	Atherton	7:37	8:37	9:37	10:37	–	11:37	12:37	1:37
ZONE 2	Redwood City	7:41	8:41	9:41	10:41	11:04	11:41	12:41	1:41
	San Carlos	7:45	8:45	9:45	10:45	–	11:45	12:45	1:45
	Belmont	7:48	8:48	9:48	10:48	–	11:48	12:48	1:48
	Hillsdale	7:51	8:51	9:51	10:51	11:10	11:51	12:51	1:51
	Hayward Park	7:54	8:54	9:54	10:54	–	11:54	12:54	1:54
	San Mateo	7:57	8:57	9:57	10:57	11:14	11:57	12:57	1:57
	Burlingame	8:02	9:02	10:02	11:02	–	12:02	1:02	2:02
	Broadway	8:05	9:05	10:05	11:05	–	12:05	1:05	2:05
	Millbrae	8:10	9:10	10:10	11:10	11:23	12:10	1:10	2:10
ZONE 1	San Bruno	8:14	9:14	10:14	11:14	–	12:14	1:14	2:14
	So. San Francisco	8:19	9:19	10:19	11:19	–	12:19	1:19	2:19
	Bayshore	8:25	9:25	10:25	11:25	–	12:25	1:25	2:25
	22nd Street	8:30	9:30	10:30	11:30	–	12:30	1:30	2:30
	San Francisco	8:38	9:38	10:38	11:38	11:41	12:38	1:38	2:38

Train No.	435	437	439	441	803	443	445	447	449	*451 (SAT ONLY)
Shuttle Bus										
Departs Tamien	1:33	2:33	3:33	4:33	5:10	5:33	6:33	7:33	8:33	–
Arrives SJ Diridon	1:45	2:45	3:45	4:45	5:22	5:45	6:45	7:45	8:45	–
San Jose Diridon	2:00	3:00	4:00	5:00	5:35	6:00	7:00	8:00	9:00	10:30
Santa Clara	2:05	3:05	4:05	5:05	–	6:05	7:05	8:05	9:05	10:35
Lawrence	2:10	3:10	4:10	5:10	–	6:10	7:10	8:10	9:10	10:40
Sunnyvale	2:14	3:14	4:14	5:14	5:45	6:14	7:14	8:14	9:14	10:44
Mountain View	2:19	3:19	4:19	5:19	5:50	6:19	7:19	8:19	9:19	10:49
San Antonio	2:23	3:23	4:23	5:23	–	6:23	7:23	8:23	9:23	10:53
California Ave	2:27	3:27	4:27	5:27	–	6:27	7:27	8:27	9:27	10:57
Palo Alto	2:31	3:31	4:31	5:31	5:58	6:31	7:31	8:31	9:31	11:01
Menlo Park	2:34	3:34	4:34	5:34	–	6:34	7:34	8:34	9:34	11:04
Atherton	2:37	3:37	4:37	5:37	–	6:37	7:37	8:37	9:37	11:07
Redwood City	2:41	3:41	4:41	5:41	6:04	6:41	7:41	8:41	9:41	11:11
San Carlos	2:45	3:45	4:45	5:45	–	6:45	7:45	8:45	9:45	11:15
Belmont	2:48	3:48	4:48	5:48	–	6:48	7:48	8:48	9:48	11:18
Hillsdale	2:51	3:51	4:51	5:51	6:10	6:51	7:51	8:51	9:51	11:21
Hayward Park	2:54	3:54	4:54	5:54	–	6:54	7:54	8:54	9:54	11:24
San Mateo	2:57	3:57	4:57	5:57	6:14	6:57	7:57	8:57	9:57	11:27
Burlingame	3:02	4:02	5:02	6:02	–	7:02	8:02	9:02	10:02	11:32
Broadway	3:05	4:05	5:05	6:05	–	7:05	8:05	9:05	10:05	11:35
Millbrae	3:10	4:10	5:10	6:10	6:23	7:10	8:10	9:10	10:10	11:40
San Bruno	3:14	4:14	5:14	6:14	–	7:14	8:14	9:14	10:14	11:44
So. San Francisco	3:19	4:19	5:19	6:19	–	7:19	8:19	9:19	10:19	11:49
Bayshore	3:25	4:25	5:25	6:25	–	7:25	8:25	9:25	10:25	11:55
22nd Street	3:30	4:30	5:30	6:30	–	7:30	8:30	9:30	10:30	12:00
San Francisco	3:38	4:38	5:38	6:38	6:41	7:38	8:38	9:38	10:38	12:08

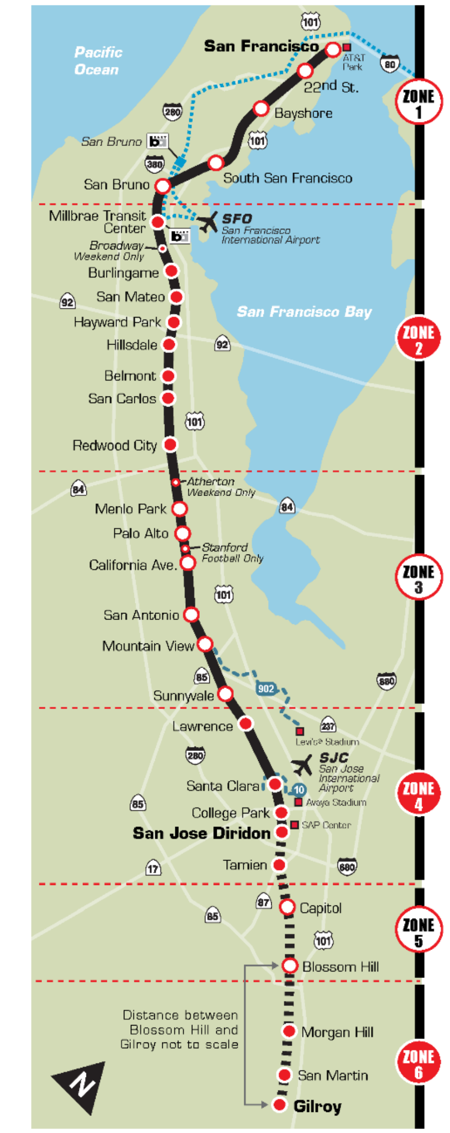
Southbound - WEEKEND SERVICE to SAN JOSE

On weekends, a shuttle bus connects the Tamien and Diridon stations. Caltrain fare policies apply.
Timetable subject to change without notice.

400 Local | 800 Baby Bullet

Zone	Train No.	422	424	426	428	802	430	432	434
ZONE 1	San Francisco	8:15	9:15	10:15	11:15	11:59	12:15	1:15	2:15
	22nd Street	8:20	9:20	10:20	11:20	–	12:20	1:20	2:20
	Bayshore	8:25	9:25	10:25	11:25	–	12:25	1:25	2:25
	So. San Francisco	8:31	9:31	10:31	11:31	–	12:31	1:31	2:31
	San Bruno	8:35	9:35	10:35	11:35	–	12:35	1:35	2:35
ZONE 2	Millbrae	8:39	9:39	10:39	11:39	12:15	12:39	1:39	2:39
	Broadway	8:43	9:43	10:43	11:43	–	12:43	1:43	2:43
	Burlingame	8:45	9:45	10:45	11:45	–	12:45	1:45	2:45
	San Mateo	8:51	9:51	10:51	11:51	12:23	12:51	1:51	2:51
	Hayward Park	8:54	9:54	10:54	11:54	–	12:54	1:54	2:54
	Hillsdale	8:57	9:57	10:57	11:57	12:27	12:57	1:57	2:57
	Belmont	9:00	10:00	11:00	12:00	–	1:00	2:00	3:00
	San Carlos	9:03	10:03	11:03	12:03	–	1:03	2:03	3:03
	Redwood City	9:09	10:09	11:09	12:09	12:35	1:09	2:09	3:09
ZONE 3	Atherton	9:13	10:13	11:13	12:13	–	1:13	2:13	3:13
	Menlo Park	9:16	10:16	11:16	12:16	–	1:16	2:16	3:16
	Palo Alto	9:19	10:19	11:19	12:19	12:41	1:19	2:19	3:19
	California Ave	9:23	10:23	11:23	12:23	–	1:23	2:23	3:23
	San Antonio	9:27	10:27	11:27	12:27	–	1:27	2:27	3:27
	Mountain View	9:31	10:31	11:31	12:31	12:49	1:31	2:31	3:31
	Sunnyvale	9:36	10:36	11:36	12:36	12:54	1:36	2:36	3:36
ZONE 4	Lawrence	9:40	10:40	11:40	12:40	–	1:40	2:40	3:40
	Santa Clara	9:45	10:45	11:45	12:45	–	1:45	2:45	3:45
	San Jose Diridon	9:53	10:53	11:53	12:53	1:05	1:53	2:53	3:53
	Shuttle Bus			AM	PM				
	Departs SJ Diridon	10:00	11:00	12:00	–	1:13	2:00	3:00	4:00
	Arrives Tamien	10:10	11:10	12:10	–	1:23	2:10	3:10	4:10

Train No.	436	438	440	442	804	444	446	448	450 (SATURDAY ONLY)	454 (SATURDAY ONLY)
San Francisco	3:15	4:15	5:15	6:15	6:59	7:15	8:15	9:15	10:15	12:01
22nd Street	3:20	4:20	5:20	6:20	–	7:20	8:20	9:20	10:20	12:06
Bayshore	3:25	4:25	5:25	6:25	–	7:25	8:25	9:25	10:25	12:11
So. San Francisco	3:31	4:31	5:31	6:31	–	7:31	8:31	9:31	10:31	12:17
San Bruno	3:35	4:35	5:35	6:35	–	7:35	8:35	9:35	10:35	12:21
Millbrae	3:39	4:39	5:39	6:39	7:15	7:39	8:39	9:39	10:39	12:25
Broadway	3:43	4:43	5:43	6:43	–	7:43	8:43	9:43	10:43	12:29
Burlingame	3:45	4:45	5:45	6:45	–	7:45	8:45	9:45	10:45	12:31
San Mateo	3:51	4:51	5:51	6:51	7:23	7:51	8:51	9:51	10:51	12:37
Hayward Park	3:54	4:54	5:54	6:54	–	7:54	8:54	9:54	10:54	12:40
Hillsdale	3:57	4:57	5:57	6:57	7:27	7:57	8:57	9:57	10:57	12:43
Belmont	4:00	5:00	6:00	7:00	–	8:00	9:00	10:00	11:00	12:46
San Carlos	4:03	5:03	6:03	7:03	–	8:03	9:03	10:03	11:03	12:49
Redwood City	4:09	5:09	6:09	7:09	7:35	8:09	9:09	10:09	11:09	12:55
Atherton	4:13	5:13	6:13	7:13	–	8:13	9:13	10:13	11:13	12:59
Menlo Park	4:16	5:16	6:16	7:16	–	8:16	9:16	10:16	11:16	1:02
Palo Alto	4:19	5:19	6:19	7:19	7:41	8:19	9:19	10:19	11:19	1:05
California Ave	4:23	5:23	6:23	7:23	–	8:23	9:23	10:23	11:23	1:09
San Antonio	4:27	5:27	6:27	7:27	–	8:27	9:27	10:27	11:27	1:13
Mountain View	4:31	5:31	6:31	7:31	7:49	8:31	9:31	10:31	11:31	1:17
Sunnyvale	4:36	5:36	6:36	7:36	7:54	8:36	9:36	10:36	11:36	1:22
Lawrence	4:40	5:40	6:40	7:40	–	8:40	9:40	10:40	11:40	1:26
Santa Clara	4:45	5:45	6:45	7:45	–	8:45	9:45	10:45	11:45	1:31
San Jose Diridon	4:53	5:53	6:53	7:53	8:05	8:53	9:53	10:53	11:53	1:39
Shuttle Bus									PM	AM
Departs SJ Diridon	5:00	6:00	7:00	–	8:13	9:00	10:00	–	–	–
Arrives Tamien	5:10	6:10	7:10	–	8:23	9:10	10:10	–	–	–



Visit www.caltrain.com/stations for detailed station information and location.

Appendix C – Traffic Count Raw Data

Appendix C - 2017 Traffic Count Raw Data

Traffic Data Service -- San Jose, CA
Event Counts

EventCount-15055 -- English (ENU)

Datasets:
Site: **[1EB] CHARLESTON RD W OF ALMA ST**
Input A: 2 - East bound. - Lane= 0, Added to totals. (/2.000)
Input B: 0 - Unused or unknown. - Lane= 0, Excluded from totals.
Data type: Axle sensors - Separate (Count)

Profile:
Name: Default Profile
Scheme: Count events divided by setup divisor
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

*** Thursday, February 23, 2017=9258, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
62	**16**	**10**	**14**	**30**	**64**	**141**	**451**	**729**	**680**	**553**	**577**	**510**	**582**	**581**	**760**	**746**	**669**	**697**	**491**	**366**	**327**	**130**	**76**	
27	8	2	2	4	9	29	86	130	**132**	153	157	134	154	124	193	**175**	134	194	153	88	91	51	27	28
12	2	2	6	7	11	26	92	**223**	213	134	121	118	141	158	183	**215**	194	173	122	99	93	29	17	12
11	3	4	3	11	20	31	116	**193**	155	136	132	124	135	144	**184**	166	203	156	128	99	79	35	20	14
12	3	2	3	8	25	56	157	**183**	181	131	168	136	153	156	**201**	191	139	175	89	81	66	16	13	7

AM Peak 0815 - 0915 (731), AM PHF=0.82 PM Peak 1530 - 1630 (774), PM PHF=0.90

*** Friday, February 24, 2017=9308, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
61	**23**	**11**	**15**	**28**	**59**	**131**	**446**	**700**	**610**	**587**	**617**	**540**	**635**	**558**	**729**	**663**	**709**	**626**	**589**	**334**	**314**	**227**	**102**	
28	8	2	3	3	11	20	56	**137**	136	155	151	125	160	113	**189**	154	156	133	151	101	93	63	25	37
12	2	3	4	4	11	29	95	**210**	177	148	156	143	152	142	**161**	187	203	186	162	84	94	77	28	17
14	5	2	5	10	19	33	120	**186**	141	140	165	132	167	154	**203**	147	185	176	144	81	68	50	26	14
7	8	4	3	11	18	50	**176**	168	157	145	146	141	157	150	**177**	176	166	133	132	68	60	38	23	11

AM Peak 0745 - 0845 (708), AM PHF=0.84 PM Peak 1500 - 1600 (729), PM PHF=0.90

*** Saturday, February 25, 2017=7325, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
79	**30**	**18**	**16**	**20**	**37**	**62**	**167**	**290**	**463**	**520**	**634**	**525**	**540**	**550**	**681**	**651**	**498**	**453**	**334**	**205**	**262**	**176**	**119**	
37	7	8	0	7	10	9	28	61	90	146	**141**	126	128	172	135	**208**	126	177	93	56	47	48	32	39
17	6	5	5	3	5	12	40	69	104	96	**182**	127	154	137	153	**181**	108	98	101	49	55	57	34	11
14	12	4	7	4	8	13	45	65	129	149	**166**	111	124	116	**173**	121	126	91	59	55	88	44	34	21
11	5	1	4	6	14	29	55	96	141	130	**146**	161	136	126	**220**	141	138	88	82	45	72	27	19	17

AM Peak 1100 - 1200 (634), AM PHF=0.87 PM Peak 1530 - 1630 (782), PM PHF=0.89

*** Sunday, February 26, 2017=6020, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
88	**24**	**14**	**9**	**11**	**21**	**53**	**107**	**274**	**408**	**497**	**512**	**514**	**534**	**518**	**513**	**488**	**437**	**287**	**242**	**174**	**159**	**87**	**54**	
39	6	6	0	4	3	4	24	45	99	112	127	**157**	129	**145**	121	160	116	88	64	55	46	28	20	13
11	6	4	2	1	5	11	22	51	94	117	**117**	116	129	**132**	125	116	118	74	70	45	40	18	15	17
21	5	2	4	4	7	17	26	66	86	138	**128**	115	**136**	115	132	102	98	70	55	33	44	19	12	6
17	7	2	3	2	6	21	35	113	130	130	**140**	126	**140**	126	136	111	106	56	54	42	29	22	7	3

AM Peak 1115 - 1215 (542), AM PHF=0.86 PM Peak 1330 - 1430 (553), PM PHF=0.95

Traffic Data Service -- San Jose, CA
Event Counts

EventCount-15054 -- English (ENU)

Datasets:

Site: **[1WB] CHARESTON RD W OF ALMA ST**
Input A: 4 - West bound. - Lane= 0, Added to totals. (/2.000)
Input B: 0 - Unused or unknown. - Lane= 0, Excluded from totals.
Data type: Axle sensors - Separate (Count)

Profile:

Name: Default Profile
Scheme: Count events divided by setup divisor
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

*** Thursday, February 23, 2017=8603, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
33	**20**	**7**	**12**	**23**	**109**	**256**	**517**	**650**	**691**	**573**	**464**	**483**	**495**	**505**	**585**	**557**	**671**	**665**	**484**	**308**	**227**	**159**	**113**	
9	5	1	2	2	15	36	84	173	**170**	156	107	115	120	105	124	130	146	**181**	155	91	52	39	28	19
11	5	1	5	3	17	52	131	134	**178**	147	126	129	131	115	143	122	**188**	182	132	81	61	45	34	14
7	3	2	2	5	26	64	143	**179**	169	127	108	126	110	125	149	163	**175**	145	104	70	70	39	33	7
6	7	3	3	13	51	105	160	**165**	175	144	123	114	135	162	169	143	**163**	158	94	67	45	37	18	5

AM Peak 0830 - 0930 (691), AM PHF=0.97 PM Peak 1715 - 1815 (706), PM PHF=0.94

*** Friday, February 24, 2017=8536, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
45	**23**	**12**	**11**	**28**	**100**	**240**	**502**	**640**	**644**	**534**	**494**	**496**	**512**	**479**	**584**	**555**	**666**	**621**	**420**	**280**	**291**	**228**	**138**	
19	1	6	2	4	18	36	96	201	**165**	134	116	126	125	112	126	141	152	**177**	119	88	70	76	48	21
14	7	2	0	7	14	45	116	132	**163**	143	110	141	128	107	171	127	**187**	152	135	68	75	67	29	15
7	7	2	4	10	26	66	112	134	**161**	135	132	110	133	111	150	143	**166**	144	88	67	60	41	35	8
5	8	2	5	7	42	93	178	**173**	156	122	137	121	127	150	138	144	**162**	149	79	57	86	44	26	10

AM Peak 0845 - 0945 (661), AM PHF=0.96 PM Peak 1715 - 1815 (691), PM PHF=0.93

*** Saturday, February 25, 2017=6617, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
54	**39**	**36**	**11**	**13**	**39**	**80**	**163**	**313**	**410**	**414**	**452**	**489**	**583**	**486**	**589**	**496**	**502**	**371**	**322**	**237**	**198**	**196**	**130**	
21	13	9	3	2	3	11	36	57	79	103	106	**119**	105	**121**	127	122	111	98	80	57	54	47	40	21
15	10	17	3	2	4	14	38	65	96	98	118	**123**	**129**	122	127	130	113	82	95	60	39	46	41	12
8	6	6	2	3	11	21	44	82	99	109	105	**107**	**181**	131	125	115	143	107	67	54	51	54	29	17
10	10	4	3	6	21	34	45	110	138	105	**123**	140	**170**	113	210	130	135	85	81	67	55	50	21	6

AM Peak 1145 - 1245 (472), AM PHF=0.96 PM Peak 1315 - 1415 (599), PM PHF=0.83

*** Sunday, February 26, 2017=5519, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
56	**52**	**27**	**16**	**11**	**23**	**47**	**96**	**161**	**249**	**397**	**419**	**497**	**490**	**529**	**462**	**437**	**387**	**384**	**238**	**199**	**172**	**102**	**71**	
21	10	9	4	4	5	6	19	18	60	90	83	**95**	**130**	136	128	117	91	99	70	51	50	35	20	10
12	16	8	4	3	4	11	26	40	57	96	100	**134**	114	124	126	112	103	103	60	58	42	21	21	9
17	11	6	5	2	4	13	24	44	49	101	105	**132**	125	138	97	111	98	93	56	44	46	21	13	6
6	15	4	3	3	10	17	27	59	83	111	**132**	**136**	122	131	112	98	96	90	52	46	35	25	17	7

AM Peak 1145 - 1245 (493), AM PHF=0.92 PM Peak 1215 - 1315 (531), PM PHF=0.98

Traffic Data Service -- San Jose, CA
Class Report

CustomList-15062 -- English (ENU)

Datasets:
Site: **[3EB] CHURCHILL AVE W OF ALMA ST**
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 100 mph.
Direction: East (bound)
Name: Default Profile
Scheme: Vehicle classification (Scheme F)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

Column Legend:
0 [Time] 24-hour time (0000 - 2359)
1 [Total] Number in time step
2 [Cls] Class totals

*** Thursday, February 23, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	12	0	12	0	0	0	0	0	0	0	0	0	0	0
0100	13	0	13	0	0	0	0	0	0	0	0	0	0	0
0200	8	1	5	2	0	0	0	0	0	0	0	0	0	0
0300	3	0	3	0	0	0	0	0	0	0	0	0	0	0
0400	5	0	5	0	0	0	0	0	0	0	0	0	0	0
0500	20	0	15	3	0	1	1	0	0	0	0	0	0	0
0600	51	0	38	13	0	0	0	0	0	0	0	0	0	0
0700	154	0	138	16	0	0	0	0	0	0	0	0	0	0
0800	204	1	181	19	2	0	0	1	0	0	0	0	0	0
0900	183	1	168	14	0	0	0	0	0	0	0	0	0	0
1000	204	1	180	20	0	1	2	0	0	0	0	0	0	0
1100	228	3	200	24	0	0	1	0	0	0	0	0	0	0
1200	224	1	193	26	2	2	0	0	0	0	0	0	0	0
1300	262	5	231	25	1	0	0	0	0	0	0	0	0	0
1400	352	7	317	23	2	1	1	0	0	0	1	0	0	0
1500	306	5	263	28	2	0	3	2	3	0	0	0	0	0
1600	340	5	311	14	5	1	2	1	0	0	1	0	0	0
1700	326	6	300	8	2	2	2	2	4	0	0	0	0	0
1800	291	2	275	10	1	0	2	1	0	0	0	0	0	0
1900	219	0	206	12	1	0	0	0	0	0	0	0	0	0
2000	205	0	196	9	0	0	0	0	0	0	0	0	0	0
2100	166	2	160	4	0	0	0	0	0	0	0	0	0	0
2200	117	2	115	0	0	0	0	0	0	0	0	0	0	0
2300	53	1	49	3	0	0	0	0	0	0	0	0	0	0
07-19	**3074**	**37**	**2757**	**227**	**17**	**7**	**13**	**7**	**7**	**0**	**2**	**0**	**0**	**0**
06-22	**3715**	**39**	**3357**	**265**	**18**	**7**	**13**	**7**	**7**	**0**	**2**	**0**	**0**	**0**
06-00	**3885**	**42**	**3521**	**268**	**18**	**7**	**13**	**7**	**7**	**0**	**2**	**0**	**0**	**0**
00-00	**3946**	**43**	**3574**	**273**	**18**	**8**	**14**	**7**	**7**	**0**	**2**	**0**	**0**	**0**

Peak step 14:00 (352) **AM Peak step** 11:00 (228) **PM Peak step** 14:00 (352)

*** Friday, February 24, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	25	0	25	0	0	0	0	0	0	0	0	0	0	0
0100	14	0	13	1	0	0	0	0	0	0	0	0	0	0
0200	6	0	5	1	0	0	0	0	0	0	0	0	0	0
0300	4	0	4	0	0	0	0	0	0	0	0	0	0	0
0400	6	1	3	1	0	0	1	0	0	0	0	0	0	0
0500	23	0	19	2	0	1	1	0	0	0	0	0	0	0
0600	54	0	40	10	2	2	0	0	0	0	0	0	0	0
0700	127	0	107	19	0	0	0	1	0	0	0	0	0	0
0800	186	1	164	21	0	0	0	0	0	0	0	0	0	0
0900	190	2	164	22	1	1	0	0	0	0	0	0	0	0
1000	212	1	196	13	2	0	0	0	0	0	0	0	0	0
1100	235	2	198	33	0	0	2	0	0	0	0	0	0	0
1200	262	2	233	26	1	0	0	0	0	0	0	0	0	0
1300	265	4	239	20	0	2	0	0	0	0	0	0	0	0
1400	326	8	291	23	1	0	1	1	0	0	0	1	0	0
1500	317	4	273	31	0	1	4	2	1	0	1	0	0	0
1600	319	6	289	17	3	1	3	0	0	0	0	0	0	0
1700	314	4	281	12	6	0	4	5	2	0	0	0	0	0
1800	317	6	291	9	2	0	4	1	3	0	0	1	0	0
1900	237	2	219	15	0	0	0	0	1	0	0	0	0	0
2000	191	0	185	6	0	0	0	0	0	0	0	0	0	0
2100	212	1	205	5	0	0	0	1	0	0	0	0	0	0
2200	124	0	122	2	0	0	0	0	0	0	0	0	0	0
2300	65	1	59	5	0	0	0	0	0	0	0	0	0	0
07-19	**3070**	**40**	**2726**	**246**	**16**	**5**	**18**	**10**	**6**	**0**	**1**	**2**	**0**	**0**
06-22	**3764**	**43**	**3375**	**282**	**18**	**7**	**18**	**11**	**7**	**0**	**1**	**2**	**0**	**0**
06-00	**3953**	**44**	**3556**	**289**	**18**	**7**	**18**	**11**	**7**	**0**	**1**	**2**	**0**	**0**
00-00	**4031**	**45**	**3625**	**294**	**18**	**8**	**20**	**11**	**7**	**0**	**1**	**2**	**0**	**0**

Peak step 14:00 (326) **AM Peak step** 11:00 (235) **PM Peak step** 14:00 (326)

*** Saturday, February 25, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	28	0	26	2	0	0	0	0	0	0	0	0	0	0
0100	17	1	16	0	0	0	0	0	0	0	0	0	0	0
0200	13	0	13	0	0	0	0	0	0	0	0	0	0	0
0300	1	0	0	1	0	0	0	0	0	0	0	0	0	0
0400	6	0	5	1	0	0	0	0	0	0	0	0	0	0
0500	9	0	7	2	0	0	0	0	0	0	0	0	0	0
0600	28	0	22	6	0	0	0	0	0	0	0	0	0	0
0700	65	0	56	9	0	0	0	0	0	0	0	0	0	0
0800	123	0	112	11	0	0	0	0	0	0	0	0	0	0
0900	160	0	147	13	0	0	0	0	0	0	0	0	0	0
1000	190	1	183	6	0	0	0	0	0	0	0	0	0	0
1100	222	5	207	10	0	0	0	0	0	0	0	0	0	0
1200	267	2	245	19	1	0	0	0	0	0	0	0	0	0
1300	289	2	268	17	0	1	1	0	0	0	0	0	0	0
1400	259	6	231	16	3	0	2	0	1	0	0	0	0	0
1500	356	9	320	21	1	0	2	1	1	0	0	0	0	1
1600	301	3	279	15	3	0	0	0	1	0	0	0	0	0
1700	213	0	205	7	0	0	1	0	0	0	0	0	0	0
1800	243	2	231	6	2	1	1	0	0	0	0	0	0	0
1900	223	2	209	12	0	0	0	0	0	0	0	0	0	0
2000	115	0	109	6	0	0	0	0	0	0	0	0	0	0
2100	137	1	130	6	0	0	0	0	0	0	0	0	0	0
2200	113	0	109	2	0	1	0	1	0	0	0	0	0	0
2300	62	0	58	4	0	0	0	0	0	0	0	0	0	0
07-19	**2688**	**30**	**2484**	**150**	**10**	**2**	**7**	**1**	**3**	**0**	**0**	**0**	**0**	**1**
06-22	**3191**	**33**	**2954**	**180**	**10**	**2**	**7**	**1**	**3**	**0**	**0**	**0**	**0**	**1**
06-00	**3366**	**33**	**3121**	**186**	**10**	**3**	**7**	**2**	**3**	**0**	**0**	**0**	**0**	**1**
00-00	**3440**	**34**	**3188**	**192**	**10**	**3**	**7**	**2**	**3**	**0**	**0**	**0**	**0**	**1**

Peak step 15:00 (356) **AM Peak step** 11:00 (222) **PM Peak step** 15:00 (356)

CustomList-15062 Page 3

*** Sunday, February 26, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	39	0	36	3	0	0	0	0	0	0	0	0	0	0
0100	19	0	17	2	0	0	0	0	0	0	0	0	0	0
0200	11	0	10	1	0	0	0	0	0	0	0	0	0	0
0300	7	0	7	0	0	0	0	0	0	0	0	0	0	0
0400	5	0	4	1	0	0	0	0	0	0	0	0	0	0
0500	9	0	8	1	0	0	0	0	0	0	0	0	0	0
0600	15	0	15	0	0	0	0	0	0	0	0	0	0	0
0700	51	0	45	6	0	0	0	0	0	0	0	0	0	0
0800	85	0	77	8	0	0	0	0	0	0	0	0	0	0
0900	139	0	132	7	0	0	0	0	0	0	0	0	0	0
1000	174	3	162	9	0	0	0	0	0	0	0	0	0	0
1100	188	5	175	7	0	0	1	0	0	0	0	0	0	0
1200	224	6	202	15	0	0	1	0	0	0	0	0	0	0
1300	271	5	250	12	1	0	2	0	1	0	0	0	0	0
1400	212	1	200	11	0	0	0	0	0	0	0	0	0	0
1500	249	4	231	12	0	0	2	0	0	0	0	0	0	0
1600	236	3	222	10	1	0	0	0	0	0	0	0	0	0
1700	242	1	228	13	0	0	0	0	0	0	0	0	0	0
1800	190	1	178	11	0	0	0	0	0	0	0	0	0	0
1900	138	1	131	6	0	0	0	0	0	0	0	0	0	0
2000	108	0	99	9	0	0	0	0	0	0	0	0	0	0
2100	91	0	86	5	0	0	0	0	0	0	0	0	0	0
2200	59	0	58	1	0	0	0	0	0	0	0	0	0	0
2300	36	0	35	1	0	0	0	0	0	0	0	0	0	0
07-19	**2261**	**29**	**2102**	**121**	**2**	**0**	**6**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
06-22	**2613**	**30**	**2433**	**141**	**2**	**0**	**6**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
06-00	**2708**	**30**	**2526**	**143**	**2**	**0**	**6**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
00-00	**2798**	**30**	**2608**	**151**	**2**	**0**	**6**	**0**	**1**	**0**	**0**	**0**	**0**	**0**

Peak step 13:00 (271) **AM Peak step** 11:00 (188) **PM Peak step** 13:00 (271)

In profile: Vehicles = 14215 / 17381 (81.78%)

Traffic Data Service -- San Jose, CA
Class Report

CustomList-15060 -- English (ENU)

Datasets:
Site: **[3WB] CHURCHILL AVE W OF ALMA ST**
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 100 mph.
Direction: West (bound)
Name: Default Profile
Scheme: Vehicle classification (Scheme F)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

Column Legend:
0 [Time] 24-hour time (0000 - 2359)
1 [Total] Number in time step
2 [Cls] Class totals

*** Thursday, February 23, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	11	0	11	0	0	0	0	0	0	0	0	0	0	0
0100	6	0	6	0	0	0	0	0	0	0	0	0	0	0
0200	3	0	3	0	0	0	0	0	0	0	0	0	0	0
0300	6	0	5	1	0	0	0	0	0	0	0	0	0	0
0400	11	0	9	2	0	0	0	0	0	0	0	0	0	0
0500	78	0	64	13	0	1	0	0	0	0	0	0	0	0
0600	163	0	142	19	0	0	1	0	1	0	0	0	0	0
0700	353	6	320	24	2	0	1	0	0	0	0	0	0	0
0800	462	8	400	48	3	0	2	0	1	0	0	0	0	0
0900	374	8	327	34	1	1	2	0	0	1	0	0	0	0
1000	297	7	265	23	0	1	0	0	1	0	0	0	0	0
1100	359	3	310	39	5	1	0	0	1	0	0	0	0	0
1200	297	2	263	28	3	0	1	0	0	0	0	0	0	0
1300	346	4	308	31	0	2	0	0	1	0	0	0	0	0
1400	353	2	306	40	4	1	0	0	0	0	0	0	0	0
1500	351	1	312	36	1	0	0	0	1	0	0	0	0	0
1600	313	0	287	21	4	1	0	0	0	0	0	0	0	0
1700	414	1	391	20	2	0	0	0	0	0	0	0	0	0
1800	351	2	341	8	0	0	0	0	0	0	0	0	0	0
1900	262	1	252	7	1	1	0	0	0	0	0	0	0	0
2000	168	1	163	4	0	0	0	0	0	0	0	0	0	0
2100	136	0	133	3	0	0	0	0	0	0	0	0	0	0
2200	87	0	85	2	0	0	0	0	0	0	0	0	0	0
2300	41	0	40	1	0	0	0	0	0	0	0	0	0	0
07-19	**4270**	**44**	**3830**	**352**	**25**	**7**	**6**	**0**	**5**	**1**	**0**	**0**	**0**	**0**
06-22	**4999**	**46**	**4520**	**385**	**26**	**8**	**7**	**0**	**6**	**1**	**0**	**0**	**0**	**0**
06-00	**5127**	**46**	**4645**	**388**	**26**	**8**	**7**	**0**	**6**	**1**	**0**	**0**	**0**	**0**
00-00	**5242**	**46**	**4743**	**404**	**26**	**9**	**7**	**0**	**6**	**1**	**0**	**0**	**0**	**0**

Peak step 8:00 (462) **AM Peak step** 8:00 (462) **PM Peak step** 17:00 (414)

CustomList-15060 Page 2

*** Friday, February 24, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	13	0	13	0	0	0	0	0	0	0	0	0	0	0
0100	16	0	16	0	0	0	0	0	0	0	0	0	0	0
0200	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0300	10	0	9	1	0	0	0	0	0	0	0	0	0	0
0400	19	0	15	1	0	1	2	0	0	0	0	0	0	0
0500	78	0	65	12	0	1	0	0	0	0	0	0	0	0
0600	183	1	166	15	0	1	0	0	0	0	0	0	0	0
0700	294	3	276	13	1	0	0	0	1	0	0	0	0	0
0800	419	2	380	29	6	0	1	0	1	0	0	0	0	0
0900	380	9	324	43	2	2	0	0	0	0	0	0	0	0
1000	332	0	304	25	2	0	1	0	0	0	0	0	0	0
1100	372	1	325	44	1	1	0	0	0	0	0	0	0	0
1200	321	8	284	29	0	0	0	0	0	0	0	0	0	0
1300	299	1	275	20	2	1	0	0	0	0	0	0	0	0
1400	356	1	317	37	0	0	0	0	1	0	0	0	0	0
1500	350	1	317	29	3	0	0	0	0	0	0	0	0	0
1600	345	0	319	21	4	1	0	0	0	0	0	0	0	0
1700	365	0	348	16	1	0	0	0	0	0	0	0	0	0
1800	328	0	314	13	0	0	0	0	1	0	0	0	0	0
1900	301	0	290	10	1	0	0	0	0	0	0	0	0	0
2000	159	0	155	4	0	0	0	0	0	0	0	0	0	0
2100	149	0	144	5	0	0	0	0	0	0	0	0	0	0
2200	108	0	107	1	0	0	0	0	0	0	0	0	0	0
2300	48	0	48	0	0	0	0	0	0	0	0	0	0	0
07-19	**4161**	**26**	**3783**	**319**	**22**	**5**	**2**	**0**	**4**	**0**	**0**	**0**	**0**	**0**
06-22	**4953**	**27**	**4538**	**353**	**23**	**6**	**2**	**0**	**4**	**0**	**0**	**0**	**0**	**0**
06-00	**5109**	**27**	**4693**	**354**	**23**	**6**	**2**	**0**	**4**	**0**	**0**	**0**	**0**	**0**
00-00	**5246**	**27**	**4812**	**368**	**23**	**8**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**

Peak step 8:00 (419) **AM Peak step** 8:00 (419) **PM Peak step** 17:00 (365)

*** Saturday, February 25, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	34	0	33	1	0	0	0	0	0	0	0	0	0	0
0100	17	0	16	1	0	0	0	0	0	0	0	0	0	0
0200	11	0	11	0	0	0	0	0	0	0	0	0	0	0
0300	5	0	5	0	0	0	0	0	0	0	0	0	0	0
0400	15	0	14	1	0	0	0	0	0	0	0	0	0	0
0500	28	0	24	4	0	0	0	0	0	0	0	0	0	0
0600	50	0	46	2	0	1	0	0	1	0	0	0	0	0
0700	113	0	104	9	0	0	0	0	0	0	0	0	0	0
0800	206	0	192	14	0	0	0	0	0	0	0	0	0	0
0900	244	0	230	14	0	0	0	0	0	0	0	0	0	0
1000	288	1	268	18	0	1	0	0	0	0	0	0	0	0
1100	364	3	335	26	0	0	0	0	0	0	0	0	0	0
1200	411	6	388	14	1	0	1	0	1	0	0	0	0	0
1300	360	4	337	18	0	0	1	0	0	0	0	0	0	0
1400	351	2	332	16	1	0	0	0	0	0	0	0	0	0
1500	299	0	284	15	0	0	0	0	0	0	0	0	0	0
1600	252	0	240	12	0	0	0	0	0	0	0	0	0	0
1700	227	1	221	5	0	0	0	0	0	0	0	0	0	0
1800	238	0	226	12	0	0	0	0	0	0	0	0	0	0
1900	202	0	196	6	0	0	0	0	0	0	0	0	0	0
2000	130	2	123	5	0	0	0	0	0	0	0	0	0	0
2100	141	0	138	3	0	0	0	0	0	0	0	0	0	0
2200	86	0	81	4	0	1	0	0	0	0	0	0	0	0
2300	51	0	51	0	0	0	0	0	0	0	0	0	0	0
07-19	**3353**	**17**	**3157**	**173**	**2**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
06-22	**3876**	**19**	**3660**	**189**	**2**	**2**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**
06-00	**4013**	**19**	**3792**	**193**	**2**	**3**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**
00-00	**4123**	**19**	**3895**	**200**	**2**	**3**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**

Peak step 12:00 (411) **AM Peak step** 11:00 (364) **PM Peak step** 12:00 (411)

*** Sunday, February 26, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	29	0	26	3	0	0	0	0	0	0	0	0	0	0
0100	23	0	23	0	0	0	0	0	0	0	0	0	0	0
0200	10	0	10	0	0	0	0	0	0	0	0	0	0	0
0300	10	0	8	2	0	0	0	0	0	0	0	0	0	0
0400	4	0	2	2	0	0	0	0	0	0	0	0	0	0
0500	12	0	12	0	0	0	0	0	0	0	0	0	0	0
0600	43	0	41	2	0	0	0	0	0	0	0	0	0	0
0700	75	0	67	8	0	0	0	0	0	0	0	0	0	0
0800	113	0	110	3	0	0	0	0	0	0	0	0	0	0
0900	157	2	150	3	1	1	0	0	0	0	0	0	0	0
1000	259	6	240	13	0	0	0	0	0	0	0	0	0	0
1100	291	2	284	5	0	0	0	0	0	0	0	0	0	0
1200	319	3	298	18	0	0	0	0	0	0	0	0	0	0
1300	307	6	288	13	0	0	0	0	0	0	0	0	0	0
1400	313	4	296	13	0	0	0	0	0	0	0	0	0	0
1500	300	2	288	9	1	0	0	0	0	0	0	0	0	0
1600	247	0	239	7	0	1	0	0	0	0	0	0	0	0
1700	214	0	210	4	0	0	0	0	0	0	0	0	0	0
1800	179	0	174	5	0	0	0	0	0	0	0	0	0	0
1900	135	0	130	4	1	0	0	0	0	0	0	0	0	0
2000	118	0	113	5	0	0	0	0	0	0	0	0	0	0
2100	108	0	104	4	0	0	0	0	0	0	0	0	0	0
2200	66	0	63	3	0	0	0	0	0	0	0	0	0	0
2300	34	0	33	1	0	0	0	0	0	0	0	0	0	0
07-19	**2774**	**25**	**2644**	**101**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
06-22	**3178**	**25**	**3032**	**116**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
06-00	**3278**	**25**	**3128**	**120**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
00-00	**3366**	**25**	**3209**	**127**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Peak step 12:00 (319) **AM Peak step** 11:00 (291) **PM Peak step** 12:00 (319)

In profile: Vehicles = 17977 / 20914 (85.96%)

Traffic Data Service -- San Jose, CA
Class Report

CustomList-15059 -- English (ENU)

Datasets:
Site: **[2EB] MEADOW DR W OF ALMA ST**
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 100 mph.
Direction: East (bound)
Name: Default Profile
Scheme: Vehicle classification (Scheme F)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

Column Legend:
0 [Time] 24-hour time (0000 - 2359)
1 [Total] Number in time step
2 [Cls] Class totals

*** Thursday, February 23, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	12	0	12	0	0	0	0	0	0	0	0	0	0	0
0100	7	0	6	1	0	0	0	0	0	0	0	0	0	0
0200	3	0	2	1	0	0	0	0	0	0	0	0	0	0
0300	5	0	5	0	0	0	0	0	0	0	0	0	0	0
0400	8	0	5	3	0	0	0	0	0	0	0	0	0	0
0500	31	0	24	6	0	0	1	0	0	0	0	0	0	0
0600	76	0	69	6	0	1	0	0	0	0	0	0	0	0
0700	244	7	207	29	1	0	0	0	0	0	0	0	0	0
0800	362	3	323	33	0	2	1	0	0	0	0	0	0	0
0900	270	3	240	21	1	2	2	0	1	0	0	0	0	0
1000	252	5	199	44	1	2	0	1	0	0	0	0	0	0
1100	235	5	193	35	2	0	0	0	0	0	0	0	0	0
1200	211	4	172	35	0	0	0	0	0	0	0	0	0	0
1300	282	12	223	46	0	1	0	0	0	0	0	0	0	0
1400	246	7	197	42	0	0	0	0	0	0	0	0	0	0
1500	351	20	280	43	4	1	0	0	2	0	0	1	0	0
1600	310	9	266	32	2	0	0	0	1	0	0	0	0	0
1700	340	10	303	23	2	0	1	0	0	1	0	0	0	0
1800	279	8	248	20	0	1	0	1	1	0	0	0	0	0
1900	250	4	222	24	0	0	0	0	0	0	0	0	0	0
2000	161	3	151	7	0	0	0	0	0	0	0	0	0	0
2100	92	1	84	7	0	0	0	0	0	0	0	0	0	0
2200	80	1	67	12	0	0	0	0	0	0	0	0	0	0
2300	30	1	24	5	0	0	0	0	0	0	0	0	0	0
07-19	**3382**	**93**	**2851**	**403**	**13**	**9**	**4**	**2**	**5**	**1**	**0**	**1**	**0**	**0**
06-22	**3961**	**101**	**3377**	**447**	**13**	**10**	**4**	**2**	**5**	**1**	**0**	**1**	**0**	**0**
06-00	**4071**	**103**	**3468**	**464**	**13**	**10**	**4**	**2**	**5**	**1**	**0**	**1**	**0**	**0**
00-00	**4137**	**103**	**3522**	**475**	**13**	**10**	**5**	**2**	**5**	**1**	**0**	**1**	**0**	**0**

Peak step 8:00 (362) **AM Peak step** 8:00 (362) **PM Peak step** 15:00 (351)

*** Friday, February 24, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	14	0	13	1	0	0	0	0	0	0	0	0	0	0
0100	6	0	5	1	0	0	0	0	0	0	0	0	0	0
0200	3	0	2	1	0	0	0	0	0	0	0	0	0	0
0300	7	0	6	1	0	0	0	0	0	0	0	0	0	0
0400	5	0	3	2	0	0	0	0	0	0	0	0	0	0
0500	33	1	25	7	0	0	0	0	0	0	0	0	0	0
0600	82	0	75	7	0	0	0	0	0	0	0	0	0	0
0700	226	5	188	32	1	0	0	0	0	0	0	0	0	0
0800	347	5	300	34	2	3	3	0	0	0	0	0	0	0
0900	280	1	249	25	2	3	0	0	0	0	0	0	0	0
1000	244	2	194	41	4	2	1	0	0	0	0	0	0	0
1100	233	6	189	37	0	1	0	0	0	0	0	0	0	0
1200	249	8	203	38	0	0	0	0	0	0	0	0	0	0
1300	262	26	197	38	1	0	0	0	0	0	0	0	0	0
1400	281	7	234	37	0	2	1	0	0	0	0	0	0	0
1500	350	20	278	42	3	1	4	0	2	0	0	0	0	0
1600	299	12	247	37	1	0	0	0	2	0	0	0	0	0
1700	312	14	270	25	0	0	1	1	1	0	0	0	0	0
1800	324	9	288	27	0	0	0	0	0	0	0	0	0	0
1900	247	1	219	26	1	0	0	0	0	0	0	0	0	0
2000	179	0	166	13	0	0	0	0	0	0	0	0	0	0
2100	143	2	124	17	0	0	0	0	0	0	0	0	0	0
2200	126	0	110	16	0	0	0	0	0	0	0	0	0	0
2300	51	0	48	3	0	0	0	0	0	0	0	0	0	0
07-19	**3407**	**115**	**2837**	**413**	**14**	**12**	**10**	**1**	**5**	**0**	**0**	**0**	**0**	**0**
06-22	**4058**	**118**	**3421**	**476**	**15**	**12**	**10**	**1**	**5**	**0**	**0**	**0**	**0**	**0**
06-00	**4235**	**118**	**3579**	**495**	**15**	**12**	**10**	**1**	**5**	**0**	**0**	**0**	**0**	**0**
00-00	**4303**	**119**	**3633**	**508**	**15**	**12**	**10**	**1**	**5**	**0**	**0**	**0**	**0**	**0**

Peak step 15:00 (350) **AM Peak step** 8:00 (347) **PM Peak step** 15:00 (350)

*** Saturday, February 25, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	26	0	25	1	0	0	0	0	0	0	0	0	0	0
0100	15	0	14	1	0	0	0	0	0	0	0	0	0	0
0200	6	0	5	1	0	0	0	0	0	0	0	0	0	0
0300	4	0	2	2	0	0	0	0	0	0	0	0	0	0
0400	9	0	7	2	0	0	0	0	0	0	0	0	0	0
0500	16	0	15	1	0	0	0	0	0	0	0	0	0	0
0600	36	0	35	1	0	0	0	0	0	0	0	0	0	0
0700	82	1	70	11	0	0	0	0	0	0	0	0	0	0
0800	141	1	123	17	0	0	0	0	0	0	0	0	0	0
0900	209	2	175	31	0	1	0	0	0	0	0	0	0	0
1000	250	3	212	33	2	0	0	0	0	0	0	0	0	0
1100	273	7	230	34	0	0	1	0	1	0	0	0	0	0
1200	289	9	243	32	2	0	1	0	2	0	0	0	0	0
1300	292	14	248	28	1	0	1	0	0	0	0	0	0	0
1400	320	12	265	41	0	1	0	0	1	0	0	0	0	0
1500	285	8	251	26	0	0	0	0	0	0	0	0	0	0
1600	254	3	220	30	1	0	0	0	0	0	0	0	0	0
1700	245	3	207	34	0	0	1	0	0	0	0	0	0	0
1800	239	2	213	24	0	0	0	0	0	0	0	0	0	0
1900	172	0	156	16	0	0	0	0	0	0	0	0	0	0
2000	130	1	114	15	0	0	0	0	0	0	0	0	0	0
2100	112	1	106	5	0	0	0	0	0	0	0	0	0	0
2200	82	0	71	11	0	0	0	0	0	0	0	0	0	0
2300	49	0	45	4	0	0	0	0	0	0	0	0	0	0
07-19	**2879**	**65**	**2457**	**341**	**6**	**2**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**
06-22	**3329**	**67**	**2868**	**378**	**6**	**2**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**
06-00	**3460**	**67**	**2984**	**393**	**6**	**2**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**
00-00	**3536**	**67**	**3052**	**401**	**6**	**2**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**

Peak step 14:00 (320) **AM Peak step** 11:00 (273) **PM Peak step** 14:00 (320)

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*** Sunday, February 26, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	19	0	18	1	0	0	0	0	0	0	0	0	0	0
0100	15	1	13	1	0	0	0	0	0	0	0	0	0	0
0200	5	0	4	1	0	0	0	0	0	0	0	0	0	0
0300	4	0	2	2	0	0	0	0	0	0	0	0	0	0
0400	5	0	4	1	0	0	0	0	0	0	0	0	0	0
0500	6	0	6	0	0	0	0	0	0	0	0	0	0	0
0600	25	0	19	6	0	0	0	0	0	0	0	0	0	0
0700	56	0	50	6	0	0	0	0	0	0	0	0	0	0
0800	159	2	132	24	0	0	1	0	0	0	0	0	0	0
0900	244	1	207	35	0	1	0	0	0	0	0	0	0	0
1000	252	6	211	32	0	1	1	0	1	0	0	0	0	0
1100	231	2	195	33	1	0	0	0	0	0	0	0	0	0
1200	262	10	220	30	0	1	1	0	0	0	0	0	0	0
1300	302	10	258	32	0	1	1	0	0	0	0	0	0	0
1400	285	9	254	21	1	0	0	0	0	0	0	0	0	0
1500	276	7	247	18	2	1	1	0	0	0	0	0	0	0
1600	231	8	207	15	0	1	0	0	0	0	0	0	0	0
1700	234	1	211	22	0	0	0	0	0	0	0	0	0	0
1800	189	2	166	21	0	0	0	0	0	0	0	0	0	0
1900	160	2	138	20	0	0	0	0	0	0	0	0	0	0
2000	99	0	88	11	0	0	0	0	0	0	0	0	0	0
2100	87	0	80	7	0	0	0	0	0	0	0	0	0	0
2200	41	0	38	3	0	0	0	0	0	0	0	0	0	0
2300	28	0	26	2	0	0	0	0	0	0	0	0	0	0
07-19	**2721**	**58**	**2358**	**289**	**4**	**6**	**5**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
06-22	**3092**	**60**	**2683**	**333**	**4**	**6**	**5**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
06-00	**3161**	**60**	**2747**	**338**	**4**	**6**	**5**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
00-00	**3215**	**61**	**2794**	**344**	**4**	**6**	**5**	**0**	**1**	**0**	**0**	**0**	**0**	**0**

Peak step 13:00 (302) **AM Peak step** 10:00 (252) **PM Peak step** 13:00 (302)

In profile: Vehicles = 15191 / 18158 (83.66%)

Traffic Data Service -- San Jose, CA
Class Report

CustomList-15058 -- English (ENU)

Datasets:
Site: **[2WB] MEADOW DR W OF ALMA ST**
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 100 mph.
Direction: West (bound)
Name: Default Profile
Scheme: Vehicle classification (Scheme F)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

Column Legend:
0 [Time] 24-hour time (0000 - 2359)
1 [Total] Number in time step
2 [Cls] Class totals

*** Thursday, February 23, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	11	0	10	1	0	0	0	0	0	0	0	0	0	0
0100	12	0	11	1	0	0	0	0	0	0	0	0	0	0
0200	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0300	4	0	4	0	0	0	0	0	0	0	0	0	0	0
0400	13	1	10	2	0	0	0	0	0	0	0	0	0	0
0500	27	1	24	2	0	0	0	0	0	0	0	0	0	0
0600	75	2	64	6	0	0	3	0	0	0	0	0	0	0
0700	245	16	199	25	2	1	0	0	1	0	0	1	0	0
0800	439	23	377	24	2	3	2	1	4	2	0	0	0	1
0900	277	23	216	35	1	0	2	0	0	0	0	0	0	0
1000	219	13	173	28	1	2	0	0	1	1	0	0	0	0
1100	240	12	194	33	1	0	0	0	0	0	0	0	0	0
1200	253	8	204	39	1	1	0	0	0	0	0	0	0	0
1300	243	8	209	25	0	0	1	0	0	0	0	0	0	0
1400	303	8	252	40	1	1	0	0	1	0	0	0	0	0
1500	354	12	299	40	1	1	1	0	0	0	0	0	0	0
1600	352	12	300	38	1	0	0	0	1	0	0	0	0	0
1700	477	8	433	35	0	0	0	0	0	0	0	1	0	0
1800	448	5	401	37	1	0	4	0	0	0	0	0	0	0
1900	274	7	249	16	0	0	1	0	0	0	1	0	0	0
2000	211	6	191	12	0	1	1	0	0	0	0	0	0	0
2100	166	0	152	13	0	0	1	0	0	0	0	0	0	0
2200	73	1	63	8	0	0	1	0	0	0	0	0	0	0
2300	47	3	40	4	0	0	0	0	0	0	0	0	0	0
07-19	**3850**	**148**	**3257**	**399**	**12**	**9**	**10**	**1**	**8**	**3**	**0**	**2**	**0**	**1**
06-22	**4576**	**163**	**3913**	**446**	**12**	**10**	**16**	**1**	**8**	**3**	**1**	**2**	**0**	**1**
06-00	**4696**	**167**	**4016**	**458**	**12**	**10**	**17**	**1**	**8**	**3**	**1**	**2**	**0**	**1**
00-00	**4764**	**169**	**4076**	**464**	**12**	**10**	**17**	**1**	**8**	**3**	**1**	**2**	**0**	**1**

Peak step 17:00 (477) **AM Peak step** 8:00 (439) **PM Peak step** 17:00 (477)

*** Friday, February 24, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	30	1	27	2	0	0	0	0	0	0	0	0	0	0
0100	13	0	12	1	0	0	0	0	0	0	0	0	0	0
0200	7	0	6	1	0	0	0	0	0	0	0	0	0	0
0300	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0400	13	1	11	1	0	0	0	0	0	0	0	0	0	0
0500	37	1	33	3	0	0	0	0	0	0	0	0	0	0
0600	69	2	58	9	0	0	0	0	0	0	0	0	0	0
0700	245	12	197	29	1	0	1	0	0	0	0	0	0	5
0800	453	20	380	36	4	2	2	0	5	1	2	0	0	1
0900	248	11	206	28	1	1	1	0	0	0	0	0	0	0
1000	244	5	198	40	0	1	0	0	0	0	0	0	0	0
1100	265	8	224	28	1	2	1	0	1	0	0	0	0	0
1200	240	4	196	38	0	1	0	0	1	0	0	0	0	0
1300	267	13	231	20	1	1	0	0	0	0	0	1	0	0
1400	322	6	276	36	0	1	1	1	1	0	0	0	0	0
1500	359	8	312	36	0	3	0	0	0	0	0	0	0	0
1600	315	14	283	15	0	0	3	0	0	0	0	0	0	0
1700	458	10	413	30	0	0	0	2	2	0	0	0	0	1
1800	414	6	390	14	1	0	1	0	1	0	0	0	0	1
1900	334	6	313	13	1	0	1	0	0	0	0	0	0	0
2000	195	4	166	24	0	0	0	0	0	0	1	0	0	0
2100	184	1	172	10	0	0	1	0	0	0	0	0	0	0
2200	140	0	130	10	0	0	0	0	0	0	0	0	0	0
2300	66	1	63	2	0	0	0	0	0	0	0	0	0	0
07-19	**3830**	**117**	**3306**	**350**	**9**	**12**	**10**	**3**	**11**	**1**	**2**	**1**	**0**	**8**
06-22	**4612**	**130**	**4015**	**406**	**10**	**12**	**12**	**3**	**11**	**1**	**3**	**1**	**0**	**8**
06-00	**4818**	**131**	**4208**	**418**	**10**	**12**	**12**	**3**	**11**	**1**	**3**	**1**	**0**	**8**
00-00	**4919**	**134**	**4298**	**426**	**10**	**12**	**12**	**3**	**11**	**1**	**3**	**1**	**0**	**8**

Peak step 17:00 (458) **AM Peak step** 8:00 (453) **PM Peak step** 17:00 (458)

*** Saturday, February 25, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	37	0	36	1	0	0	0	0	0	0	0	0	0	0
0100	20	0	20	0	0	0	0	0	0	0	0	0	0	0
0200	13	0	13	0	0	0	0	0	0	0	0	0	0	0
0300	2	0	2	0	0	0	0	0	0	0	0	0	0	0
0400	10	0	9	1	0	0	0	0	0	0	0	0	0	0
0500	17	1	16	0	0	0	0	0	0	0	0	0	0	0
0600	40	1	36	3	0	0	0	0	0	0	0	0	0	0
0700	56	3	50	3	0	0	0	0	0	0	0	0	0	0
0800	114	5	100	8	1	0	0	0	0	0	0	0	0	0
0900	197	6	175	13	1	1	1	0	0	0	0	0	0	0
1000	229	12	193	21	1	0	2	0	0	0	0	0	0	0
1100	287	10	240	33	3	0	1	0	0	0	0	0	0	0
1200	326	8	275	42	1	0	0	0	0	0	0	0	0	0
1300	301	7	262	31	0	0	0	0	1	0	0	0	0	0
1400	249	7	224	16	0	1	1	0	0	0	0	0	0	0
1500	357	13	310	28	3	0	1	0	2	0	0	0	0	0
1600	285	5	260	18	0	0	0	0	2	0	0	0	0	0
1700	315	14	276	23	0	0	0	1	1	0	0	0	0	0
1800	279	3	262	14	0	0	0	0	0	0	0	0	0	0
1900	190	4	170	15	0	0	0	0	1	0	0	0	0	0
2000	162	3	148	11	0	0	0	0	0	0	0	0	0	0
2100	132	2	120	9	0	0	1	0	0	0	0	0	0	0
2200	118	0	113	5	0	0	0	0	0	0	0	0	0	0
2300	59	0	55	4	0	0	0	0	0	0	0	0	0	0
07-19	**2995**	**93**	**2627**	**250**	**10**	**2**	**6**	**1**	**6**	**0**	**0**	**0**	**0**	**0**
06-22	**3519**	**103**	**3101**	**288**	**10**	**2**	**7**	**1**	**7**	**0**	**0**	**0**	**0**	**0**
06-00	**3696**	**103**	**3269**	**297**	**10**	**2**	**7**	**1**	**7**	**0**	**0**	**0**	**0**	**0**
00-00	**3795**	**104**	**3365**	**299**	**10**	**2**	**7**	**1**	**7**	**0**	**0**	**0**	**0**	**0**

Peak step 15:00 (357) **AM Peak step** 11:00 (287) **PM Peak step** 15:00 (357)

*** Sunday, February 26, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	32	1	28	3	0	0	0	0	0	0	0	0	0	0
0100	21	1	18	2	0	0	0	0	0	0	0	0	0	0
0200	19	0	18	1	0	0	0	0	0	0	0	0	0	0
0300	7	0	7	0	0	0	0	0	0	0	0	0	0	0
0400	6	0	6	0	0	0	0	0	0	0	0	0	0	0
0500	12	0	12	0	0	0	0	0	0	0	0	0	0	0
0600	24	0	24	0	0	0	0	0	0	0	0	0	0	0
0700	42	1	35	6	0	0	0	0	0	0	0	0	0	0
0800	94	3	83	5	1	0	1	0	0	0	0	0	0	1
0900	149	6	122	18	0	1	1	0	1	0	0	0	0	0
1000	236	7	206	22	0	1	0	0	0	0	0	0	0	0
1100	257	6	238	10	0	1	1	0	1	0	0	0	0	0
1200	339	11	306	18	3	0	0	0	1	0	0	0	0	0
1300	293	11	253	26	1	1	1	0	0	0	0	0	0	0
1400	288	15	249	23	0	0	0	0	1	0	0	0	0	0
1500	284	12	253	17	2	0	0	0	0	0	0	0	0	0
1600	310	11	270	25	0	1	0	0	2	0	1	0	0	0
1700	292	7	257	26	0	0	1	0	1	0	0	0	0	0
1800	235	4	217	14	0	0	0	0	0	0	0	0	0	0
1900	167	3	146	18	0	0	0	0	0	0	0	0	0	0
2000	116	4	105	7	0	0	0	0	0	0	0	0	0	0
2100	124	1	106	17	0	0	0	0	0	0	0	0	0	0
2200	69	0	66	3	0	0	0	0	0	0	0	0	0	0
2300	41	0	39	2	0	0	0	0	0	0	0	0	0	0
07-19	**2819**	**94**	**2489**	**210**	**7**	**5**	**5**	**0**	**7**	**0**	**1**	**0**	**0**	**1**
06-22	**3250**	**102**	**2870**	**252**	**7**	**5**	**5**	**0**	**7**	**0**	**1**	**0**	**0**	**1**
06-00	**3360**	**102**	**2975**	**257**	**7**	**5**	**5**	**0**	**7**	**0**	**1**	**0**	**0**	**1**
00-00	**3457**	**104**	**3064**	**263**	**7**	**5**	**5**	**0**	**7**	**0**	**1**	**0**	**0**	**1**

Peak step 12:00 (339) **AM Peak step** 11:00 (257) **PM Peak step** 12:00 (339)

In profile: Vehicles = 16935 / 20314 (83.37%)

*** Friday, February 24, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	59	1	55	2	0	0	0	0	0	1	0	0	0	0
0100	31	0	26	4	0	1	0	0	0	0	0	0	0	0
0200	14	0	11	3	0	0	0	0	0	0	0	0	0	0
0300	15	0	11	3	0	0	0	0	0	1	0	0	0	0
0400	13	0	11	1	0	1	0	0	0	0	0	0	0	0
0500	51	0	44	4	0	1	0	0	1	1	0	0	0	0
0600	123	0	100	18	3	2	0	0	0	0	0	0	0	0
0700	328	4	284	36	1	2	1	0	0	0	0	0	0	0
0800	441	3	389	37	1	1	6	0	1	0	0	2	0	1
0900	398	2	357	33	4	0	1	0	1	0	0	0	0	0
1000	391	2	348	35	1	2	1	0	1	1	0	0	0	0
1100	436	5	381	44	1	0	5	0	0	0	0	0	0	0
1200	456	3	387	56	1	4	4	0	0	1	0	0	0	0
1300	506	9	421	61	1	4	9	0	0	1	0	0	0	0
1400	530	2	452	63	1	4	7	0	1	0	0	0	0	0
1500	508	6	449	44	0	1	8	0	0	0	0	0	0	0
1600	540	10	477	42	0	0	10	0	1	0	0	0	0	0
1700	579	13	523	31	1	0	9	0	0	0	1	1	0	0
1800	623	10	570	32	1	0	8	0	1	0	0	1	0	0
1900	531	9	492	24	2	1	3	0	0	0	0	0	0	0
2000	361	1	335	21	2	2	0	0	0	0	0	0	0	0
2100	245	4	229	12	0	0	0	0	0	0	0	0	0	0
2200	210	3	192	14	0	1	0	0	0	0	0	0	0	0
2300	172	1	156	14	1	0	0	0	0	0	0	0	0	0
07-19	**5736**	**69**	**5038**	**514**	**13**	**18**	**69**	**0**	**6**	**3**	**1**	**4**	**0**	**1**
06-22	**6996**	**83**	**6194**	**589**	**20**	**23**	**72**	**0**	**6**	**3**	**1**	**4**	**0**	**1**
06-00	**7378**	**87**	**6542**	**617**	**21**	**24**	**72**	**0**	**6**	**3**	**1**	**4**	**0**	**1**
00-00	**7561**	**88**	**6700**	**634**	**21**	**27**	**72**	**0**	**7**	**6**	**1**	**4**	**0**	**1**

Peak step 18:00 (623) **AM Peak step** 8:00 (441) **PM Peak step** 18:00 (623)

*** Saturday, February 25, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	68	1	61	6	0	0	0	0	0	0	0	0	0	0
0100	56	0	52	3	0	1	0	0	0	0	0	0	0	0
0200	33	1	28	4	0	0	0	0	0	0	0	0	0	0
0300	15	0	12	1	0	0	0	0	0	2	0	0	0	0
0400	20	0	15	4	0	0	0	0	1	0	0	0	0	0
0500	19	0	15	3	1	0	0	0	0	0	0	0	0	0
0600	61	0	45	15	1	0	0	0	0	0	0	0	0	0
0700	133	1	109	22	0	1	0	0	0	0	0	0	0	0
0800	193	1	177	14	0	1	0	0	0	0	0	0	0	0
0900	302	3	276	21	0	0	2	0	0	0	0	0	0	0
1000	344	4	296	37	3	1	1	0	1	0	1	0	0	0
1100	436	5	389	28	5	1	8	0	0	0	0	0	0	0
1200	447	7	399	33	2	0	5	0	1	0	0	0	0	0
1300	491	5	429	52	0	0	5	0	0	0	0	0	0	0
1400	462	2	411	43	1	0	5	0	0	0	0	0	0	0
1500	521	11	474	32	0	1	3	0	0	0	0	0	0	0
1600	476	3	437	34	0	0	2	0	0	0	0	0	0	0
1700	540	12	489	35	0	0	4	0	0	0	0	0	0	0
1800	483	4	441	34	1	0	3	0	0	0	0	0	0	0
1900	403	2	368	32	0	0	1	0	0	0	0	0	0	0
2000	258	2	243	12	0	1	0	0	0	0	0	0	0	0
2100	238	0	214	23	1	0	0	0	0	0	0	0	0	0
2200	164	1	150	12	1	0	0	0	0	0	0	0	0	0
2300	125	1	117	7	0	0	0	0	0	0	0	0	0	0
07-19	**4828**	**58**	**4327**	**385**	**12**	**5**	**38**	**0**	**2**	**0**	**1**	**0**	**0**	**0**
06-22	**5788**	**62**	**5197**	**467**	**14**	**6**	**39**	**0**	**2**	**0**	**1**	**0**	**0**	**0**
06-00	**6077**	**64**	**5464**	**486**	**15**	**6**	**39**	**0**	**2**	**0**	**1**	**0**	**0**	**0**
00-00	**6288**	**66**	**5647**	**507**	**16**	**7**	**39**	**0**	**3**	**2**	**1**	**0**	**0**	**0**

Peak step 17:00 (540) **AM Peak step** 11:00 (436) **PM Peak step** 17:00 (540)

*** Sunday, February 26, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	67	0	63	4	0	0	0	0	0	0	0	0	0	0
0100	49	2	40	7	0	0	0	0	0	0	0	0	0	0
0200	24	0	24	0	0	0	0	0	0	0	0	0	0	0
0300	15	0	13	1	0	0	0	0	0	1	0	0	0	0
0400	14	0	10	3	0	1	0	0	0	0	0	0	0	0
0500	14	0	11	2	1	0	0	0	0	0	0	0	0	0
0600	36	0	31	5	0	0	0	0	0	0	0	0	0	0
0700	85	0	79	6	0	0	0	0	0	0	0	0	0	0
0800	180	0	167	12	0	0	1	0	0	0	0	0	0	0
0900	282	1	256	24	0	0	0	0	0	1	0	0	0	0
1000	305	5	278	16	1	0	4	0	1	0	0	0	0	0
1100	382	4	338	35	0	0	4	0	1	0	0	0	0	0
1200	411	4	370	29	0	0	8	0	0	0	0	0	0	0
1300	454	11	397	42	1	0	2	0	1	0	0	0	0	0
1400	416	6	378	24	5	0	3	0	0	0	0	0	0	0
1500	430	8	396	21	0	0	5	0	0	0	0	0	0	0
1600	440	5	401	32	0	0	1	0	0	0	0	1	0	0
1700	428	9	383	35	0	0	1	0	0	0	0	0	0	0
1800	389	3	351	34	0	1	0	0	0	0	0	0	0	0
1900	348	1	319	24	0	0	4	0	0	0	0	0	0	0
2000	233	2	216	15	0	0	0	0	0	0	0	0	0	0
2100	173	1	159	13	0	0	0	0	0	0	0	0	0	0
2200	102	1	91	10	0	0	0	0	0	0	0	0	0	0
2300	79	0	71	6	1	0	0	0	1	0	0	0	0	0
07-19	**4202**	**56**	**3794**	**310**	**7**	**1**	**29**	**0**	**3**	**1**	**0**	**1**	**0**	**0**
06-22	**4992**	**60**	**4519**	**367**	**7**	**1**	**33**	**0**	**3**	**1**	**0**	**1**	**0**	**0**
06-00	**5173**	**61**	**4681**	**383**	**8**	**1**	**33**	**0**	**4**	**1**	**0**	**1**	**0**	**0**
00-00	**5356**	**63**	**4842**	**400**	**9**	**2**	**33**	**0**	**4**	**2**	**0**	**1**	**0**	**0**

Peak step 13:00 (454) **AM Peak step** 11:00 (382) **PM Peak step** 13:00 (454)

In profile: Vehicles = 26432 / 68170 (38.77%)

Traffic Data Service -- San Jose, CA
Class Report

CustomList-15067 -- English (ENU)

Datasets:
Site: **[4] PALO ALTO AVE W OF ALMA ST**
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 100 mph.
Direction: West (bound)
Name: Default Profile
Scheme: Vehicle classification (Scheme F)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

Column Legend:
0 [Time] 24-hour time (0000 - 2359)
1 [Total] Number in time step
2 [Cls] Class totals

*** Thursday, February 23, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	43	0	36	7	0	0	0	0	0	0	0	0	0	0
0100	19	0	16	2	0	0	0	0	0	1	0	0	0	0
0200	7	0	5	2	0	0	0	0	0	0	0	0	0	0
0300	7	0	5	2	0	0	0	0	0	0	0	0	0	0
0400	29	0	23	5	0	1	0	0	0	0	0	0	0	0
0500	85	2	62	21	0	0	0	0	0	0	0	0	0	0
0600	170	4	134	32	0	0	0	0	0	0	0	0	0	0
0700	425	8	338	70	2	4	2	1	0	0	0	0	0	0
0800	560	15	485	54	3	2	0	0	1	0	0	0	0	0
0900	507	8	429	68	1	1	0	0	0	0	0	0	0	0
1000	476	6	396	67	2	1	0	0	2	1	1	0	0	0
1100	568	7	457	98	1	4	0	0	1	0	0	0	0	0
1200	577	8	489	78	1	1	0	0	0	0	0	0	0	0
1300	556	6	484	63	1	1	0	0	0	1	0	0	0	0
1400	558	6	488	63	0	1	0	0	0	0	0	0	0	0
1500	673	3	591	79	0	0	0	0	0	0	0	0	0	0
1600	736	10	663	60	1	0	1	0	0	0	0	1	0	0
1700	804	5	745	50	3	0	0	0	1	0	0	0	0	0
1800	690	3	636	51	0	0	0	0	0	0	0	0	0	0
1900	497	3	463	29	0	1	1	0	0	0	0	0	0	0
2000	363	2	335	26	0	0	0	0	0	0	0	0	0	0
2100	299	0	282	17	0	0	0	0	0	0	0	0	0	0
2200	204	0	194	10	0	0	0	0	0	0	0	0	0	0
2300	109	1	98	10	0	0	0	0	0	0	0	0	0	0
07-19	**7130**	**85**	**6201**	**801**	**15**	**15**	**3**	**1**	**5**	**2**	**1**	**1**	**0**	**0**
06-22	**8459**	**94**	**7415**	**905**	**15**	**16**	**4**	**1**	**5**	**2**	**1**	**1**	**0**	**0**
06-00	**8772**	**95**	**7707**	**925**	**15**	**16**	**4**	**1**	**5**	**2**	**1**	**1**	**0**	**0**
00-00	**8962**	**97**	**7854**	**964**	**15**	**17**	**4**	**1**	**5**	**3**	**1**	**1**	**0**	**0**

Peak step 17:00 (804) **AM Peak step** 11:00 (568) **PM Peak step** 17:00 (804)

*** Friday, February 24, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	57	0	53	4	0	0	0	0	0	0	0	0	0	0
0100	31	0	25	5	0	0	0	0	0	1	0	0	0	0
0200	18	0	15	2	1	0	0	0	0	0	0	0	0	0
0300	11	0	9	2	0	0	0	0	0	0	0	0	0	0
0400	26	0	20	4	0	1	0	0	1	0	0	0	0	0
0500	71	0	55	14	0	1	1	0	0	0	0	0	0	0
0600	210	1	173	33	2	0	0	0	0	1	0	0	0	0
0700	368	5	297	60	1	3	0	0	2	0	0	0	0	0
0800	513	10	447	47	3	4	2	0	0	0	0	0	0	0
0900	494	9	422	57	3	3	0	0	0	0	0	0	0	0
1000	513	9	440	59	1	2	1	0	1	0	0	0	0	0
1100	534	6	467	55	1	3	0	0	0	2	0	0	0	0
1200	549	6	493	47	0	0	1	0	0	1	0	1	0	0
1300	590	3	533	51	0	2	0	0	0	1	0	0	0	0
1400	644	9	579	56	0	0	0	0	0	0	0	0	0	0
1500	720	12	643	63	1	0	0	0	0	1	0	0	0	0
1600	698	6	628	64	0	0	0	0	0	0	0	0	0	0
1700	773	7	730	35	1	0	0	0	0	0	0	0	0	0
1800	628	4	595	29	0	0	0	0	0	0	0	0	0	0
1900	507	3	473	30	1	0	0	0	0	0	0	0	0	0
2000	385	2	366	17	0	0	0	0	0	0	0	0	0	0
2100	337	3	317	17	0	0	0	0	0	0	0	0	0	0
2200	261	1	249	11	0	0	0	0	0	0	0	0	0	0
2300	163	2	146	15	0	0	0	0	0	0	0	0	0	0
07-19	**7024**	**86**	**6274**	**623**	**11**	**17**	**4**	**0**	**3**	**5**	**0**	**1**	**0**	**0**
06-22	**8463**	**95**	**7603**	**720**	**14**	**17**	**4**	**0**	**3**	**6**	**0**	**1**	**0**	**0**
06-00	**8887**	**98**	**7998**	**746**	**14**	**17**	**4**	**0**	**3**	**6**	**0**	**1**	**0**	**0**
00-00	**9101**	**98**	**8175**	**777**	**15**	**19**	**5**	**0**	**4**	**7**	**0**	**1**	**0**	**0**

Peak step 17:00 (773) **AM Peak step** 11:00 (534) **PM Peak step** 17:00 (773)

*** Saturday, February 25, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	91	1	81	8	0	1	0	0	0	0	0	0	0	0
0100	66	0	63	3	0	0	0	0	0	0	0	0	0	0
0200	35	0	34	1	0	0	0	0	0	0	0	0	0	0
0300	12	1	10	0	0	0	0	0	0	1	0	0	0	0
0400	28	0	23	4	1	0	0	0	0	0	0	0	0	0
0500	39	0	32	6	0	1	0	0	0	0	0	0	0	0
0600	71	1	58	11	0	1	0	0	0	0	0	0	0	0
0700	139	1	122	16	0	0	0	0	0	0	0	0	0	0
0800	223	5	186	29	1	2	0	0	0	0	0	0	0	0
0900	364	7	310	45	0	1	1	0	0	0	0	0	0	0
1000	464	9	416	37	1	0	0	0	0	0	0	0	0	1
1100	533	4	496	29	2	0	2	0	0	0	0	0	0	0
1200	555	8	505	38	1	2	0	0	0	0	0	1	0	0
1300	616	7	560	43	2	1	0	0	2	1	0	0	0	0
1400	629	12	582	32	1	1	1	0	0	0	0	0	0	0
1500	606	5	558	42	0	0	0	0	1	0	0	0	0	0
1600	532	3	497	31	1	0	0	0	0	0	0	0	0	0
1700	485	2	453	30	0	0	0	0	0	0	0	0	0	0
1800	486	3	441	42	0	0	0	0	0	0	0	0	0	0
1900	372	0	344	28	0	0	0	0	0	0	0	0	0	0
2000	279	2	260	17	0	0	0	0	0	0	0	0	0	0
2100	321	0	304	16	0	1	0	0	0	0	0	0	0	0
2200	204	1	191	12	0	0	0	0	0	0	0	0	0	0
2300	175	0	161	12	0	1	0	0	0	0	1	0	0	0
07-19	**5632**	**66**	**5126**	**414**	**9**	**7**	**4**	**0**	**3**	**1**	**0**	**1**	**0**	**1**
06-22	**6675**	**69**	**6092**	**486**	**9**	**9**	**4**	**0**	**3**	**1**	**0**	**1**	**0**	**1**
06-00	**7054**	**70**	**6444**	**510**	**9**	**10**	**4**	**0**	**3**	**1**	**1**	**1**	**0**	**1**
00-00	**7325**	**72**	**6687**	**532**	**10**	**12**	**4**	**0**	**3**	**2**	**1**	**1**	**0**	**1**

Peak step 14:00 (629) **AM Peak step** 11:00 (533) **PM Peak step** 14:00 (629)

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*** Sunday, February 26, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	92	1	83	8	0	0	0	0	0	0	0	0	0	0
0100	62	1	57	4	0	0	0	0	0	0	0	0	0	0
0200	35	1	33	1	0	0	0	0	0	0	0	0	0	0
0300	11	0	10	1	0	0	0	0	0	0	0	0	0	0
0400	14	1	11	1	0	0	1	0	0	0	0	0	0	0
0500	20	0	19	1	0	0	0	0	0	0	0	0	0	0
0600	56	0	52	2	0	2	0	0	0	0	0	0	0	0
0700	119	2	107	10	0	0	0	0	0	0	0	0	0	0
0800	225	0	206	19	0	0	0	0	0	0	0	0	0	0
0900	344	2	313	27	1	1	0	0	0	0	0	0	0	0
1000	414	1	384	28	0	0	0	0	1	0	0	0	0	0
1100	494	6	460	26	0	0	0	0	2	0	0	0	0	0
1200	530	9	485	34	0	0	0	0	2	0	0	0	0	0
1300	516	5	489	21	0	1	0	0	0	0	0	0	0	0
1400	526	8	490	26	0	0	1	0	1	0	0	0	0	0
1500	521	8	488	25	0	0	0	0	0	0	0	0	0	0
1600	516	5	471	39	1	0	0	0	0	0	0	0	0	0
1700	455	4	418	33	0	0	0	0	0	0	0	0	0	0
1800	384	5	351	28	0	0	0	0	0	0	0	0	0	0
1900	326	3	297	26	0	0	0	0	0	0	0	0	0	0
2000	217	0	200	17	0	0	0	0	0	0	0	0	0	0
2100	183	1	171	10	1	0	0	0	0	0	0	0	0	0
2200	122	0	113	9	0	0	0	0	0	0	0	0	0	0
2300	63	0	57	6	0	0	0	0	0	0	0	0	0	0
07-19	**5044**	**55**	**4662**	**316**	**2**	**2**	**1**	**0**	**6**	**0**	**0**	**0**	**0**	**0**
06-22	**5826**	**59**	**5382**	**371**	**3**	**4**	**1**	**0**	**6**	**0**	**0**	**0**	**0**	**0**
06-00	**6011**	**59**	**5552**	**386**	**3**	**4**	**1**	**0**	**6**	**0**	**0**	**0**	**0**	**0**
00-00	**6245**	**63**	**5765**	**402**	**3**	**4**	**2**	**0**	**6**	**0**	**0**	**0**	**0**	**0**

Peak step 12:00 (530) **AM Peak step** 11:00 (494) **PM Peak step** 12:00 (530)

In profile: Vehicles = 31633 / 68170 (46.40%)

Traffic Data Service -- San Jose, CA
Class Report

CustomList-15067 -- English (ENU)

Datasets:
Site: **[4] PALO ALTO AVE W OF ALMA ST**
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 100 mph.
Direction: West (bound)
Name: Default Profile
Scheme: Vehicle classification (Scheme F)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

Column Legend:
0 [Time] 24-hour time (0000 - 2359)
1 [Total] Number in time step
2 [Cls] Class totals

*** Thursday, February 23, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	43	0	36	7	0	0	0	0	0	0	0	0	0	0
0100	19	0	16	2	0	0	0	0	0	1	0	0	0	0
0200	7	0	5	2	0	0	0	0	0	0	0	0	0	0
0300	7	0	5	2	0	0	0	0	0	0	0	0	0	0
0400	29	0	23	5	0	1	0	0	0	0	0	0	0	0
0500	85	2	62	21	0	0	0	0	0	0	0	0	0	0
0600	170	4	134	32	0	0	0	0	0	0	0	0	0	0
0700	425	8	338	70	2	4	2	1	0	0	0	0	0	0
0800	560	15	485	54	3	2	0	0	1	0	0	0	0	0
0900	507	8	429	68	1	1	0	0	0	0	0	0	0	0
1000	476	6	396	67	2	1	0	0	2	1	1	0	0	0
1100	568	7	457	98	1	4	0	0	1	0	0	0	0	0
1200	577	8	489	78	1	1	0	0	0	0	0	0	0	0
1300	556	6	484	63	1	1	0	0	0	1	0	0	0	0
1400	558	6	488	63	0	1	0	0	0	0	0	0	0	0
1500	673	3	591	79	0	0	0	0	0	0	0	0	0	0
1600	736	10	663	60	1	0	1	0	0	0	0	1	0	0
1700	804	5	745	50	3	0	0	0	1	0	0	0	0	0
1800	690	3	636	51	0	0	0	0	0	0	0	0	0	0
1900	497	3	463	29	0	1	1	0	0	0	0	0	0	0
2000	363	2	335	26	0	0	0	0	0	0	0	0	0	0
2100	299	0	282	17	0	0	0	0	0	0	0	0	0	0
2200	204	0	194	10	0	0	0	0	0	0	0	0	0	0
2300	109	1	98	10	0	0	0	0	0	0	0	0	0	0
07-19	**7130**	**85**	**6201**	**801**	**15**	**15**	**3**	**1**	**5**	**2**	**1**	**1**	**0**	**0**
06-22	**8459**	**94**	**7415**	**905**	**15**	**16**	**4**	**1**	**5**	**2**	**1**	**1**	**0**	**0**
06-00	**8772**	**95**	**7707**	**925**	**15**	**16**	**4**	**1**	**5**	**2**	**1**	**1**	**0**	**0**
00-00	**8962**	**97**	**7854**	**964**	**15**	**17**	**4**	**1**	**5**	**3**	**1**	**1**	**0**	**0**

Peak step 17:00 (804) **AM Peak step** 11:00 (568) **PM Peak step** 17:00 (804)

*** Friday, February 24, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	57	0	53	4	0	0	0	0	0	0	0	0	0	0
0100	31	0	25	5	0	0	0	0	0	1	0	0	0	0
0200	18	0	15	2	1	0	0	0	0	0	0	0	0	0
0300	11	0	9	2	0	0	0	0	0	0	0	0	0	0
0400	26	0	20	4	0	1	0	0	1	0	0	0	0	0
0500	71	0	55	14	0	1	1	0	0	0	0	0	0	0
0600	210	1	173	33	2	0	0	0	0	1	0	0	0	0
0700	368	5	297	60	1	3	0	0	2	0	0	0	0	0
0800	513	10	447	47	3	4	2	0	0	0	0	0	0	0
0900	494	9	422	57	3	3	0	0	0	0	0	0	0	0
1000	513	9	440	59	1	2	1	0	1	0	0	0	0	0
1100	534	6	467	55	1	3	0	0	0	2	0	0	0	0
1200	549	6	493	47	0	0	1	0	0	1	0	1	0	0
1300	590	3	533	51	0	2	0	0	0	1	0	0	0	0
1400	644	9	579	56	0	0	0	0	0	0	0	0	0	0
1500	720	12	643	63	1	0	0	0	0	1	0	0	0	0
1600	698	6	628	64	0	0	0	0	0	0	0	0	0	0
1700	773	7	730	35	1	0	0	0	0	0	0	0	0	0
1800	628	4	595	29	0	0	0	0	0	0	0	0	0	0
1900	507	3	473	30	1	0	0	0	0	0	0	0	0	0
2000	385	2	366	17	0	0	0	0	0	0	0	0	0	0
2100	337	3	317	17	0	0	0	0	0	0	0	0	0	0
2200	261	1	249	11	0	0	0	0	0	0	0	0	0	0
2300	163	2	146	15	0	0	0	0	0	0	0	0	0	0
07-19	**7024**	**86**	**6274**	**623**	**11**	**17**	**4**	**0**	**3**	**5**	**0**	**1**	**0**	**0**
06-22	**8463**	**95**	**7603**	**720**	**14**	**17**	**4**	**0**	**3**	**6**	**0**	**1**	**0**	**0**
06-00	**8887**	**98**	**7998**	**746**	**14**	**17**	**4**	**0**	**3**	**6**	**0**	**1**	**0**	**0**
00-00	**9101**	**98**	**8175**	**777**	**15**	**19**	**5**	**0**	**4**	**7**	**0**	**1**	**0**	**0**

Peak step 17:00 (773) **AM Peak step** 11:00 (534) **PM Peak step** 17:00 (773)

*** Saturday, February 25, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	91	1	81	8	0	1	0	0	0	0	0	0	0	0
0100	66	0	63	3	0	0	0	0	0	0	0	0	0	0
0200	35	0	34	1	0	0	0	0	0	0	0	0	0	0
0300	12	1	10	0	0	0	0	0	0	1	0	0	0	0
0400	28	0	23	4	1	0	0	0	0	0	0	0	0	0
0500	39	0	32	6	0	1	0	0	0	0	0	0	0	0
0600	71	1	58	11	0	1	0	0	0	0	0	0	0	0
0700	139	1	122	16	0	0	0	0	0	0	0	0	0	0
0800	223	5	186	29	1	2	0	0	0	0	0	0	0	0
0900	364	7	310	45	0	1	1	0	0	0	0	0	0	0
1000	464	9	416	37	1	0	0	0	0	0	0	0	0	1
1100	533	4	496	29	2	0	2	0	0	0	0	0	0	0
1200	555	8	505	38	1	2	0	0	0	0	0	1	0	0
1300	616	7	560	43	2	1	0	0	2	1	0	0	0	0
1400	629	12	582	32	1	1	1	0	0	0	0	0	0	0
1500	606	5	558	42	0	0	0	0	1	0	0	0	0	0
1600	532	3	497	31	1	0	0	0	0	0	0	0	0	0
1700	485	2	453	30	0	0	0	0	0	0	0	0	0	0
1800	486	3	441	42	0	0	0	0	0	0	0	0	0	0
1900	372	0	344	28	0	0	0	0	0	0	0	0	0	0
2000	279	2	260	17	0	0	0	0	0	0	0	0	0	0
2100	321	0	304	16	0	1	0	0	0	0	0	0	0	0
2200	204	1	191	12	0	0	0	0	0	0	0	0	0	0
2300	175	0	161	12	0	1	0	0	0	0	1	0	0	0
07-19	**5632**	**66**	**5126**	**414**	**9**	**7**	**4**	**0**	**3**	**1**	**0**	**1**	**0**	**1**
06-22	**6675**	**69**	**6092**	**486**	**9**	**9**	**4**	**0**	**3**	**1**	**0**	**1**	**0**	**1**
06-00	**7054**	**70**	**6444**	**510**	**9**	**10**	**4**	**0**	**3**	**1**	**1**	**1**	**0**	**1**
00-00	**7325**	**72**	**6687**	**532**	**10**	**12**	**4**	**0**	**3**	**2**	**1**	**1**	**0**	**1**

Peak step 14:00 (629) **AM Peak step** 11:00 (533) **PM Peak step** 14:00 (629)

CustomList-15067 Page 3

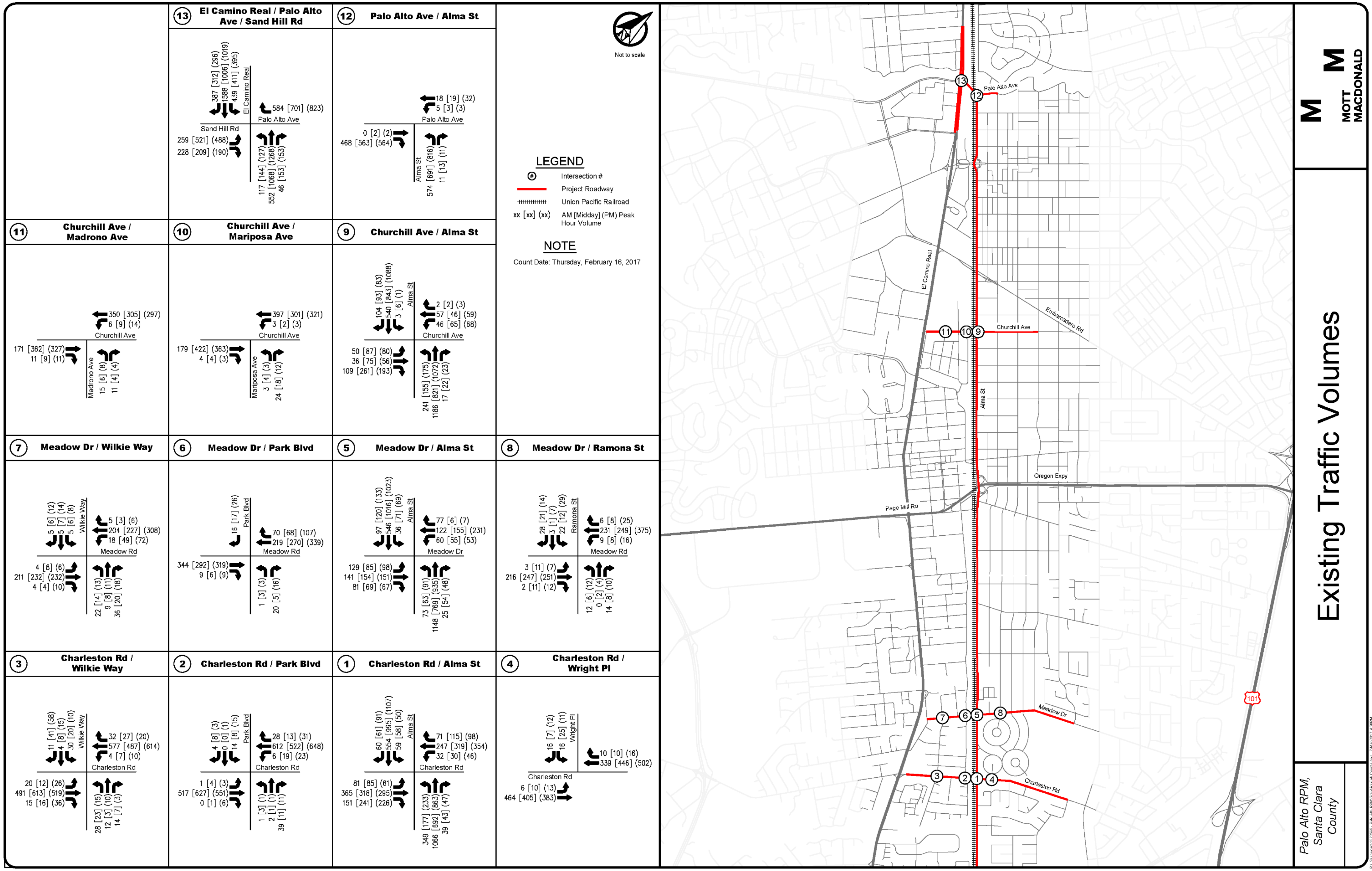
*** Sunday, February 26, 2017**

Time	Total	Cls 1	Cls 2	Cls 3	Cls 4	Cls 5	Cls 6	Cls 7	Cls 8	Cls 9	Cls 10	Cls 11	Cls 12	Cls 13
0000	92	1	83	8	0	0	0	0	0	0	0	0	0	0
0100	62	1	57	4	0	0	0	0	0	0	0	0	0	0
0200	35	1	33	1	0	0	0	0	0	0	0	0	0	0
0300	11	0	10	1	0	0	0	0	0	0	0	0	0	0
0400	14	1	11	1	0	0	1	0	0	0	0	0	0	0
0500	20	0	19	1	0	0	0	0	0	0	0	0	0	0
0600	56	0	52	2	0	2	0	0	0	0	0	0	0	0
0700	119	2	107	10	0	0	0	0	0	0	0	0	0	0
0800	225	0	206	19	0	0	0	0	0	0	0	0	0	0
0900	344	2	313	27	1	1	0	0	0	0	0	0	0	0
1000	414	1	384	28	0	0	0	0	1	0	0	0	0	0
1100	494	6	460	26	0	0	0	0	2	0	0	0	0	0
1200	530	9	485	34	0	0	0	0	2	0	0	0	0	0
1300	516	5	489	21	0	1	0	0	0	0	0	0	0	0
1400	526	8	490	26	0	0	1	0	1	0	0	0	0	0
1500	521	8	488	25	0	0	0	0	0	0	0	0	0	0
1600	516	5	471	39	1	0	0	0	0	0	0	0	0	0
1700	455	4	418	33	0	0	0	0	0	0	0	0	0	0
1800	384	5	351	28	0	0	0	0	0	0	0	0	0	0
1900	326	3	297	26	0	0	0	0	0	0	0	0	0	0
2000	217	0	200	17	0	0	0	0	0	0	0	0	0	0
2100	183	1	171	10	1	0	0	0	0	0	0	0	0	0
2200	122	0	113	9	0	0	0	0	0	0	0	0	0	0
2300	63	0	57	6	0	0	0	0	0	0	0	0	0	0
07-19	**5044**	**55**	**4662**	**316**	**2**	**2**	**1**	**0**	**6**	**0**	**0**	**0**	**0**	**0**
06-22	**5826**	**59**	**5382**	**371**	**3**	**4**	**1**	**0**	**6**	**0**	**0**	**0**	**0**	**0**
06-00	**6011**	**59**	**5552**	**386**	**3**	**4**	**1**	**0**	**6**	**0**	**0**	**0**	**0**	**0**
00-00	**6245**	**63**	**5765**	**402**	**3**	**4**	**2**	**0**	**6**	**0**	**0**	**0**	**0**	**0**

Peak step 12:00 (530) **AM Peak step** 11:00 (494) **PM Peak step** 12:00 (530)

In profile: Vehicles = 31633 / 68170 (46.40%)

Appendix D - Existing Traffic Turning Volumes at Key Intersections



mottmac.com/americas

Travel Demand Model Validation Report

City of Palo Alto: Rail Program Management

October 30, 2017

City of Palo Alto

Mott MacDonald
4301 Hacienda Drive
Suite 300
Pleasanton CA 94588
United States of America

T +1 (925) 469 8010
F +1 (925) 469 8011
mottmac.com

City of Palo Alto
250 Hamilton Avenue
Palo Alto, CA 94301

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City of Palo Alto

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
V2	3/3/17	R Davies	M DiFrancia		
V3	3/10/17	R Davies	M DiFrancia		
V4	6/30/17	R Davies	M DiFrancia		
V5	10/30/17	A Nie	R Davies		

Document reference:

Information class: Standard

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3. Model Review 3

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1. Introduction

The City of Palo Alto Travel Demand model is an essential source of information and part of the “tool kit” the Consultant will use for the technical analyses of the Task 4: Rail Corridor Circulation Study, as part of the Consultant’s Rail Program Management Services. Task 4 itemizes a number of subtasks that will be carried out as follows:

- Data Review
- Existing Documents
- Existing Traffic Counts
- Travel Demand Models
- Development Proposals
- Utilities and Right of Way
- Field Observations
- Collision Data
- Grade Crossing Hazards and Gate Downtime
- Evaluation of Alternatives

This report focuses on the Travel Demand Model. The Travel Demand Model is a regional model that has been used by the City of Palo Alto (referred to as the “City”) to provide transportation information on the Comprehensive Plan and other major changes that will impact transportation. The Travel Demand Model was developed based on the VTA regional travel demand model using the Cube Voyager program. How the model will be used is described together with the background setting for the analyses.

A description of the model is included together with identifying its limitations and the appropriate way of integrating the use of the model into the analyses that form a major component of the overall evaluation studies. The Consultant has reviewed the output of the model at its base year (2014) with newly obtained and other recent traffic volume counts. This provides a measure of how the model can be used. Finally, the proposed analytical methods the consultant intends to use are discussed.

2. Background and Use of the Travel Demand Model

The Rail Corridor Circulation Study is set up to assess what the effect will be of the alternative grade separation road/rail designs on the street based traffic. This will include all motorized vehicles, bicycles, and pedestrians. This report addresses motorized vehicles only; other modes are covered elsewhere.

Analyses of the Travel Demand Model reflect automobiles, taxis, road transit (bus and shuttles), and trucks. The model simulates road traffic patterns and volumes in the road network. It is responsive to connectivity in the road network and delay-generated-congestion on the road network. It will simulate the rerouting of traffic to reflect all drivers (apart from fixed rate road transit services), minimizing their journey times.

For this exercise, only the road traffic assignment model is used. There are other choice models within the overall modeling framework (mainly location and mode choice), but they are not considered to be impacted sufficiently by the alternative forms of grade crossings to be reflected in the analyses.

The Travel Demand Model is very large (almost 3,000 zones) and is primarily intended to be used to assess the impact of major changes in land use and transportation infrastructure and services. For example, a major capacity increase of a freeway or changes in population or employment in the City and surrounding area. However, the model is quite suitable for assessing driver's responses to major changes in road connectivity and delays generated by congestion. It is also the best tool available for forecasting future growth in travel demand.

The Consultant will use the Travel Demand Model for two important elements of the analysis. First, it will be used to assess the rerouting of drivers to respond to connectivity changes by either grade separations or road closures replacing current at grade crossing, for example. This will allow the impact of rerouting to be analyzed with the alternatives being tested. The second use will be to assess the most likely growth of travel demand and its impact in the future years at the key points in the road network. This growth will be applied to observed traffic volumes and movements to project to a future year estimation of traffic conditions.

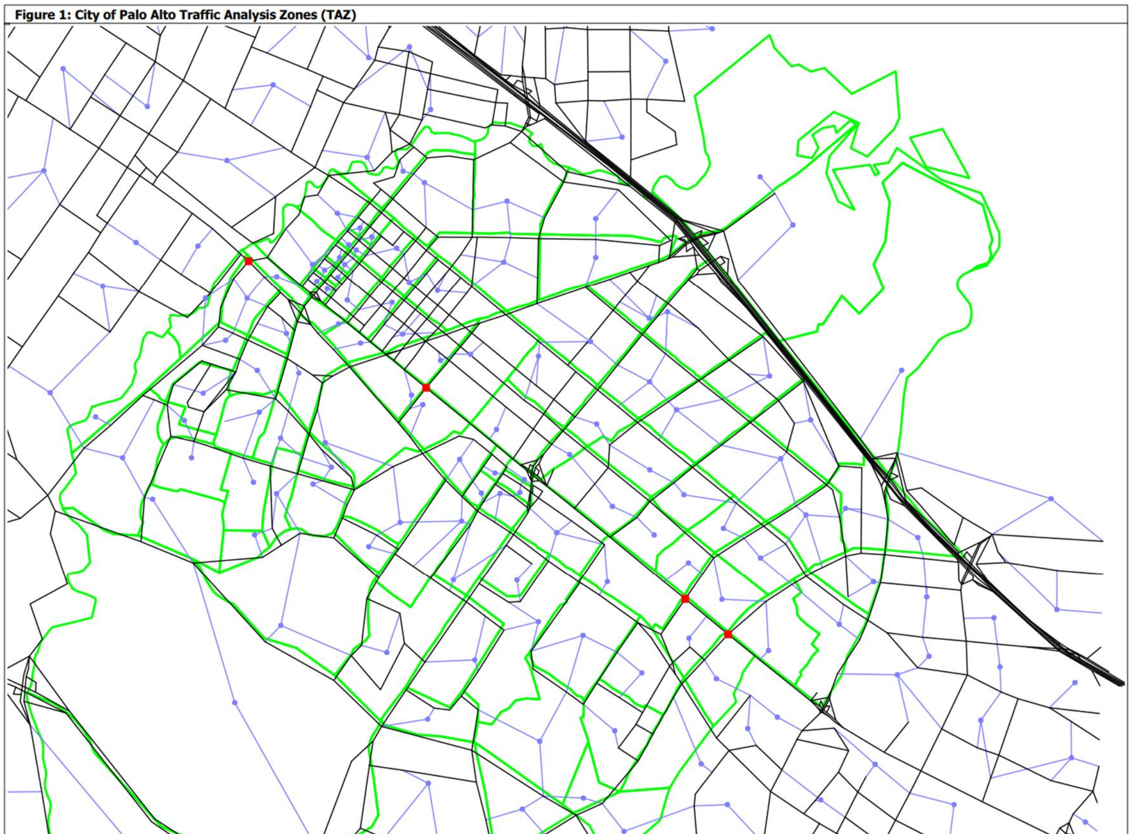
At the key intersection and grade crossings, a more detailed approach will be applied. New data has been obtained from recent traffic counts and this data, along with the use of forecast growth parameters, will be used as input to a more detailed modeling of the intersections. This is described further in in the following sections of the report.

3. Model Review

Although the model geographically covers the whole Bay Area (nine counties), its focused area is the City of Palo Alto, where it has more detailed information about the roadway network and land use. The City model has 2,980 traffic analysis zones (TAZs). The zones are denser in the City area than in other areas. The base year of the model is 2014, and the planning horizon year is 2030. Figure 1 below shows the TAZs for the City of Palo Alto.

Figure 1: Traffic Analysis Zones

Figure 1: City of Palo Alto Traffic Analysis Zones (TAZ)



Green: TAZ boundaries; Red: at-grade highway and Caltrain crossings

3.1 Travel Demand Models

Two models were received from Hexagon Transportation Consultants, who currently maintains the City model:

- 2014 base year model
- 2030 Alt 1 model. This is one of the many future year models of the City. The City has a number of future year models, each representing a different planning scenario. The 2030 Alt 1 model is considered the most appropriate for this study, as it represents the currently approved City Comprehensive Plan.

The City model has a number of traffic forecasting periods: AM peak 4-Hour, PM peak 4-Hour, Mid-Day, and Night. In this study, only the peak hour traffic forecasts will be used, as those represent the most critical conditions. The City model, however, does not produce peak hour traffic directly. The peak hour forecasts have to be derived through factoring the AM 4-Hour and PM 4-Hour traffic forecasts. The same process will be followed for forecasting peak hour traffic in this study, as would be done for other infrastructure projects in the City.

3.2 Limitations of the Model

The City model is not an intersection based model in the sense that turning movement delay is not explicitly modeled and is not sensitive to volume changes. The model is not intended to address this level of detail. From the traffic operation point of view, this is a limitation of the model because in urban streets, traffic delay is typically incurred at intersections instead of the link level. This model uses speed/flow relationships with implicit (average) delays for intersections.

3.3 Roadway Network in the Study Area

The City model is not built on a GIS network. It therefore lacks many roadway network details in the study area. This is illustrated in Figure 2, where the thick blue lines represent the model network while the gray lines represent the GIS network. It can be seen from the figure that there are many streets that are not included in the model. The missing of those local streets, and the fact that not all local streets are represented, may affect how traffic is assigned or routed in the model. This is completely normal for a strategic model covering the size of area that it does. Therefore, the model forecasts need to be examined on how they can be used for traffic operations analysis.

Figure 2: Model Network vs. GIS Network

Source: Mott MacDonald and ArcGIS, 2017

3.4 Study Intersections

This project has four (4) key study intersections / railway and highway crossings. In the following section, the actual layout of these intersections is compared with what has been assumed in the model. Aerial photos are used to show the actual layouts of these intersections. From north to south the intersections are:

1. Palo Alto Ave with El Camino Real
2. Churchill Ave with Alma Street
3. Meadow Drive with Alma Street
4. Charleston Rd with Alma Street

Alma street is a four (4) lane arterial throughout the City and a main north-south route alongside and immediately to the east of the Caltrain tracks. The intersecting streets have an east-west orientation and are four (4) lanes in width.

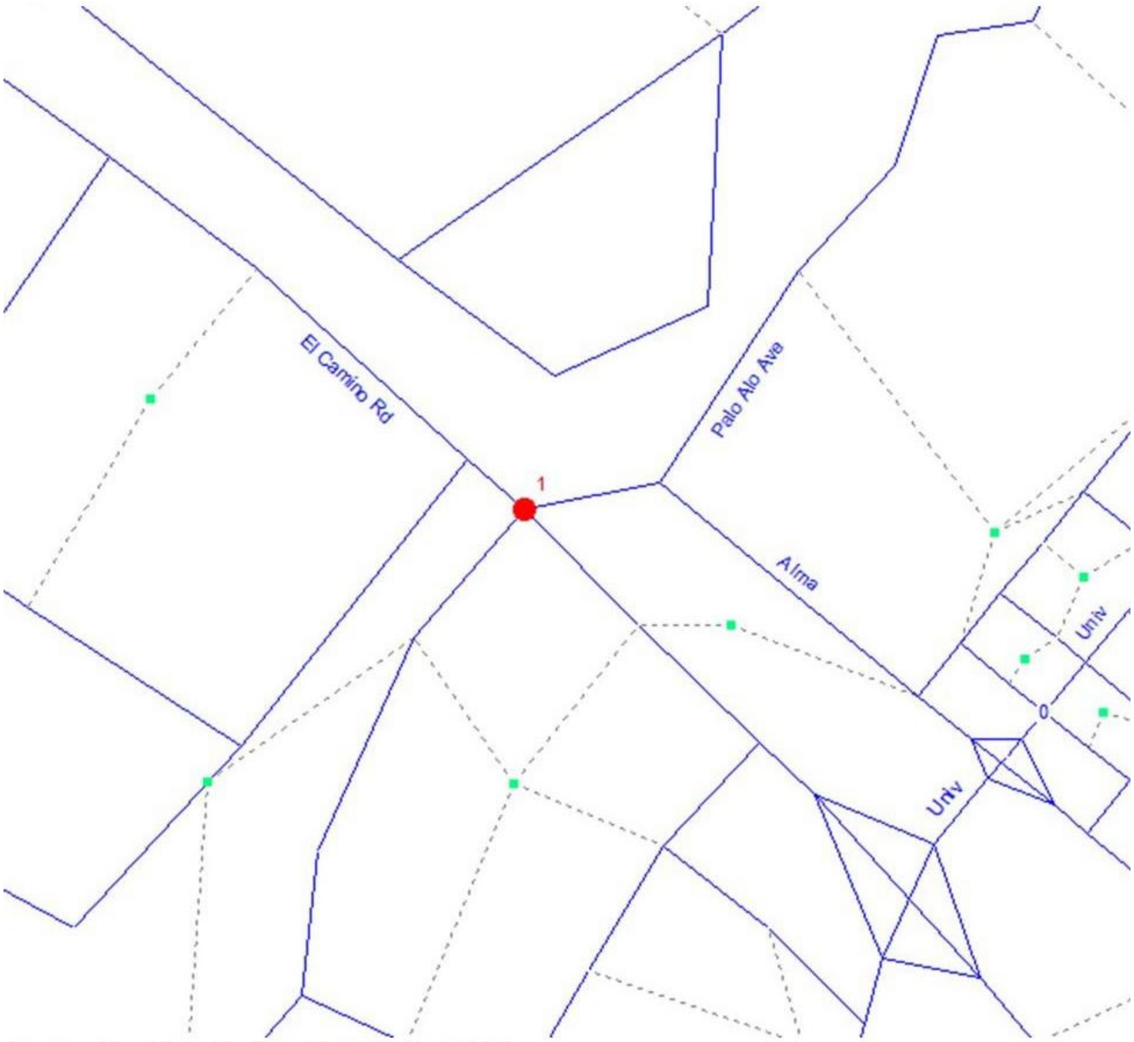
Intersection 1: Palo Alto Ave / El Camino Real

The intersection is identified by Node 5255. The actual layout is presented in Figure 3 and the model layout in Figure 4.

Figure 3: Palo Alto Avenue/ El Camino Real

Source: Google Earth 2016

Figure 4: Palo Alto Avenue/El Camino Real in the City Model



Source: City of Palo Alto Travel Demand Model 2016

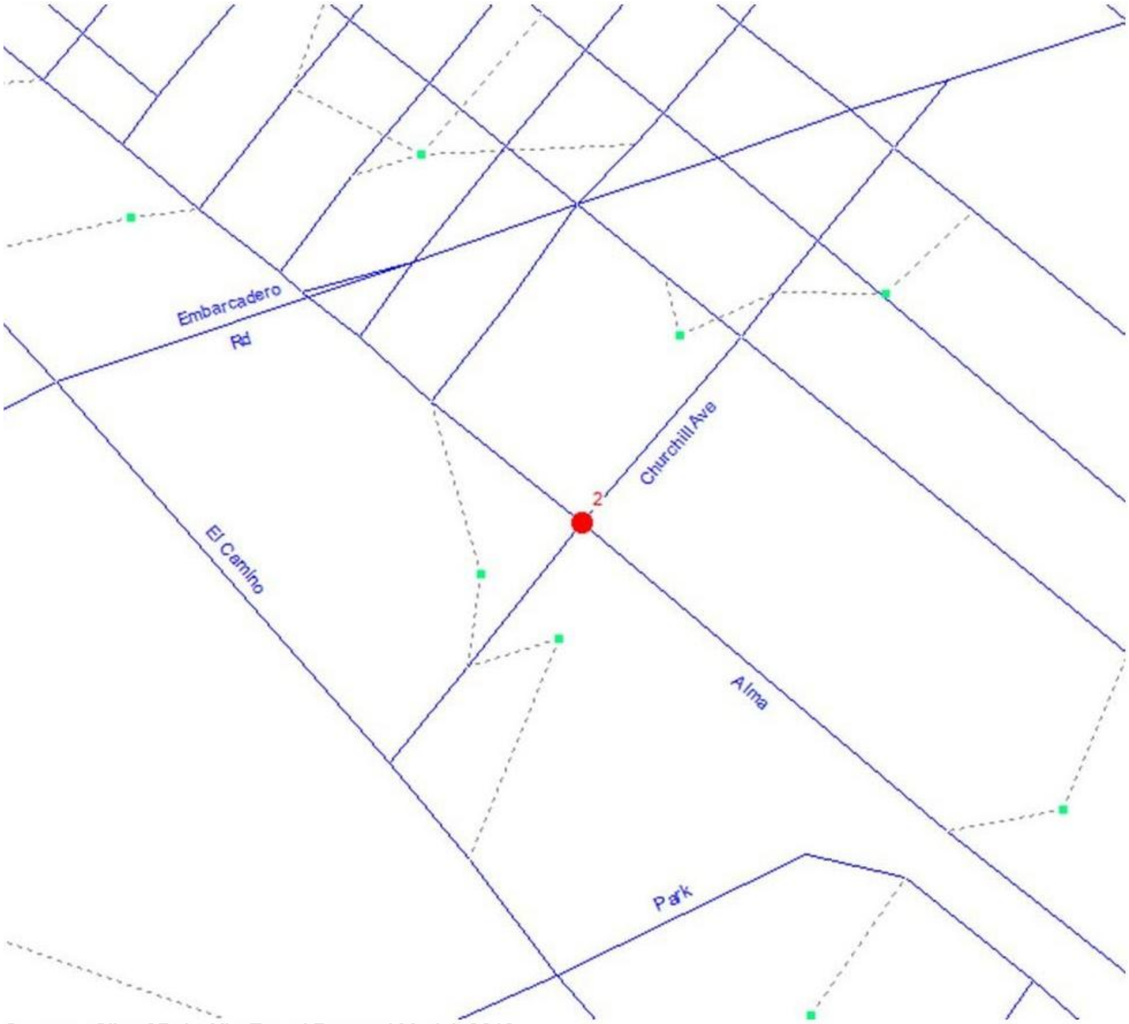
Intersection 2: Churchill Ave / Alma Street

The intersection is identified by Node 5507 in the City model. The actual layout is presented in Figure 5 and the model layout in Figure 6.

Figure 5: Churchill Ave and Alma Street

Source: Google 2016

Figure 6: Churchill Avenue/Alma Street in the City Model



Source: City of Palo Alto Travel Demand Model, 2016

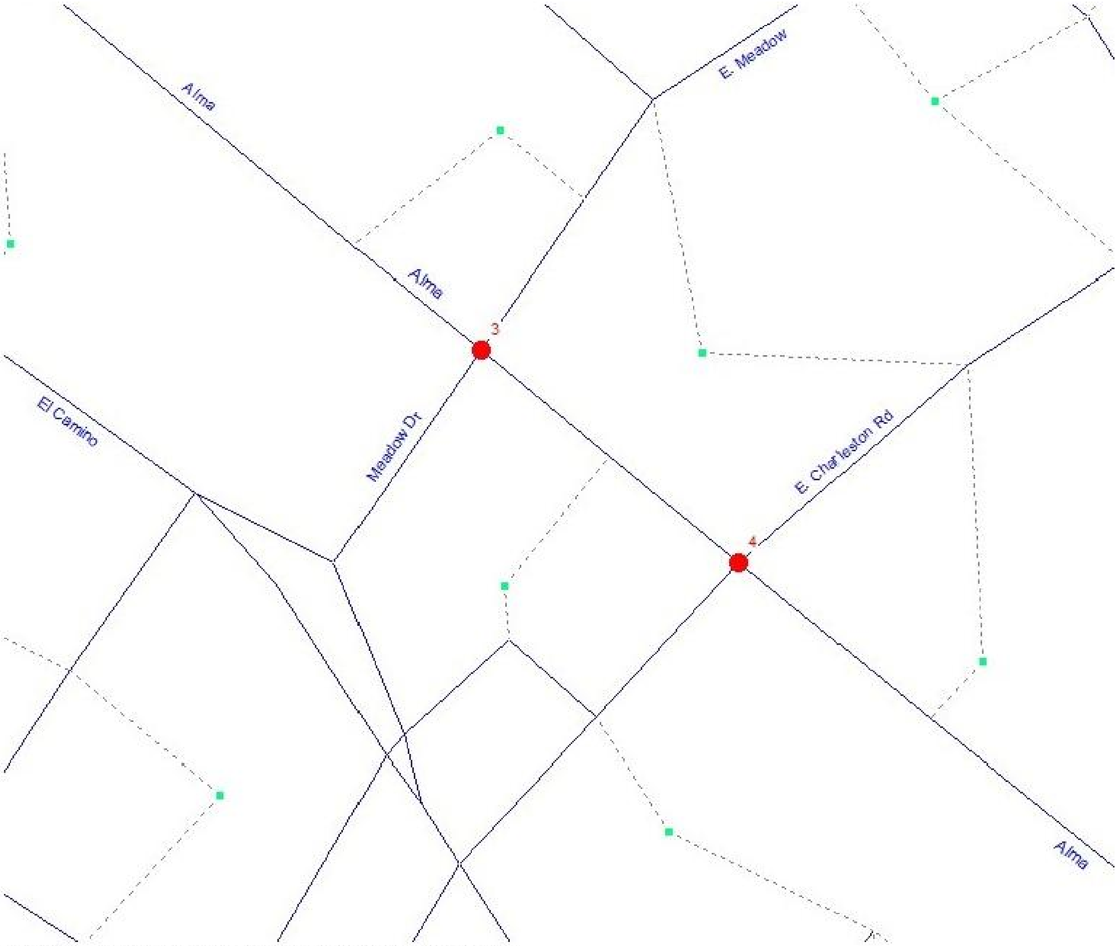
Intersection 3: Meadow Drive / Alma Street

This intersection is identified by Node 4643 in the City model. The actual layout is presented in Figure 7 and the model layout in Figure 8.

Figure 7: Meadow Drive and Alma Street

Source: Google Earth, 2016

Figure 8: Model Layout of Charleston Road and Meadow Drive Along Alma Street



Source: City of Palo Alto Travel Demand Model, 2016

Figure 9: Charleston Road/ Alma Street

Source: Google Earth, 2016

Intersection 4: Meadow Drive / Alma Street

This intersection is identified by Node 9350 in the City model. The actual intersection layout is presented in Figure 9, and the model layout is presented in Figure 8.

3.5 Model Results Validation

The purpose of the model validation is to better understand the capacity of the model in forecasting traffic at the corridor level in the study area, as well as the proper use of the model forecast for traffic operations analysis. The validation is not intended to be a "critique" of the model but rather to develop how it can be used in the process. The comparison of the modeled with counted flows is highly unlikely to be the same:

- The model peak hour flows are converted from four (4) peak-hour traffic assignment results, whereas the counted flows are true peak hour flows.
- Models of this size are not intended to be used at individual street or intersection level.
- The model does not represent all of the streets in the City.
- Traffic counts can also vary from day to day.
- The model is 2014, and the counts are 2015/16.

The model is validated in two ways. The first is to compare the 2014 traffic forecasts with the 2015/2016 traffic counts. The second way is to compare the 2014 traffic forecast with the 2030 traffic forecasts and check the reasonableness of the volume change, i.e., whether the volume changes are reasonably explained by the network and land use changes.

3.6 2014 Model Results vs. Traffic Counts

The comparison of the base year traffic forecasts with traffic counts is summarized in Table 1. The "Counts" column represents the 2015/2016/2017 observed traffic counts, and the "model" column represents the traffic forecasts from the 2014 base year model (note: the El Camino Real / Palo Alto Ave intersection traffic counts are from 2017, while those of other intersections are from 2015/2016). The comparison is conducted for one hour in both the AM and PM peak periods at the four key study intersections.

Table 1: Base Year Model Forecast Validation

Int.	Approach direction	AM Peak					PM Peak				
		Counts	Model	Diff	Diff%	GEH*	Counts	Model	Diff	Diff%	GEH
1.El Camino Real / Palo Alto Ave	SB	2414	2537	123	5%	2.5	1710	2121	411	24%	9.4
	NB	715	964	249	35%	8.6	1548	2291	743	48%	17.0
	EB	487	239	-248	-51%	13.0	687	297	-381	-56%	17.3
	WB	584	434	-150	-26%	6.6	823	720	-103	-13%	3.7
2.Alma St. / Churchill Ave	SB	696	658	-38	-5%	1.5	1161	1215	54	5%	1.6
	NB	1529	650	-879	-57%	26.6	1463	864	-599	-41%	17.6
	EB	203	47	-156	-77%	14.0	438	46	-392	-89%	25.2
	WB	94	98	4	4%	0.4	160	46	-114	-71%	11.2
3.Alma St. / Meadow Dr	SB	812	723	-89	-11%	3.2	1346	1038	-308	-23%	8.9
	NB	1348	1184	-164	-12%	4.6	1361	1386	25	2%	0.7
	EB	434	611	177	41%	7.7	368	759	391	106%	16.5
	WB	368	188	-180	-49%	10.8	441	116	-325	-74%	19.5
4.Alma St. / Charleston Rd	SB	746	1290	544	73%	17.1	1259	1696	437	35%	11.4
	NB	1470	1379	-91	-6%	2.4	1455	1480	25	2%	0.7
	EB	666	243	-423	-64%	19.8	668	274	-394	-59%	18.2
	WB	399	250	-149	-37%	8.3	522	228	-294	-56%	15.2

Source: observed traffic counts and 2014 base year traffic forecast model

* GEH stands for Geoffrey Edward Havers, who developed a statistical method of measuring the "goodness of fit" between two independent data sets. It is a modified Chi Squared test and outputs a statistical value for the comparison. It has been adopted by the UK Department of Transportation, many U.S. State DOTs, and the travel demand modeling industry in general.

A number of observations can be made from the comparison:

- The volume discrepancy between the model forecasts and the traffic counts demonstrates that the model should not be used directly to estimate individual traffic flows. The general standard is that when the GEH value is greater than 5.0, the data sets are not compatible, which was to be expected.
- The model forecasts on Alma Street are generally lower than the observed traffic counts.

Based on the above, it was decided that future year traffic forecasts from the model should not be used directly for traffic operational analyses at a detailed level and would be used to estimate the growth in traffic demand. The models would also be used to identify changes in travel patterns.

3.7 2030 Model Results vs. 2014 Model Results

The comparison between the 2030 future year forecasts and the base year forecasts is presented in Table 2.

Table 2: 2030 Alt. 1 Model Forecast Validation

Int.	Approach direction	AM Peak				PM Peak			
		2014	2030	Diff	Diff%	2014	2030	Diff	Diff%
1. El Camino Real / Palo Alto Ave	SB	2537	3203	666	26%	2121	2794	673	32%
	NB	964	1113	149	15%	2291	2706	415	18%
	EB	239	199	-40	-17%	297	265	-32	-11%
	WB	434	609	175	40%	720	902	182	25%
2.Alma St. / Churchill Ave	SB	658	829	171	26%	1215	1576	361	30%
	NB	650	970	320	49%	864	1084	220	25%
	EB	47	75	28	60%	46	62	16	35%
	WB	98	102	4	4%	46	53	7	15%
3.Alma St. / Meadow Dr	SB	723	949	226	31%	1038	1481	443	43%
	NB	1184	1552	368	31%	1386	1741	355	26%
	EB	611	691	80	13%	759	782	23	3%
	WB	188	158	-30	-16%	116	114	-2	-2%
4.Alma St. / Charleston Rd	SB	1290	1531	241	19%	1696	2080	384	23%
	NB	1379	1741	362	26%	1480	1643	163	11%
	EB	243	313	70	29%	274	470	196	72%
	WB	250	378	128	51%	228	648	420	184%

Source: observed traffic counts, and 2014/ 2030 year traffic forecast models

The comparison shows that:

- The 2030 future year traffic forecasts are systematically higher than the base year forecasts along Alma Street. The volume growth incremental rate is roughly 2% annually. This is an expected result.
- The cross-street traffic largely increases over time. But at a few locations, the future year forecasts are lower than the base year forecasts by a small margin. There are some, reassignments in the model that account for this.

The volume change seems to be consistent along Alma Street and the growth rate seems to be reasonable. The growth shown is quite suitable to be added to traffic forecasts to derive a set of improved 2030 traffic forecasts.

4. Future Year Modeling Methodology

4.1 Travel Models

The City Travel Demand Models will be used to derive the growth in traffic volumes for all the traffic operations analyses (TOA). This will be commenced by examining two different time travel models:

- 2014 base year model. The model approximately represents the existing year condition.
- 2030 Alt 1 model. This model represents one of the City's most likely future year conditions. For this project, this model reflects the no-build condition.

Based on these two models, other models will be constructed to evaluate the future year "project" conditions. The use of "project" in this instance means any planning or design measures that are related to this study and to be explored in this study. A number of varying project conditions will require evaluation. The approach is to add the forecast growth from the models to the observed traffic volumes:

- Refined traffic forecast = counts + (future year model forecast – base year model forecast).

4.2 Improvement Plans in the Traffic Forecasting Model

Assuming the potential project alternatives in this study are limited to local roadway improvements such as grade-separation, roadway signing and restriping, or even traffic signal treatment, these improvements are unlikely to change the overall traffic demand or traffic distribution pattern at the regional level. These local improvements typically affect only route choice: if a specific route becomes more attractive, it is going to draw more traffic from adjacent parallel streets. This is essentially a traffic assignment issue.

It is also assumed that the above roadway improvements change traffic delay at the turning movement level rather than the link level. For example, grade-separation effectively reduces signal delays and thereby reduces intersection turning movement delay.

The following steps will be followed to incorporate each roadway improvement into the model:

- Revise the model network to reflect the geometric changes
- Estimate traffic delays due to the increase from four (4) trains each in the peak hour, each direction, at current at-grade intersections, to ten trains each direction.
- Estimate the traffic delay as a result of these geometric changes, using traffic operation models (Synchro).
- These will then be used to estimate turn penalties in the model at the intersections under review.

More details on the methodology and the results of these tests will be contained in later reports.

mottmac.com

2077 Gateway Place, Suite 550
San Jose, CA 95110
T. 408.572.8800
F. 408.572.8799
mottmac.com

MOTT MACDONALD

Mr. Joshuah D. Mello, AICP
Chief Transportation Official
PLANNING & COMMUNITY ENVIRONMENT
Transportation
City of Palo Alto
P.O. Box 10250
Palo Alto, CA 94303

Report No. 1 of the Rail Corridor Circulation Studies: SCENARIOS 1 to 6 - DRAFT

October 27, 2017

1. Introduction

1.1 On 28 June 2017, a staff report was presented to the City Council Rail Committee entitled “Draft Rail Program Circulation Study Scenarios.” In this Staff Report, six (6) different scenarios were recommended for study that were intended to support the identification and evaluation of grade separation alternatives. This document reports on the outcomes of those studies and also includes a description of the background; the objectives; and the methodologies employed to obtain the results.

1.2 The intent of the Rail Corridor Circulation Study was to estimate the effect on traffic circulation under up to eight (8) different scenarios that have been modeled using the regional/Citywide travel demand model. This has been used to assess the diversionary (traffic rerouting) impacts of the possible changes to the rail corridor road network in the City that future grade crossing layouts may cause. A more detailed examination of the intersections at, and close to, the current at-grade crossings has also been carried out using traffic operational models. These “Year 2030” scenarios include several variations of grade crossings and grade separations at each railroad corridor crossing location. The first two scenarios (“Year 2030 No Build Scenario One” and “Year 2030 No Build Scenario Two”) do not include any new grade crossings, new grade separations or modifications to existing crossings, as they refer to the “No Build” scenarios. The remaining six (6) scenarios (Year 2030 Scenarios 1 through 6) include varying collections of new multi-modal grade-separated crossings, new bicycle-and-pedestrian-only grade-separated crossings, new grade separations, modified grade crossings, and closed grade crossings. The analysis of scenarios is intended to inform the selection of grade separations alternatives for more in-depth study and evaluation. These scenarios are for testing only and are not intended to establish any policy directions or suppose a preferred alternative.

1.3 The impacts of any future modifications to the current at-grade and grade-separated crossings will affect accessibility across the Caltrain tracks. To construct a grade separation where currently there is an existing at-grade crossing, clearly reduces the interference or obstruction caused by that crossing and therefore improves East/West access/capacity at that location. That may or may not attract additional vehicular traffic to that crossing. Similarly, closing (i.e., eliminating) an existing at-grade crossing will cause traffic to divert to other routes. The intent of this study is to assess probable changes to motor vehicle and bicycle traffic circulation/demands under changes in accessibility/capacity caused by railroad crossing related infrastructure improvement scenarios. To the extent that it is possible with the demand models, an order-of-magnitude quantification of those changes is described.

1.4 Even if no changes or modifications are made to the existing rail crossings, increases in traffic demands driven by land-use and population growth would occur between existing and future (2030) conditions. Vehicular traffic is forecast to grow at a little over 1% per year. The Caltrain service modifications, made possible by the electrification, are likely to double the number of trains in the peak periods compared to now, when they are implemented. There is also the potential for having high-speed rail services on this line, in addition to Caltrain. The combination of the increased frequency of gate closures at the crossings and increased traffic flows will undoubtedly increase road congestion from what it is now.

1.5 Two types of Year 2030 “No Build” scenarios were first defined. A Year 2030 “No Build 1” scenario was first developed that includes growth in traffic between current and Year 2030 conditions while assuming no change to existing rail service frequencies, and no change in existing roadway circulation conditions. Included in the Circulation Study tests, is another Year 2030 “No Build 2” scenario where both the increased train frequencies and traffic growth (between existing and year 2030) are simulated within the demand models, while assuming no future construction occurs. The “No Build 2” with both train frequencies and traffic volume scenario forms the ‘baseline’ from which comparisons against the scenario tests are made.

1.6 The current average number of gate closures caused by passing trains is 6-7 per hour over the peak periods. The highest number in any one hour recorded is 10. The assumptions within the demand modeling is that this will rise to an average of 20 by 2030 if both Caltrain Modernization and high-speed-rail services are implemented. Caltrain current signal system headways allow for a maximum of an express train every five (5) minutes and a local train every six (6) minutes. This would mean 24 express trains per hour for both directions if evenly spaced at five-minute intervals and 20 local trains per hour if evenly spaced at six-minute intervals. Neither of these conditions would be likely to occur in “real life”. Firstly, the service will most likely be a mixture of both local and express trains and secondly, running at uniform minimum headways through a peak hour is highly unlikely to be achievable in practice. Therefore, by assuming a maximum of 20 gate closures per hour over the peak periods, the model is addressing the likely worst-case scenario in terms of traffic disruption.

It is also likely that with such intense service frequencies, that occasionally, a single-gate closure could accommodate two (2) trains passing in opposite directions, meaning that the number of gate closures was actually less than the total two-way train frequency.

1.7 Finally, conclusions are drawn from the series of 'sensitivity' tests carried out for alternative scenarios. It is important to note what is forecast to happen if nothing is done to improve the crossings and not only whether diversions will occur under various scenarios of infrastructure changes, but whether their impact is likely to be significant or not. The study area is shown in Figure 1.1.

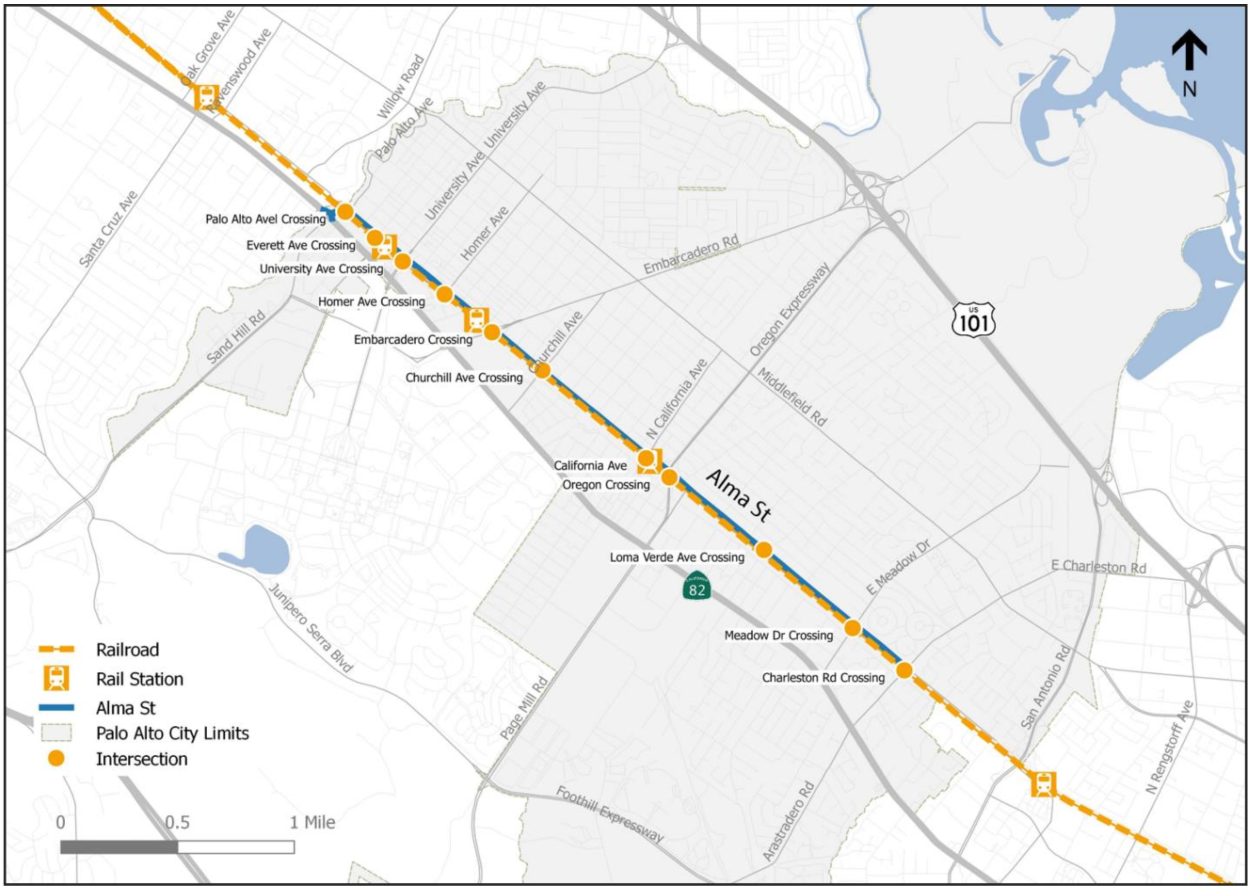


Figure 1.1 The Study Area

and the operational models

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2. Study Methods

2.1 A two-step analysis process was used to complete the circulation study. A large-scale regional/citywide traffic demand model is first used to estimate both the growth in traffic demand within the road network and the diversion impacts that any proposed changes to the road infrastructure will cause. The demand model is fully described in the "Travel Model Validation Report." Since the regional model cannot simulate traffic flows reliably at an individual roadway link or intersection level, a more refined post-processing of forecasts and operational analysis at an individual intersection level is completed in the second step. This is described below in Section 2.5 to 2.7.

2.2 The Travel Demand Model runs on a "Cube Voyager" software platform. This is a universally accepted platform throughout the planning industry. The model itself comes from the MTC and Santa Clara VTA regional models and is compatible with all models used for infrastructure planning on the Peninsula and the Bay Area. The models are forecast to the future year of 2030 and outputs estimates of traffic volume conditions for the hourly average of a four-hour peak period in both the morning and afternoon for an average week day. Both inputs to and outputs from the Travel Demand Models and the operational models are mounted on the City's website.

2.3 The Travel Demand Model is a four-stage model in which trip generation, trip distribution (locations), mode choice (motor vehicle, transit or rail) and assignment (either highway, transit or rail networks) are estimated. The model is calibrated on observations at a base-year against land-use and population data. For future year forecasts to 2030, the main input to the models are the future year assumptions on the 2030 land uses; populations; employment and car ownership. This is the same model that has been used for developing the transportation elements of the Comprehensive Plan. The model is owned by and is accessible through the City of Palo Alto.

2.4 The train frequencies that cause gate closures during the peak periods vary considerably at the crossing locations from three (3) per hour to ten (10) per hour. The highest frequencies tend to be 8:00-9:00 am and 6:00-7:00 pm. The other variable involved is the crossing traffic volume. It is a combination of these two variables that produces congestion. Crossing traffic volume peaks at different times at different location and at different times to the train frequency peaks. For example, at the Palo Alto crossing, westbound traffic peaks between 11:00 am and 12:00 pm. At Churchill Rd and E/W Meadow Dr, the afternoon peak hour for eastbound traffic is 3:00 pm to 4:00 pm. So, a single peak-hour demand model would not capture all the peak conditions and would not be fully representative for analysis. By adopting the City's Demand Model that covers a four-hour peak period for both the AM and PM, the study has encapsulated the dynamic variables that make up traffic congestion.

The qualification being that the highest peaks at individual locations could generate more congestion for a short time than the model would predict.

A further issue is that of a phenomenon called “peak spreading.” As traffic congestion grows, drivers tend to change their time of travel to avoid the worst conditions. It is traffic saturated conditions that cause “peak spreading” to happen, where the physical capacity of the system is reached. When looking at the possibility of a 20% growth of traffic by the year 2030, it is likely that the highest peak traffic volumes could not be accommodated by some parts of the road network capacity. The result would be an expansion of the peak conditions to a wider time period. By using a four-hour average peak period, this growth can be realistically simulated by the demand model.

The analyses of the operational conditions, however, does use current peak hour volumes, with growth added by the demand model to analyze those conditions in the future forecast year of 2030. This means that the operational analyses will have captured the most congested conditions.

2.5 The individual intersection-level forecasts were developed using Year 2017 intersection turning-volume level ground counts as the basis. Each of the critical intersections that include the rail crossings were surveyed early in 2017, with new weekday peak-hour traffic counts obtained at thirteen (13) study intersections. This included the actual rail crossing intersections as well as the closely located and influential adjacent intersections.

2.6 The traffic count data and forecasts were used as input to a traffic operational modeling procedure to analyze the performance of the intersection. The software platform is Synchro® (Version 8). This is a popular traffic operational analysis software platform that is universally used and accepted throughout North America.

2.7 The Synchro® analysis was initially used for the 2017 (actual) conditions and reported in the Existing Conditions Report. For the future forecast year of 2030, the 2017 count data was modified/refined to reflect regional-model forecasted growth in traffic demand through year 2030 from year 2017. The impact, as a result of traffic growth, was analyzed with the Synchro® software. The Demand Model was used to estimate that growth. The result is that at individual intersections, the peak one-hour (as opposed to the four-hour average of the peak period) demands are more accurately represented.

2.8 To address the important issue of Bicycle accessibility, a separate analysis procedure was used. This consisted of developing an accessibility map, based on travel time contours (an isochronic analysis), using a GIS-based mapping procedure. This plots the travel distance that can be achieved with 5, 10, 15 and 20-minute cycling times. The process, therefore, easily identifies the ability of bicyclists to make east/west movements across the Caltrain tracks and indicates where there is good and poor accessibility. The average bicycle speed was taken as 12 mph, which is what the City typically uses to time traffic signals along bikeways.

3. Scenario Specifications

3.1 Eight (8) separate circulation scenarios were tested with both the morning (AM) and afternoon (PM) peak period models at a future forecast year of 2030. These are presented in Tables 1 and 2. Table 1 describes the six (6) scenarios that are analyzed and Table 2 is a tabular representation of the scenarios.

3.2 For each at-grade crossing, there are a variety of treatments available.

- Remain as it is today with all-modes having access. (No change)
- Closure for all modes. (Motor vehicles)
- Closure for vehicles, pedestrians, bicycles, but retaining Pedestrian and Bicycle access, either remaining at-grade or grade separated.
- Grade separation for all modes.
- Widen existing grade-separated crossings.

There are other measures that can also be implemented such as remaining as an at-grade crossing for all modes but imposing a quiet zone. This is not an option that can be analyzed within the modeling procedures in the circulation studies, but is a qualitative assessment in terms of impacts. For the demand model tests, there is no sensitivity to the type of grade separation that may be employed, only that the current obstruction caused by the presence of the rail crossing is removed.

3.3 An analysis of the details of traffic operations for specific designs will be the subject of further work when the alternatives are being considered.

3.4 The following are the crossing locations and their current (or future committed) conditions:

- Palo Alto Avenue (AKA Alma Street) – existing at-grade, all modes
- Everett Avenue/Lytton Avenue – planned grade-separated bicycle/pedestrian
- University Avenue – existing grade-separated, all modes
- Homer Avenue – existing grade-separated bicycle/pedestrian
- Embarcadero Road – existing grade-separated, all modes
- Churchill Avenue – Existing at-grade, all modes
- California Avenue – existing grade-separated bicycle/pedestrian
- Oregon Expressway – existing grade-separated with no pedestrian access
- Loma Verde Avenue/Matadero Creek – planned grade-separated bicycle/pedestrian
- East/West Meadow Drive – existing at-grade, all modes
- East/West Charleston Road – existing at-grade, all modes
- San Antonio Road – existing grade-separated, all modes

This represents the “No Build” infrastructure condition.

Table 1, below, presents a general description of each of the sample scenarios that were tested. All were analyzed for the future forecast year of 2030.

Also, to be noted is that where the circulation study assumes grade separations, it does not differentiate between the type of separation (below grade, above grade, etc.). This is due to the focused nature of the analyses and means that additional circulation analysis will likely be needed for grade separation alternatives that emerge through the community process if, for example, the type of separation results in local street closures in the vicinity. It was also assumed that all grade separations included full connections (both turning and through movements) with Alma Street, as it exists today.

Table 1 - Description of Test Scenarios

Scenario	General Description of Changes
No Build – Scenario 1	No changes to the crossings; existing rail service levels.
No Build – Scenario 2	No changes to the crossings; additional Caltrain plus High-Speed Rail Service for the peak period the forecast frequencies. (6 Caltrain and 4 HSR trains per hour in each direction in the peak periods.)
Sample Scenario 1 (Low Build)	Closed at-grade crossings at Palo Alto Ave (AKA Alma St), Churchill Ave, and E/W Meadow Dr; widened grade-separated crossing at Embarcadero Rd; new grade-separated crossing at E/W Charleston Rd.
Sample Scenario 2 (Low-Medium Build)	Closed at-grade crossings at Palo Alto Ave (AKA Alma St) and E/W Meadow Dr; new grade-separated bicycle/pedestrian crossing at Everett Ave/Lytton Ave and Loma Verde Ave/Matadero Creek; new quiet zone at-grade crossing at Churchill Ave; new grade-separated crossing at E/W Charleston Rd
Sample Scenario 3 (Medium Build)	Widened grade-separated crossing at Embarcadero Rd; new grade-separated bicycle/pedestrian crossing at Churchill Ave and E/W Meadow Dr; new grade-separated crossing at E/W Charleston Rd
Sample Scenario 4 (Full Build Phase 1)	New grade-separated bicycle/pedestrian crossing at Loma Verde Ave/Matadero Creek; new grade-separated crossing at E/W Charleston Rd
Sample Scenario 5 (Full Build Option A)	New at-grade quiet zone crossing at Palo Alto Ave (Alma St); new grade-separated bicycle/pedestrian crossings at Churchill Ave and Loma Verde Ave/Matadero Creek; new grade-separated crossing at E/W Meadow Dr and E/W Charleston Rd
Sample Scenario 6 (Full Build Option B)	New grade-separated crossings at Palo Alto Ave (AKA Alma St), Churchill Ave, E/W Meadow Dr, and E/W Charleston Rd; new grade-separated bicycle/pedestrian crossings at Everett Ave/Lytton Ave and Loma Verde Ave/Matadero Creek; widened grade-separated crossing at Embarcadero Rd

Table 2 - Rail Corridor Circulation Study: Traffic Measures

Crossing	Existing (No Build)	Sample Scenario 1 Low Build	2 Low-Medium Build	3 Medium Build	4 Full Build Phase 1	5 Full Build Option A	6 Full Build Option B
Palo Alto Ave (AKA Alma St)	A	X	X	A	A	Q	S
University Ave	S	S	S	S	S	S	S
Embarcadero Rd	S	W	S	W	S	S	W
Churchill Ave	A	X	Q	A	A	A	A
Oregon Expwy	S	S	S	S	S	S	S
E/W Meadow Dr	A	X	X	A	A	S	S
E/W Charleston Rd	A	S	S	S	S	S	S

Key EXISTING Bicycle and Pedestrian measures for these scenarios are contained in Table 6.

NEW A = At Grade Q = Quiet Zone W = Widened Grade Separated
X = Closed to all Traffic S = Grade Separated

4. Scenario Test Results 1: Traffic Diversions

4.1 For the six (6) test scenarios, the travel demand model was used to assess the diversion effects. The model was used to estimate how travel patterns will change when accessibility changes. This shows where increases and decreases occur in traffic volumes when a scenario is compared to the "No Build" scenarios. These are shown graphically in Figures 4.1 to 4.12. The "No Build Scenario 1" will include all infrastructure and rail service as it exists today (2017) with the forecasted 2030 traffic demand. The "No Build Scenario 2" includes all infrastructure as it exists today, but with the forecasted 2030 traffic demand and the increase in the frequency of rail crossing gate closures resulting from proposed Caltrain and High-Speed Rail service.

4.2 In 2030, the train frequency in the peak periods of the average weekday is forecast to increase to around three times today's service levels (i.e., from an average of 6-7 trains per hour to 20 trains per hour). This assumes both Caltrain and high-speed rail future forecast services will be operating. It could be speculated that even if high-speed rail is not in service by then, the demand for Caltrain services could push the train frequency to that level. That could be near to a practical saturation level for Caltrain services to operate if no further modifications (such as more passing tracks) are constructed.

In simple capacity terms, this translates to approximately a 20% reduction in vehicular capacities across the Caltrain at-grade crossings from today. For both the No-Build Scenario 1 and Scenario 2, a 15% increase in total vehicular traffic volumes crossing the rail lines within the City is forecast through Year 2030 over existing conditions.

4.3 The difference between No Build Scenario 1 and No Build Scenario 2 is that there would be a vehicular traffic rerouting effect for the individual crossings due to the increase in grade-crossing congestion caused by effectively tripling the potential for gate closures. Essentially crossing traffic reduces on Palo Alto Ave; E/W Meadow Dr and Charleston Rd and increases on Oregon Expressway and San Antonio Rd. There is little effect on Churchill Ave; University Ave and Embarcadero Rd. So, there is a redistribution of routing to the grade-separated crossings in the south of the City.

4.4 In the rest of the comparisons, the "No Build Scenario 2" option is assumed to be the baseline, so in Figures 4.1 to 4.12, the "traffic differences" diagrams are shown for each scenario against the "No Build Scenario 2", with the red overlay showing which roads will have increased traffic flows and the green overlay showing where traffic flows will be reduced. For each scenario, a summary of this is included with a description of the effect on the volumes using the various rail crossings within the City.

4.5 SAMPLE SCENARIO 1

Sample Scenario 1 has three (3) of the at-grade crossings closed and Charleston Rd. grade separated. Embarcadero Rd is widened. The total 2030 traffic crossing reduces to 2017 levels, so the growth is effectively rerouted out of the City. University Ave and Embarcadero Rd experience small increases but Charleston Rd experiences very high increases in traffic flows, over 50% above the No Build Scenario 2 flows, shown in Figures 4.1 and 4.2.

4.6 SAMPLE SCENARIO 2

Scenario 2 has Palo Alto Ave and Meadow Dr closed; Churchill Ave remaining at grade and Charleston Rd grade separated. The total crossing traffic flows reduce by around 10% from the No Build Scenario 2 conditions, so around 5% above today's conditions. There is some small amount of increases to traffic on the grade-separated crossings, with the exception of Charleston Rd which experiences over 50% increase in traffic flow.

In the westbound direction, Oregon Expressway is likely to exceed LOS D. In the eastbound direction, Embarcadero Rd is likely to be congested, well above LOS D. University Ave is not likely to exceed LOS D. Shown in Figures 4.3 and 4.4.

4.7 SAMPLE SCENARIO 3

Scenario 3 has the existing grade separation at Embarcadero Rd being widened and with Charleston Rd grade separated. There are slight increases for Palo Alto Ave and Embarcadero Rd but over a 50% increase from the No Build Scenario 2 for Charleston Rd.

The widening of Embarcadero Rd reduces potential congestion and assists in balancing the traffic volumes between the grade-separated crossing. The widening, therefore, is a justifiable measure and serves the purpose for which it is intended. Both Palo Alto Ave and Embarcadero Rd are likely not to exceed LOS D. Shown in Figures 4.5 and 4.6.

4.8 SAMPLE SCENARIO 4

The only change from No Build Scenario 2 to Sample Scenario 4 is that a grade separation for Charleston Road is included. There is little change except for Charleston Rd itself, which attracts over an additional 50% of traffic flow. Shown in Figures 4.7 and 4.8.

4.9 SAMPLE SCENARIO 5

Scenario 5 has an at-grade quiet zone at Palo Alto Ave and grade separations at Charleston Rd and Meadow Dr. Churchill Ave remains at-grade. Both Meadow Dr and Charleston Rd experience a high level of additional traffic flow. This is likely to have the effect of having similar traffic operating conditions as today, on the existing grade separations. So, the traffic growth is taken up by the new grade-separated crossings. Shown in Figures 4.9 and 4.10.

4.10 SAMPLE SCENARIO 6

This scenario offers the greatest level of total capacity increase for the crossings within the City of all the scenarios tested. It has all the specifications of sample scenario 5 with the addition of widening at Embarcadero Rd and Palo Alto Ave grade separated. Churchill Ave stays the same as today. Each of the former at-grade crossings that are assumed to be grade separated attract substantial additional traffic flows – much of which is diverted from the existing grade-separated crossings in the City. The existing grade-separated crossings operate with similar levels of traffic flow to today and substantially better than in No Build Scenario 2. Shown in Figures 4.11 and 4.12.

4.11 DISCUSSION ON TRAFFIC DIVERSION OUTCOMES

Although six (6) scenarios is only a fraction of the vast number of possible combinations and permutations for different layouts of the crossings in the City, it seems the tests completed provide a reasonable picture of likely outcomes of different scenarios. These range from Sample Scenario 1, the most restrictive, which is specified to close down all the at-grade crossings except Charleston Rd, to Sample Scenario 6, that includes grade separating every crossing that is currently at-grade, except for Churchill Ave.

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FIGURE 4.1 - 2030 AM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 1 V NO BUILD 2

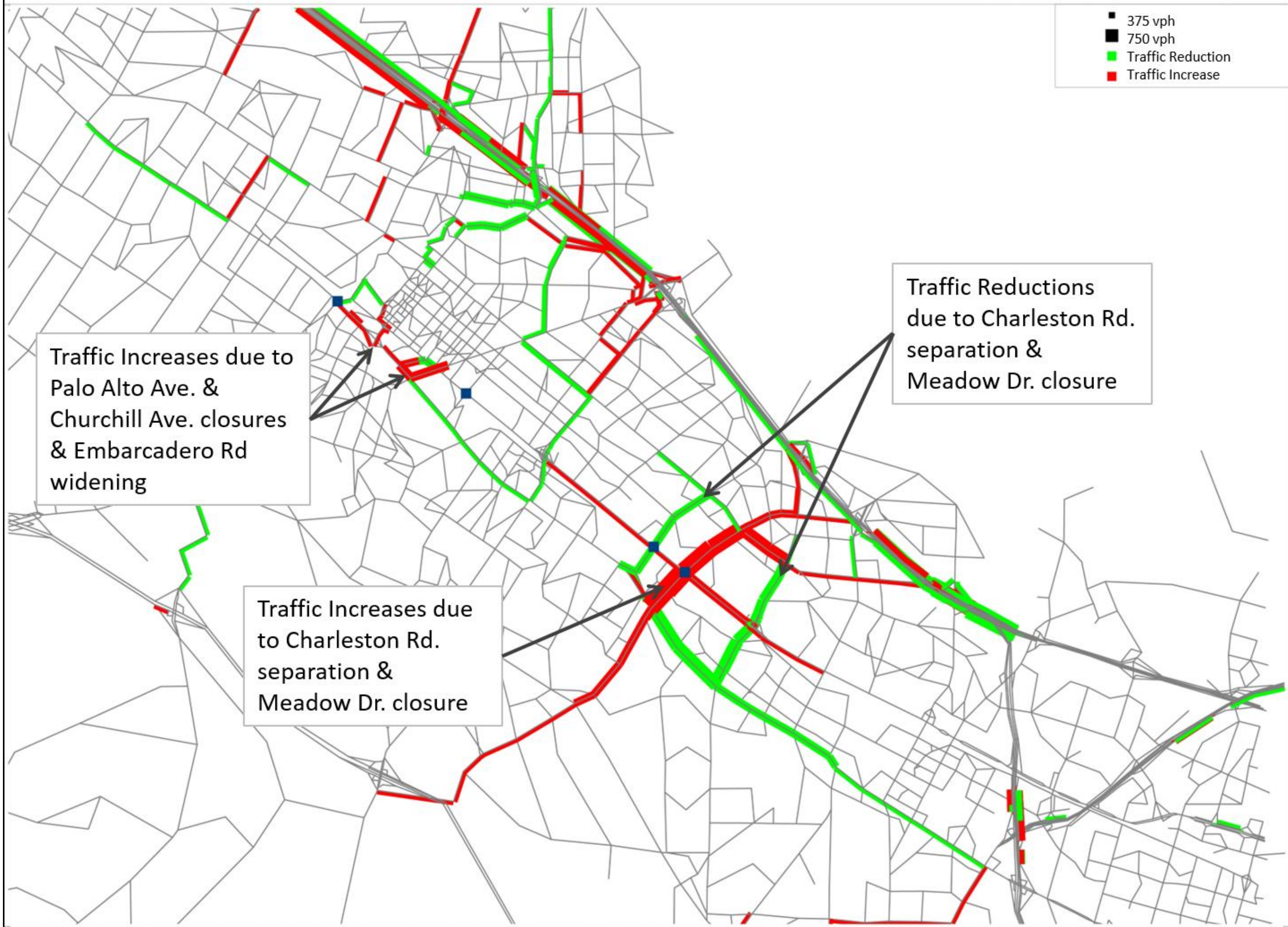

FIGURE 4.2 - 2030 PM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 1 V NO BUILD 2

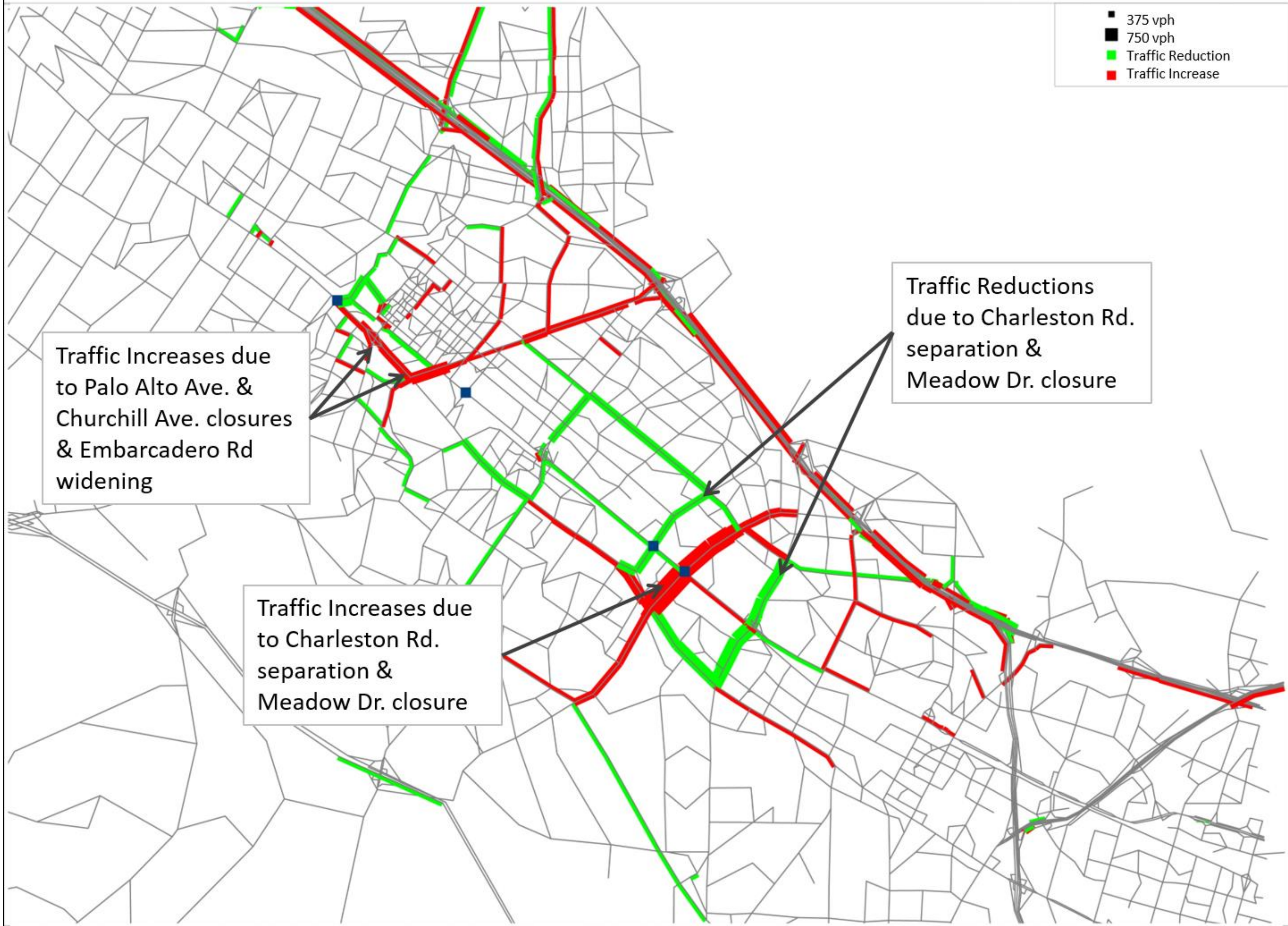

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FIGURE 4.3 - 2030 AM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 2 V NO BUILD 2

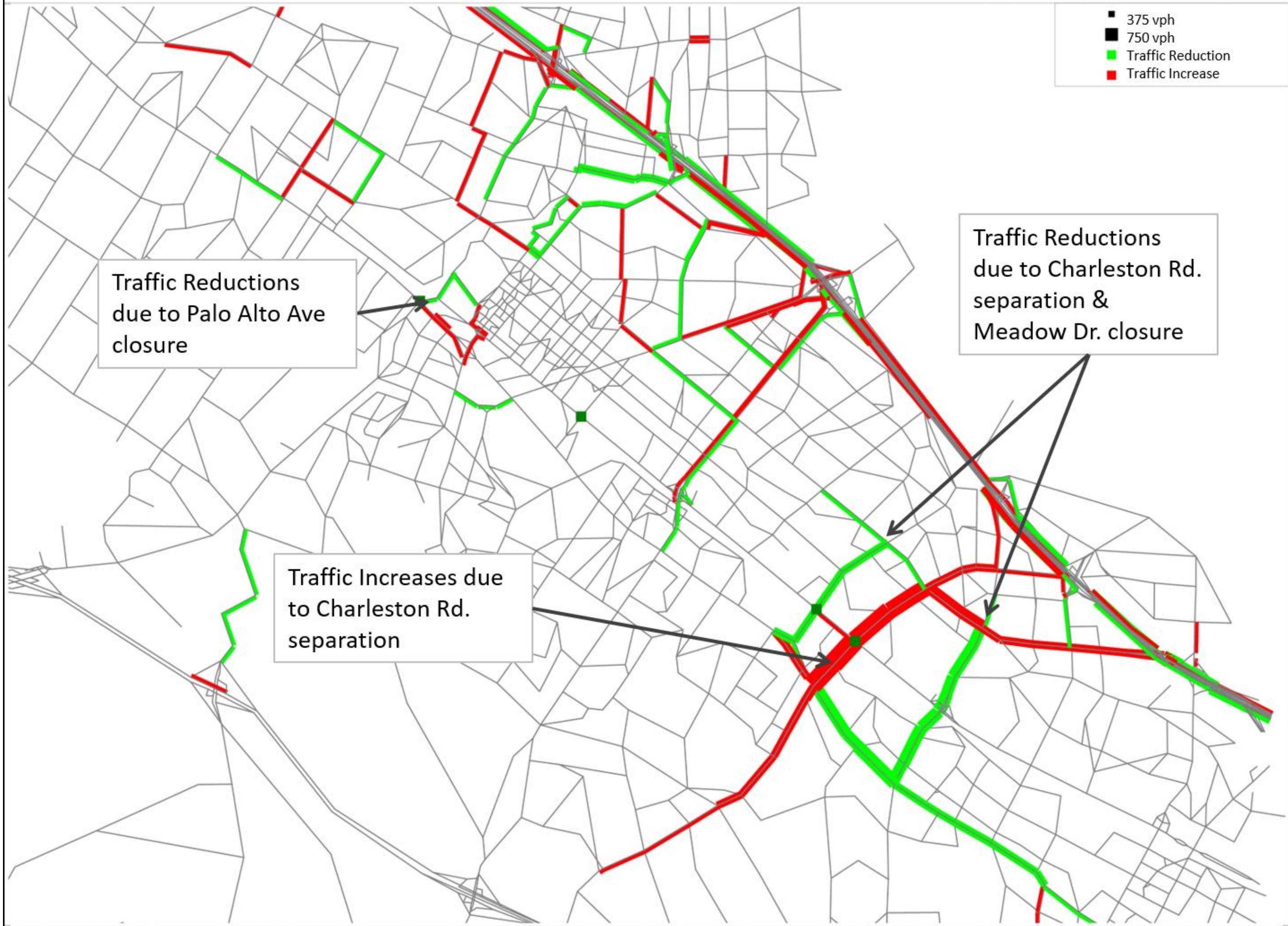

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FIGURE 4.4 - 2030 PM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 2 V NO BUILD 2

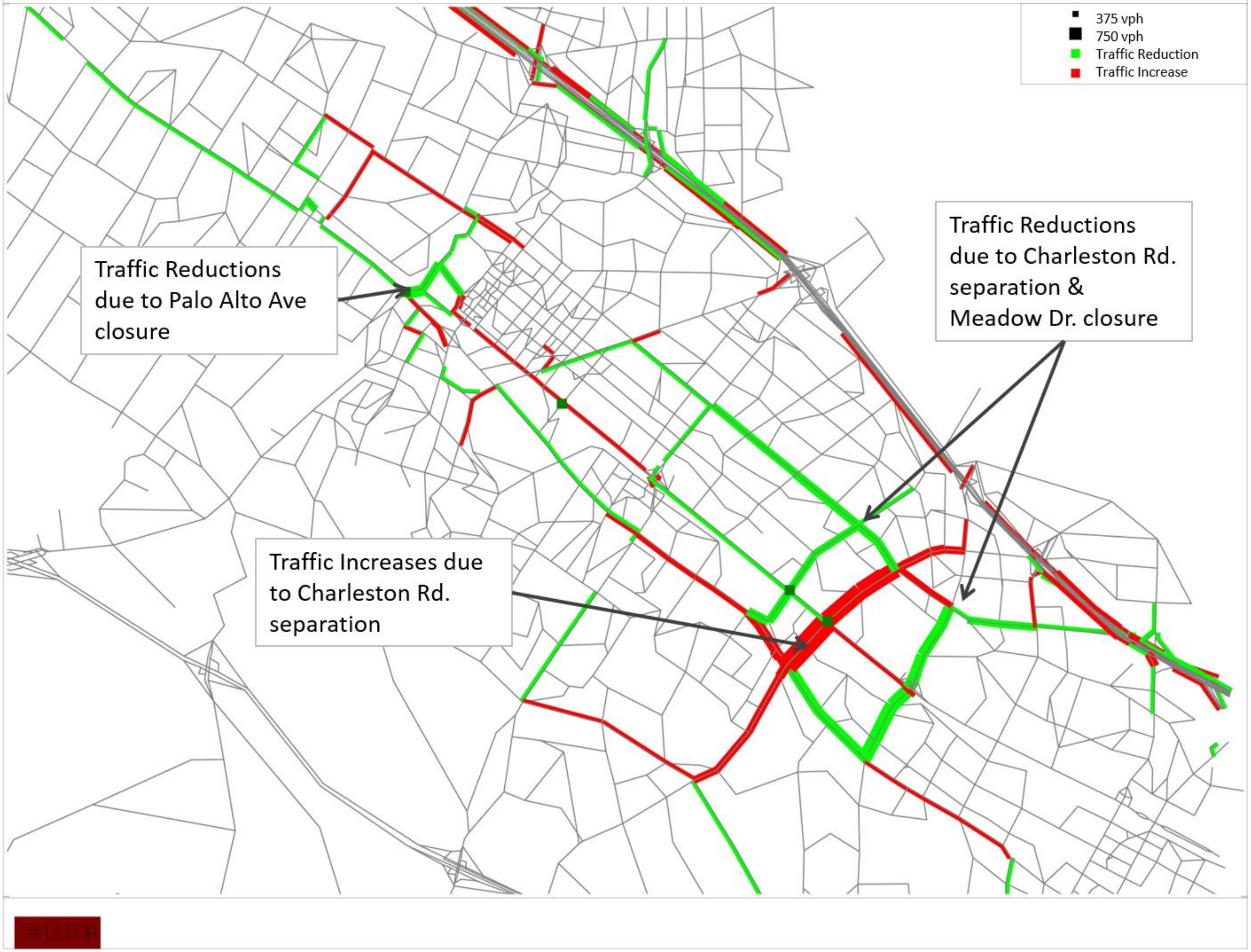

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FIGURE 4.5 - 2030 AM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 3 V NO BUILD 2

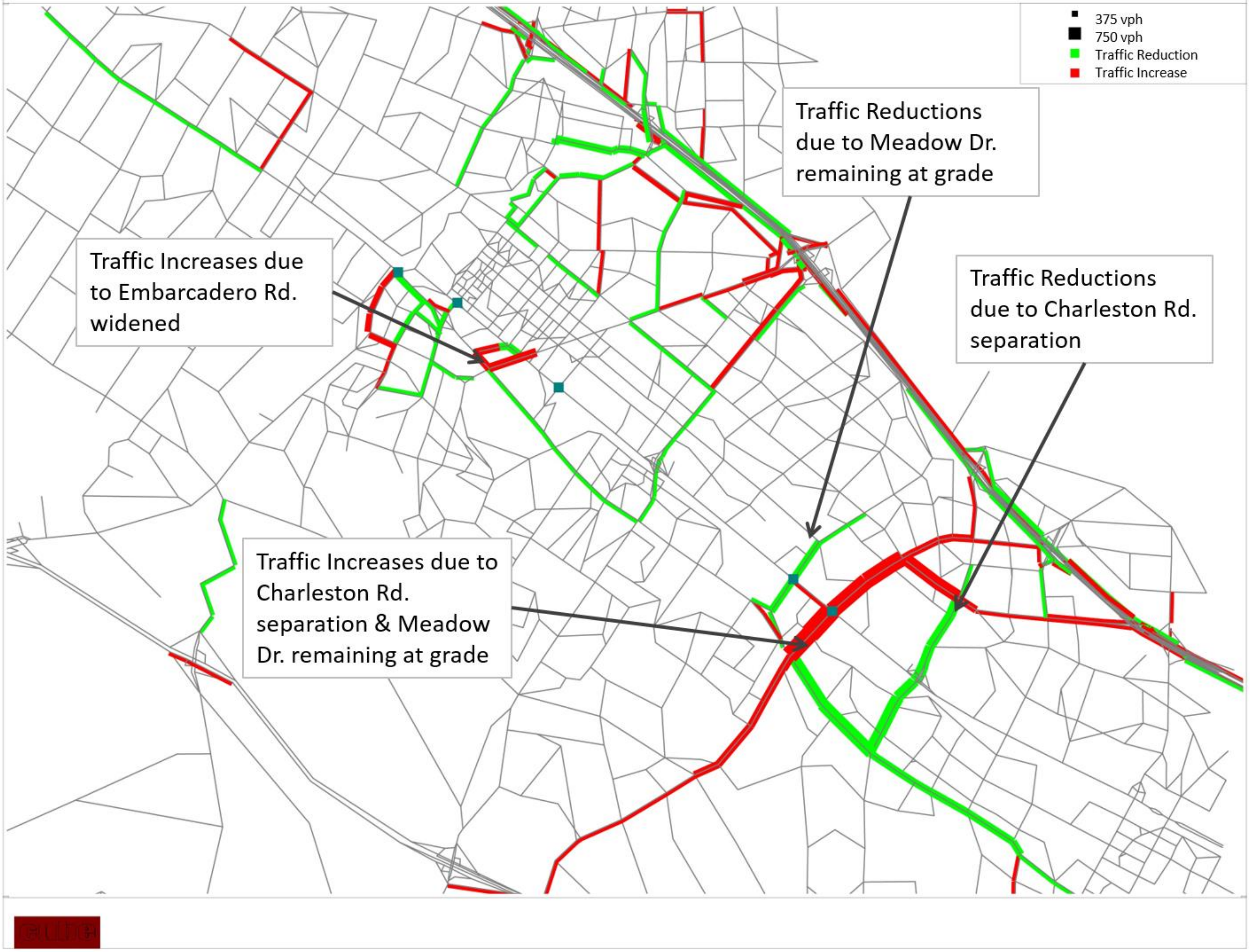

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FIGURE 4.6 - 2030 PM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 3 V NO BUILD 2

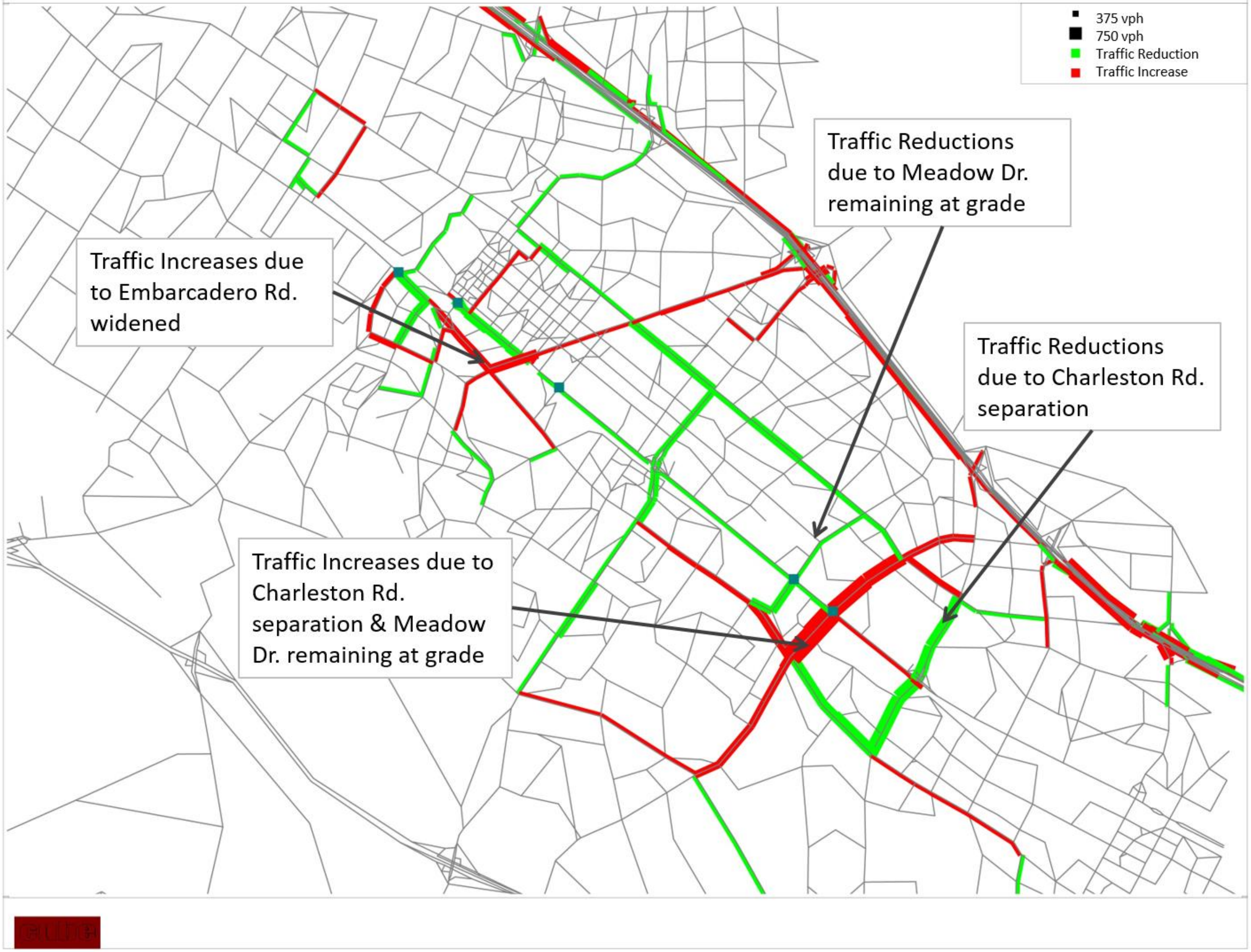

FIGURE 4.7 - 2030 AM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 4 V NO BUILD 2

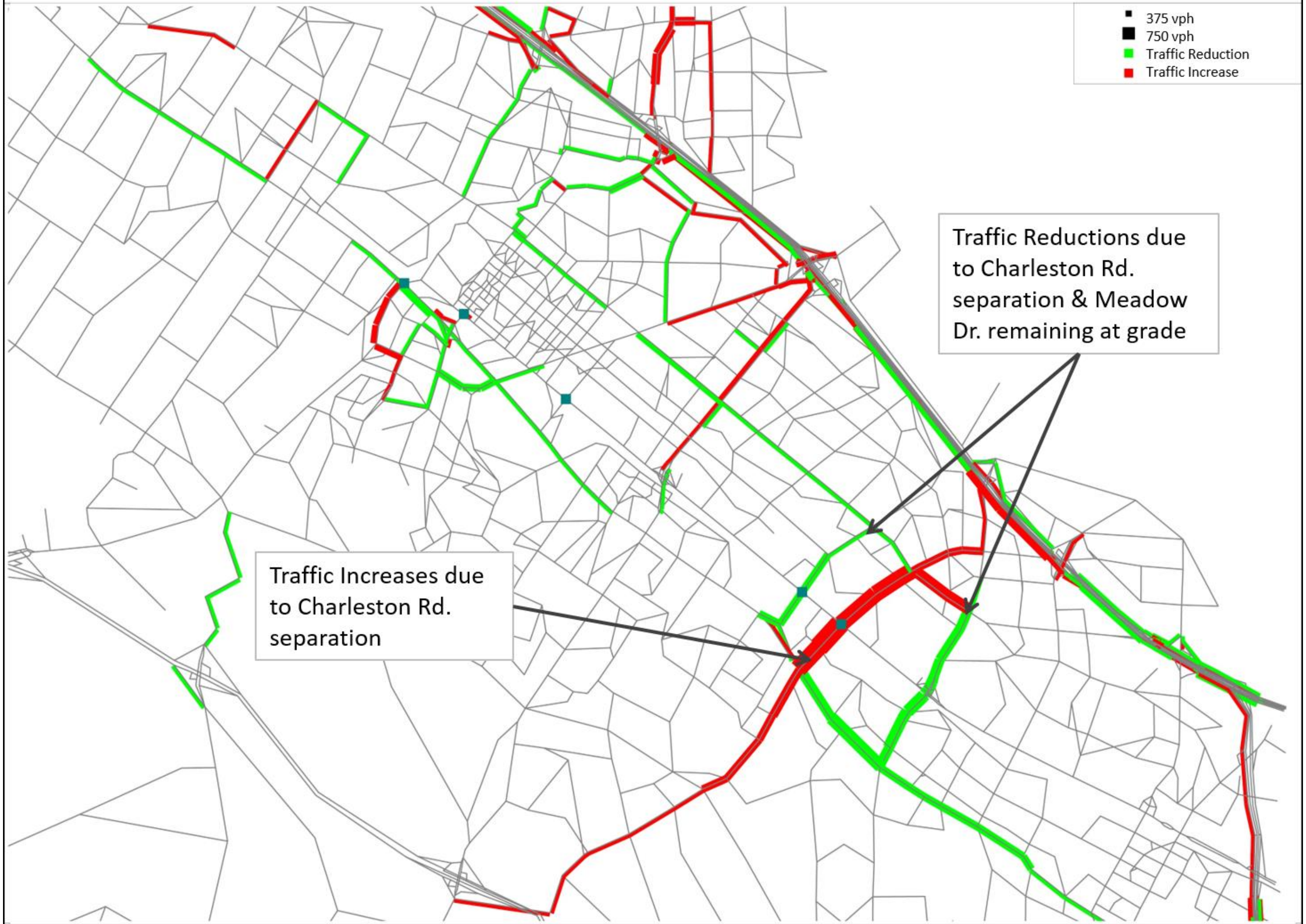

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FIGURE 4.8 - 2030 PM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 4 V NO BUILD 2

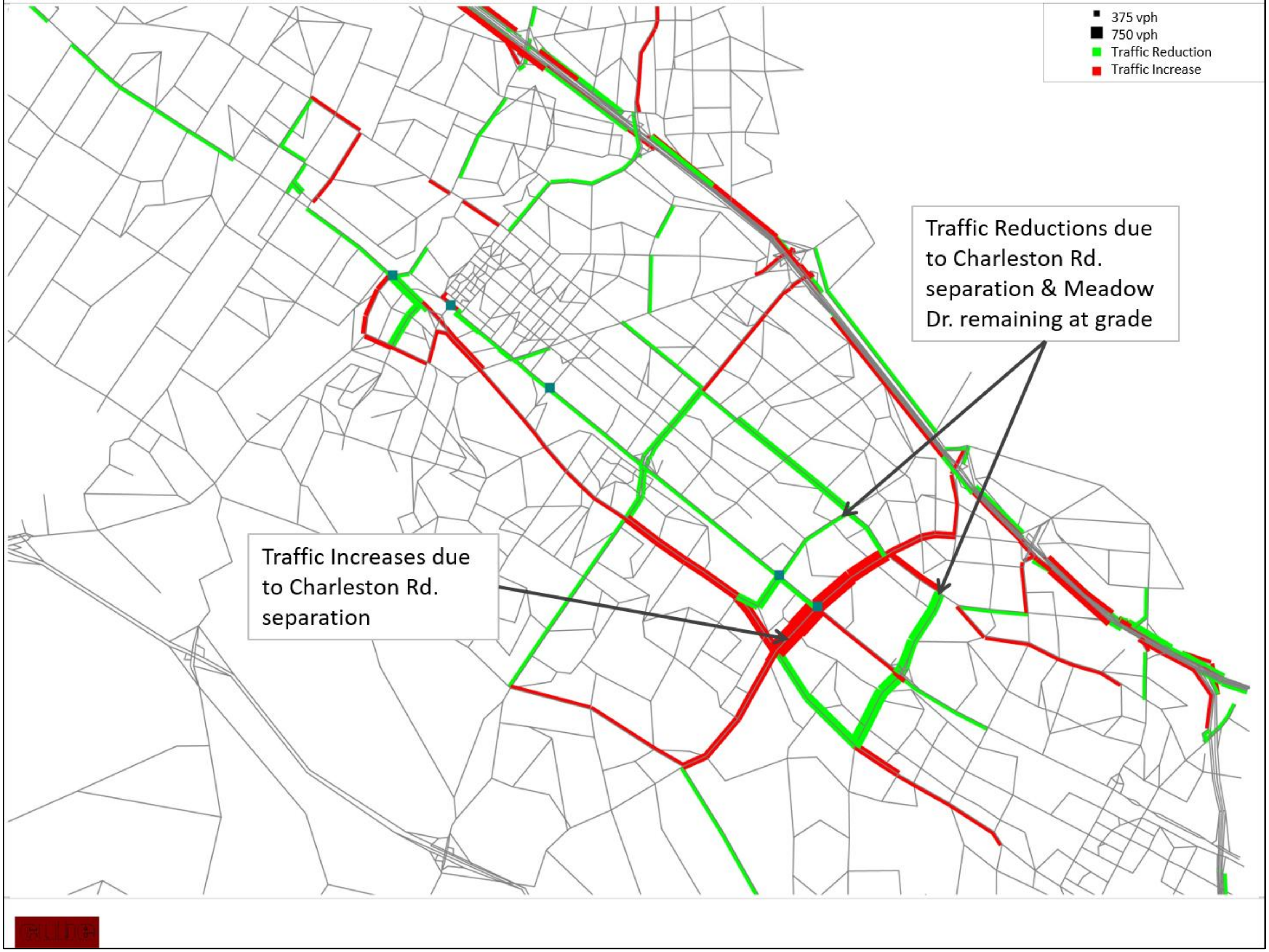

FIGURE 4.9 - 2030 AM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 5 V NO BUILD 2

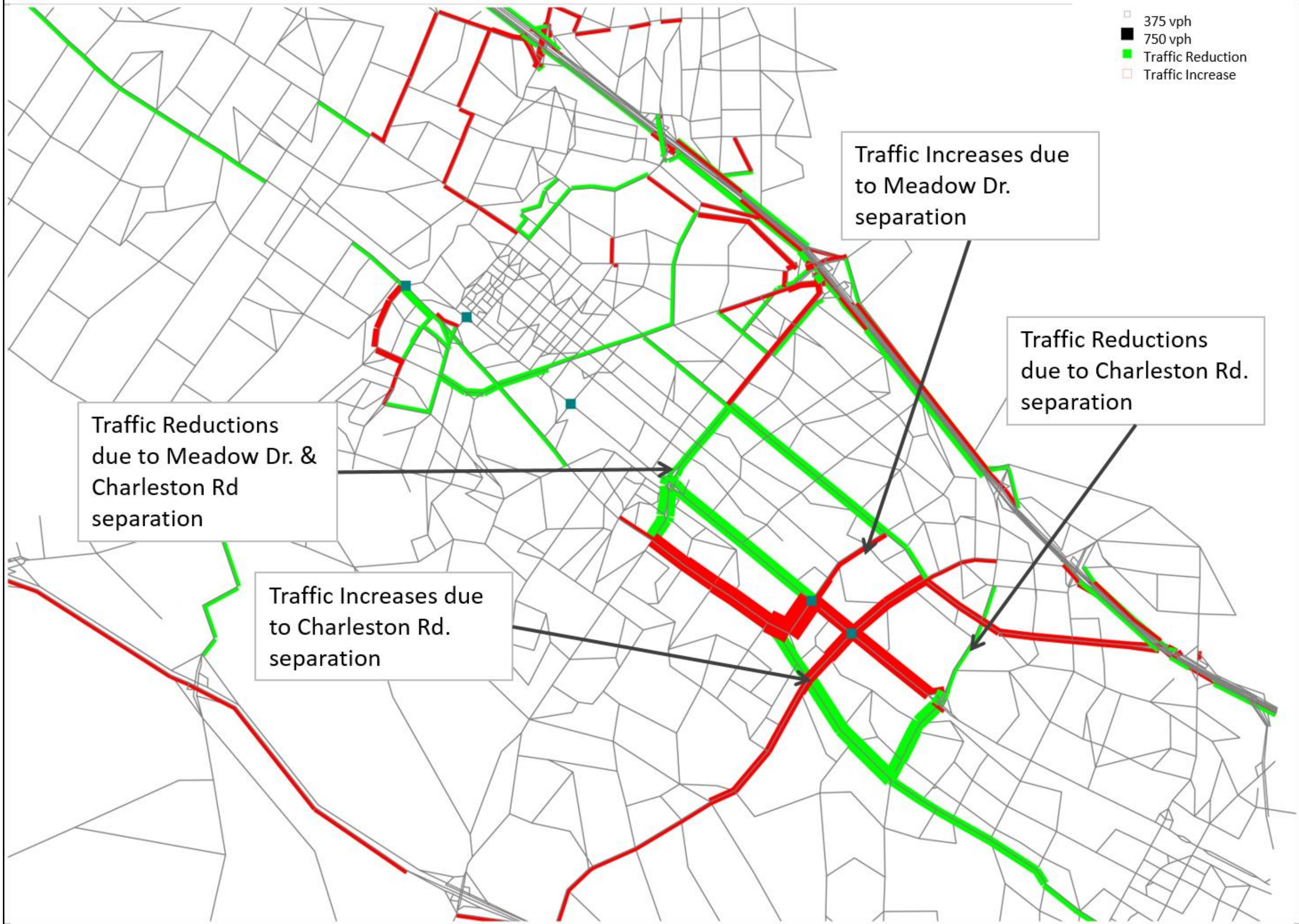

FIGURE 4.10 - 2030 PM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 5 V NO BUILD 2

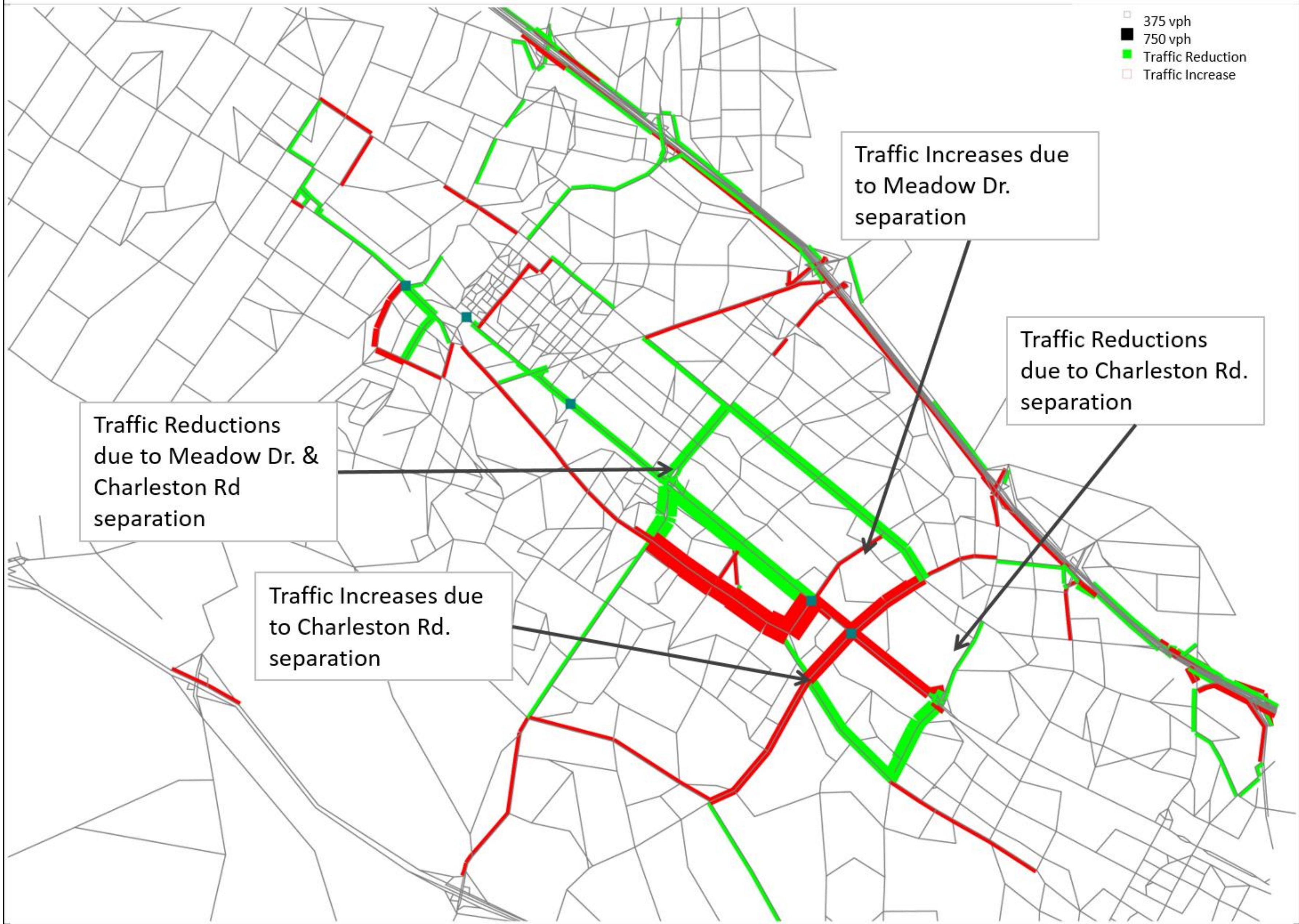

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FIGURE 4.11 - 2030 AM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 6 V NO BUILD 2

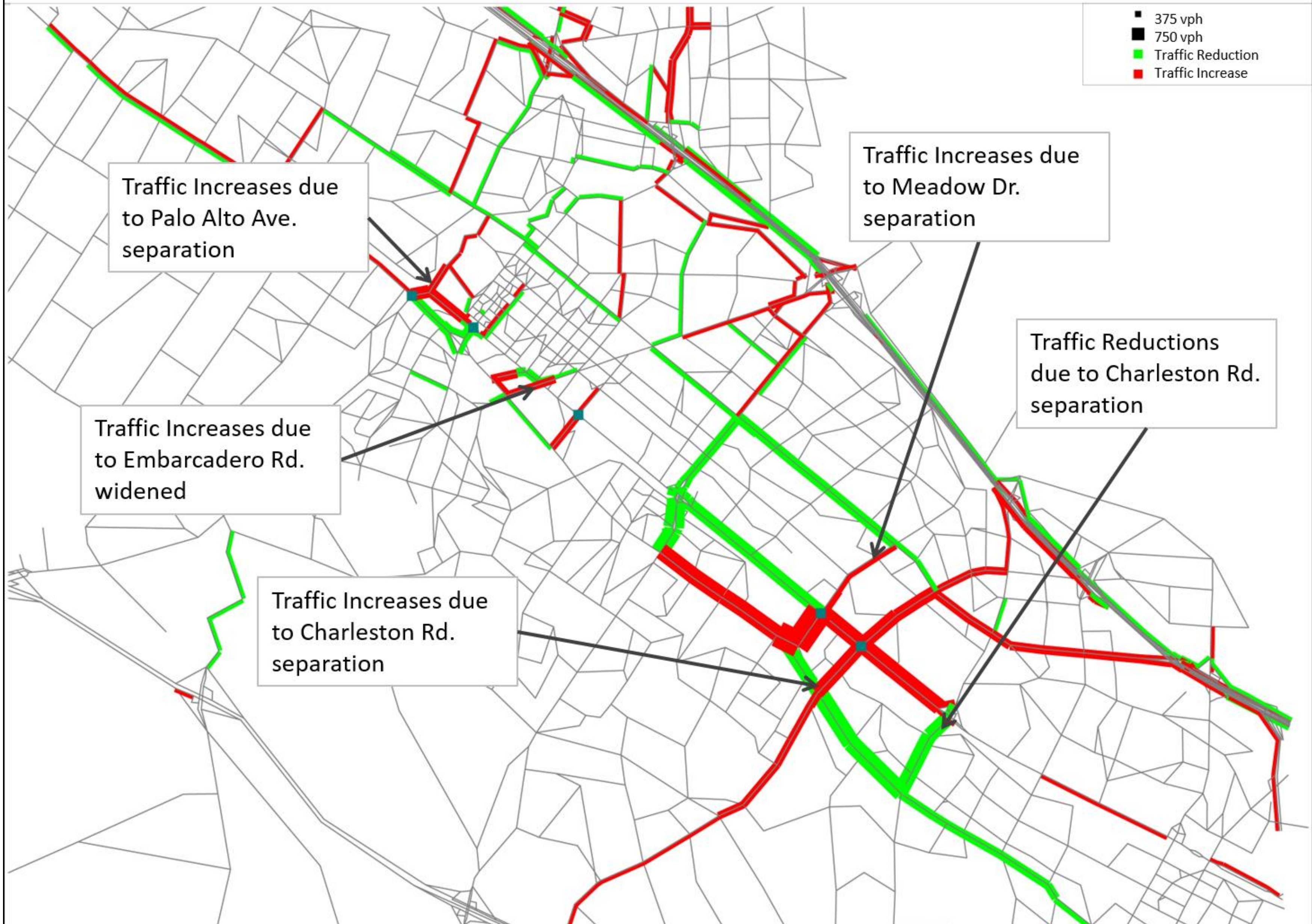
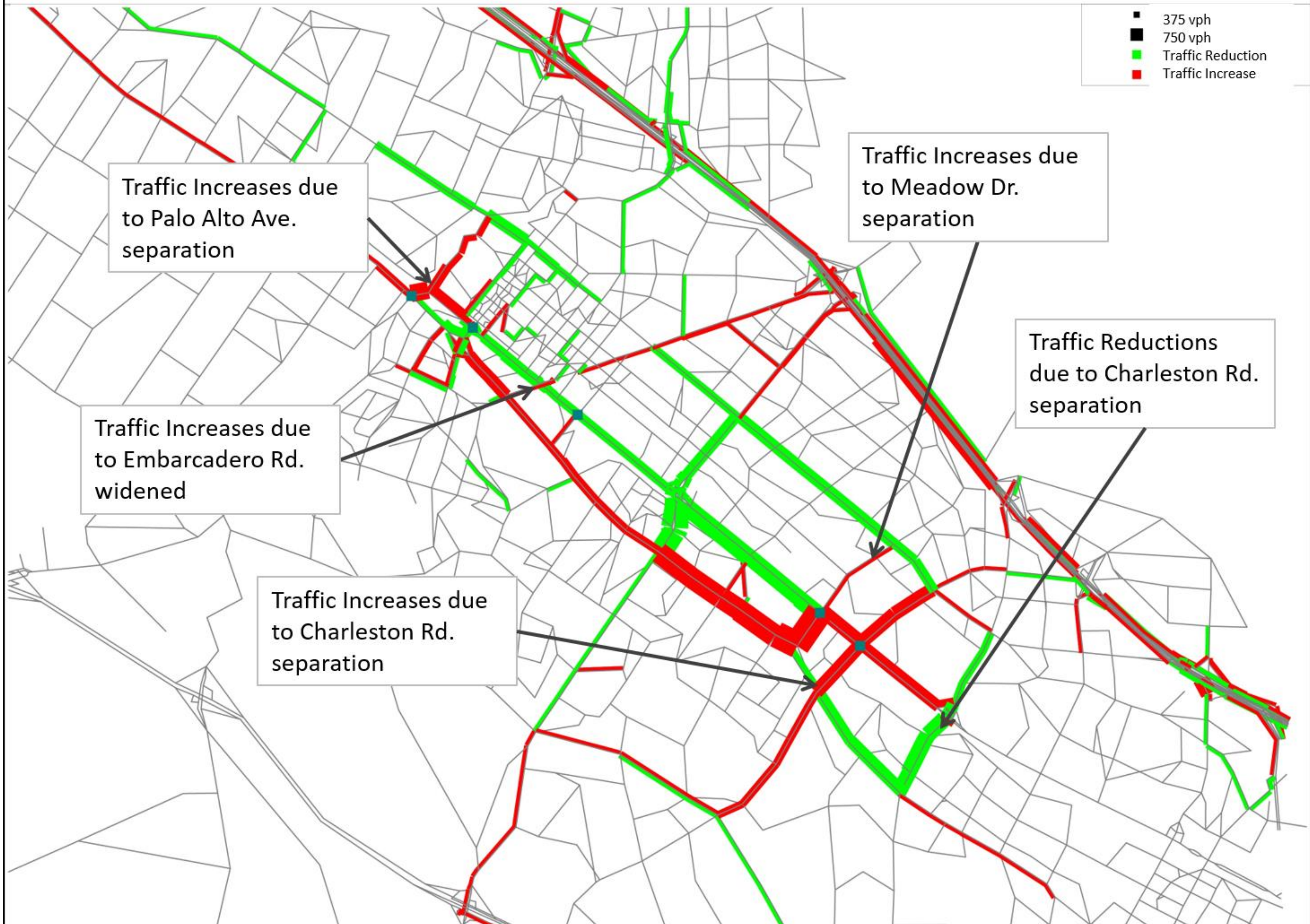


FIGURE 4.12 - 2030 PM PEAK TRAFFIC DIFFERENCES DIAGRAM. SCENARIO 6 V NO BUILD 2



In general, the outcomes of the tests are intuitive with those crossings that remain at grade shedding traffic to either the existing grade-separated crossings or any that will be newly constructed as grade separated. The exception is Churchill Ave which seems relatively insensitive to changes in the layout and functions of the crossings. This may be because Churchill is used for very local trips that are unlikely to reroute without significant inconvenience.

4.12 If the grade separations were to be constructed, then some rerouting would occur from the existing grade separations. Charleston Rd is particularly likely to experience this if it is grade separated; specifically attracting traffic that currently uses the San Antonio Road grade-separated crossing. Charleston Rd and Arastradero Rd corridor is one of the few connecting routes for I-280 and US 101

Sample Scenario 1 is likely to divert the 15% growth in traffic demand from today to 2030, out of the City and divert existing traffic from the routes that are closed to those that are grade separated. This is shown in Figures 4.13 and 4.14.

It should be noted that in Figures 4.13 to 4.16 the increases are compared to current conditions, not to the “No Build Scenario 2.” This gives a perspective to the likely increases compared to today.

4.13 Sample Scenario 6 displays about the highest crossing capacity of the six (6) sample scenarios for vehicular traffic. Churchill Ave is not assumed grade separated, but seems fairly insensitive to change and may not make any significant difference. Sample Scenario 6 is technically equivalent to having the Caltrain track below or above ground for the whole length through the City, from a traffic modeling perspective.

This Scenario attracts some 5% more total crossing traffic than No Build Scenario 2. All routes that are currently at-grade and become grade separated in Scenario 6 will attract significant additional volumes of traffic, as can be seen in Figures 4.15 and 4.16. Much of this traffic reroutes from existing grade crossings, particularly San Antonio Road.

4.14 In Table 3 – a summary assessment of the likely effects of the different proposals for the at-grade treatments are shown, as demonstrated by the model.

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Table 3 - Response of the at-grade intersections to change

Condition / Location	Remain at-grade	Closed	Grade-separated
Palo Alto Ave / Alma St	Little effect	Sheds small amount of traffic to Ravenswood Ave and University Ave	Significantly increases traffic flows. (~30%)
Churchill Ave	Little effect	Considerable diversion to Embarcadero Rd, which if widened could operate satisfactorily.	It is suspected that there would be little effect on other grade crossings, if other separations implemented. Could attract small amounts of traffic.
E/W Meadow Drive	As traffic grows, will shed to Oregon Expressway and Charleston Rd (if grade separated)	Some diversion to Charleston Road; significant if Charleston is grade-separated	Significantly increases traffic flows (~50%)
Charleston Rd	As traffic grows, will shed to San Antonio Road	Not tested but likely to either shed significant traffic to San Antonio Road or reduce traffic overall	Significant increases to traffic flows (50+%). Some diverts from San Antonio Rd.

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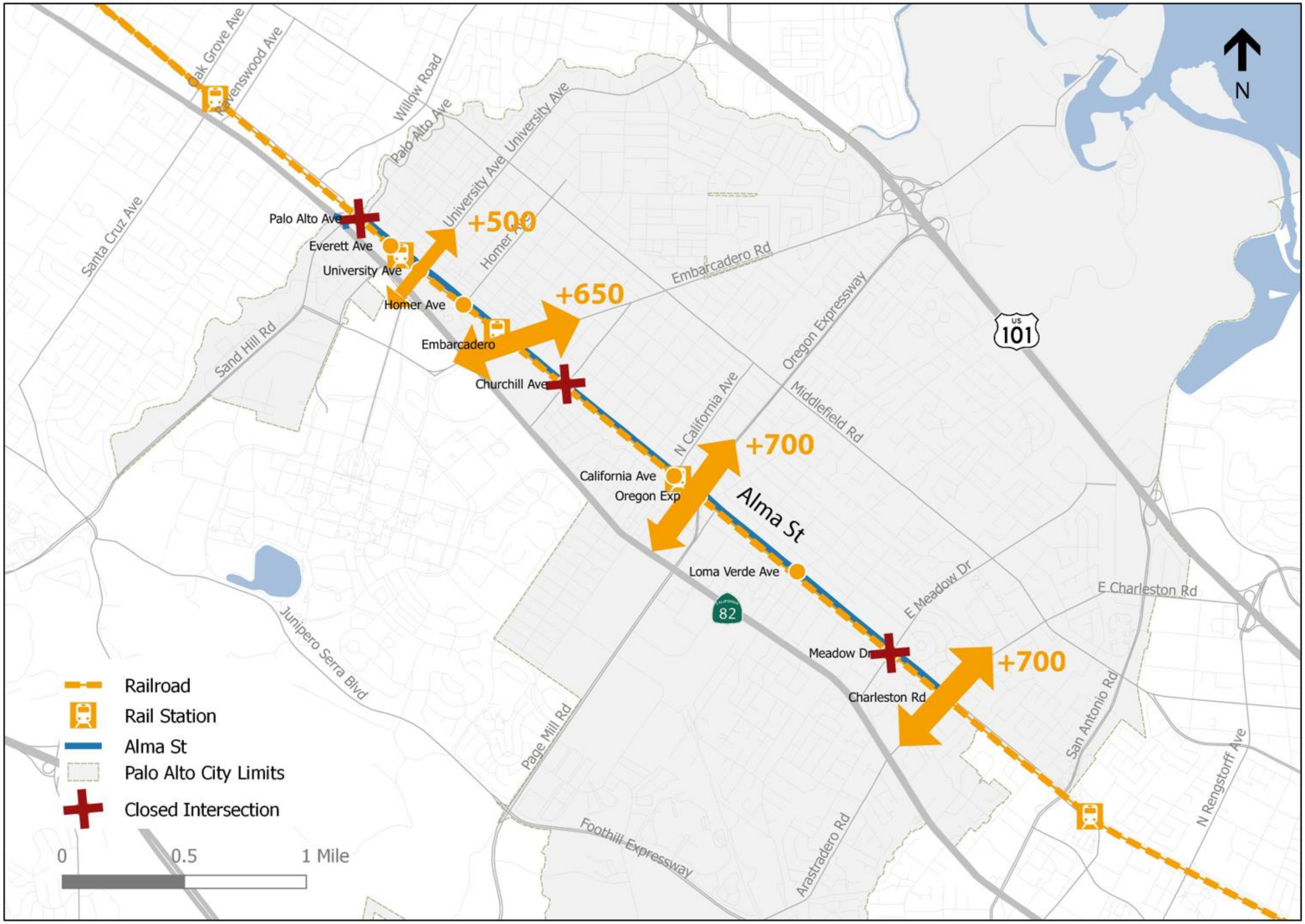

Figure 4.13 Flow Increases From 2017 to 2030 (AM Peak) VPH: All At-Grade Closed Except Charleston Rd. – Sample Scenario 1

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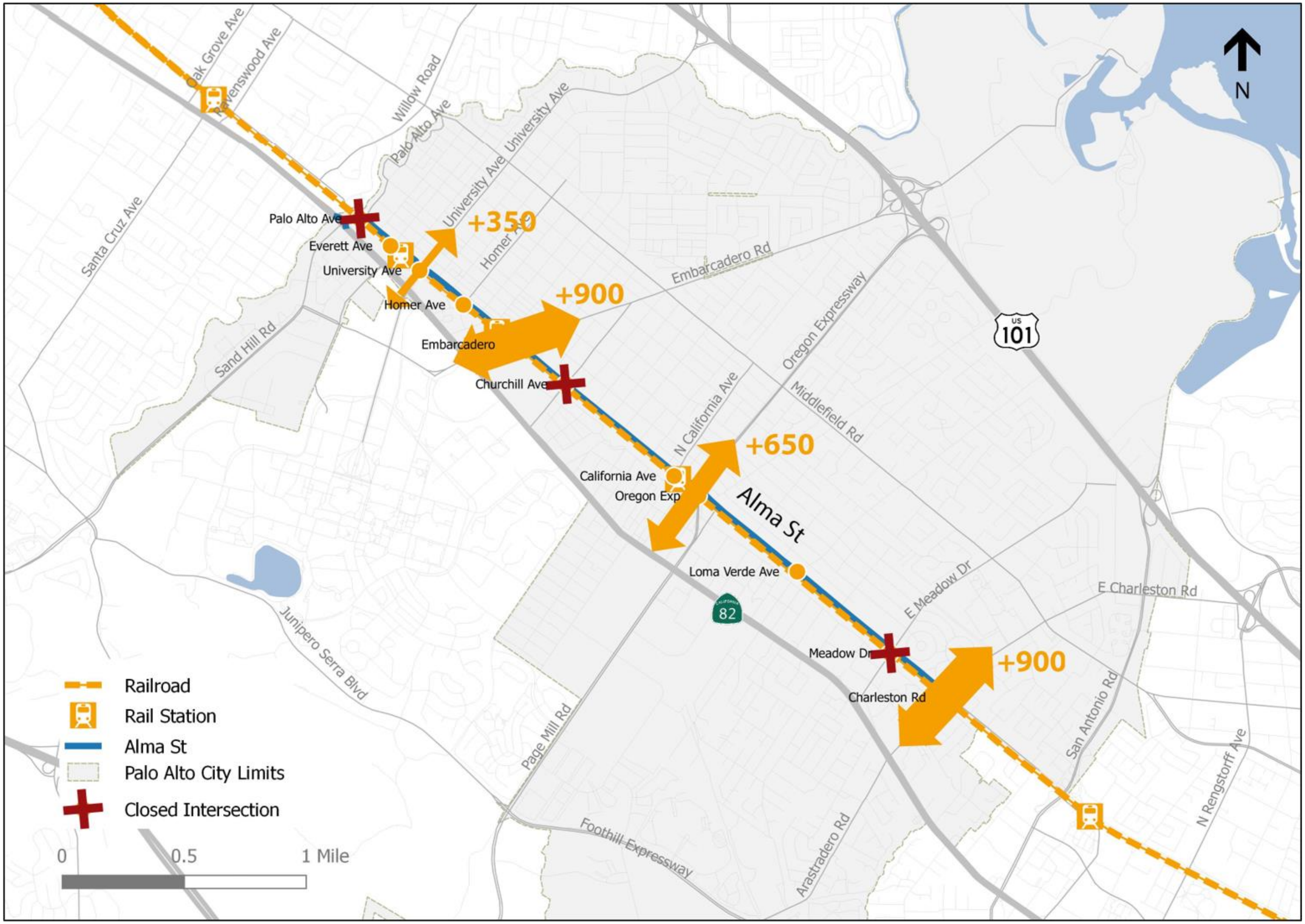

Figure 4.14 Flow Increases From 2017 to 2030 (PM Peak) VPH: All At-Grade Closed Except Charleston Rd. – Sample Scenario 1

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Figure 4.15 Flow Increases From 2017 to 2030 (AM Peak) VPH: Full Grade Separation Except Churchill Ave. – Sample Scenario 6

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Figure 4.16 Flow Increases From 2017 to 2030 (PM Peak) VPH: Full Grade Separation Except Churchill Ave. – Sample Scenario 6

5. Scenario Test Results 2: Intersection Analyses

5.1 GENERAL

This section of the report describes the results of a more detailed examination of the operational performance of the intersections. The computer program Synchro® (version 8) was used for the analysis. For each intersection, the traffic flows surveyed in 2017 were used as input with the addition of forecast traffic growth from 2017 to 2030. The growth was estimated using the travel demand model.

The forecast traffic flows are described below. This is followed by an analysis of the conditions, in terms of traffic delay and queues, that are likely to occur if the Caltrain services are increased to, firstly, Caltrain modernization specification and secondly, to both the Caltrain Modification and high-speed rail specification for train service frequencies. This section then describes the more detailed analyses that have been carried out for the performance of the intersections under Sample Scenarios 1 to 6. Finally, a discussion is included in the results.

5.2 TRAFFIC FLOWS

The intersections analyzed are shown in Figure 5.1. and listed below.

5.3 The following are the intersections that have been examined:

- Palo Alto Avenue/Alma St (unsignalized intersection)
- El Camino Real/Palo Alto Ave/Sand Hill Rd
- Churchill Ave/Alma St
- Churchill Ave/Mariposa Ave (unsignalized intersection)
- Churchill Ave/Madrona Ave (unsignalized intersection)
- Meadow Dr/Ramona St (unsignalized intersection)
- Meadow Dr/Alma St
- Meadow Dr/Park Blvd (unsignalized intersection)
- Meadow Dr/Wilkie Way
- Charleston Rd/Wright Pl (unsignalized intersection)
- Charleston Rd/Alma St
- Charleston Rd/Park Blvd (unsignalized intersection)
- Charleston Rd/Wilkie Way

These intersections were all subject to count surveys in 2017 – as reported and analyzed in the “Existing Conditions Report.”

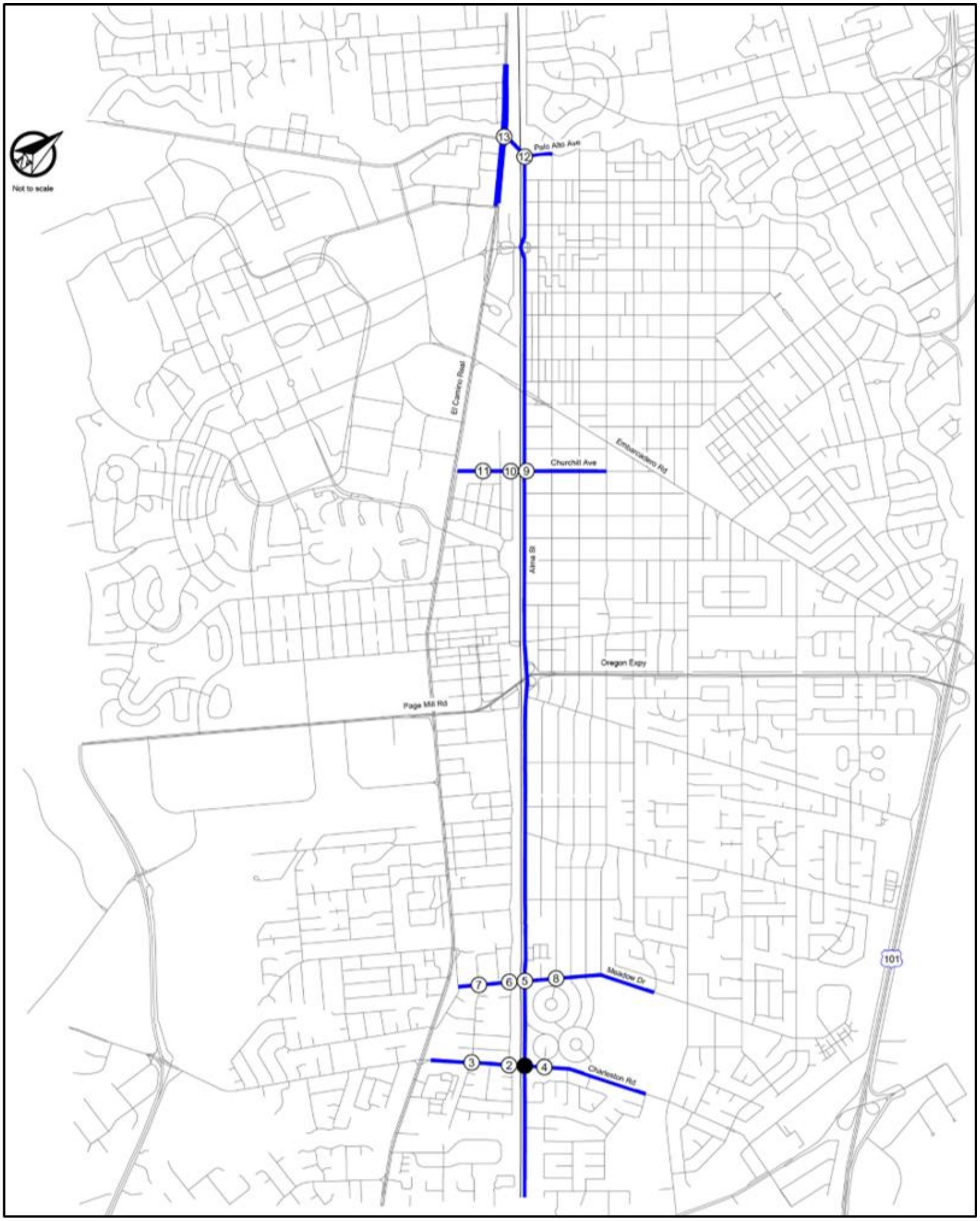

Figure 5.1 Intersections Analyzed on At-Grade Crossing Routes

5.4 TRAFFIC CONDITIONS FOR "NO BUILD" SCENARIOS

Tests were carried out for a number of possible conditions for the future:

2017 - current conditions

2020 - Caltrain Modernization train frequency increases

2030 - Caltrain Modernization and high-speed-rail train frequency increases (No Build Scenario 2)

In Figure 5.2, the average vehicle delays are shown under the three (3) analysis years described above. As can be seen, particularly in the PM peak, delays are forecast to at least double in many cases from 2017 to 2030.

5.5 Figures 5.3 and 5.4 show the likely queue formation for the future year of 2030 in the PM peak for a "No Build Scenario 2" condition. The PM peak, generally, has higher volume of flows than the AM peak. Queues become a more serious issue when they cause gridlock by backing up through intersections that are up-stream (in traffic flow terms) of the intersection under examination. As can be seen, this occurs at a number of the intersections under review and particularly on El Camino Real, which is a major route through the City.

5.6 Table 4 below shows the typical level-of-service (LOS) for the key traffic flows that cross the rail track for the three (3) analysis years at each of the at-grade crossings (as set out above in 5.4).

Table 4 – Level-of-Service of Key Rail Crossing Movements

Crossing	2017	2020	2030
Palo Alto Ave	E/F	F	F
Churchill Ave	E	F	F
Meadow Dr	D/E	D/E	E/F
Charleston Rd	E/F	F	F

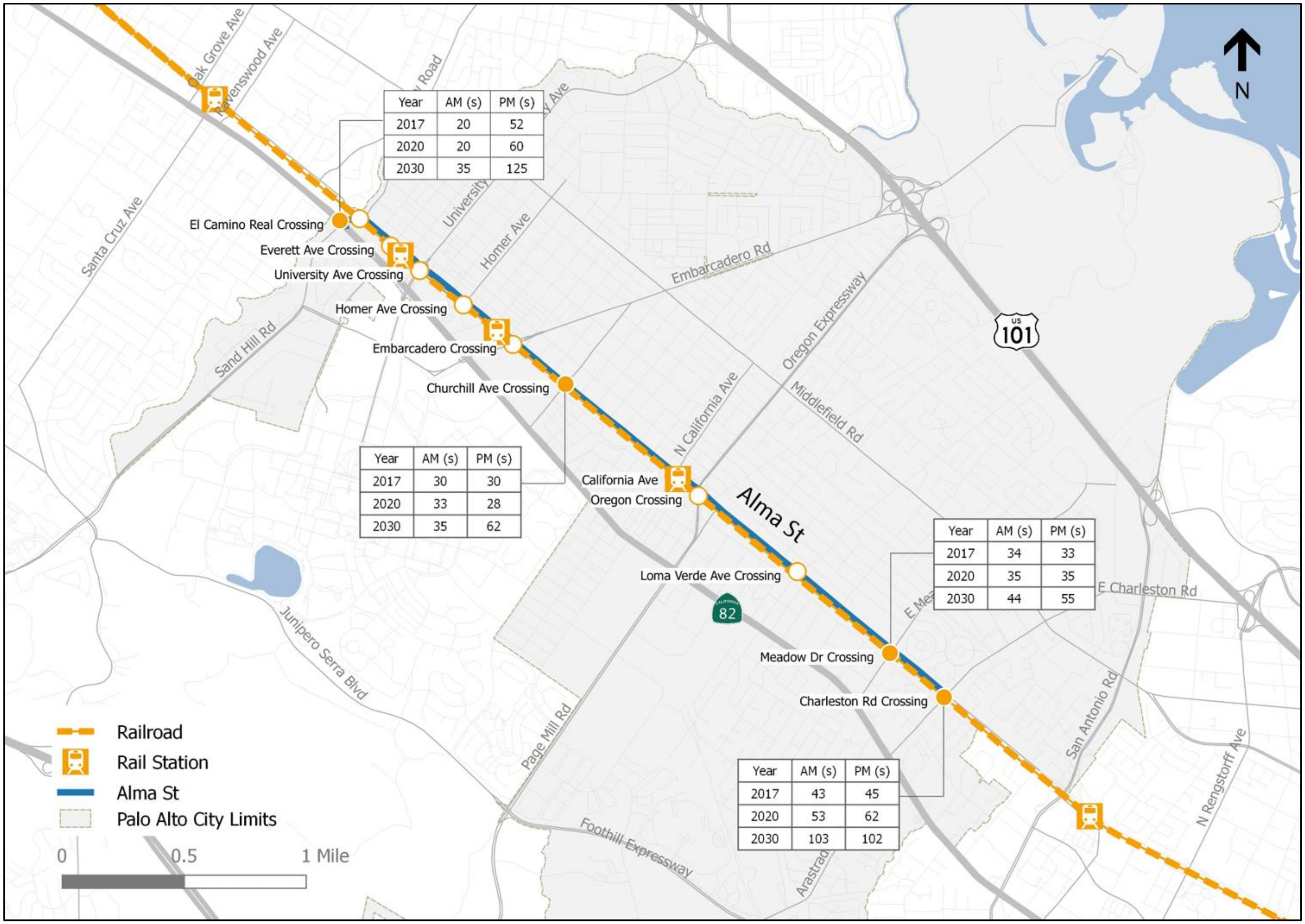

Figure 5.2 Vehicle Delays for “No Build” Condition With Programed Train Frequency Increases

Figure 5.3 2030 PM Peak Period Estimated “No Build” Queues at Palo Alto Ave. & Churchill Ave.

Figure 5.4 2030 PM Peak Period Estimated “No Build” Queues at Meadow Dr. & Charleston Rd.

5.7 TRAFFIC CONDITIONS UNDER SAMPLE SCENARIOS 1-6 AT 2030

Table 5 shows a summary of the motor vehicle level-of-service (LOS) for traffic operations at the intersections analyzed on the Caltrain track crossing routes, that are currently at grade as set out in paragraph 5.3 and shown in Figure 5.1. The LOS is for the times when the rail gates are not closed. For the LOS for times when the gates are closed, Table 4 should be referred to. It should be remembered that the forecast flows into the intersections vary considerably between different scenarios and therefore the LOS will also vary. For example, when an existing at-grade crossing is assumed to be grade separated in a scenario, it is likely to attract more traffic, which then can deteriorate the intersection LOS's on that route. This also means that some routes that remain at-grade will operate at a better LOS during times when the rail crossing gate is open, than when they are assumed to be grade separated. This is usually because traffic is deterred from using a route with an at-grade crossing because of the likelihood of gate closures. When a route that was previously at-grade is proposed for grade-separation, the demand model shows it will attract additional traffic and that additional traffic may cause a deterioration in the operating LOS at the intersections on that route. When future alternative (more detailed) designs for grade operations are carried out, these conditions may well be improved.

Table 5 – Level-of-Service of Traffic Operations at the Intersections on the Rail Track Crossing Routes

Sample Scenarios

Scenario & Time Period / Crossing Route	"No Build" Scenario 2		1		2		3		4		5		6	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Palo Alto Ave	C	C	A	A	A	A	C	C	C	C	C	C	C	F
Churchill Ave	C	D	A	A	C	C	C	D	C	C	C	C	C	D
Meadow Dr	C	C	C	C	C	C	C	C	C	C	E	F	E	D
Charleston Rd	D	E	F	F	F	F	F	F	F	F	F	F	F	F

5.8 DISCUSSION ON TRAFFIC OPERATION ANALYSES

Under the "No Build Scenario 2" condition which assumes maximum increase in train services from Caltrain and high-speed-rail, all of the at-grade crossings are likely to operate at LOS-F for traffic signal phases during which a rail track gate closure is included. With the forecast frequencies of closures, this will occur on an increasing number of occasions during the peak periods (one every three [3] minutes on average). Conversely, if an at-grade crossing remains at-grade, traffic will likely divert to other routes and this may improve the operating LOS for periods when no gate closures occur.

5.9 For routes where currently at-grade crossings are converted to grade separations, additional traffic is likely to be attracted which may deteriorate the LOS for all intersections on that route. This can be seen in Table 5; however, where the all mode closures of the rail crossings at Palo Alto Ave; Churchill Ave and Meadow Dr (Scenario 1) are implemented, it may improve the LOS of the surrounding intersections.

If closures were to be implemented and traffic diverted to existing grade crossings, then the LOS on Embarcadero Rd and Oregon Expressway are likely to operate higher than LOS D. Without widening, Embarcadero Rd in an eastbound direction would likely be highly congested and above LOS D.

5.10 A further consideration is that the actual timings of the gate-crossing cannot be predicted precisely. There is a randomness associated with arrival time of the train within a given time period. This is exacerbated by the fact that the services are two-way operations, each direction having their own frequency characteristics. This may mean that on occasions, the traffic queuing from one signal phase that included a gate closure may not sufficiently recover to a normal non-gate closure condition, before another gate-closure phase occurs for the traffic signal. Conversely, opposite direction trains may utilize one gate closure, resulting in more open gate time within a given window.

5.11 In summary, for those crossing routes that remain at-grade, it is likely that the intersections will operate at LOS F for the times when there is a gate closure. Due to traffic being attracted away from these routes, because of the likelihood of drivers experiencing a gate closure, the traffic volumes on those routes are likely to reduce. This would mean the LOS would improve when no gate closures occurred. However, for the forecast train frequencies in 2030 under the full impact of Caltrain Modernization and high-speed-rail specifications, the likelihood of a traffic signal phase including a gate closure becomes very much higher than today.

For those routes that do have future grade separated Caltrain track crossings, where none exist today, increased traffic flows are likely to occur and thus the LOS at the intersections on that route may deteriorate.

6. Bicycle & Pedestrian Accessibility

6.1 As part of the scenario testing, a variety of different proposals for new bicycle and pedestrian crossings for the Caltrain track were prepared. These are shown in Table 6 below.

As part of any future grade-separated crossings, both bicycle and pedestrian facilities will be fully accommodated within the overall infrastructure designs.

These will be equivalent in access and safety terms to the latest standards and to any of the other newly constructed Bicycle/Pedestrian-only grade separations.

Table 6 - Rail Corridor Circulation Study: Bicycle and Pedestrian Measures for the Sample Scenarios 1-6

Crossing	Existing (No Build)	Sample Scenario					
		1	2	3	4	5	6
		Low Build	Low-Medium Build	Medium Build	Full Build Phase 1	Full Build Option A	Full Build Option B
Everett Ave/Lytton Ave	-	-	B/P	-	-	-	B/P
Homer Ave	B/P	B/P	B/P	B/P	B/P	B/P	B/P
Churchill Ave [1]		-	-	B/P	-	B/P	-
California Ave	B/P	B/P	B/P	B/P	B/P	B/P	B/P
Loma Verde Ave/ Matadero Creek	-	-	B/P	-	B/P	B/P	B/P
E/W Meadow Dr. [1]		-	-	B/P	-	-	-

Key EXISTING

NEW

B/P = Grade-Separated Bicycle/Pedestrian Only
[1] = In close proximity

6.2 The sample scenarios with crossing closures for all modes (1 and 2) if implemented without the provision of pedestrian and bicycle-crossing facilities close by, would seriously deteriorate mobility for those modes of travel. For the No Build Scenario 2 and as it is today, there is a significant gap between Oregon Expressway and Meadow Dr. With Sample Scenario 1, this gap is extended by the closure of Meadow Dr. Added to this, new gaps would appear between Oregon Expressway and Churchill Ave and north of Palo Alto Ave. Sample Scenario 2 is a considerable improvement on Sample Scenario 1 with the addition of new Bicycle/Pedestrian-crossing facilities at Everett Ave/Lytton Ave and at Loma Verde Ave/Matadero Creek. Sample Scenario 2 though, still reduces mobility north of Palo Alto Ave by closing it, and also, marginally between the new Loma Verde Ave/Matadero Ave crossing and Charleston Rd, by closing Meadow Dr.

6.3 Sample Scenario 6 provides the maximum accessibility for Bicyclists and Pedestrians of all the scenarios tested. As all at-grade crossings are assumed grade separated, except Churchill Ave, and all proposed new grade-separated crossings for bicycle and pedestrian are assumed constructed, the overall level of accessibility is very high. This is shown in Figure 6.3. The only remaining at-grade crossing that does not have improved Bicycle and Pedestrian crossing facilities would be Churchill Avenue

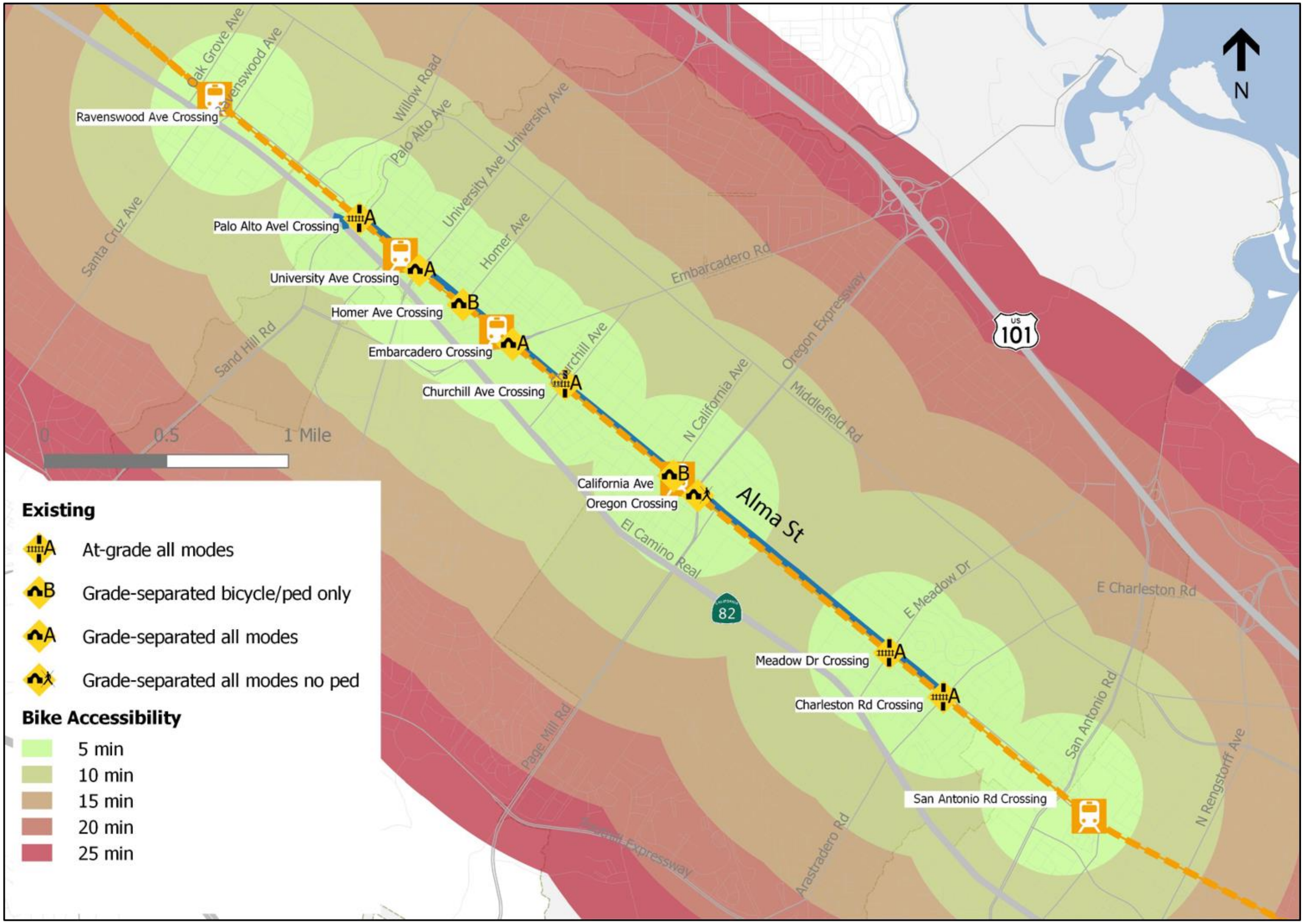

Figure 6.1 Bicycle Accessibility Map: Existing Conditions

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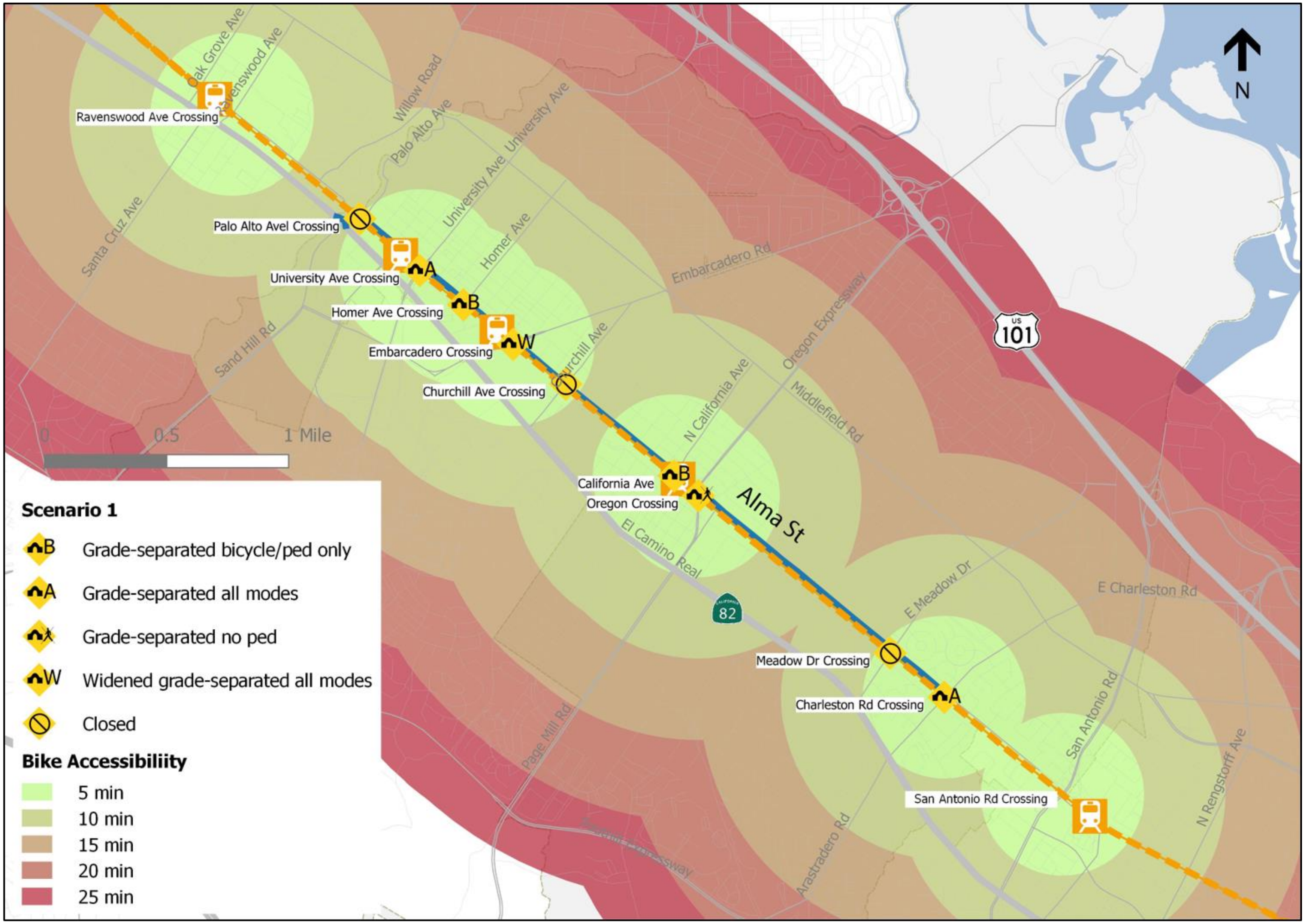

Figure 6.2 Bicycle Accessibility Map: Sample Scenario 1

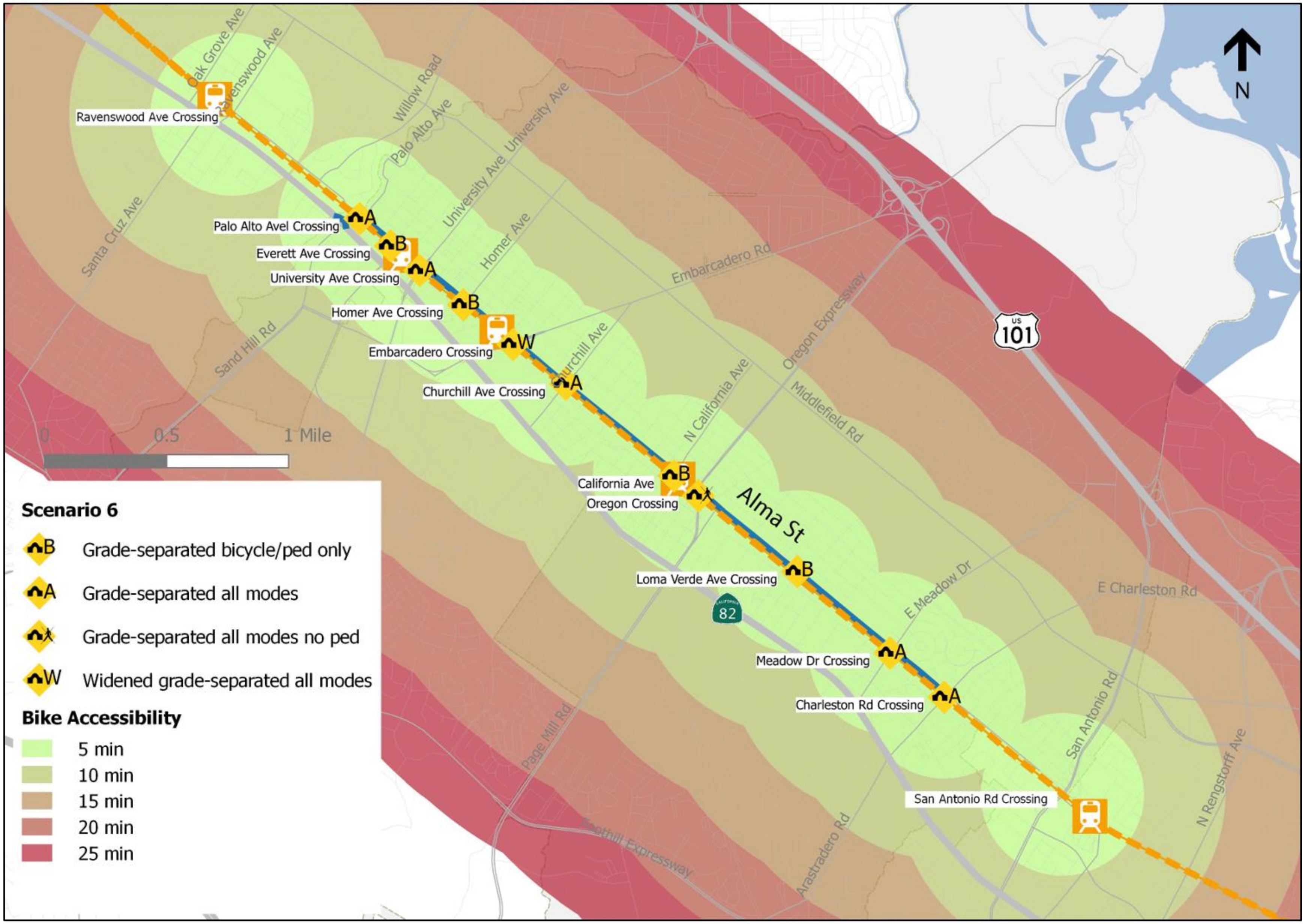

Figure 6.3 Bicycle Accessibility Map: Sample Scenario 6

7. Road Safety

7.1 The Existing Conditions Report, the accident data showed the following in Table 7.

Table 7: Study Area Intersection Roadway Accident Data 2011-2015

Item / Location	Alma St & Palo Alto Ave	Alma St & Churchill Ave	Alma St & Meadow Dr	Alma St & Charleston Rd
Total Collisions	6	30	25	27
Injury Collisions	1	10	11	10
Fatal Collisions	0	0	0	1

Source: SWITRS data provided by City of Palo Alto, 2017

Churchill Ave, Meadow Dr and Charleston Rd all have around the same level of total collisions and injury-related collisions, with one (1) fatality at Charleston Rd. Any new construction to the latest standards, particularly a grade separation or closure, is likely to reduce the potential for accidents.

8. Summary and Conclusions

8.1 The Traffic Circulation Study tests were carried out with the City's Travel Demand Model for examining the impacts of traffic growth and any traffic diversionary effects from the different layouts and combinations of grade separations. Although the number of permutations and combinations of different forms of treatment to the Caltrain crossings are potentially very high, the six (6) representative tests carried out have provided a reasonable picture of what is likely to happen under the most foreseeable/practical scenarios.

8.2 Six (6) sample scenarios were tested that ranged from a very restricted accessibility specification to one with a very high level of accessibility across the Caltrain tracks.

8.3 Total growth in traffic across the Caltrain track crossing from now (2017) to 2030 is forecast to be around 15% under "No Build" condition.

8.4 Under a "No Build Scenario 2" condition (i.e., with the expected maximum of 20 trains per hour during peak periods), the increased delays at the at-grade crossings would cause traffic to divert to the currently grade-separated crossings; particularly Oregon Expressway and San Antonio Rd. The conditions on both of these routes is likely to be worse than LOS D.

8.5 For a situation with the higher level of restricted access (Sample Scenario 1), the test assumed closure of the Palo Alto Ave; Churchill Ave and Meadow Dr at-grade crossings. Charleston Rd was assumed grade separated. For this scenario, the overall 2030 traffic volumes across the Caltrain track within the City would reduce to levels that exist today and the 'growth' would be diverted out of the City.

8.6 Sample Scenarios 1 and 2 would seriously reduce bicycle and pedestrian accessibility across the Caltrain track and, therefore, active transportation mobility in general, unless newly constructed crossings were provided in the same or close-by locations.

8.7 For the scenarios with a number of grade separations replacing currently at-grade crossings, the total 2030 traffic across the Caltrain tracks could grow by more than 20% from today. This means some traffic is diverted in from outside the City compared to a “No Build” conditions.

8.8 In all cases, currently at-grade crossings, if they were to be grade separated, would attract traffic from the existing grade-separated crossings. Charleston Rd and Meadow Dr are likely to attract over 50% increases relative to the No Build Scenario 2 with Palo Alto Ave over 30%. Much of the additional traffic would be diverted from the currently grade-separated crossings. This is likely to improve the LOS on all the existing grade-separated crossings.

8.9 The model shows that the traffic that diverts to be the longer distance traffic, whereby decisions by drivers on changes in routing are made outside the City.

8.10 The more detailed examination of the individual intersection traffic operations shows that under the forecast “No Build Scenario 2” conditions, the intersection at the rail crossings would be operating at Level-of-Service F on an overall basis and could incur at least twice the delay experienced today.

8.11 For Caltrain crossing routes within the City that are assumed to remain at-grade, the traffic flow volumes are forecast to experience little change from 2017, and any additional traffic due to growth diverts to those crossings where there are grade separations. Such grade separations may be the existing ones or newly constructed ones. Thus, the traffic operational conditions for the routes that remain at-grade remain similar to today when a gate-closure does not interfere with the signal phasing. However, for the signal phases where a gate closure does impose on the phasing conditions, the motor vehicle level-of-service drops to F. In 2030 with full Caltrain modernization and high-speed rail train pre-emptions, this would occur a substantial number of times during the peak periods.

8.12 For the Caltrain crossing routes within the City that are assumed to be upgraded from at-grade to grade separated, the traffic volumes are likely to increase substantially. This could cause the level-of-service of the individual intersections on the crossing routes, close to the track, to deteriorate.

8.13 Any complete all-mode closures on the crossing routes will cause substantial reduction in mobility to bicyclists and pedestrians unless either an existing grade-separated crossing is close by or a new one is constructed.

8.14 In the period from 2011 to 2015, a total of 88 accident collisions were recorded, of which 32 involved injury and one (1) a fatality. New construction, either grade separations or closures, are likely to reduce this substantially.